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Machine vs. Hand Drilling in Sinking on the Rand

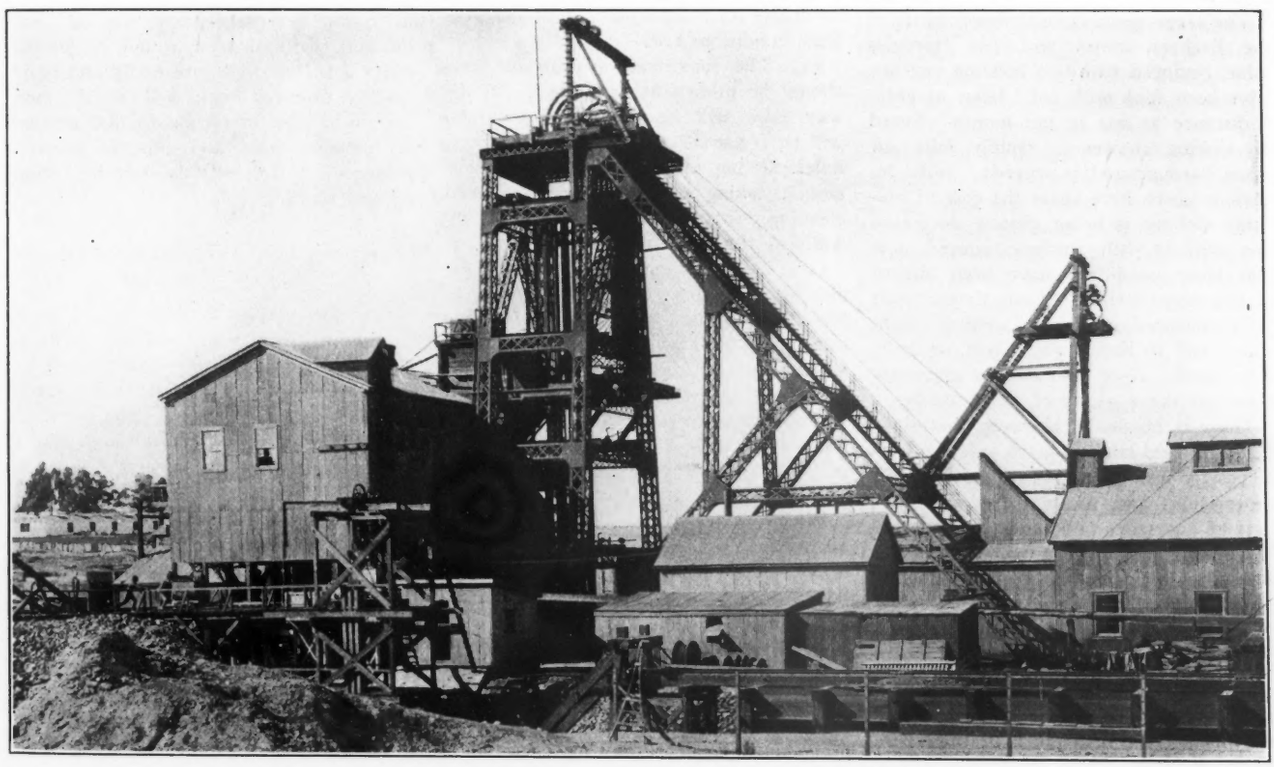
Future Labor Shortage, Attending Industrial Development and Improved Drill Design, Will Cause Machine Sinking to Become Preferable

BY EUSTACE M. WESTON*

At present undoubtedly sinking with hand labor is the most popular method of shaft sinking on the Rand. The natives or Chinese not only clean out the broken rock but also do the drilling, which is mainly double-hand hammer-work; three 8-hr. shifts are worked.

Someone recently writing on the subject has summed up the arguments against machine sinking as follows: "Modern seven-compartment shafts are 46x9 ft. between rock. The shafts of these proportions would call for a large number of machines and their great width would call for very long bars. The hoisting and lowering of so many machines with their gear would be troublesome and occupy much time. A very objectionable feature in connection with the machine drilling of shafts is that the large charges of explosive shake and shatter the shaft walls and render them somewhat insecure; soundness of the walls is essential. Then again, with machine work and the heavy charges necessary when machines are used, the timbering has to be kept further from the shaft bottom, or, if brought fairly close, iron plates are used. It is safer and more convenient to have the timbering close to the bottom. Machine sinking is not so flexible as hand sinking. A miss-fired hole with machine sinking occasionally interferes seriously with the work. With hand drilling this is not so. Another point against machine drilling is the lashing, or cleaning out. The tonnage broken in one round of such holes is so great that the debris is several feet deep. This material packs hard and tight; consequently the cleaning out is more difficult than with hand drilling."

Some of these reasons are good; some are not; but, at present, this represents the general opinion on the Rand. I think there is much to be said in favor of machine sinking and that, with a probable shortage of labor in the future, machine sinking will again be more frequently adopted and will be conducted as economically and, on the average, as rapidly as hand sinking where the amount of hard ground encountered bears a fair proportion to the total footage, especially in case that water proves troublesome. Machine sinking, strange as the statement may seem, has never had an opportunity on this field of competing with hand labor under the most favorable conditions and has not been used to the best advantage for any period long enough to compare average footages in hard and soft rock.



PERMANENT HEADFRAME, NO. V SHAFT, ROBINSON DEEP GOLD MINING COMPANY

Rapid Shaft Sinking on the Rand

Two winding engines are essential to rapid progress, yet the only shaft, sunk with air drills, that was equipped with

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these, was the Village Deep shaft. In favorable ground 150 ft. was sunk in a month. This was the only month I believe in which heavy flow of water did not interfere. Shafts on the Geduld mine were sunk with machines 135 ft. in a month with two skips only. In some of the hardest ground met with on the field the Rand Collieries shaft was sunk with machines 103 ft. in one month, only two buckets being at work. Against these we have the great footages recorded by hand sinking. At the Simmer West mine 203 ft. was sunk in one month. The shaft was about 28x8 ft. between rock. For six months the average monthly distance sunk was 152 feet. The number of buckets hoisted per shift averaged 36. But this would only deepen a 34x9 ft. shaft a little over 110 ft. per month. This shows the important relation, when speed of sinking is considered, that the winding capacity has to the area to be excavated. With only one hoisting engine the whole mine must sometimes wait on one man, who has the bucket delayed in the shaft for some reason.

The large seven-compartment shafts at the Brakpan mines and the Hercules mine, equipped with two hoisting engines, have been sunk with hand labor as great a distance as 204 ft. per month. Speed of sinking, however, rapidly falls off when hard ground is entered. With regard to costs, here again the cost of machine sinking is being greatly decreased and will be still further reduced now that labor conditions have been altered by the recent strike. At one time a shaft shift consisted of one foreman, eight whites and 16 Kafirs when eight air drills were used. Now four whites efficiently supervise the working of 11 air drills.

There is no doubt, however, that sinking with hand labor is much safer and involves far less worry and responsibility in supervision; and, where the ground consists of quartzites and slates of moderate hardness, hand drilling will always remain the favorite method of sinking as long as sufficient labor is available.

The Rand, the Field for a Satisfactory Air-Hammer Drill.

Frankly, here on the Rand we know nothing about shaft sinking with air-hammer drills. We read much of their performance in America. We are told that they can easily beat large machines for shaft sinking. We sometimes see advertisements of the leading makers in our papers and hear of trials at various mines though, I believe, they have never been employed in shaft sinking here. Somehow these drills never seem able to do the work here that they are reported to do in their native land.

I am aware that there are many conditions on the Rand adverse to their employment. There is the miserably low, average air pressure employed in most producing mines. This, I have always contended, is one of the greatest causes on the Rand of low efficiency in drilling. There is also the dust question, which would here practically forbid the employment of types unprovided with a water attachment in boring steep, up holes in which such drills work to greatest advantage.

If, however, any maker thinks he has a machine suitable for shaft sinking, such a machine could be supplied at the Rand Collieries with air at 80 or 90 lb. for shaft sinking. I think I could guarantee that a machine that could drill 3 or 4 vertical holes, 3 to 4 ft. deep, in moderately hard quartzite in 2 to 3 hours, working if necessary with the holes under water, would very soon supersede on the Rand, all others for shaft sinking and would even displace hand labor. The Gordon drill, however, gives some promise of being a success.[1]

Conditions Favoring Rapid Sinking With Air Drills

I must now pass on to a discussion of what I believe to be the conditions most favorable for rapid sinking with machines. Such conditions are:

(1) The maximum quantity of rock should be broken at each blast. In this way time will be saved because there will be fewer delays in loading and firing holes, setting up and tearing down machines, taking out tools and workmen, cleaning down timbers and examining the walls of the shaft after blasting.

(2) By rightly judging the charge of explosive necessary, the rock should be broken to the best size for rapid loading into buckets or skips. However, this size to which the rock breaks, depends largely on the character of the rock. Rock, broken into pieces, weighing from 20 to 200 lbs., is most rapidly placed by hand in buckets, while very fine rock must be shoveled, which takes longer.

Where water is present in moderate quantities, by having a large quantity of broken rock on the shaft bottom several hours of dry shoveling can be obtained. The amount of time lost in dealing with even a moderate amount of water is very noticeable. When the sandstones and quartzites of the Witwatersrand, as is often the case, contain a considerable proportion of talcose and micaceous material, water converts the mass into a pudding-like aggregate that must be dealt with in the right manner or it is very difficult to shovel. In my own experience I found, contrary to the writer quoted, that such ground would settle and pack just as badly after a round of hand-drilled holes have been blasted as after machine-drilled holes have been fired.

Where rock of this character is met with, the best way to deal with it is by lowering a hose at each end of the shaft and attaching to each hose a short blow-pipe. The blow-pipe is stabbed about four inches into the loose rock and the whole mass worked over thus. It is important also to excavate a good sump, the water in which is either pumped or bailed out frequently, so that the level of the water stays below that of the broken rock, thus keeping it partially drained. By these means even the worst setting rock, that is almost hopeless to attack with pick and shovel while water-logged, may be shoveled fairly rapidly.

(3) It will then be obvious that the most rapid cleaning out can be done, when there is a maximum quantity of broken rock on the bottom, which is easily available for loosening with picks and raising into the bucket by hand or shovel. It is always the last 10 or 15 tons of rock spread all over the shaft bottom or partially loosened by the blast, that takes the major portion of the time to clean up and which reduces the average tonnage hoisted per hour. It is obvious, therefore, that if a shaft can be sunk by blasting a "round" every 5 ft., it will be sunk quicker than when a round is blasted every 4 ft., for the more easily and more quickly removed rock will, in the first case, bear a greater ratio to that portion of the rock hard and slow to remove. Besides less time will be lost in setting up and blasting.

Conditions That Influence the Length of Hole to be Used

The question as to what is the most economical length of hole to drill in sinking a five-compartment shaft must be considered in the light of these and other considerations. We must remember first that, where only two buckets are available for hoisting, most of the actual time of the drilling shift is occupied by setting up, taking down and sending up machine steel and such gear as bars, block, wedges, etc. It must also be remembered that, other things being equal, it is economical to drill long holes instead of short ones. Less time on the average is lost setting up; besides, the first few feet of the hole occupy the greater part of the time in drilling, because the hole has to be carefully "pitched," sometimes a long and tedious operation requiring patience and skill; then the hole must be started with a slow-drilling, star-bit of large gage. It takes only a few minutes of drilling to lengthen a hole from six feet to eight feet. It would appear, therefore, that the most economical length of hole must be found by trial. Theoretically the length would be such that it will break clear to the bottom with one loading and firing.

Other factors have, however, to be considered. The longer the holes drilled in the sump, and these are drilled at an angle of 45 deg. to 35 deg. from the vertical, the greater the width of shaft bot-

[1]Since Mr. Weston's article was written the Gordon hammer drill has won the stope-drill contest, fostered by the *South African Mines*, in which the drills competing were mainly of the piston type.

tom that can be bridged, and the less the number of holes required behind the sump holes to give a fair burden between the cut holes and those for blasting out the ends of the shaft. If the space under both hoisting compartments can be left available for the use of both buckets, gear can be more rapidly sent up and down.

The most fatal objection, however, to relying on this method for making the best progress is the fact that, where deep holes are blasted in rock, broken by many jointings, the blasts, exploding first, lift large slabs of rock even from the ground behind them, and so are very apt to cut off or tear out fuses from other holes, thus causing miss-fires.

But in most cases miss-fires can be traced either to defective fuse or to old fuse in which the rubber has rotted so that it cracks when thrust into the holes. Fuse lit out of proper rotation, and water, entering detonators, also cause miss-fires.

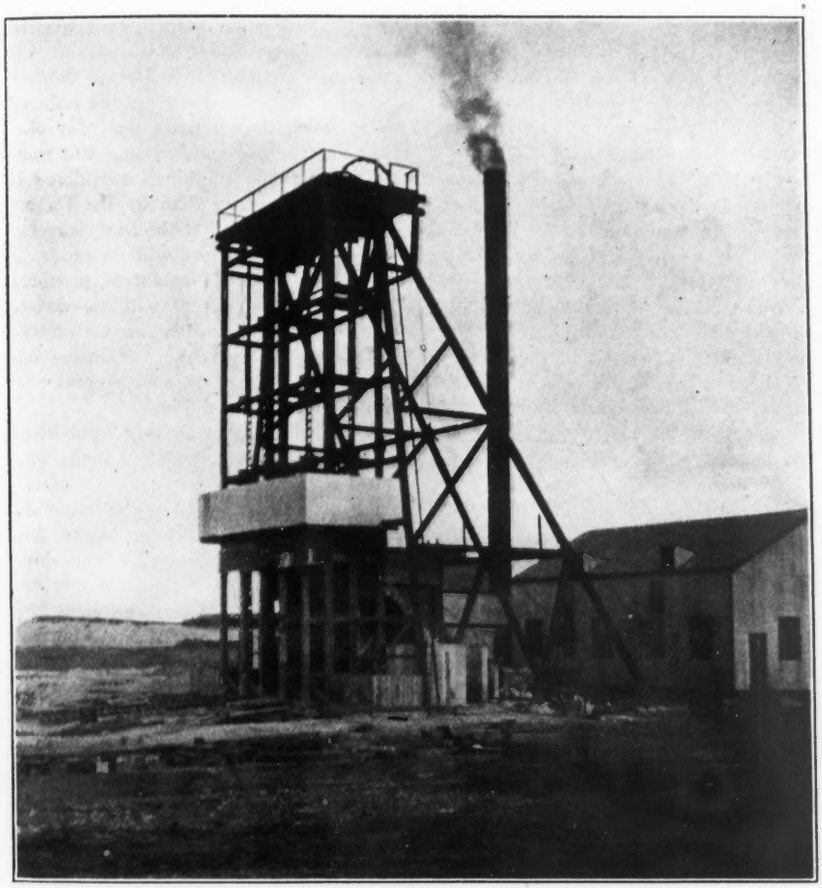
At the Hercules mine the danger of drilling into missed holes is guarded against by making a rough sketch of the shaft bottom before each firing showing the position and direction of holes; this is handed to the foreman on the following shift.

The Most Economical Length of Hole to Use

A certain percentage of miss-fires thus occurs frequently. This means that in many cases a second blast must be made; and in any case, it is impossible to be sure that some stumps of holes will not be left. Of course it may happen several times in succession that all the holes "go" and also break well, but this cannot be depended on in practical work. In these large shafts it has never been found practical to employ electric blasting. Reliance is placed on fuses, the very best quality costing here 11c. per coil of 24 ft. being generally used here. Fuses, 12 ft. long, are used; double fuses are placed in the leading holes, and all are well greased at the detonators. If a second blast has to be made there is, of course, a loss of time involved in finding, blowing out and recharging the old holes. Hence in practice the best length of hole to be employed in shaft sinking will be the longest that can be conveniently drilled.

In five-compartment shafts, about 34x9 ft. between rock, the most convenient length of hole is about 10 ft. for the sump holes and about 8 ft. for other holes. In seven-compartment shafts steel 14 ft. long is used in drilling the cut holes; these lengths of holes mean that the bottom of the shaft is cleaned up once for every 3½ to 4 ft. sunk. It often happens in favorable ground that no second blast is required, but in very tough ground or, when many miss-fires have occured, a third blast may sometimes be necessary.

The practical objection to using cut holes, as long as 12 ft., and followed by the breaking out holes, 10 ft. deep, is that in hard ground the starters would have to be given a greater gage than 3¼ in. and the total weight of steel used would have to be much increased. The gages used at its gold mines by the Rand Collieries, Ltd., are 3¼, 2¾, 2½, 2¼, 2, 1¾, and 1½ inches. Besides, the very long steel used would be awkward to handle and to send up and down while the first charge would be too far down to lift the top half of the burden on the holes.



TEMPORARY, WOODEN HEADFRAME, NO. 2 SHAFT, BRAKPAN MINES, LTD.

Shaft Record, Brakpan Mines, Ltd.

C. B. Brodigan, manager of the Brakpan Mines, Ltd., has kindly furnished me with details of the record sinking accomplished in July, 1907. The shaft was sunk from 1690 ft. to 1894 ft. in 31 working days, making the depth sunk during the month 204 ft. The ground was of course of a soft and favorable nature. The dimensions of the shaft, inside the timbers, are 41x8 ft., or between rock about 43x9 ft.; 33 tons are broken per foot sunk. Hand-drilling has been used entirely. An average of about 48 natives are employed per shift on the bottom. About 50 to 60 natives go down to clean out the shaft; drilling is started as soon as the ends of the shaft are cleaned.

In order that the broken rock will be spread more over the shaft bottom and thus be rendered more readily loaded into the buckets, no benches are cut in the bottom. Three buckets are used for each engine, there being thus always two buckets on the shaft bottom. The natives are employed mostly on double-hand hammer-work. About 42 holes, approximately 5 ft. deep, are drilled per round. The tonnage broken per hole for July was 1.6. The holes are arranged with a center cut.

The equipment at this mine was specially laid out to allow of reaching the reef at a depth of 3700 ft. at a minimum capital outlay. The head-frame shown in the accompanying cut cost about £900 erected. The hoisting engines as before stated are geared engines. The manager claims that, as there must always be some doubt as to the prospects of mines at such deep levels, a temporary equipment for hand sinking, when the rock is of normal hardness, is the most rational and economical method of proving a mine.

The July costs of sinking No. 2 shaft at this mine were remarkable for a seven-compartment shaft. They included all mining expenses, such as cost of super-

intendence and mine office expenses which were divided between the two shafts that were being sunk. The cost was only about £22 14s. per foot; of this about £14 10s. per foot was the cost of sinking proper.

In smaller shafts, sunk by hand, the bottom of the shaft is cut out in benches; holes as deep as 6 ft. are drilled. The Howard shaft was sunk by this method and a three-compartment shaft on a Van Ryn Proprietary mine, in which skips were used, was sunk 150 ft. in one month by Chinese, the bench method being used. Where, however, two hoisting engines are employed, the shaft is sunk with a flat bottom.

One great advantage that hand sinking has over machines, is that with machines the whole shaft must be stopped while wall plates are being lowered. With hand sinking this is done while drilling is going on in the bottom.

Pumping

Water met with in sinking is, when possible, bailed for a time, but as soon as it can be, the water is caught by a water-tight ring in the shaft from which it is piped to a sump and pumped by air or electric pumps to the surface. Electric pumps are becoming increasingly popular. They are generally of the three-throw, ram type. Centrifugal pumps are employed, I think, on only one property. The lifts are from 500 to 2000 ft. On the Angelo Deep there are installed Hoppe pumps with a capacity of 8000 to 16,000 gal. per hour. They are driven by Siemens three-phase motors 50 cycle, 588 r. p.m., developing 100 b.h.p.; current is sent down the shaft in three-core, lead-covered cables. The water is raised 2000 ft. through Mannesman steel piping.

Where, as in sinking the seven-compartment shaft, at the Dreifontein Deep property, a large amount of water is encountered, timbers are kept very close to the bottom. There, two heavy sinking pumps were placed on staging placed on one of the lower sets. The weight of these heavy pumps supported by blocking of the different sets, by the hanging bolts and also by special wire ropes, equipped with a tightening attachment and fastened to the last set of bearers. With hand labor for sinking, the sump was kept at one end under the pump suctions and holes were drilled keeping the sump as a cut. Just before blasting, the suction hose were disconnected and hauled up; the water rose so rapidly that the bottom was covered by several feet of water before the holes went off, consequently the pumps and timbers were not damaged.

For comparison I give the costs of breaking and shoveling rock in sinking the following shafts. The No. 1 shaft at the Rand Collieries and the Kleinfontein Reef shaft were sunk with machines, the others were sunk by hand. No. 1 shaft, Rand Collieries, average for four months, shaft about 34x9 ft.; ground, quartzites and amygdaloidal diabase. The average footage sunk per month was 120; cost per ton 10s. 9d. In very hard diabase, 103 ft. was sunk; cost per ton 12s. 0.2d. In soft shales, 112 ft. was sunk; cost per ton 8s. 5.5d.; Kleinfontein Reef shaft, 34x9 ft. in quartzites, 107 ft. sunk, cost per ton 11s. 7.286d.; Brakpan mines shaft, 43x9 ft., quartzites, 124 ft. sunk, cost per ton 8s. 11.2d.; City Reef shaft 46x9 ft., 125.6 ft. sunk, cost per ton 9s. 2d.; Hercules shaft, 47x9 ft., 119 ft. sunk, cost per ton 8s. 5d.; Wolhuter Reef shaft 46x9 ft., 95 ft. sunk, cost per ton 10s. 6d.

Conclusions

To sum up: Hand sinking in most of the rock met with on the Witwatersrand, is cheaper and quicker than machine sinking. It involves less initial outlay of capital and is somewhat safer.

Hand sinking, however, requires a large supply of good native or Chinese labor. When sinking pumps have to be used, these interfere considerably with sinking by hand.

Machine sinking is on the whole more expensive than hand labor, but less unskilled labor is required and the rate of progress through hard rock is better. With the best appliances, the average rate of progress, when machines are used, should approach that of hand sinking, wherever there is in the shaft a fair proportion of hard rock.

Costs for explosives are bound to be much lower in hand sinking, for the amount of explosive consumed in re-charging and re-firing holes is less than in machine sinking. However, where the shaft is sunk with machines and the sump and bench system is used, the amount of explosive used per ton approximates that in hand sinking.

Considering the shortage of labor, which will increase in the future owing to the repatriation of the Chinese and further development of other industries than mining in South Africa, I feel confident that on the Rand, air drills will rapidly increase in favor for shaft work.

Brazilian Diamond Mining

Consul-General George E. Anderson, of Rio de Janeiro, supplies the following information regarding the great changes in diamond mining in Brazil:

With the installation of dredging machinery at points along the Jequitinhonha river in the State of Minas Geraes, a revolution in the mining industry of the diamond district of Brazil is practically effected, which will probably have an important effect upon the diamond markets of the world.

American capital has obtained possession of practically all the diamond-bearing territory in the Diamantina country. Work on the mines already has led to such a demand for improved transportation facilities that an American engineer has been summoned to take charge of the construction of a highway from the end of the railway of Curalinho to the mining country.

The city of Diamantina, which is the center of the diamond and gold mining activities for that portion of Brazil, is reached generally by two routes. One is by leaving the railroad at Curvello, Minas Geraes, and taking mule train for the three to four days' trip. This route ranges over some very rough country, including two rivers separated by high ridges, the main ridge reaching well toward 5000 ft. elevation where the trail crosses it. It can only be taken by mules or horses. The other route is by leaving the railroad at Curalinho, farther north than Curvello. It can be taken in rough stages and wagons, but perhaps all things considered is a more difficult trip than by the former route. It is stated that the State government of Minas Geraes will extend railroad connections to Diamantina, provided the Federal Government will not do so, but how soon there will be any betterment is doubtful. The cost of transporting machinery and supplies under present conditions is all but prohibitive.

It has been authoritatively established that some of the diamonds originally sold as Indian diamonds came from Brazil. Heretofore practically all of the output of Brazilian diamonds has gone to Europe, chiefly to Paris and London. The shipments to the United States are increasing in number and value, and it is the expectancy of the American interests now investing so heavily in Brazilian diamond properties that they will be able to sell their products direct to American buyers.

It is the understanding in the Diamantina district that the export tax on diamonds, which has heretofore interfered with the sale and shipment of stones, will be modified or removed altogether to the betterment of the trade. The exports of diamonds from Brazil in 1906 amounted to about $310,000, as compared with about $150,000 in 1905, but the figures in neither case even approximate the actual value of stones exported. These figures also include the declared values of black or amorphous diamonds from Bahia, the trade in which is increasing.

Petroleum Exports

Exports of mineral oils from the United States in January were: Crude petroleum, 5,746,334 gal.; napthas, 2,159,016; illuminating oils, 74,794,276; lubricating and paraffin, 12,932,477; residuum, 3,399,627; total, 99,031,730 gal., which compares with 77,904,199 in January, 1907, showing an increase of 21,127,531 gal., or 27.1 per cent.

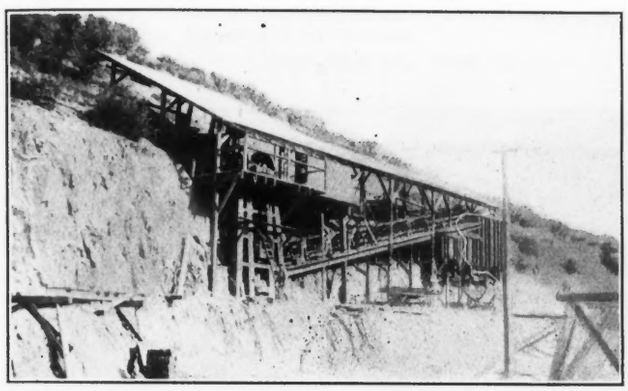
Matte Smelting at Ingot, California

Hot Blast Has Been Found Effective in Treating the Charges Carrying a Large Proportion of Zinc and Little Iron

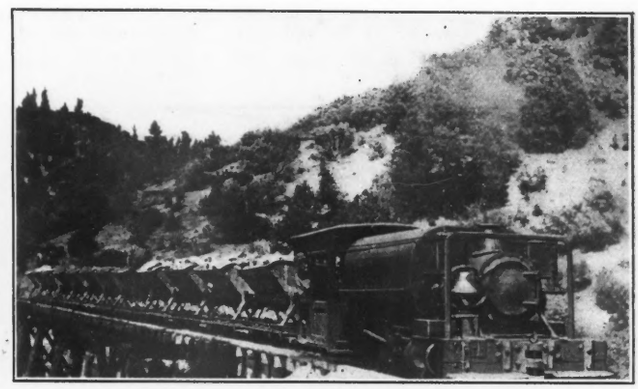
BY W. B. BRETHERTON*

The mines belonging to the Great Western Gold Company are old, well known properties. In fact, one of the claims patented was taken up before 1872. The first attempts at smelting were made with lead to save the silver; this proved a failure. Later other attempts on a larger scale were made with a matting furnace after roasting the ore in heaps.

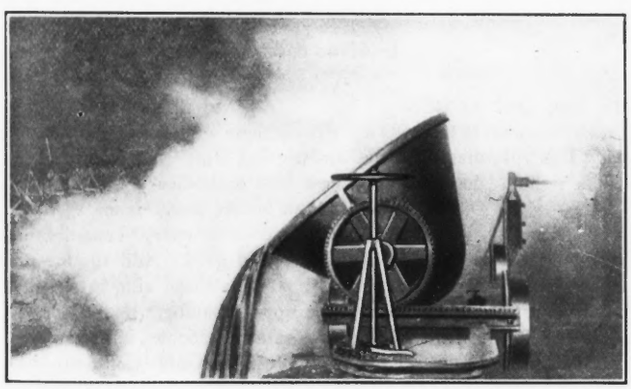
Then the Great Western Gold Company purchased the mines and developed the property with shafts and drifts, proving the existence of large orebodies. A smelting plant with sampling works and general offices was built one mile south of the mines on North Cow creek, and connected with the mines by a 30-in. gage tram road.



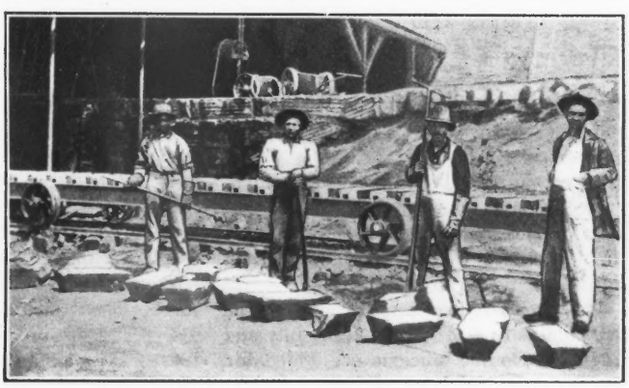
CRUSHING PLANT



ORE TRAIN



DUMPING SLAG



TRUCK AND MOLDS FOR MATTE

Smelting Under Difficulties

It now became necessary to get some returns from the ore piled up in the smelter yard. The blast furnace was started in March, 1905, and made a run of about one week with some roasted ore, left over from the old smelting plant, mixed with the rich slag from the same source. But just as soon as the roasted material was gone and there was nothing left to smelt but raw ore, every attempt at smelting proved a failure. This continued from March until the following July, when S. E. Bretherton was called upon for advice.

Upon investigation, it was found that the men forming the furnace crew had all had experience with furnaces smelting clean copper-iron sulphides, and had been attempting to run the furnace with the ordinary depth of burden above the tuyeres and a very high blast pressure. The result was that each campaign lasted only a few hours, and was followed by several days of labor digging the furnace out.

The ore averaged only 11.6 per cent. iron in the form of a sulphide, and 14.3 per cent. zinc, also in the form of sulphide. It was evident what kind of a slag would have to be made to carry this large quantity of zinc especially if the furnace was carried so full as to form incrustations on the walls, and not hot enough on top to oxidize the excess zinc. The problem was to dispose of the zinc in excess of what the slag would carry; and in this case the slag could not carry the maximum amount on account of the large percentage of barium contained in the ore. For this reason Mr. Bretherton decided to run with a low column of ore above the tuyeres, and a very hot top, which practice has proved successful. The company had a hot blast stove ready for use on his arrival, which was a great advantage. In fact I doubt if these ores could be smelted with cold blast unless roasted first.

The first year's operations here were expensive, due to the limitations of the one small blast furnace already installed, and the old arrangement for handling the ore to the furnace. In the old arrangement the ore had to be handled twice; in

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fact, it required only one man less to handle the 80 tons burden of the one small furnace than we now require per shift to handle 243 tons of material.

The small furnace required a larger percentage of coke than we are using at present, although a hot-blast stove of the same size was employed in both cases. The reason for the large fuel requirement is found in the shape of the old furnace which had a deep bosh on each side, the working shaft widening all the way from the crucible to the feed floor; this allowed the blast and heat to escape too freely up the sides of the furnace, especially with a low ore column above the tuyeres, in time causing the crucible to become chilled unless an excessive amount of coke was used.

Present Operations

At present we are using a blast furnace designed by S. E. Bretherton which, although less than twice as long has three times the capacity of the old one. It is 150 in. long by 42 in. wide, and has 12 tuyeres on a side; the old furnace had six tuyeres and was 96 in. long by 42 in. wide. The new furnace is water-jacketed in one piece the entire hight (three jackets on a side) from the crucible casting to the feed floor, with only slight bosh for a short distance on each side above the tuyeres.

The ore mixture smelted during the five months of April, May, June, July and August, including silicious ore added for flux, gave the following average analysis: Copper, 2.81 per cent.; iron, 11.6; lime, 5.4; zinc, 14.3; sulphur, 20.25; silica, 18; alumina, 5.3; and baryta, 7.4 per cent. In addition to the carbon dioxide which goes with the lime, the ore contains considerable organic matter in black shales. The gold and silver which the ore contains is purposely omitted, for although these precious metals are an important item in the profit balance, they do not enter into the metallurgical reactions in the blast furnace to any great extent. Allowing for the usual losses of zinc and sulphur by volatilization, this mixture yielded the following slag:

COMPOSITION, BLAST FURNACE SLAG.

	Calculated. Per Cent.	Actual. Per Cent.
Ferrous Oxide	18.61	18.4
Lime	20.00	19.5
Zinc Oxide	12.46	12.0
Silica	27.7	28.6
Alumina	9.8	10.0
Barium Oxide	11.38	9.8
Copper	.....	.2
	99.95	98.5

The increase in silica and alumina was due to the ash in the coke. The lime was added as a flux. Of course the analyses given represent a general average; the ores and slags varied more or less from the results shown.

The matte produced during these five months averaged 28.35 per cent. copper and 16 per cent. zinc; this shows a concentration of ten to one of the green or raw ore, allowing a loss in copper of 5 per cent., which our metallurgical records show. Our silver losses average 5.75 per cent. but the gold makes the very heavy gain of 39 per cent., due to the presence of traces not sufficient to weigh in some of the ores treated.

The results show that 40.92 per cent. of the zinc entered the slag, and 11.04 per cent. the matte; the balance, 47.98 per cent., was volatilized. This volatilized zinc yielded a product which should have been saved.

Advantage of Hot Blast

Even with hot blast the percentage of coke required here is rather high, that is, for hot-blast smelting; it amounts to 7 to 7½ per cent. on the burden. We did try to get along with less; but fighting "freeze-ups" was too expensive, and with less coke we could not carry as much blast or as hot a top.

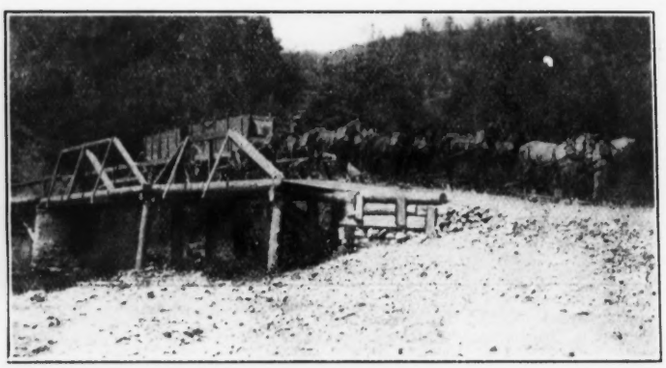
With cold-blast smelting, which we had to adopt at one time before adding our second stove, the lower limit of coke was 13½ to 14½ per cent. on the burden. This additional coke, which amounted to 6 per cent. of the charge necessary when cold blast was employed, decreased oxidation. When we tried cold blast two weeks while our U-pipe stove was being fitted with an additional set of pipes this additional 6 per cent. of coke amounted to 14½ tons in 24 hours. At $22.50 per ton, this represents a difference in favor of hot blast of $326.25; deducting $59 for operating expense and repairs, this leaves a net saving of $267.25 per day in favor of hot blast. In addition, hot blast enabled us to volatilize more of our excess zinc and sulphur and to get the benefit of more iron in the slag.

Since the experience which gave these results showing the great disadvantage of cold blast, we have installed a second hot-blast stove, manufactured by the Risdon Iron Works, San Francisco. This stove has twice the heating surface of the first stove and the cost of construction is less than half as much.

We use more than the usual amount of coke for hot blast smelting, due to the infusible character of the slag, which requires a high temperature.

In the operation of the furnace an ordinary fire-brick-lined over-flow spout with water-jacketed tip of the type, made by the Colorado Iron Works, lasts during an entire campaign of 30 to 40 days without repairs except occasional patching with mud.

UNLOADING COKE INTO BINS



HAULING COKE

A Zinc Mine

The ore which we smelt contains a large amount of zinc, but our richest and largest zinc orebodies are left in the mine. These bodies assay from 25 to 40 per cent. zinc and carry considerable copper, silver and gold. Add to this the 36 per cent. of volatilized zinc in the flue dust in the upper chambers near the base of the stack, and it becomes apparent that the Great Western Gold Company has a zinc property of considerable importance. If a successful plant were installed to treat and save the zinc in the ore, and also to catch the flue dust from the blast furnace, perhaps including a suitable bag house, the metal could be produced on a large scale. One year ago we painted our offices and boarding houses with some of the dust from the flues mixed with boiled oil, used as paint on wood; it is giving very satisfactory results. The flue dust in the first dust chamber which is carried over mechanically rather than by volatilization, does not contain so much zinc, and is more suitable for resmelting.

The company has under construction a

branch railroad 13 miles long to connect Bella Vista, the terminus of the present branch with the mines. This will enable the company to send the zinc ores and products to the market at advantageous rates.

During the five months taken as a basis for the description of the smelting operations here given, the furnace was in operation 128 days. During these 128 days, 2,046,031 lb. of metallic zinc were volatilized, an average of 16,000 lb. every 24 hours.

Iron Ore in Tunis

According to a correspondent of the *Mining Journal*, the companies of Jebel Zrissa and of Jebel Slata await only the completion of the loading quays at Goletta to commence sending their ore to port. Both these mines are in the neighborhood of Kala Senaam and Kala Jerda, and their product will pass over the same line as the phosphates; the capacity of this road will soon be doubled in order to cope with the enormous traffic it will have to deal with.

The Bone-Guelma railway is constructing a line from the Nebeur mines of Djebel Hadid via Beja and Mateur to Bizerta, and its completion has been promised for the end of 1909; but while experience shows that railway work is rarely executed within the specified time, it is certain that at no distant date this country will be shipping from all sources a big quantity of iron ore to Europe. The Nefsa company and the Mokta company have concessions in the north of Tunisia, for the carriage of whose mineral to Bizerta a line is nearing completion.

Oil is one of the chief causes of commutator troubles.

The Iron Ranges East of Lake Nepigon, Ontario*

By A. P. Coleman and E. S. Moore†

Work on the iron ranges east of Lake Nepigon in Ontario was carried on through the summer of 1906. Within the last few years many claims have been staked on these ranges, and a certain amount of stripping and diamond drilling has been done. The work of the authors was in coöperation. The rocks of the region examined include a number of types divided between the Lower Huronian and the Keewatin. At or near the top of the latter occurs the iron foundation of two distinct types, one banded gray and black with silica and magnetite, the other banded red and bluish gray or black, consisting of jasper and hematite. The northern iron range has been traced for about a mile in a general northeasterly direction on the north side of Sturgeon river, but a row of locations six miles in length, extending to the northeast and southwest has been surveyed. The broadest outcrops of the iron formation on this range have a width of 80 paces, some greenish slate being mixed with the banded silica and iron ore. Most of the ore looks black and affects the compass.

SMELTING WORKS, GREAT WESTERN GOLD COMPANY

The Central range is situated about three miles to the south of the Sturgeon river. Here outcrops of jasper and rich or lean hematite have been found in six areas of considerable magnitude, scattered through a plain largely covered by sand and peat bog. From east to west they extend three miles and from north to south their greatest width is five-eighths of a mile. Whether some of these areas are connected beneath the surface is uncertain, but fairly probable. While the width of this formation is unusually great, the banded ore and jasper are generally much interrupted by interbedded gray schists, which often contains a good deal of siderite but must be looked on as greatly diminishing the total amount of iron in the secondary orebodies. In the close interformation available for concentration in bedding of schist with banded silica and iron ore the range presents a feature seldom found in other ranges of the Lake Superior region and one which cannot be considered promising. However, taking into account the great width of the range, three times that of the Helen formation on the Michipicoten, Dr. Coleman concludes that there should still be abundance of iron available for the production of secondary orebodies, although up to the present no large bodies of such ores have been found.

The Southern range, a short distance to the south of the Central range, is not definitely separated from it at the eastern end, where the outcrops are much scattered. It contains enough magnetite to make the compass useless, and with the black magnetite there is also some hematite and a little dull red jasper. There are three prominent outcrops of the iron formation, one west of lake Windegokan, one on Still lake and one northeast of Watson lake, besides a number of lesser outcrops in various parts of the region. A mass of considerable proportions west of lake Windegokan showed on two analyses only 36.75 and 36.56 per cent. of iron as hematite and the best analysis of material from Still lake gave 36.86 iron as hematite. Some of the best samples of the deposit northeast of Watson lake would make ore of low grade, one analysis giving 48.9 of iron as magnetite; but considering the narrowness of the band, the widest part of which is about 35 paces, it would probably not yield any considerable quantity of ore unless magnetic survey might disclose a body not in view.

Speaking of the region generally, Dr. Coleman observes that in the aggregate there is a considerable amount of lean ore with comparatively small amounts of injurious impurities, but generally in narrow lenses, separated by several feet of jasper and schist. The striking of ore at a depth of 414 ft. indicates that the formation is not shallow. Thin sections of the ore show minutely crystalline silica disseminated through the magnetite of the northern and southern ranges and the hematite of the Central range. In the case of magnetite there is a possibility of magnetic concentration, but the feebler magnetism of the hematite would probably render it incapable of concentration by this method. In any case the particles are small and the ore would require fine pulverization and subsequent briquetting or agglutination to makes it available for the furnace.

*Abstract from paper in "Report" of Ontario Bureau of Mines, 1907.

†Geologists, Geological Survey of Canada.

The Commercial Aspect of Rand "Profits"

Failure to Include Capital Redemption and Interest in Working Costs Has, in Many Cases, Made Profits Appear Where There Is Actual Loss

BY GEORGE A. DENNY*

It is no idle expression to say that the mining industry of the Rand is dependent for its future well-being on an expansion of its present basis. I have made some calculations[1] which show that in 10 years the output of the mines now producing will probably have dropped 20 per cent., because about 20 companies, including some of the biggest producers on the fields, will have been exhausted. In order that the present rate of output may be maintained, it will be necessary to bring new producers into operation. The 20 companies which will drop out during the next 10 years, though they contribute approximately only 10 per cent. of the gold output, furnish between 50 and 60 per cent. of the annual dividends. They include the highest grade producers of the field, and practically all of the historic outcrop mines, and when they cease production the remaining mines can only produce half the present total dividends. These outcrop mines must be replaced by deep level companies, and a deep level company owning, say, 200 claims, must necessarily expend about eight times the capital per claim required for a similarly equipped outcrop mine of the same area, the figures in the two cases being, say, £3200 per claim in the case of the deep level company, and £400 per claim for the outcrop company. The dividend possibilities on an equal grade of ore are therefore self-evident.

To the general reader it is not at all clear why the Rand should require a reduction in working costs. If he analyzes the gold returns for June of 1907 he will find the following approximate figures: Total capital of companies producing, approximately, £35,000,000; total share market valuation, approximately, £65,000,000; total declared working profit, £733,000, or per annum, £8,796,000; apparent annual return on market valuation, 13½ per cent.

A return of 13½ per cent., as an average, he would conclude is a satisfactory earning on capital invested in mines, the features and conditions of which are unusually well known. A further investigation, however, would show that the declared monthly "profits" are greatly in excess of the dividends, indicating that a large proportion of it is not "profit" at all. A comparison of the dividends paid by the companies with the working profits declared would show that on the average the dividends are only 70 per cent. of the working "profit." On this basis he could estimate that for 1907 the dividends for the Rand, on the basis of the June declaration, would be in the neighborhood of £6,000,000. A return of six millions on a capital of 65 millions represents an interest return of 9¼ per cent. nearly; so that, apparently, there is still no necessity to complain of the yield, and therefore it would seem that there is no impelling motive for the cry of working costs reduction.

The probable average life of the present producing mines is about 15 years. A prudent investor will therefore calculate his returns over a period which gives a fair margin of safety, say, 12 years. The proposition then resolves itself into the computation of the "present value" of £6,000,000 per annum for 12 years, calculating interest at 8 per cent. and redeeming capital at 3 per cent. This amount will be found to be approximately £40,000,000 sterling; that is to say, the safe purchase price of the producing mines of the Witwatersrand to-day is approximately £40,000,000, while the share market quotation is approximately £65,000,000, or 62½ per cent. in excess. The importance of the question which is agitating the Rand to-day can now be appreciated, because even what are considered as low share quotations are not justified, if the conditions we have stated be insisted upon.

Working Costs

In order to understand thoroughly the position, it is necessary to enumerate the items which are included in the working costs. The generic heads are: Mining, reduction, general expenses. A summary of the working costs items would be somewhat as follows, based upon the tonnage milled: Mining, 12s.; milling, 3s. 6d.; cyaniding, 3s.; general mine expenditure, 1s. 6d.; mine development redemption, 2s.; head office expenses, 1s.; total, 23s. per ton of ore milled (excluding 10 per cent. Government tax.) An investigation of the subject would disclose that no allowance, other than for mines development redemption, is made for the return of capital, and in order to find the incidence of fair charges for interest on capital, and its redemption in the working costs, the following example of a very usual case is shown: Share market valuation of a company, say, £1,000,000; life, 10 years; dividend, £140,000 per annum; tonnage treated, 350,000 per annum; working costs, 23s. per ton.

We have now to add to these the item of redemption of capital, figuring this at an amount which when compounded annually for 10 years, will replace the full share valuation of the company.

Redemption fund for 10 years at 3 per cent. compound interest on a million sterling equals £87,200 per annum; or 5s. per ton on 350,000 tons milled. Thus the actual cost is 28s., and not 23s., as would appear from the ordinary statement of costs. If on top of this it is assumed that 8 per cent. per annum represents the minimum rate of interest demanded for a mining investment, there is an additional £80,000 per annum which must be added to the working costs, resulting in a charge of 4s. 6d. per ton on 350,000 tons milled. Turning now to the dividend annually distributed by the company, when redemption and interest are not considered, we find that the dividend is £140,000. But when mining rates of interest, and redemption fund, are taken into account, it is shown that £167,000, approximately, per annum must be divided.

I am perfectly aware that this will introduce an entirely new factor into statements of cost; but, after all, a statement of cost is supposed to predicate a statement of profit, or loss; although this is in no case true of the Rand mining companies' statements.

Capital Redemption

Mining, even of the safest character, is hedged around with many and various uncertainties, and even if the value of the ore is regular, and the deposit unaffected by dikes and faults—which is rarely experienced—extraneous conditions and events, such as wars, strikes, etc., may create heavy losses both directly, because of destruction or damage to property, or indirectly, because of interest losses.

To insure himself against these possibilities, the mining investor should satisfy himself that the "life" of the mine, as computed by the responsible technical advisers of a given company has been fully conveyed to shareholders (because it sometimes is not), and he should calculate his capital redemption payments accordingly; but in no case should he per-

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Note—Abstract from a pamphlet reprinted from the London *Mining Journal*. Further extracts from this pamphlet will be published in subsequent issues.

*Mining engineer, London, England.

[1]Since these calculations were made the Rand engineers have arrived at figures quite confirmatory, and presented them before the Labor Commission.

mit the capital replacement fund to accrue over a longer period than 10 years. He must also invest the redemption fund at the most secure, and therefore the lowest, interest-paying securities, and in any case never calculate to replace capital at a higher rate than 3 per cent.

The rate of interest he should require on his investment must be one commensurate with the risk, and in any event not less than 8 per cent. per annum—this minimum having been recently stated by a magnate before the Labor Commission.

Assume the case of a shareholder who has invested £1000 in a sound dividend mine with a probable life of over 10 years, reasonably assured. What is the minimum annual amount which the company must pay him to satisfy the conditions previously prescribed?

The interest charge amounts to £80 per annum, and the capital redemption contribution to £88, or a total of £168 per annum. Assuming that 1000 shares had been purchased for the £1000 invested, and that the shareholder received £168 per annum for 10 years reasonably assured, the shares would be worth par.

Let us take, for example, the case of an actual deep level company, the shares of which are quoted to-day well above par, and subject its operations to the test previously prescribed. The company was formed in 1894, and has therefore been in existence over 12 years. It spent before commencing to produce gold, approximately, £625,000. To have redeemed its capital, even on a basis of 15 years' life, and paid 8 per cent. for interest, it should have yielded since its inception an annual dividend of £83,600, amounting in the 12 years of its existence to £1,003,200. It has actually paid in that period less than £200,000 in dividends; therefore the losses at present stand at the appalling amount of over £800,000. The declared working "profits" amount to, approximately, £380,000, so that in any case the dividend has only been at the rate of 52½ per cent. of the working "profits." In other words, it has been necessary to appropriate for the uses of the company about £180,000, presumably for re-investment in its business. The question is, by what amount working costs would need to be reduced to make good the company's past losses? Even if a reduction of 10s. per ton were made, its losses cannot be recouped.

There does exist in almost all the mine accounts an item called "Mine development redemption," which, however, is treated in so extraordinary a manner by the majority of companies that its real bearing cannot easily be ascertained. One group of mines, for instance, commences production after having spent in shafts and mine development, in some cases, several hundreds of thousands of pounds. Thereafter it theoretically develops as much ore as it mines, and charges the outlay in the current "working costs," the reserves, supposedly, not being entrenched upon. But it makes no attempt to redeem the hundreds of thousands of pounds which have been spent prior to the producing era, nor to pay any interest thereupon. For the purposes of the original shareholder, therefore, the "profits" declared by that group must first be subjected to interest and redemption charges; otherwise the capital sum, plus interest, must be regarded as lost.

Take an actual mine, for instance, which has expended approximately £300,000 on shafts and development at least 12 years ago. In the ordinary course this sum, if invested in a 3 per cent. security, and allowed to accumulate, would now have reached a total of £428,000, and be available for distribution. That amount, at least, therefore stands unredeemed and unrecognized, to the debit of mine development account. As the mines are "wasting assets," the burden of such charges becomes greater and greater year by year, and the mine becomes correspondingly less and less able to sustain the burden. Where, then, does it end? I leave the investor who is drawing "profits" to calculate for himself.

Interest Charges

This leads to a consideration of what charges are inevitably involved in these undertakings, and what is the incidence of these charges. In other words, what are the *actual* as opposed to the *partial*, working costs.

To follow this more easily it is advisable to take the case of an average Witwatersrand deep level mine, and compare the position with the charges *all in*, to that when the "profits" are declared without reference to interest and capital redemption.

Rand Practice—Interest on Capital and Redemption Ignored: Cash actually expended, £1,000,000; dividends, say, 80 per cent. of working profits = 8 per cent. per annum = £80,000; total dividends received after 10 years, £800,000. Result: Apparent dividend of 10 per cent per annum on capital. Actual loss, £200,000 and interest on £1,000,000 for 15 years. (Ten years productive, and five years initial stages.)

Real Working Costs—Charges All In: Cash actually expended, £1,000,000; interest demanded: 8 per cent. per annum, and fund for replacement of capital, 3 per cent. in 10 years; unproductive period (shaft sinking, development, and equipment), five years; amount of £1,000,000 in five years at 8 per cent. compound interest (approximate), £1,470,000; annual dividend required (on an outlay of £1,470,000), £246,000; dividend received after 10 years, £2,460,000. (The last instalment has to be added, and to accumulate before the total capital sum is repaid.)

An examination of these two instances will show that in the first case the shareholders would only have received £820,000 for £1,000,000 invested—that is, they would have lost £200,000 of capital and 8 per cent. simple interest on £1,000,000 for 15 years, i. e., the sum of £1,200,000.

In the second instance, the annual dividend demanded is more than treble that the shareholders would have received in the first case, but the two positions are radically different; for whereas in the first case shareholders, as a result of their operations, will have lost £200,000 of their capital and £1,200,000 interest, in the second they will have received a steady 8 per cent. interest for the use of their money, from the time the company was formed, and have practically repaid the whole capital sum ventured in the undertaking.

The second instance taken, it must be remembered, is calculated upon a par basis; therefore if the investment of £1,000,000 is represented by a share capital of 1,000,000 shares, each share would be worth £1. In the first case taken, the £1 shares would only be worth, on the same basis for parity, say, 6s. 6d. per share showing a capital loss of 13s. 6d. per share.

These simple instances will make it clear how vitally important it is that a shareholder should consider the incidence of the interest and redemption charges; and how easily he may be misled by statements of "profits" in which the full working costs are not considered.

We have, however, by no means exhausted the burden of interest charges, one of the most important of which is that relating to the accumulation of interest on capital embarked in deep level undertakings. In the average deep level mine it may be taken that at least five years will be occupied in reaching the producing stage. Let it be assumed that the company will spend £1,000,000, which will be required as under: 1st year, £100,000; 2d year, £150,000; 3d year, £200,000; 4th year, £250,000; 5th year, £300,000.

These amounts must bear interest at the rate demanded for the investment—viz., 8 per cent. Interest will, therefore, accumulate at the rate of 8 per cent. for five years, after which time it is assumed the mine will have entered the producing stage.

A million pounds at 8 per cent. compound interest amounts in five years to £1,470,000, approximately. The interest burden, therefore, amounts to £470,000.

It may be assumed as a set-off to this amount that the capital called up would remain on deposit at 4 per cent., the annual amounts for the exploitation of the property being withdrawn as required. The accrued interest would amount to, approximately, £103,630, which sum deducted from the accrued interest on the capital at 8 per cent.—viz., £470,000—leaves a debit balance of, say, £366,000. This latter amount is therefore an extra

charge upon the property when production will have begun, making the total capital involved £1,366,000.

This amount of £1,366,000, and not the sum of only £1,000,000, is what the mine must pay interest upon and redeem. The difference in the annual dividends required in the two cases on a 10 years' life, and the same charges as previously assigned, would be as follows: Annual dividend for interest and redemption fund when only the actual expenditure of a million pounds is taken into account, equals, £167,200; total payments in ten years, £1,672,000; annual dividend for interest and redemption fund when the proper amount of £1,366,000 is taken into account, equals, £228,400; total payments in 10 years, £2,284,000; loss to shareholders by improper method, £612,000. (In these calculations it is assumed that the annuity is not "fixed" at the lower basis.)

There is yet a further aspect of the incidence of the interest charges—viz., that which is created when the period of production is deferred.

Deferred Dividends

The stupendous losses to shareholders, as from this aspect, when large amounts of capital are involved, are such that were they fully realized the policy of "husbanding the company's resources" which is so often announced to shareholders in excuse for inactivity, would in most cases be altered to one which would cause an immediate redistribution of the available assets.

For the purpose of illustrating the effect of deferring production, the following conditions may be assumed: Total capital involved, when production should have begun (as before), £1,366,000; estimated life of the mine, 20 years; annual dividend required for 20 years on the basis previously assigned, on the sum of £1,366,000, £160,000. This sum of £160,000 we will assume to be a fixed annuity.

Now, let it be taken that the dividends have, for one cause or another, been deferred for a period of three years. Amount of £1,366,000 at 8 per cent. for three (deferred) years, £1,721,000. The annuity of £160,000, be it observed, remains unchanged, and represents 8 per cent. interest plus redemption fund, on the capital sum of £1,366,000. By deferring dividends, however, the capital sum has been increased to £1,721,000, and therefore the annuity represents a much smaller interest earning—viz., only 5½ per cent., as compared with 8 per cent. when there was no deferrence.

Looking at the proposition in another way, it is obvious that if the dividends had not been deferred, the capital involved would have been £1,721,000, minus £1,366,000, equals £355,000 less in amount, and as the dividend in each case is the same, it follows that the deferrence has involved an additional cost of £325,000, which otherwise might have been utilized in another investment.

The actual loss, therefore, is the simple interest on £355,000 for 20 years at 8 per cent., or the sum of £568,000.

If this loss accrues when dividends are deferred for only three years, it is easy to estimate the piled-up losses of those shareholders who put their capital into mining companies formed 10 or 15 years ago, and still inactive, or, if active, non-dividend paying.

Economy in Capital Cost

These then are the losses which really matter, and they furnish adequate reason for the depression in the Rand mining industry to-day.

They represent the amounts which the shareholders expected to receive as profits and replacement of capital, and I think it will be admitted, the scope for saving in these must quite overreach any possible reduction in the "working cost."

I do not pretend to believe that the recognition of the proper incidence of interest charges can favorably affect the bulk of the existing producing mines on the Rand, unless under some such scheme as I have suggested in another and later paragraph. On the contrary, the application of these principles would show that many so-called "profits" are, if properly construed, in reality serious losses, and that many companies declaring these so-called "profits" can never hope to extricate themselves from their financial burdens, or to earn one penny of legitimate profit.

Mining in the Transvaal

Special Correspondence

There has been lately a general revival in the share market, both in Johannesburg and London. The dividend-paying gold stocks have advanced considerably, and have carried some of the rubbish upward also. On the whole there is a cloud over the diamond market, as the outlook for diamonds is distinctly bad.

The general advance in the dividend-paying gold shares is explained by the steady reduction in working costs, with a consequent increase in profits. As the bank rate in London will be reduced shortly, money seems to be less tight and people are disposed to get shares which are giving fair interest. Whether the public will go in heavily for Rand shares now remains to be seen. The element of speculation has been reduced to a minimum, and anyone buying these shares knows fairly well what interest he will receive.

The success of the Gordon drill in the recent competition held on the Robinson mine has something to do with the better feeling. The enthusiasts seem to believe that this machine will solve the labor problem, and that when it is working on a large scale, a great reduction in the number of Kafirs required to work the mines will be obtained. That the Gordon drill will have considerable success is probable, but whether it will accomplish all that some people claim, is very improbable. As there is a satisfactory supply of Kafir labor just now, the demand for the Gordon drill will not be as great as when labor becomes scarce.

The number of coolies on the Rand is growing less. On Dec. 31 there were 35,676 Chinese at work on the mines of the Transvaal. No difficulty is being experienced so far in replacing the time-expired coolies. Much more attention is being given to the Kafirs than formerly, and no doubt the better treatment they now receive will increase the popularity of the Rand. There are many reasons why the native labor supply should be so satisfactory just now. The depression all over South Africa is forcing the natives to work, and as the diamond industry is also depressed the Kafirs must come to the gold mines for employment.

One of the famous mines of the Rand, the Bonanza, is just about finished. The mine has lasted at least two years longer than was anticipated. The reduction plant will not stop turning out gold, however, for the Robinson Central Deep, an adjoining mine, will take over the plant. For some time this arrangement has been known to the public, and no doubt accounts for the high price of the shares on the stock exchange of Robinson Central Deeps.

The December gold output establishes a record for the Transvaal. It needs to be pointed out, however, that the December output benefited to the extent of 38,678 oz. reserved gold transfered to working profit. The output for the whole of the Transvaal comes out at 583,526 oz., of which the Rand contributed 562,684 oz. During the month the total number of stamps running was 8741, of which 8383 were on the Rand.

Provided a sufficient labor supply is obtainable, the outlook for 1908 is good. Every economy is being made on the Rand, and it is possible that this year will see the working costs reduced below the present figure, $4.80 per ton. The men at the head of affairs feel somewhat worried over the outlook for native labor in 1908. Just now the supply is adequate, but they fear a shortage in six months or so. Whether the Gordon drill can make good this shortage remains to be seen. If it is a success on a large scale fewer Kafirs will be required to break rock in the stopes.

A bulletin of the Department of Agriculture states that the passivity of iron in regard to rusting produced by immersion in solutions of chromates, chromic acid or bichromates is probably not due to a protecting oxide film but to a film of oxygen.

Some German Overhead Tramways

Transportation of Material by Overhead Tramways, Operated by Electricity. Improvements in Practice in Construction of Tramways

BY ALFRED GRADENWITZ*

Suspended wire-rope railways were first introduced into Europe about 15 years ago when the type used was that known as Telpher. Owing to the unsatisfactory results given by these first ropeways, they failed to be generally adopted; their driving gear was many times in excess of the weight of the load hauled. Attention has, however, been quite lately directed toward the construction of this kind of conveying railway in Germany, and among the new types in use, those constructed by Bleichert & Co., of Leipzig-Gohlis, are the best known. It should be mentioned that besides alterations from the original type in the construction of the trucks and driving gears, the safety devices, running ropes and switches are designed on entirely new lines.

Requirements of Suspended Tramways.

Independence of hand labor in the operation of the trucks is one of the most important features in this system, in conjunction with a traveling speed as high as possible with convenient safety devices. The track, switches and curves have been so calculated as to permit running speeds of 2 to 2.5 m., and even as high as 3 to 3.3 m. per second to be attained.

*Berlin, Germany.

In connection with loads less than 1500 kg., single-track suspended railways are mainly used, this arrangement being the only one where transportable switches can be used. In connection with heavier loads (1500 to 10,000 kg. and more) a type of conveying railway has been designed which, though a single rail is used, may be called a double-track railway. The runway nearly always consists of a channel-shaped girder, frequently of built-up construction, the running wheels traveling on the inner side of the lower flange.

A suspended railway truck carrying about 1000 kg. coal is represented in Fig. 1. The driving gear is fitted in a casing inclosed at the sides and on top. Two small motors and the bolt for the suspension of the truck body have been arranged at one side of the casing. The current is supplied by a bare wire stretched out above the supporting rope, the latter serving as return. Where fairly high loads are dealt with, two motors are provided for, especially where there are heavy grades. In most cases, especially in connection with level portions of stationary suspended railways, one motor, as represented in Fig. 2, would be quite sufficient. Owing to the necessity of keeping the weight of the motors and driving gears as low as possible, it has been found desirable that they should mainly overcome the friction on horizontal tracks. It would frequently be uneconomical to choose a given gradient for the whole of the railway with the obtaining differences. The Bleichert type accordingly includes inclined tracks over short distances wherever the arrangement of vertical elevators is impracticable.

Dealing with Grades.

These short grades are dealt with independently of the truck-driving motors, by arranging in parallel to the traveling rail a moving traction wire-rope or chain, which is automatically introduced at the lowest point of the inclined track into a grip connected to the driving gear, hauling the load up the grade, while throwing the motors of the truck out of gear (see Fig. 3). At the upper end the rope is automatically disengaged, while the current is again thrown into the driving-motor circuit.

By the separation of lifting work and friction work, many advantages are secured, the capacity of the driving motors being reduced, while the current supply from the mains is kept constant, each truck absorbing the same amount of cur-

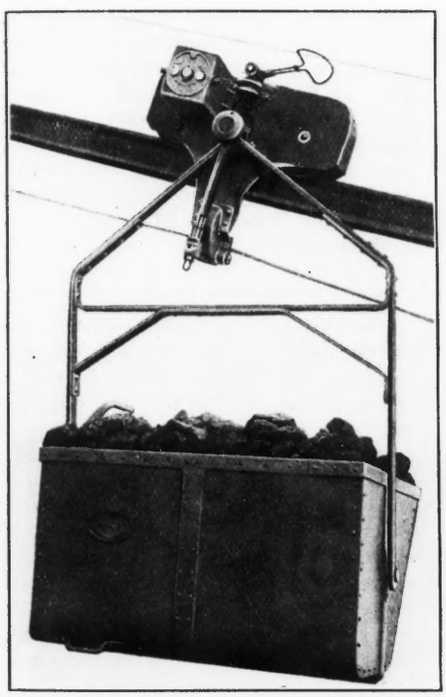


FIG. 1. BUCKET FOR INCLINED TRAMWAY

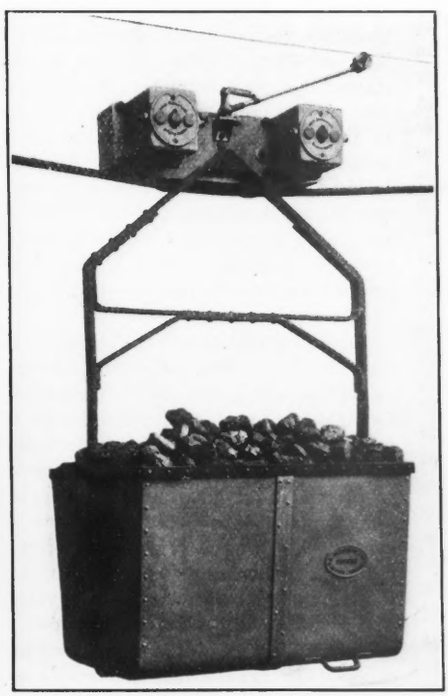


FIG. 4. BUCKET FOR WIRE-ROPE TRAMWAY

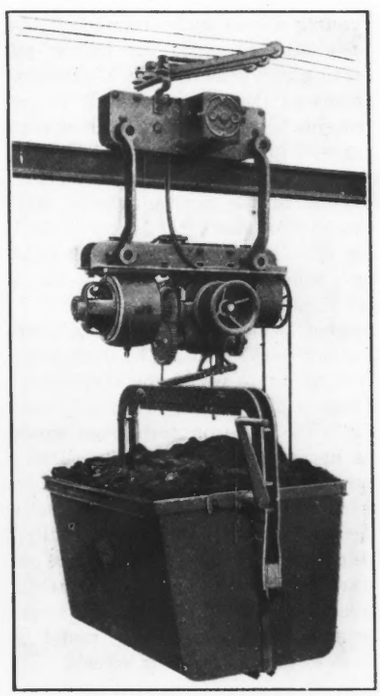


FIG. 2. BUCKET WITH SUSPENDED MOTOR

rent while traversing the level. If the grades were dealt with exclusively by means of the driving motors, these would have to be given a much larger capacity, greatly increasing both the first cost and the cost of operation. Fig. 4 shows a truck with grip while running on a grade.

A Carrier for Unloading Vessels.

A suspended wire-rope railway of the above type is represented in Fig. 5, the loads being lifted from the vessel by means of a bucket and after being conveyed through a hopper into the roadway trucks, are carried across a bridge and through various buildings to the place of unloading, where they arrive on a track of about 30 deg. inclination. To return the goods kept in store and the empty trucks, the second track of the inclined railway is used, which is operated by the same rope as the former.

The normal driving gears of single-motor trucks, Figs. 6 and 7, include two steel side shields between which the cast steel running wheels rotate round hollow axles of phosphor-bronze, the hollow portion serving as a reservoir for lubrication. The treads of the running wheels project on one side beyond the rim, to allow the driving and braking disks to be fixed. The driving spur wheel is placed on the nave of one of the driving wheels, while to the nave of the other is keyed the braking disk, the band of which is tightened by a substantial spiral spring. The brake is lifted during operation by a lifting magnet, which is also situated between the two steel shields. The truck boxes are free to rotate round the suspension rods (Figs. 1 and 4) and are mostly made to tilt. The flat-iron suspension carries at its upper end a thick wrought-iron head surrounding a bolt laterally projecting from the steel shields. These electrically operated driving gears are readily provided with a special lifting device as represented in Figs. 6, 7 and 2, when the truck body should obviously be suspended by two flat bars pivoting round points close to the two running wheels.

In constructing these lifting gears care should be taken to subject the driving gear to loads as uniform and central as possible. The Bleichert trucks (Figs. 6 and 7) include, for this purpose, two rope drums, the axle of which is at right angles to the rail, the worm gearing being located between these two drums keyed to a continuous shaft. The trucks further include a terminal switch, operated by a stop lever to throw the lifting motor automatically out of gear in the uppermost position of the load, and a reversing starter operated from underneath.

A Coal-carrying Plant

A suspended wire-rope railway of this type has been in operation some time at a Saxon factory, where it serves to unload coal from the railway cars and to charge a suction gas generator. The trucks conveying the coal to the bunkers have automatically tilting bodies, while the running gear operating the generator, in addition to a winch is provided with a balance, and carries a truck-body with bottom.

The connections of the lifting and driving motors are seen from Fig. 9, three current collector rollers and three conductors being used to permit an independent operation of the lifting and running motors. A special bare conductor wire is used as return.

The current-leading conductors have recently been replaced by a T-shaped iron on which a current-collecting shoe slides, The latter is more convenient than collector rollers, any shuntings in the air being dispensed with, thus increasing the safety in operation.

As will be readily seen from Fig. 9, the truck is provided with a steering arrangement enabling the direction of traveling to be reversed automatically after reaching a given point. These connections are represented in Figs. 10 and 14. The armature *F* (Fig. 10) and the field magnet coil *g* of the motor, as well as the two current collectors *h, i,* are connected to the fixed contacts *k, l, m, n,* of the switch. The movable part of the latter includes the switching roller *o* on which the insulated current-making pieces *p q* are placed, as well as the steering lever *a* with the auxiliary lever *b c*. Stops *d e* are provided at the two terminal stations of the track.

Supposing the venicle to travel to the right in the position of the first lever *a*, as represented in Fig. 10. After reaching the right-hand terminal station, the switching arm *a* will immediately strike against the stop *d*, so as to assume the position represented in Fig. 11. The current making pieces *p q* will accordingly put the contacts *k n* or *l* and *m* in connection with each other, thus reversing the direction of the current in the armature. The vehicle will accordingly reverse its direction.

Shortly after the beginning of the back course (Fig. 12) the auxiliary lever *c* connected to the switching lever *a* will strike the fixed stop *d*, thus raising the lever *a* to the position represented in Fig. 12, when the connections being the same as in Fig. 11, the vehicle will keep its return motion. The lever *a* is now, however, high enough to strike the stop *e* on reaching the left-hand terminal station, Fig. 13, thus re-establishing the connections shown in Fig. 10 and accordingly the initial direction of travel. As the course is continued the auxiliary lever *b* will strike the stop *e*, thus raising the lever sufficiently to strike the stop *d* on reaching the right-hand terminal station. The two current collectors may be replaced by a single collector, the rails being used as return. Resistances may be inserted at the terminal stations into the working conductors to avoid any heavy shocks in reversing.

Motors and Speeds.

Horizontal tracks are mainly dealt with in the Bleichert railways, the energy of the motors being extended solely for overcoming the frictional resistances between the wheel and rail. The small absorbtion of energy thus entailed will allow fairly small motors to be used. As regards the type of motor both direct and rotary current machines can be used, and as to the former, series motors will be generally used to especial advantage, owing to the more satisfactory starting torque. Short-circuit motors will on the other hand be the best type of rotary current machines.

According to the above this type of suspended railway allows of rather high traveling speeds, 2.5 to 3 m. per second and more being quite suitable figures. In fact the speed is limited only in curvatures and switches. A special feature in the Bleichert type of railway is that travelling speed can be made to correspond to each radius of curvature, the speed on curves being automatically controlled by inserting resistances into the working circuit. This arrangement allows the efficiency of the plant to be greatly increased, the maximum speed not being dependent on the smallest curvature. The same arrangement may evidently be used also on the straight track, at crossings or switches which have likewise to be traversed at a limited speed.

Arrangement of Switches.

The Bleichert suspended railways are provided with a special arrangement for fastening the switches which is represented in Figs. 15 and 16. The continuous rail which serves as return, is represented by *i i*, being the branch rail with the switch. The working conductors *d d* and *a* are situated above the rails. Whereas the working conductors *d d* are electrically connected to the current generator, the conductor is insulated from the circuit by two insulating pieces, *b* and *c*. The piece *a* is electrically connected to the conductor *d* by the insulated conductors *e f*, including the switch fixed to the running rail *i*, opposite the tongue *h* of the switch. The switch *g* is operated by the rod *q* moving in the box *r*, traversing the rail *i* and terminating in a head under which a plate-spring *s* is working. As the switch *h* is opened (Fig. 15) the plate-spring *s* will move the rod *q* by a certain amount from the box *r*, opening the switch *g* and thus throwing the current out of the working conductor *a*. An electrically operated suspended railway truck traveling from *i* to *i* will accordingly be stopped on the track *a*, which is free from current. On the switch being locked as shown in Fig. 16, the tongue is applied against the rod *q* throwing the latter against the switching lever *g* which, on closing the switch, completes the current in the circuit *a*, when a truck arriving from *i* will, after

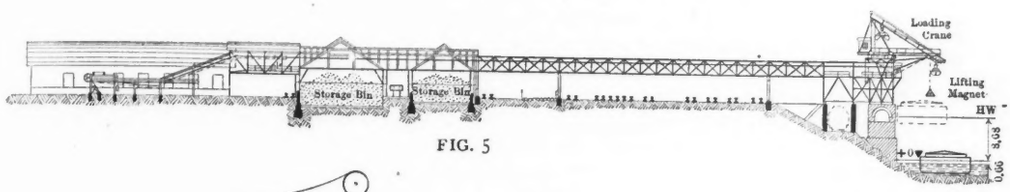


FIG. 5

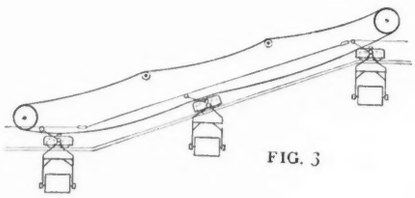


FIG. 3

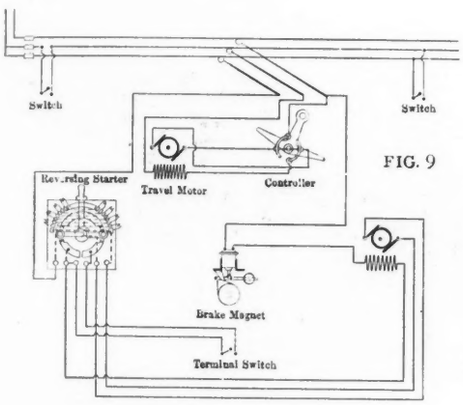


FIG. 9

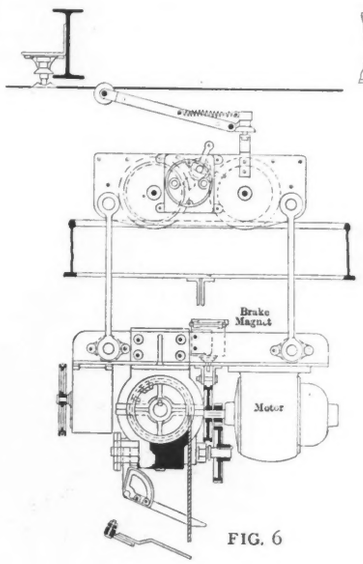


FIG. 6

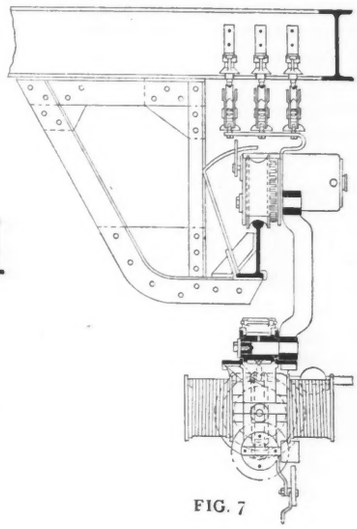


FIG. 7

FIG. 10

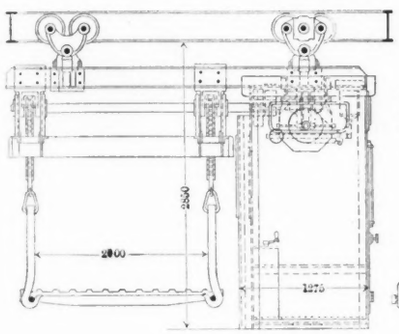


FIG. 17

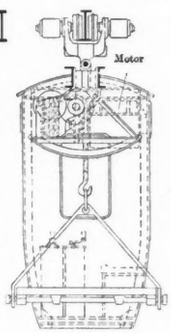
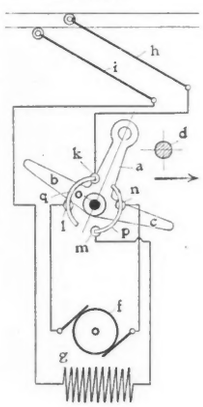


FIG. 18



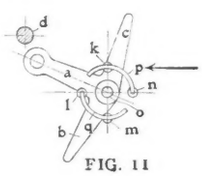


FIG. 11

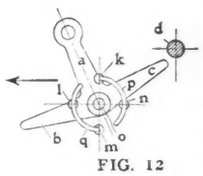


FIG. 12

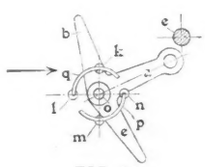


FIG. 13

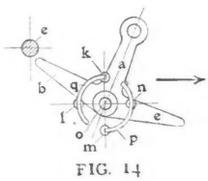


FIG. 14

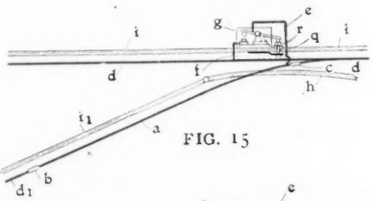


FIG. 15

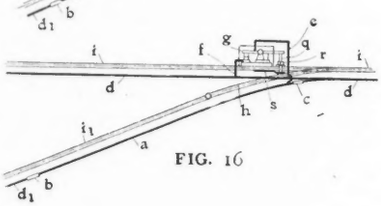


FIG. 16

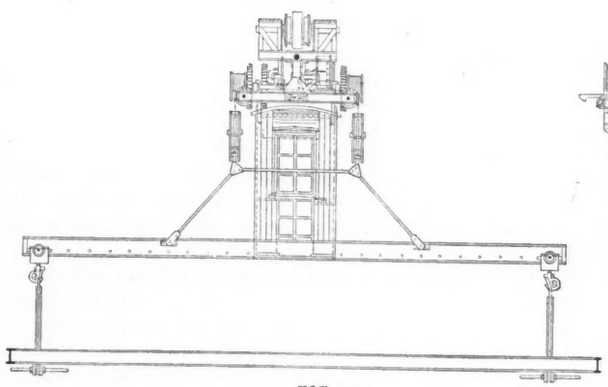


FIG. 20

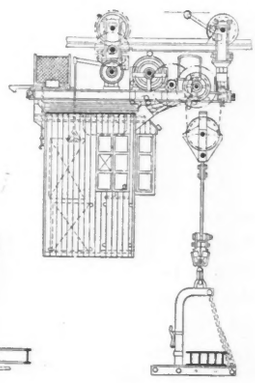


FIG. 21

DETAILS OF GERMAN OVERHEAD TRAMWAYS

traversing the switch *h*, pass on the other track. The arrangement for traversing crossings is quite similar.

Moving Large Quantities.

In unloading large vessels or railway trains a special point should be made of conveying great quantities at a time, to be discharged at different places; the continuous operation should be replaced by another traction system, coupling a series of automatically running trucks one behind the other while removing the current collectors from the working conductor. The first truck is coupled to a special driver's truck containing the current collector and switches for the whole train, the arrangement corresponding to that of electrical passenger railways, where each car is separately operated, while the whole train is controlled from a single point. In Figs. 17 and 18 is represented a truck with driver's cabin and winch which is used for the transport of ingots between rolling mill and furnace; this has been designed for a large Rhenanian steel-works. The ingots are placed on a cast-iron ribbed plate supported by a lateral suspension, which is carried by chains. The truck is suspended from two sets of wheels in such a way that all the wheels are strongly held against the runway. The trucks are free to move round the longitudinal bolts, while the sets of wheels rotate round vertical pivots, thus allowing sharp curves to be traversed. The running wheels are driven by two motors and the lifting gear by one motor arranged within the driver's stand. The latter is inclosed and provided with double sheet-metal walls between which an air circulation is kept up by a ventilating fan, to protect the operator against the radiating heat of the ingots. The whole of the running gear, as well as the chain-drive, is further protected by a sheet-metal shield against heat radiation. The trucks are designed for a useful load of 2000 kg., which is conveyed on the level at a maximum speed of 1.5 m. per second; that should be reduced somewhat in the curves. The traveling motors have an output of 1.5 h. p. each, owing to the small grade to be dealt. The lifting motor has 12.5 h. p. capacity.

Coke Storage Carrier.

The electrically operated suspended railway truck represented in Fig. 19 was designed for the distribution of coke on a storage yard. Owing to the straightness of the track the arrangement of bridges has been dispensed with, while the under frame, together with the traveling gear, has been connected by jointed longitudinal bolts to allow of a lateral movement. Only the pair of running wheels situated above the driver's cabin are driving wheels, each being operated by a special motor; the rims of these running wheels are provided with milled teeth engaging in the intermediate gearing. The lifting motor is placed on the underframe, and is connected to worm-gearing engaging in the worm-wheel by means of a flexible clutch. The two rope drums are keyed to the worm-wheel shaft, which is braked by electricity. The suspension has been so designed as to enable the crane driver to disengage at any level the pawl of the tilting box. The driver's cabin further contains resistances and controllers. The lifting speed of the winch for 600 kg. useful load is about 30 m. per minute with a motor capacity of 7.5 to 8 h.p., while the traveling speed is 150 m. per minute, requiring an aggregate output of 2.5 to 3 h. p.

A larger carrier, designed for traveling over narrow curves, has two sets of 4 wheels each, coupled in two trucks.

A Girder Carrier.

An interesting girder-loading plant installed at the Rimamurany Iron Works at Budapest is represented in Figs. 20 and 21. The car intended for the transport of girders and rolled-iron up to 10 m. length and 5000 kg. weight, travels on the lower flange of the framework-girder running alongside crane bridges 90 m. in length. The two motors driving the truck are located underneath the latter and act on the running wheels, which are fitted with milled-toothed rims, through a double transmission. The influence of lateral oscillations is acted against by the suspension. The lifting gear is operated by a motor, and on the extension of the motor-shaft are mounted the braking-disk on one side, and on the other the driving pinion for the intermediate shaft. A rope is slung round the two drums. Between the two tackle rollers runs a rope intended to compensate any unevenness in the load.

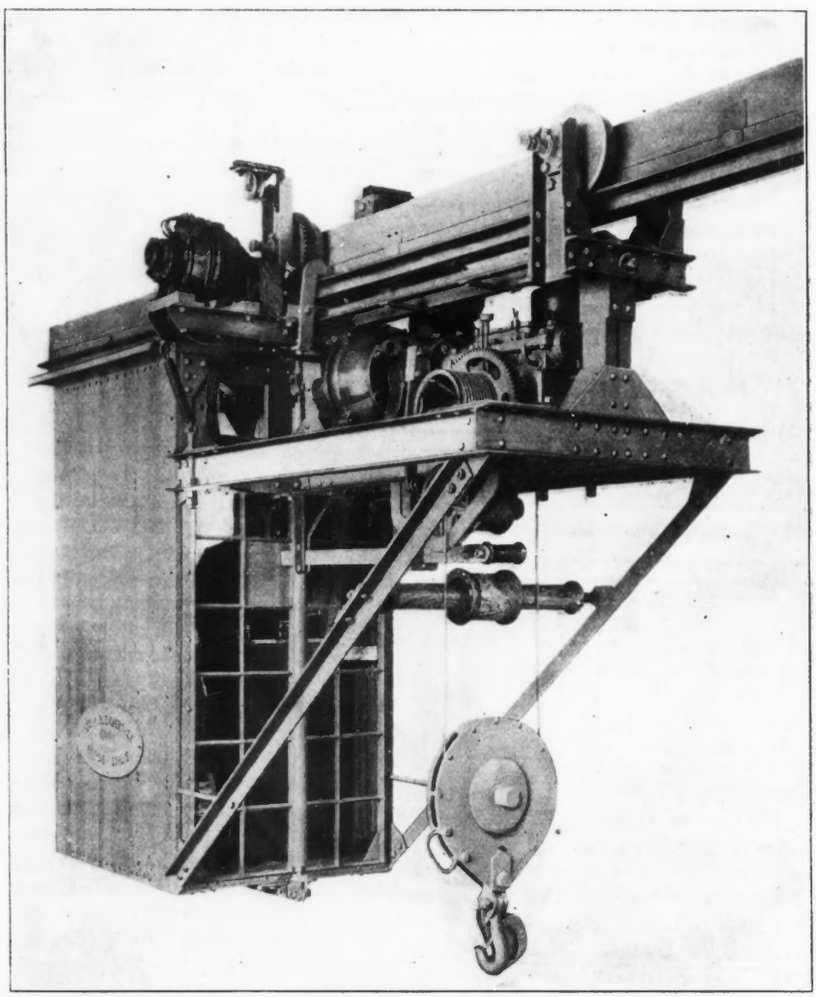


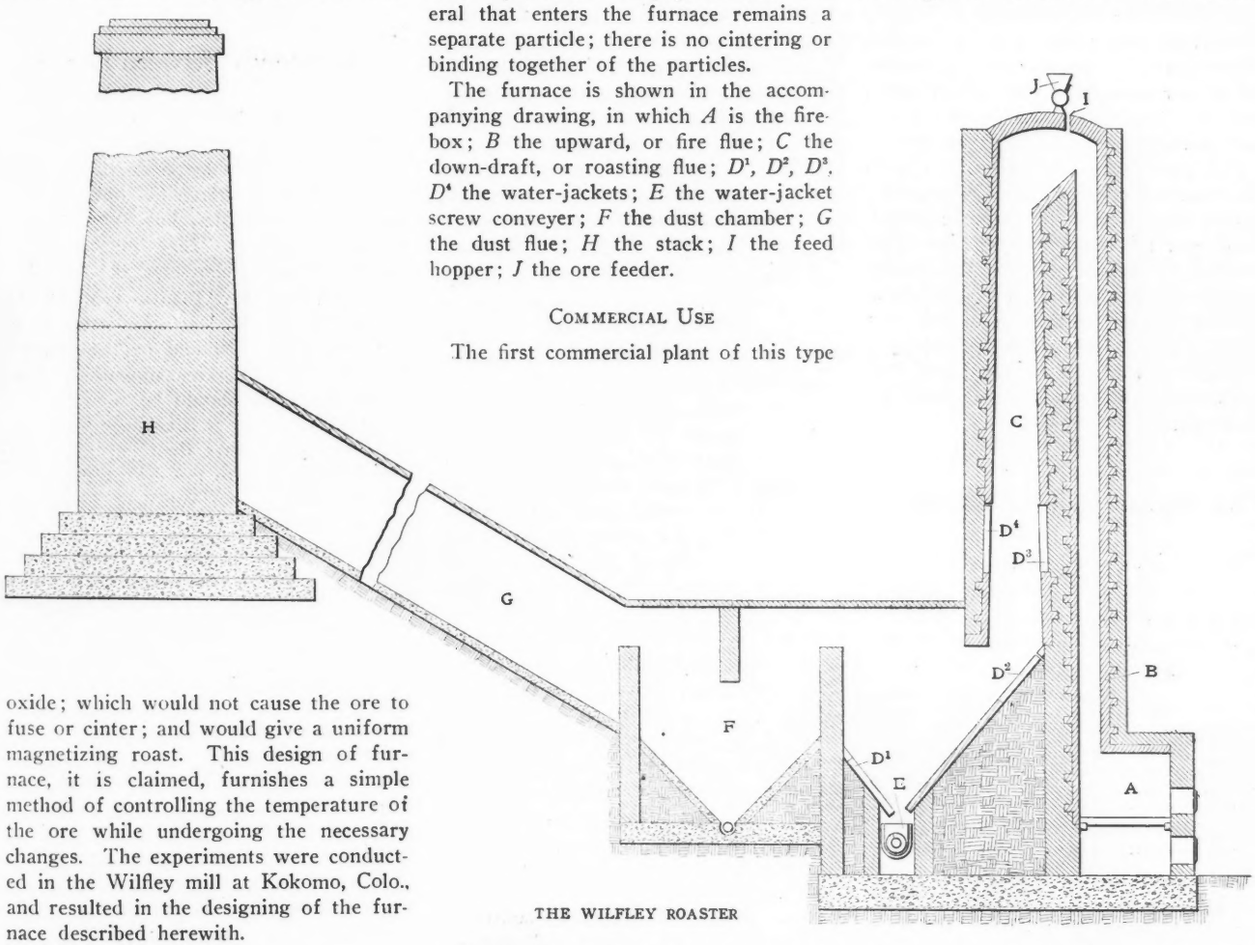
FIG. 19. CARRIAGE FOR STRAIGHT TRACKS

Both the crab and the travelling gear are operated from the driver's cabin. The crab has a bearing capacity of 5000 kg., and a lifting speed of 20 m. per minute. The crane traveling speed with the same load is 2 m. per second. The rotary current motors—the two traveling motors of 6 h.p. each and one lifting motor of 35 h.p.—work with 300 volts tension and 40 periods.

The Wilfley Furnace

By J. M. McClave*

This furnace was designed by A. R. Wilfley, of Denver, Colo., after three years of experimental work. It is intended to meet the objections existing to the different types of furnaces heretofore used in roasting iron sulphides in preparation for magnetic separation. The result sought was a furnace which would not require too much skilled labor; which would not carry the roast too far and convert some of the pyrite into iron oxide; which would not cause the ore to fuse or cinter; and would give a uniform magnetizing roast. This design of furnace, it is claimed, furnishes a simple method of controlling the temperature of the ore while undergoing the necessary changes. The experiments were conducted in the Wilfley mill at Kokomo, Colo., and resulted in the designing of the furnace described herewith.



THE WILFLEY ROASTER

Construction of the Furnace.

The furnace is of the tower type, and a special feature is that the ore to be roasted and the hot gases travel in the same direction. There are two flues in the tower; the hot gases from the fire-box pass up one flue to the top of the furnace and there come in contact with the stream of falling ore. The hot gases ignite the sulphur and the chemical change takes place while the ore falls through the second or roasting flue to the base of the furnace. The ore is roasted in the down-draft flue while descending with the hot gases. At the bottom of this flue the hot ore falls on water-jacket plates, and is cooled while in a disseminated state. The ore is fed in at the top of the tower in a thin sheet and falls on a plate having a slope of 50 deg., where it comes in contact with the hot gases and by the time it falls 20 ft. to the water-jacket cooling zone the varying sized particles have been changed to a magnetic sulphide. At the base of the furnace the ore falls into a water-jacket screw conveyer, which discharges the material to an elevator, which in turn delivers it to a revolving cooler where the temperature is reduced to about 60 deg. F.; thence it passes to the magnetic separators. Every particle of mineral that enters the furnace remains a separate particle; there is no cintering or binding together of the particles.

The furnace is shown in the accompanying drawing, in which *A* is the fire-box; *B* the upward, or fire flue; *C* the down-draft, or roasting flue; D^1, D^2, D^3, D^4 the water-jackets; *E* the water-jacket screw conveyer; *F* the dust chamber; *G* the dust flue; *H* the stack; *I* the feed hopper; *J* the ore feeder.

Commercial Use

The first commercial plant of this type has been installed at the works of the Colorado Zinc Company, Denver, Colo. The complete plant consists of a roasting furnace, cooling apparatus, four Ding magnetic separators and seven Wilfley tables. The plant has a capacity of 100 tons per day.

The ore first passes through a revolving dryer to a storage bin, then to the roaster, from the roaster to a revolving cooler, and then to the Ding magnetic separators. The separators make two products, a finished iron and lead-zinc-silica product. The lead-zinc-silica passes to a dry screen and is sized for the tables. Four of the tables are arranged to make a finished zinc concentrate. The lead-zinc middlings and the zinc-silica middlings from these tables pass to separate tables for final treatment.

Features of the Process

An interesting feature of the process is in the lead and zinc separation on the tables. In roasting the high temperature has changed the zinc and lead sulphides in such a manner that even the very finest particles will not float. This makes it possible to make a very close separation of the lead and zinc on the tables. When treating this roasted ore on the tables the wash-water runs clear. When the same ore is treated in crude form without roasting, the wash-water will contain from 10 to 15 per cent. of lead-zinc slimes. Another important feature is simplicity in handling the ore and the small number of machines and apparatus necessary to produce a large tonnage of finished products. The crude ore is crushed dry and sized to about 16 mesh, then passed direct to the furnace. In roasting there is from 10 to 15 per cent. sulphur driven off. The magnetic separator removes the iron, which represents from 40 to 50 per cent. This leaves the lead-zinc-silica for table dressing, amounting to 35 or 45 per cent.

A furnace 8x8 ft. and 30 ft. high has a capacity of 100 tons in 24 hours. The roaster does not require close watching or skilled labor to operate. The tempera-

*Metallurgical engineer, Colorado Zinc Company, Denver, Colorado.

ture is controlled by an electric pyrometer; the thermo-electric couple is inserted in the roasting flue above the water-jackets. The furnace-man watches the pyrometer as he would a steam gage on a boiler. When the ore is being fed regularly, the temperature does not change more than 10 deg. Shutting off the feed and starting up again does not change the temperature more than 100 deg. There is no difficulty in holding the temperature at the desired point to make the proper roast. The furnace seems to adjust itself automatically to the desired temperature.

Fuel Consumption

The coal used varies with the amount of iron pyrite in the ore. An ore containing 25 per cent. iron will require about one ton of coal in 24 hours. The coal is used mainly to regulate the temperature.

This process has a wider range than the magnetic or electrostatic separators, as they depend upon the magnetic permeability and the conductivity of the minerals to be separated. With the roaster the iron pyrite is converted to a magnetic sulphide and the separation of this iron is accomplished with low-power magnets.

Nearly all forms of complex lead-zinc-iron ores can be treated economically by this process.

The Sicilian Sulphur Situation

The exports of sulphur from Sicily for four years past are reported by Messrs. Emil Fog & Sons, of Messina, as follows, in the tons of 1030 kg. used in the trade:

	1904	1905	1906	1907
United States.....	100,680	70,332	41,283	9,476
France.....	103,042	96,170	87,536	59,725
Italy.....	79,619	99,633	79,519	58,926
United Kingdom..	18,108	18,847	20,883	16,561
Russia.....	15,141	16,673	16,181	15,210
Spain & Portugal..	12,436	15,674	15,422	12,778
Germany.....	31,613	28,319	34,967	37,100
Austria.....	23,374	25,111	22,756	24,597
Greece & Turkey ..	25,376	25,069	26,560	27,608
Belgium	13,627	14,442	13,940	8,853
Scandinavia	20,120	18,288	21,608	25,155
Holland.....	8,122	4,425	5,539	11,379
Other Countries...	24,487	23,277	21,238	26,646
Total.....	475,745	456,260	387,432	334,014

The decrease in 1907, as compared with 1906, was 53,418 tons, or 13.8 per cent.; as compared with 1904, it was 141,731 tons, or 29.8 per cent. From 1904 to 1907 the exports to the United States decreased 91,204 tons, or 90.6 per cent. The more important items under other countries in 1907 were 7212 tons to South Africa; 4620 to North Africa; 4847 to the East Indies; 3313 to Australia; 2142 tons to South America.

During the last six years the production in Sicily has considerably exceeded the consumption, as is shown by the statement of stocks on hand at the close of each year. The unsold stocks on Dec. 31 are reported as follows, in metric tons:

	Stocks.	Increase.
1902	339,113	.....
1903	361,220	22,107
1904	396,541	35,321
1905	462,437	65,896
1906	525,115	62,678
1907	576,377	51,262

From the close of 1902 to the end of 1907 the stocks, or unsold surplus, increased by 237,264 tons. The exports, added to the increase in stocks, give a production of 385,276 tons for 1907, so that the stocks at the close of the year were equal to about 1½ years' production. This does not appear to constitute a condition favorable to an advance in prices; but the Sicilian producers seem to rely upon Government aid and the operations of the Consorzio Obbligatorio for the restoration of their declining trade. Moreover, they do not seem even yet to appreciate the importance of the American production, and its probable permanence; nor the advances which the use of pyrites have made, largely as a consequence of the high prices exacted for brimstone.

Mr. Frasch, the representative of the American producers, has been in conference at Paris with the representative of the Consorzio, Signor Luzzatti, who was formerly the Italian minister of finance. Concerning this conference, Messrs. Fog & Sons report, under date of Feb. 1: "So far, nothing has transpired as to the result of negotiations; but as both parties have a common interest in avoiding a mutually detrimental price-war, it seems beyond doubt that a lasting agreement will be come to. Even if Mr. Frasch could not be persuaded to buy annually a large quantity of brimstone from Sicily, they are sure to agree as to the necessity of maintaining, or even raising, actual values. As a preliminary measure the Consorzio has increased prices for America from $19.50 to $22, which means that prices for Europe, although they have been raised 5c. per month from February until June, are now cheaper than those quoted for export to the United States. Actual price for California is now $16.44, and for Australia $16.68 per ton, f.o.b."

These prices represent a considerable discount from the general quotation, which on Feb. 1 was given at $18.66 per ton for best unmixed seconds in bulk—the usual commercial grade.

An important point in the situation is referred to in the following paragraph from Fog & Sons' circular: "As the Italian Government at the same time renewed its promises of assistance, there is little doubt that the State banks will receive orders to provide also in future the large amounts required to carry the stocks inherited from the Anglo-Sicilian Company forward until disposed of. The apprehension of disorders among the miners is so great that the economical considerations have been pushed into the background for the time being. The Consorzio will, therefore, not lack the necessary financial aid to hold the stocks over until the increasing consumption of sulphur will gradually absorb the actual excess of supplies."

The important question is whether the consumption of Sicilian sulphur will increase under the conditions of price artificially maintained in the face of increasing competition. Past experience seems to point to a negative answer. The Sicilian producers and the Consorzio Obbligatorio, which is the representative of the Italian Government, are certainly facing a difficult situation, and apparently have a mistaken idea as to the best way of meeting it.

The Interval Between Levels

The interval between levels at different mines is determined by several factors, but mainly by the nature of the vein. A level is driven not only for access to the orebodies, but also for exploratory purposes. In large orebodies, fairly constant in character, the level interval can be greater than in veins where the ore is erratic. In the latter case the level interval should not be greater than 100 ft. In veins dipping at low angles the levels should be run at even closer intervals for it is cheaper to transport the ore in cars than in any other way when, owing to the dip of the vein, gravity alone is not sufficient to transport the ore in the stope.

In most mines in the lower levels the intervals can well be increased for the characteristics of the vein have become understood. For instance at Butte, the deeper levels are being driven at intervals of 200 ft. The tendency now is to concentrate the tramming of the ore upon certain levels and to use the levels between as intermediates. This greatly decreases the cost of cutting stations not only where skips but also where cages are used.

The ore chutes are carried up so as to be continuous from one level to another. A detachable chute or slide is used to discharge the ore from the mouth of a chute on one level to the chute of the lower level. By this concentration of transportation, even if the amount of ore does not warrant some form of mechanical haulage, the cost is decreased in more ways than one; for instance it becomes especially economical to keep the main tracks in good condition and to use heavier rails than otherwise would be done.

The efficiency of air-lift pumps, according to C. B. Burdick (*Journal* of the Western Society of Engineers), varies, under favorable conditions and with medium lifts, from 25 to 40 per cent. This efficiency decreases rapidly with increased hight of lift.

Meeting of the American Institute of Mining Engineers

The winter meeting of the American Institute of Mining Engineers was opened Tuesday evening, Feb. 18, in the main auditorium of the United Engineering Societies' building, as announced in the JOURNAL last week. On the following day, Wednesday, three sessions were held for the reading and discussion of papers. Thursday and Friday were taken up with excursions to various points of interest in and about New York.

WEDNESDAY MORNING

The morning session, February 19, began, Prof. R. H. Richards presiding, with an article by F. E. Junge dealing with the use of waste gases about steel mills in Germany. German steel plants have used over 500,000 h.p., for the last five years, generated by means of gas engines, and in no case has the cause of a shutdown been due to trouble with the gas-producer or on account of dirty gas.

James E. Howard outlined the scope of the Government investigation of the physical properties of steel now being carried on under Mr. Howard's supervision at the Watertown arsenal. The investigation will begin with the ingot, especially regarding the defects of continuity of structure which appear in later working, and then the physical properties promoted by different methods of mechanical treatment will be studied.

A. A. Stevenson, of the Standard Steel Works, thought that too much work is done on steel; that there is a certain amount of work causing a maximum beneficial effect, and that any work above that amount is lost work.

Dr. Raymond read a communication by Carl L. Huster, recommending that the classification of the steel be further extended. He thought that at present too much work is done on the steel above the critical points and that this was mostly lost work. He thought that especially the effect on steel of solidifying in different forms of molds should be investigated.

Dr. Raymond read a paper from P. H. Dudley, giving much data in regard to rail making. He emphasized the necessity of holding the bessemer metal in the ladle long enough before pouring. Mr. Dudley stated that in his opinion most of the defects in rails arose from causes traceable to the pipe segregation in the ingot.

Prof. H. M. Howe reviewed his paper on "Piping and Segregation in Steel Ingots," and stated that the great improvement in the physical properties of electric furnace steel was due to the long time that the charge was quiescent, which allowed plenty of time for the impurities to separate from the bath of metal and pass into the slag.

Hiram W. Hixon stated that in copper and in silver smelting great trouble was experienced at one time owing to the occlusion of gases by these metals. While in a molten condition copper occludes large quantities of sulphur dioxide, while oxygen was occluded by the molten silver. He thought that the segregation of impurities in steel was somewhat analogous and that the main reason that bessemer steel was not as good as open-hearth steel was the failure to hold the metal in the ladle before pouring.

Dr. Raymond remarked that on the recent trip made to Germany by members of the institute that they had been shown at one of the German steel works a Heroult furnace where the open-hearth steel was kept molten and allowed to stand some time before cooling. He thought that the remarkable properties of the open-hearth steel made at that plant were due to that part of the process.

A. A. Stevenson discussed Professor Howe's paper at length and exhibited many photographs showing the distribution of segregation and shape of pipes in steel ingots.

AFTERNOON SESSION

The meeting was opened at half-past two with James Douglas in the chair. The first paper, "Present Mining Conditions on the Rand," by Thomas Haight Leggett, gave a brief description of the work being done by the 71 mining companies now operating in this section of South Africa. With regard to the question of over-capitalization, the author pointed out that 47 companies had already returned, in dividends, 44 per cent. of the capital invested. Attention was called to the elaborate quarterly reports, containing a wealth of valuable information, which are issued by all these companies. Mr. Leggett deplored the methods of many companies in the United States and elsewhere which furnished only meager information to their stockholders. The author exhibited an interesting collection of "banket" and various products of the Transvaal mills.

Alfred James, president of the Institution of Mining and Metallurgy, in discussing conditions on the Rand, stated that mining costs were being steadily reduced; in one case the cost had been reduced to 14s. per ton compared with 25s. formerly prevailing on the Rand. "It is the popular idea," he said, "to work out a mine as rapidly as possible and 'after that the deluge'."

A paper by T. Lane Carter, of Johannesburg, on "The Chinese on the Rand," was read in abstract by Dr. Raymond. This was followed by "The Briquetting Plant at Bankhead, Alberta, Canada," by E. W. Parker, of Washington, D. C., which brought out a number of inquiries and some discussion.

Prof. H. M. Howe added a few remarks relative to his paper on "Piping and Segregation in Steel Ingots," which was discussed at the morning session.

The last paper of the afternoon was on the "Compression of Semi-liquid Steel Ingots," by N. Lilienberg. This was illustrated by a wooden model which showed the effect of side-compression on wax ingots.

WEDNESDAY EVENING

The stereopticon was used freely during the evening session. George I. Adams employed a series of excellent views to illustrate his paper on the "Physical Features of Peru in Relation to the Mining Industry." He explained that the high mountain ranges along the extreme western edge of the South American continent render communication with the interior difficult and by removing the moisture from the eastern winds deprive the coast country of rainfall and vegetation.

Prof. Robert H. Richards reviewed the results of his continued study of the Wilfley table. Experiments with pure copper mineral mixed with quartz showed that the separation could be greatly improved by either sizing or classifier treatment.

Joseph A. Holmes, in a paper, "Recent Coal-mine disasters in the United States," described the work of the Government in the investigation of fuels, materials of construction, etc., and spoke of the necessity of extending the work of this department. He said that while the Government tried to keep out of the field of the private engineer, the conditions in our coal mines were far from satisfactory and presented many lines of inquiry which could be properly undertaken.

Frank Haas, chemist of the Fairmont Coal Company, gave some interesting details of the Monongah disaster. He exhibited a map showing the curiously isolated areas of explosion. Evidences of local explosions had been found where it was certain that no open light had been present for years. By following the direction and force of the explosions and the study of the walls and roof, where in some cases the effects of coking showed that at least three times as much gas had been developed as could be burned locally, the conclusion was reached that the gas might have been forced into workings ordinarily entirely safe and there ignited by particles of incandescent coke.

Walter O. Snelling, in a paper on "Sulphur Dioxide as an Agent in Fighting Mine Fires," called attention to a number of advantages in employing gas generated by burning sulphur. In "A Possible Explanation of the Occurrence of Secondary Mine Explosions," he advanced the theory of advance waves of alternate compression and rarefaction in stirring up the dust, liberating gas, and producing a suitable mixture for the propagation of the explosion.

Hiram W. Hixon discussed the theory which ascribes to superheated steam all the phenomena of dynamic geology.

Humboldt and Swedenborg, Mining Engineers

The following is an abstract of a paper by R. W. Raymond, presented at the meeting of the American Institute of Mining Engineers, on Tuesday evening, Feb. 18:

Friedrich Henrich Alexander von Humboldt was born in 1769, and studied at two German universities. He published his first book, on the Basaltic Rocks of the Rhine, in 1790. In the following year he went to Freiberg, where those great men, Werner and Leopold von Buch, were his teachers. In 1793 he published his treatise on the Subterranean Flora of Freiberg, and from 1792 to 1797 he was employed as a mining official at Baireuth. This was the only practical drill which he ever experienced; and while it is not possible to ascribe supreme influence, in the career of such a universal genius, to any one episode, I think it fair to say that in many, if not all, departments of Humboldt's cyclopedic knowledge and world-wide exploration and study, the effect of his training as a geologist and mining engineer may be traced. To this cause may certainly be ascribed the extraordinary permanent value of his descriptions and opinions of the mining districts of Mexico.

Emanuel Swedenborg was one of the foremost, if not the very foremost, of all mining engineers and metallurgists who have ever lived. If he had been nothing more, his fame in this respect might have been more exalted and secure. In his versatility, his eager questioning of all natural phenomena, his combination of practical knowledge and skill with theoretical speculations, and his perennial flow of spontaneous suggestions for the benefit of his fellow-men, he resembled our own Benjamin Franklin.

Reserving more adequate discussion of Swedenborg's work for the full text of this paper, to be published hereafter, I will now merely indicate its nature and scope.

Born at Stockholm in 1688, and receiving his degree as Ph.D. at Upsala in 1709, he started at once on a pilgrimage after knowledge, practical as well as theoretical. Wherever he went he learned a new trade. First, he became an expert bookbinder; then as a student in London of the works of Newton, he boarded successively with a watchmaker, a cabinetmaker, and a maker of mathematical instruments, and made himself expert in all these occupations. Wishing to send to Sweden certain geographical globes, which could not be transported in complete form, he learned the art of engraving on copper, and made the plates himself. A little later, having to stay a while in Leyden, he learned how to grind lenses for telescopes, and acquired a set of the necessary tools.

During his stay in England, he seems to have been chiefly interested in mathematics and astronomy, and originated, among other things, a method for determining the terrestrial longitude by lunar observations. He occupied himself also with that immemorial problem of astronomical mathematics, the orbit of the moon.

A letter written in 1714 shows that he has turned his attention to mechanics, and had on hand, among other mechanical inventions the following: For a submarine ship, "which can do great damage to the fleet of the enemy;" a portable siphon for raising large quantities of water, and auxiliary inventions for utilizing this siphon in raising ships, etc.; a machine "driven by fire," "which will put the water in motion" (this sounds like a prophecy of the steam engine, but was probably, as I shall try to show hereafter, something else); new pumps of various designs; new air-guns; a new musical instrument, "by means of which one who is quite unacquainted with music may execute all kinds of airs that are marked on paper by notes" (is this a pianola?); a water-clock; and a flying carriage, showing "the possibility of remaining suspended in the air, and of being conveyed through it."

At this time he was but 27 years old. At 28 he was made an assessor of the Royal Swedish Board of Mines; but, aside from the routine duties of his office, he was detailed for engineering duty as an assistant of Christopher Polhem, the foremost Swedish engineer of the time. In this capacity he both designed and directed the overland transportation for about 14 English miles, in 1718, of a fleet of two galleys, five large boats and a sloop, as a measure of speedy reinforcement to the King of Sweden in his military operations.

In the discharge of his duties as a member of the Board of Mines, Swedenborg labored and traveled incessantly. In 1720 he published his description of Swedish blast furnaces. In 1723 he presented a memorial, accompanied with complete drawings, urging the manufacture of wrought iron in Sweden, instead of the shipment of crude pig, to be puddled and rolled in other countries. This proposal, tardily accepted, became the foundation of the manufacture of "Swede's iron," so long a source of profit to that country. He also pressed the home manufacture of salt as a source of revenue; and, having inspected the metallurgical works of Germany and other nations, he recommended improvements in the Swedish production of copper, which would greatly increase its technical economy. Meanwhile, as incidental products of his incessant activity, he published treatises on fire and combustion, and introduced an air-tight stove for the economical warming of Swedish homes. (It will be remembered that Franklin also thought it not unworthy of his genius to invent a stove—which still bears his name.)

Of Swedenborg's "Opera Philosophica et Mineralia," published about 1733, in three large folio volumes in the Latin language, the second and third volumes were devoted to iron and copper metallurgy, and were reprinted in German and French translations as classics. Dr. John Percy said of them that no books were, in his judgment, "more worthy of the attention of those interested in the history of metallurgy." And an eminent Swedish authority has declared that it is almost impossible to measure the improvement which Swedenborg brought about in the mining and metallurgical practice of Sweden.

In this imperfect preliminary sketch I have ignored the statements, more or less clearly made by Swedenborg, of great doctrines of modern science, such as the circulation of the blood; the atomic theory; the solar origin of the earth and the planets; the undulatory theory of light; the nebular hypothesis; the recognition of heat as a mode of motion; the connection between magnetism and electricity, and the principles of dynamic geology. These subjects I hope to discuss in the future and more elaborate text of this paper. At present I shall consider one further question only, namely, how has it happened that Swedenborg's claims as a leader of science and as a professional engineer have been so inadequately recognized?

One reason is, doubtless, that his books and treatises, published in Latin, have not attracted, to the extent which they deserve, the attention of modern students. Another reason may be that they appeared during a period when the operations of war engrossed the thoughts of mankind. But perhaps the chief reason is, that in middle life, Swedenborg turned his attention to theology exclusively, and that he sincerely believed himself to be in continual communication with the inhabitants of the spiritual world, and to be receiving from them revelations which it was his duty to communicate to his fellow-men. The result was, that those who did not accept his revelations were disposed to reject also his scientific observations and theories, following the erroneous old psychology, which recognized no sanity whatever in the presence of a hallucination. Some of the partisans of Swedenborg have made the same mistake, arguing that the validity and value of his scientific work warrant the acceptance of his visions of a world unseen. Both were alike wrong. Without pronouncing any opinion whatever as to Swedenborg's theological doctrines or prophecies, I think it is both practicable and just to estimate, altogether apart from them, his earlier work as a mathematician, astronomer, physicist, engineer and metallurgist; and I do not hesitate to say that such an estimate puts him in the foremost rank.

The Bituminous Washery at Tyler, Penn.

The Sulphur and Ash Contents in the Coal Are Reduced Nearly One-half. The Plant Is Run by Independent Motors

BY EDWARD K. JUDD*

One of the most northerly coke operations in the Pennsylvania bituminous field is located at Tyler, near the north boundary of Clearfield county. It is owned by the Powhatan Coal and Coke Company of Buffalo. Tyler is on the main line of the Buffalo & Susquehanna Railroad, 17 miles northeast of Du Bois, and also on the Buffalo & Allegheny Valley division of the Pennsylvania.

The Coal

The seam is the Middle Kittanning, and has an average total thickness of 3½ ft., counting 6 in. of bony and sulphurous coal at the top and 3 in. of bony at the bottom. The roof is a substantial slate, in which, at about 2 ft. above the coal, is a persistent and well defined parting. In the principal headings, the slate is taken out up to this plane, thus giving an unusually flat and smooth roof, but in the rooms, only the 33 in. of clear coal is broken down. The floor is dense fireclay.

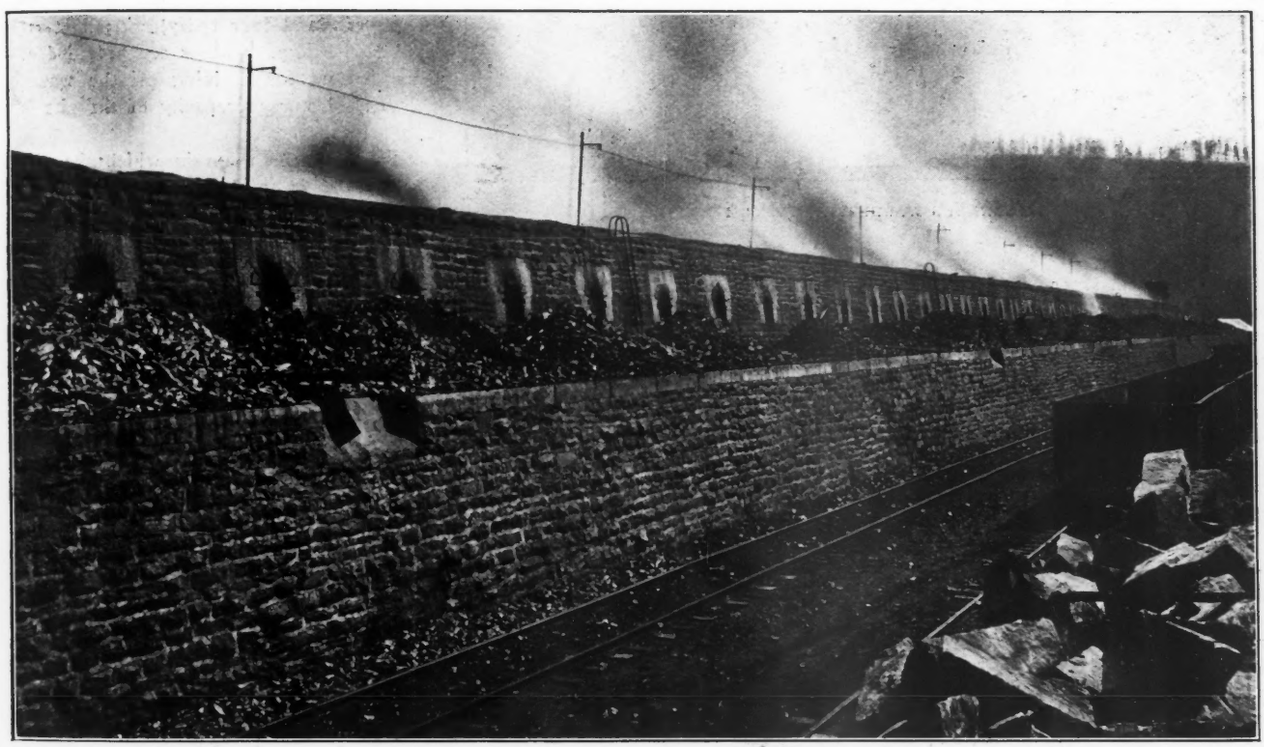
System of Mining

The seam is undercut entirely by hand, to a depth of 3 ft., when a single shot, in a room face, will bring down about six tons of coal. Rooms are 21 ft. wide and spaced 50 ft. between centers, and are driven end on, or parallel to the most prominent cleavage. The cars have to be low, and hold not more than one ton. They are hauled out of the mine openings, of which there are several, all drifts, by electric locomotives. It is down grade from the openings to the tipple, at which the entire output converges, and the roads are laid with 60-lb. rails. Seven Goodman electric locomotives are now in use, of which the largest is 100 h.p. and weighs 12 tons.

The tipple with its approach is 800 ft. long and spans a highway, two railroads and the coke yards. It has but one dump, to which the loaded cars are fed by a short chain haul, while a similar haul returns the empty cars to the original level. The load from each car falls into a scale pan in which it is weighed, and then drops into a bin from which it starts through the crushing and washing process.

Crushing

From the receiving bin, a short conveyor distributes the coal evenly over an inclined screen, with ¾-in. round holes. The undersize passes at once to the washery, while the oversize slides into a Bradford breaker. This machine consists of a cylinder 11 ft. long and of 9 ft. diameter, made of steel plate punched with 1½-in. square holes. It is mounted by spiders on an axle and is turned by rack and pinion at one end. The feed end is partially closed with an annular rim, but the discharge end is entirely open. To the inside surface of the cylinder are bolted a lot of cast-iron paddles 12 in. long, about 1½-in. thick, and projecting inwardly about 6 in. They are set obliquely so as to urge the coal forward to the discharge end. Attached to the outside of the cylinder, and concentric with it, is a truncated cone of sheet steel, punched with ¼x1½-in. slots, covering about two-thirds of the inner

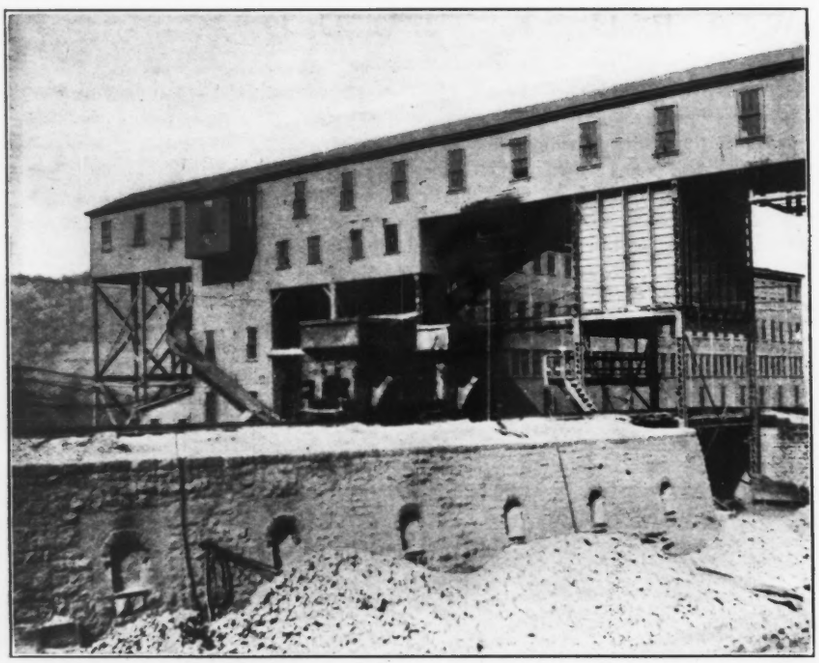


OVEN BATTERY AND COKE YARD AT THE POWHATAN PLANT

*Mining engineer, 55 Fulton street, New York City.

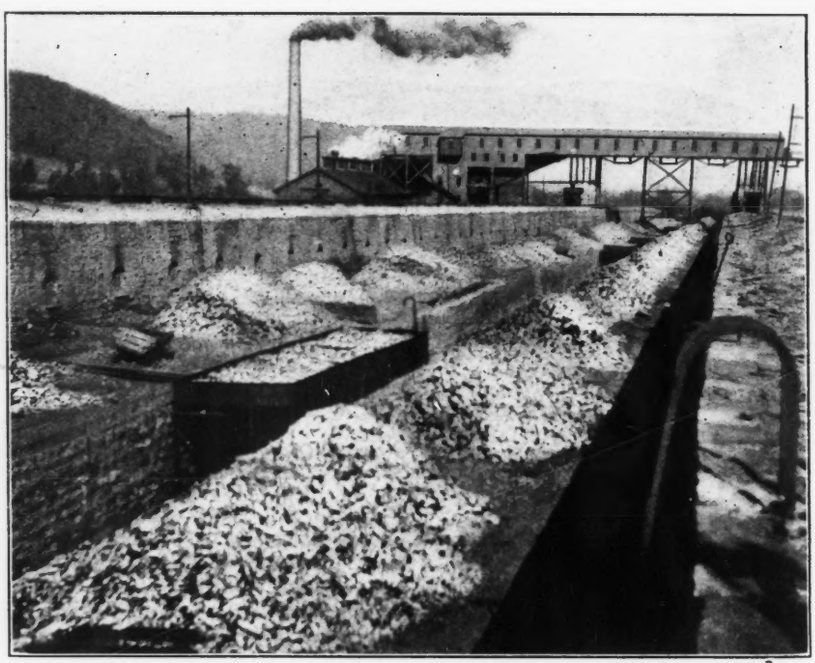
cylinder. The machine is driven by a 40 h.p. motor, and rotates about 45 revolutions per minute.

Lumps of hard and bony coal and sulphur balls resist crushing in the Bradford breaker, and are discharged from its open end; this refuse is used for firing the boilers at the plant. The fine crushed coal, which passes through both inner and outer screens, goes direct to the washery. The lump coal which, after passing through the 1½-in. holes of the inner screen, is caught and discharged by the slotted outer jacket, goes for further crushing through a pair of geared rolls.



BITUMINOUS WASHERY AT TYLER, PENN.

These rolls are 48 in. wide and of 30 in. diameter. Each roll is made up of eight 6-in. sections, to facilitate repairs, and the faces of the rolls are corrugated lengthwise. The space between rolls is about ¼ in. They are driven by a 60-h.p. motor. The coal is fed in by a short conveyor to spread the stream evenly The crushed coal, joined by the fine coal from the first screen and from the Bradford breaker, is now elevated vertically to the top of the building, where it discharges on to a horizontal belt conveyor that distributes the coal into two bins holding 150 tons each. The washery is supplied from these.



TIPPLE AND COKE YARDS AT POWHATAN WASHERY

Washery

The washing is done on Campbell tables, of which there are 36, having a total capacity of 150 tons per hour. Each set of 18 tables is driven by two 10-h.p. steam engines, one on each end of the driving shaft. The Campbell table is too well known to need complete description here. It is a frame 3 ft. wide and 9 ft. long, hung by a swinging rod at each corner. Its upper surface is slightly dished and is covered with corrugated iron whose ridges point backward toward the waste discharge. It is given a steady forward movement and an accelerating backward movement, ending in a bump, by a cam and lever.

The coal is fed at the middle of the table and water at the waste end. The coal is carried forward by the flow of water and discharged into a launder, while the slate retreats along the bottom of the table and discharges into railroad cars standing outside the building. Much of the pyrites in the coal gets reduced in size by this treatment and falls through holes in the table into the waste discharge below. The efficiency of the washing can be judged by the following data: A sample of the coal as it came to the washer, after having had some of its slate and pyrites extracted by the Bradford breaker, showed sulphur 2.162 per cent. and ash 9.04 per cent. The washed coal, at the same time, carried sulphur 1.17 per cent. and ash 5.17 per cent. The washery waste, as a whole, carried 12.69 per cent. of sulphur, the finer part being somewhat higher than the coarse.

The washed coal, on coming from the tables, passes through various launders and is finally deposited in rectangular pits for the purpose of draining off the water that goes with it. The pits are sunk below the level of the ground floor and are nested together, separated by concrete walls 2 ft. thick. There are six pits 20x35 ft., and four 15x17½ ft.; they are all 12 ft. deep. Outlets are provided at the bottom for draining off the water. The total storage capacity of the pits is 1350 tons.

Spanning the room in which the pits are located is an electrically operated excavator of the belt and bucket type. This can travel the length of the building so as to dig the drained coal from any corner of the pits. It discharges on to the first of a series of belt conveyors and elevators, the last of which delivers the still damp coal to two bins which form part of the tipple structure. From these

bins the larries get their loads for the ovens.

Power

The motive power for both mines and washery is generated in two Cahall water-tube boilers, of 300 h.p. each, and one Stirling boiler, of the same size, a total of 900 h.p. There are three 200-kw. Thompson-Ryan generators, with an output of 730 amp. each at 250 volts, driven at 180 revolutions per minute, by an equal number of McEwen 325-h.p. engines with 22x20-in. cylinders. The washery plant (except the Campbell tables, whose power is derived from four 10-h.p. vertical steam engines) is run throughout by independent motors of General Electric Company's manufacture, whose maximum capacity is as follows:

	H.P.
Feeder for loaded cars	10
Feeder for empty cars	7½
Bradford breaker	40
Rolls	60
Bucket elevator	20
Belt distributor	10
Excavator	25
Belt conveyor No. 1	5
Belt conveyor No. 2	15
Inclined belt conveyor	25
Distributing belt	30
Two larries, each	50

Coking Plant

The coking plant contains 400 of the conventional bee-hive ovens, in two double blocks. The ovens are not staggered, or "nested," as they are sometimes built in the Pittsburg district, but are exactly opposite each other. This plan, while a little more expensive to build, is thought to be cheaper to maintain, since repairs to one oven interfere less with the operation of adjoining ones. The output approximates 4¼ tons per oven drawn per day, or about 62 per cent. of the weight of coal charged. A recent representative shipment of coke had the following analysis: Volatile matter, 2.43; fixed carbon, 88.85; sulphur, 1.05; ash, 8.72 per cent. The main constituents of the ash were alumina 4.88 and silica 3.35 per cent. This coke compares favorably, as to ash, with the best Connellsville. It has the same silvery luster and breaks into large compact chunks. The entire coke output of this plant is consumed by the Buffalo and Susquehanna Iron Company at its Buffalo furnaces.

TIPPLE APPROACH TO TYLER WASHERY OF POWHATAN COAL AND COKE COMPANY

Electricity for mine lighting in working places has the following drawbacks: The lights cannot be quickly moved from place to place when a blast is about to be fired; the covering is apt to be cut by rock or coal and the sulphur in the mine water and the powder fumes in the air are likely to destroy the insulation on the wire.

Considerable coal is found in the island of Formosa. From Kempauli, in the extreme north, to the mountain ranges near Pauglian, in the far south, coal has been discovered. Much of it occurs in thin seams. Mining on a commercial scale is practiced in several localities. The mines now operated are located entirely in the north.

A New Method of Blasting

A check weigher at the South Normanton coal mine in England, has invented a method of blasting which is claimed to reduce the liability of accidents and insure the firing of every charge. The method is this: The end of a tube with a loose central needle is inserted into a cartridge of explosive material; the cartridge with the tube and needle are placed in the prepared shot hole. The hole is then rammed, after which the needle is withdrawn from the tube, and the detonator, attached to a suitable carrier, is then passed through the tube into the space left in the explosive by the withdrawal of the needle. The detonator is coupled to the battery and fired; if from any cause the explosive is not fired, or the detonator misses fire, it can be withdrawn and another detonator attached to the carrier and placed in the explosive. This method claims to place within the bounds of possibility the safe control of these detonators, which have been a menace to the lives of miners. They can be placed in charge of officials and kept from the miners, and in case of misfire, can be returned to the maker or destroyed.

To get the best results from "shooting off the solid" the face of the coal should be irregular, with the center in advance of the sides or one side ahead of the other. The roof should be fairly strong and should not break easily if timbers are displaced by the blast.

Lignite Briquetting in Germany

By Robert Schorr*

The growth of the German lignite industry has been rapid and satisfactory. Its most important branch, briquetting, was early recognized as a necessity to improve and extend the use of the low grades of coal, which have been employed for domestic purposes more than a century.

Before proceeding with the subject itself, I will say that the term "lignite" has a somewhat different meaning in the German classification of fuels, from what it has in our country. All fossil carbonaceous deposits older than peat and younger than stone-coals are generally named "brown coal." Only the latest formations, which still show a strong wooden texture and which contain up to 60 per cent. of water, are designated as lignite or bituminous wood. The color of this fuel is light to dark brown, and its analysis shows the ratio $\frac{O+N}{H} = 5$ to 6.

In its raw state it has a heating value of from 2500 to 3200 cal. per kg., or 4500 to 5760 B.t.u. per lb. Absolutely dry, it contains 57 to 67 per cent. C., 5 to 6 per cent. H. and 37 to 38 per cent. O + N, corresponding with a heating value of 4900 to 6400 Calories.

The Various Grades of Brown Coal

This young brown coal is of no importance for briquetting; practically all of the fuel used for that purpose is of the next oldest formation, called earthy brown coal, also "mulmige" or loose brown coal. It is friable and without texture, with a brown to blackish-brown color. Usually from 40 to 50 per cent. of moisture is present and the ratio $\frac{O+N}{H} = 5$. Its ultimate analysis is almost the same as of bituminous wood.

The third brown coal specie is termed shelly (muschelige) brown coal. It carries less moisture and is rather firm. The ratio $\frac{O+N}{H}$ varies from 4 to 5, and the heating value based on absolute dryness ranges from 6500 to 7000 cal. per kg. or 11,700 to 12,600 B.t.u. per lb. The oldest brown coal layers are known as Pitch-coals. They are hard, brittle and black, like stone-coals, and they contain comparatively little hygroscopic water. In the American classification they would be grouped under the headings of true lignites and sub-bituminous coals.

The largest producing lignite mines are located in Bohemia, Hungary, Texas, Dakota, Oregon, Wyoming and British Columbia. Its production in California (although there are numerous lignite beds) has gradually dwindled to about 55,000 tons annually, due to a cheap and abundant supply of fuel-oil. The ratio of $\frac{O+N}{H}$ varies in pitch-coals from 2 to 4, and the calorific value on a dry basis lies between 7200 and 8000 cal. The amount of moisture shows also much variation. Some of the Hungarian (Transylvanian) lignites contain as little as 3½ per cent., while a fair average of the moisture content in Bohemian and American lignite will be in the neighborhood of 16 per cent.

Briquetting Without a Binder

Some of these pitch-coals permit of briquetting without the aid of binder material, if used soon after being mined. If exposed to air for some time, the bituminous matter undergoes changes which are not as yet explained chemically. The coal "slacks" and in this condition a binder is required for the manufacture of a satisfactory briquet.

There are a number of other brown coal varieties which occur in rather limited quantities and which are of no importance for briquetting. The most important among these is the Schwelcoal (wax-coal) which is used exclusively for the manufacture of mineral oils, paraffin and coke. Gagat belongs to the same class. It has the appearance of asphaltum, and is used only for making jewelry.

In the year 1906 over 14,500,000 metric tons (about 16 million short tons) of briquets were made in Germany, which comprises about 75 per cent. of the world's production; of this total, nearly 12,000,000 tons were made from brown coal without the aid of a binding agent More than 33,000,000 tons of raw fuel were consumed for the purpose, or over 55 per cent. of all the brown coal mined. In addition to these hard briquets, about 400,000 tons of so-called brown coal wet-stones (Nass-steine) were marketed. Of the 3,250,000 tons of solid fuel consumed by the City of Berlin in 1905, about 1,250,000 tons were brown coal briquets.

Brown coal briquets were made in a crude way by hand, more than a hundred years ago, in the Rhine lands and in the province of Saxony. The incorporation was effected with water and letten (pottery-loam), and the fuel balls were dried in the sun. The first organized efforts to use machinery were made about 1856, originally on peat, but soon afterward on brown coal also. In 1858 von Weber constructed the first auger-type press for making "machine-peat" or wet-stones. In the same year the first open-mold type of press was built by Herr Exter, for the production of hard and dense peat briquets. Both types of presses have been steadily improved, and they have established two distinct fields.

The Manufacture of Wet-Stones

The inferior fuel-blocks known as wet-stones, contain from 25 to 40 per cent. moisture, and are made by auger-machines and wire-cutters, similar to the manner in which building bricks are made. The brown coal is disintegrated in stages, there being usually two or three disintegrators employed. The final product is discharged into a mixer and from there into the auger-press. The plastic fuel-band, issuing from the die of the press, is cut automatically by piano-wires in the usual manner. The bricks are loaded on specially built cars for air-drying. The installation of mechanical dryers or drying chambers has proved too expensive.

The largest types of auger-presses have an hourly capacity of 10,000 bricks, which weigh (air-dried) in the neighborhood of nine to ten tons. Their heating value is 6000 to 7500 B.t.u. per lb. While the manufacture of these wet-stones is decreasing, there are still 126 plants with 140 presses in operation, and the output of recent years has been about 400,000,000 bricks. The low, average, yearly duty per press indicates that these plants are not operated continuously. The pressure registered in the die does not exceed 7 atmospheres or about 100 lb. per sq. in. Consequently, the bricks are not hard, and in rough handling or during transportation, they give a considerable amount of waste. Freshly mined brown coal weighs 500 to 700 kg. per cu. m. or 31 to 44 lb. per cu. ft. Wet-stones weigh approximately the same, but being of higher heating value they are from 25 to 40 per cent. more economical in storage space. This item is governed also to some extent by the size of the bricks. The same should not exceed 200 cu. in. (12½ x4x4 in.) to facilitate air-drying.

Manufacture of Solid Brown Coal Briquets

Twenty-five years ago, only a little more than 500,000 tons of brown coal briquets were made, and in the year 1906 the production exceeded 12,000,000 tons. The returns for the first six months of 1907, show again an increase of over 10 per cent. There are in Germany, 218 plants with over 1000 presses in operation, and a large number are in the course of construction.

As stated before there is no binder required. The bituminous matter of the brown coal becomes liquefied under great pressure, thus acting as an agglomerant. Sandy brown coal contains as a rule less than 2 per cent. of bitumen and it gives an unsatisfactory brittle briquet. A large amount of bituminous ingredients is also undesirable, because a smoky briquet would result. An earthy brown coal with 4 to 6 per cent. of bitumen yields the most satisfactory article, providing the amount of sulphur is not excessive. The presence of sulphur causes fires in the dryers, and

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the dried coal generally has to be cooled to prevent sticking and self-ignition.

It was soon after the first attempts to make a solid peat briquet, that Engineer Jacobi, and the Zeitz Iron Works took up the engineering problems entailed in similar arrangements for brown coal briquetting. Their efforts led to the present system which is generally adopted, showing only differences in the construction of the dryers, and in the presence or absence of cooling conveyors for the dried coal. The mined coal is stored in receiving bins, from which it is fed by means of roller feeders or a screw-conveyor and bucket-elevator upon a double cloth shaking screen. The meshes of the first screen are 10 to 15 mm. (⅜ to ⅝ in.), and all material passing through this screen goes directly to the dryer floor. The other screen has 30 to 50 mm. openings (1¼ to 2 in.), and everything passing this mesh drops into disintegrator rolls. The rejects from the screens are conveyed to bins in the boiler room, and used for steam purposes. The disintegrated product from the rolls is generally sent over another shaking screen. The oversize is returned to the rolls and the balance (being sufficiently fine), is elevated to the floor above the dryers.

Types of Dryer Designs

There are many dryer designs for direct firing, or the use of hot air and steam. The most favored types are the plate dryer and the Schulze apparatus. The first named consists of circular plates arranged one above the other and housed in by a steel shell. A central revolving shaft with rake-arms (similar to McDougall roasting furnaces) effects the gradual descent of the fuel in serpentine lines from shelf to shelf. The heat application is usually by direct firing, hot air and steam being rarely employed. The Schulze dryer is gaining rapidly in favor. It is a cylindrical boiler (7 to 9 ft. dia. x 20 ft. long) with 200 to 240—4-in. tubes, revolving on a slight incline on hollow trunions. The brown coal slack travels slowly through the 4-in. tubes, while steam (as a rule the exhaust from the press engines) is passed around the same.

The amount of moisture left in the fuel varies from 5 to 20 per cent., depending upon conditions. A brown coal fairly rich in bitumen is dried more thoroughly than a lean one, and a rather low temperature is maintained. As the fresh brown coal carries from 46 to 50 per cent. water, such installations are extensive and costly. A large amount of raw fuel is required; 2½ to 3½ kg. for 1 kg. briquets. This includes all fuel used in the briquet itself and in the process of its manufacture. The last item amounts sometimes to 30 per cent. of the grand total requirement.

Operation of The Presses

The press is of the open-mold type (Exterpress), always directly connected with a steam engine and mounted on a horizontal bedplate. The head carries the form which is about 3.3 ft. long. In this form 20 briquets are imbedded at one time, and the friction existing between the same and the press-form acts as the resistance for the moving plunger. The pressure development rises in the last fraction of the stroke to about 1500 atmospheres or over 20,000 lb. per sq. in. The form is jacketted and steam or water is circulated depending on the kind of brown coal.

The company's trade-mark is stamped into the plunger face. This gives on each flat side of the briquet a reprint, on one side projecting and on the other depressed. The whole stream of briquets is held together by the form, and travels on channel ironways to storage places or to railroad cars. With every plunger stroke a briquet is made, and the whole column advances for a distance equal to the thickness of the briquet. The capacity of these presses is small, being 40 to 90 tons per 24 hours.

The Palour (Salon) briquets are made for domestic use. They are oblong (about 6x2¼x1¼ in. thick) and weigh 11 oz. each. Industrial briquets for factories and gas-generators, are smaller and generally cubical or cylindrical in shape.

The raw brown coal costs from 22 to 31c. per metric ton at the works. The dead cost, allowing 7 per cent. for depreciation and 5 per cent. for interest upon the total investment, amounts to about $1.30 per metric ton of briquets. The wholesale price, f.o.b. works, ranges from $16 to $23 per carload of ten tons. The labor item rarely exceeds 24c. per metric ton (2204 lb.) in small, one or two press, installations. All other manufacturing items exclusive of fuel and fixed charges are fully covered by from 8 to 11c. per ton. In view of the relatively small output of these expensive presses, and in view also of the elaborate character of German briquetting works, the fixed charges (depreciation and interest) are high. The largest brown coal company owns 20 briquetting plants with 52 presses. There are a number of other concerns operating from 8 to 42 presses. Only a few factories employ less than 4 machines.

Considerable dust is made, mostly in the dryers and at the presses, often amounting to 5 per cent. of all the raw fuel used. There are proper provisions to catch most of this dust and to prevent its escape into the working rooms. One cu. m. of briquets weighs 900 to 1000 kg., i.e., about 50 to 60 lb. per cu. ft. The heating value ranges from 8500 to 11,000 B.t.u. per lb., the briquets rarely containing more than 12 per cent moisture.

When the subject was first taken up the annual brown coal production in Germany was approximately 4,000,000 tons. At the present time, it amounts to over 60,000,000 tons, and about 8,000,000 tons are imported from Bohemia. New brown coal fields are being found, and it is estimated that there are now over 7,000,000,000, tons in sight. The German brown coal industry gives employment to about 48,000 men, not counting those employed in brown coal distilling works. The U. S. Geological Survey recently purchased a German brown coal press to be installed in the testing plant at Jamestown. Some of the North Dakota lignites permit of briquetting without binder, and there may be similar deposits in some parts of Texas and Central America. Nearly all American lignites, however, require a binder to make a merchantable briquet.

A direct current machine properly cared for will not spark under a full load or even if considerably overloaded. If sparking occurs, it is certain something is at fault. The most frequent causes of sparking have been found to be: (1) weak field; (2) short-circuit of the armature coil; (3) broken connection between the coils of the armature and commutator; (4) rough commutator or hard particles between the segments; (5) dirty, broken or improperly fitted brushes; (6) insufficient pressure of the brush; (7) improper spacing of the brushes on the commutator; (8) brushes not at the neutral point.

All important doors in gaseous mines should be electrically connected by an apparatus similar to that used at the doors of ordinary residences, so that bells ring and continue to ring so long as the doors are open.

Tests made abroad as to the relative value of lime, tar and carbolineum as preservatives for mine timber, gave the following results: Lime was found to be of little value; coal tar, while it preserved the surface of the timber, afforded no protection for the interior. Carbolineum gave good results where the timber had first been barked and well dried.

If too little powder is used when "shooting off the solid" the tamping will be blown out; when an excess of powder is used, the coal will be scattered about, props perhaps knocked down and the roof weakened. The miner should be taught that the determination of the correct amount of powder necessary for such blasting is a matter of vital importance.

It has been suggested that where miners do their own "firing from the solid," it is best to fire one shot at a time. The last miner on the air course should fire first and the other miners follow in turn, so that there will be as little annoyance from smoke as possible. Firing should be prohibited except at certain fixed periods.

The Future of Copper

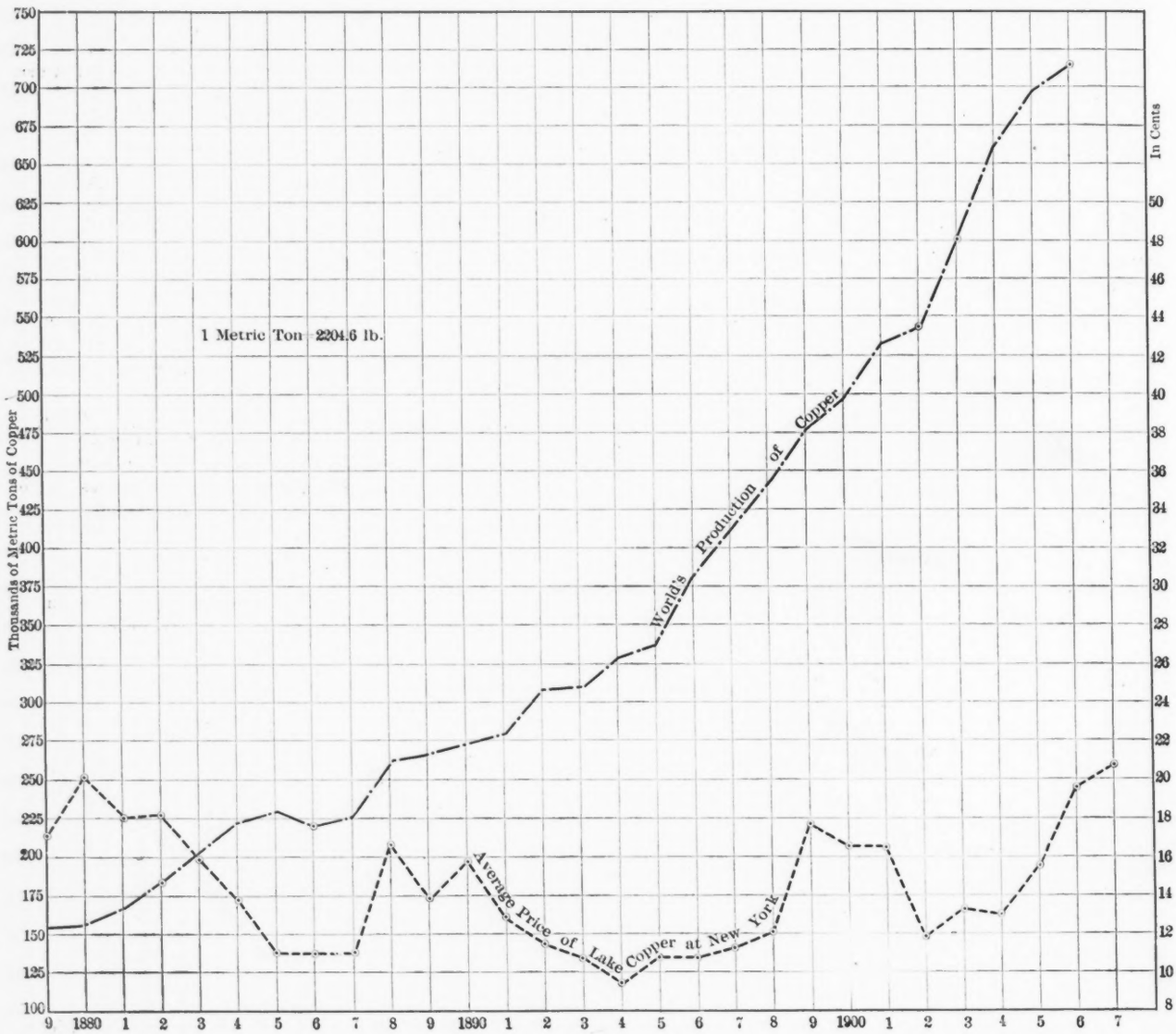
By John T. Morrow*

The object of this article is not to discuss the future of copper, with respect to the immediate moment, but rather with reference to what may be called the approximate future, that which deeply concerns the producer or consumer of the metal, as well as the investor. Those who are most closely associated with the economic side of any enterprise are prone to take too much to heart the periodic variations in the world's markets. By so doing they get sadly out of natural focus, and being so intimately associated, in the actual markets so close to their work, they are obliged to operate, as it were, through a lens which not only unduly magnifies their immediate condition, but reduces tremendously their field of observation.

In order to obtain a healthy or natural view of an industrial or economic condition, we must do away with artificial means of observation, and must retire from the field far enough so that with our own natural mind's eye we may view the situation at the proper focus. In considering the copper situation of to-day, therefore, we must not allow our conclusions to be based on the showing of a few months only, but rather upon the copper output covering a reasonable number of years.

In the data which follow in this article is shown the world's production of copper beginning with 1879, since which time accurate data on the world's production of copper are available. A chart, or set of curves, is also given herewith in order to graphically show the rapidly upward trend of the production of copper from 1879 to the present time, together with a curve showing the price of copper per pound in New York for the same period, all of which is interesting in forecasting the future of the metal that we are considering.

A few comments on the foregoing data and on the diagram will not be out of place. The production of copper for the year 1879 was 170,310 short tons. For 1906 it was 788,609 short tons. The average increase in this time was 5.84 per cent. per annum. The increase during the last 10 years (1896 to 1906) was 6.404 per cent. per annum. A forecast for the next 20 years on the basis of the rate of percentage increase for the last 27 years is shown as follows:



PRODUCTION AND PRICE OF COPPER

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WORLD'S PRODUCTION OF COPPER[1].

Year.	Metric Tons.	Short Tons.
1879	154,471	170,310
1880	156,500	172,547
1881	166,065	183,093
1882	184,620	203,550
1883	202,697	223,481
1884	223,884	246,840
1885	229,315	252,828
1886	220,669	243,295
1887	226,492	249,716
1888	262,285	281,179
1889	265,516	292,741
1890	274,065	302,166
1891	280,138	308,862
1892	309,113	340,808
1893	310,704	342,562
1894	330,075	363,920
1895	339,994	374,856
1896	384,493	423,917
1897	412,818	455,147
1898	441,282	486,529
1899	476,194	525,021
1900	496,819	547,761
1901	532,148	586,712
1902	542,209	597,805
1903	602,832	664,644
1904	663,327	731,342
1905	699,514	771,239
1906	715,268	788,609

[1]As reported by "The Mineral Industry."

PROBABLE PRODUCTION OF COPPER FROM 1906 TO 1928.

Based on percentage increase of 5.84 per cent. per annum.

Year.	Metric Tons.	Short Tons.
1906	715,000	788,313
1907	757,000	834,620
1908	801,000	883,131
1909	848,000	934,950
1910	898,000	990,077
1911	950,000	1,047,409
1912	1,005,000	1,108,049
1913	1,064,000	1,173,098
1914	1,126,000	1,241,455
1915	1,192,000	1,314,223
1916	1,262,000	1,391,400
1917	1,335,000	1,471,885
1918	1,413,000	1,557,883
1919	1,496,000	1,649,393
1920	1,583,000	1,745,314
1921	1,676,000	1,847,850
1922	1,774,000	1,955,898
1923	1,877,000	2,069,460
1924	1,987,000	2,190,738
1925	2,103,000	2,318,633
1926	2,226,000	2,454,245
1927	2,356,000	2,597,574
1928	2,493,000	2,748,622

It is interesting to compare the production of copper with its brother industry, iron. While the percentage increase in the production of copper per annum has not been as rapid as that of iron for the last 20 or 30 years, yet reference to the statistics of the iron production will show that it is far more sensitive to the periodic convulsions of trade than copper. For instance, the panics of 1893 and 1903, while they very materially reduced the output of pig iron, did not at all reduce the output of copper. As a matter of fact, during 1903 the increase of the copper production was very rapid, while in 1893 it a little more than held its own.

For those who have interests in the copper production, either as owners, producers or investors, I call attention to the two following points:

(1) The world wants copper at a rapidly increasing rate, as is unquestionably shown by the preceding data and chart, and it is perfectly fair to assume that this rate will continue to increase for the future at least as fast as it has for the last 27 years, i. e., we may confidently expect that the world will continue to absorb the production of copper at an increase of at least 5.84 per cent. per annum. This is enough for the producer and consumer, as far as output is concerned.

(2) Now, as to the price of copper. Though the price will vary from time to time, owing to periodic market conditions, yet knowing that the world is going to take copper in the future even faster than it has in the past, we also know that the world is going to pay for this copper, and of a necessity, at a price which will enable the producers to make a profit.

Colliery Notes

In locating a coking plant, the possibilities of a good supply of pure water should be carefully investigated; a water polluted with sulphur is unfit for quenching coke.

Great care should be exercised in examining shots about to be fired in well ventilated dry dip workings, as under these conditions there are present the principal essentials for a dust explosion, i.e., flame, pure air and an accumulation of dust.

When in doubt as to the weight of rails to be used for a locomotive haulage system, multiply the number of tons on one wheel by 15 and the result will be the weight in pounds per yard of rail; for example, for a 16-ton locomotive, a 60-lb. rail should be used.

In rendering first aid to an injured miner who is unconscious, make no attempt to give fluids by the mouth, for in the patient's unconscious state, they are apt to enter his wind-pipe and suffocate him. Cold water may be sprinkled on the face, or the extremities rubbed if they are uninjured.

In operating electric haulage, the more locomotives used, the cheaper the haulage. It is not necessary to increase proportionally the power for two or more locomotives, as no two motors are likely to be hauling the maximum load at the same time, neither is it necessary to increase the force at the power house.

The Connellsville region was the first of the large coking regions to be developed in the United States. Coke was made in this region in 1817 for a rolling mill at Plumsock, Penn. The first shipment of coke from the Connellsville region was in 1841. At present the shipments of coke average about 250,000 tons per week.

The care of track rollers in rope haulage is an important matter. Care should be taken that the gudgeons are not bent out of center before being placed on the track. If bearing brackets are carelessly set, the roller will be thrown out of right angle with the track; if set too close they will bind the roller and cause undue friction. If the haulage is long, the rollers should be placed from 12 to 18 ft. apart. To avoid whipping of the rope the spacing should be irregular.

Newly opened seams of coal are frequently liable to small blowers of gas In many cases, when sinking operations are in progress, one of the first indications of approaching the coal measures is the bubbles of carbureted hydrogen ascending through the water at the bottom of the shaft. When such an indication is observed, a fan should be installed at the head of the shaft and the air forced down to the bottom in canvas pipes. Naked lights should not be used.

The continual repair of coal bins used for the storage of soft coal, expensive in both time and money, can in a great degree be avoided by giving careful attention to the strength of the structure during the construction. A number of iron rods placed in such a position as to tie the bin together, with batter posts and vertical side timbers, will give sufficient protection against the movement that is apt to occur from the pressure of the bank of coal on one side of the bin. The bottom of the bin should rest on two piece stringers firmly bolted to the uprights.

In order to prevent undue wear on the supporting rollers and journals of wheel conveyors, they should be provided with fibrous packing; this allows the oil to be conveyed to the journals and rollers by capillary attraction. It is also advisable to supply the journals with an overhanging reservoir with small cocks to regulate the flow of oil. The oil rod should be so arranged that the lubricant will be wiped off by contact with the packing in the roller which maintains a continuous feed. Only moderately thick oil should be used with rollers of this design.

In the simultaneous firing of holes by electricity it is not unusual for one hole in a group to miss fire, consequently there is always an element of danger in group firing. Greater safety in firing may be obtained by the use of electrically ignited time fuses, although it must be remembered that the use of a suitable detonator would go a long way toward insuring the simultaneous ignition of group shots. "Hang fire" may occur either with the electric detonator or with the explosive. A damp detonator will often hang fire. It has been shown that a shot sometimes explodes only after prolonged turning of the exploder handle, whereas under normal conditions, less than half a turn is necessary. The retarded action of the electricity may be caused; (1) by the increased resistance in the circuit; (2) by broken wires; (3) bad and leaky joints; (4) dirt on the spring contacts and terminals, permitting only just enough electricity to heat the fuse bridge, which has then to be kept heated during several seconds before the temperature rises to the point of igniting the priming. A similar effect will be produced if the exploder is weakened on account of the loss of magnetism. Delay in ignition is sometimes caused by defects in the fuse or by wet holes or insufficient priming.

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Contents

The Osceola Report

The Osceola is the first of the Lake companies to report for 1907. Its unsatisfactory showing was so bad as to have a generally depressing effect. Out of a production of 14,134,753 lb., only 11,080,210 lb. was sold, and that fetched an average of only 18.17c. Up to Jan. 31, 1908, an additional 858,342 lb. had been sold at 14c. per lb., thus reducing further the average for the output of 1907, the final figure for which will not be known until the remainder of the stock is disposed of. As to the average price received by the various Lake companies there are plenty of surprises in store, which will develop with the publication of their reports. Probably there is none which will equal the quotational average — 20.661c. — and many will fall far below it.

This, however, has been anticipated. The great surprise of the Osceola report was the large amount of copper unsold at the end of the year. This amounted to 21.6 per cent. of the company's production. If all of the other American producers had stocks in the same ratio the total would have been in the neighborhood of 250,000,000 lb., but any such deduction would be far stretched because the datum is too small, and moreover it is well known that the market for Lake toward the end of the year was particularly slow. However, it is certainly surprising to find so much unsold copper in the hands of a company whose output is handled by the largest sales agency, especially after the great sales of October-November which were supposed to have reduced stocks to a comparatively small amount.

The Copper Market

The behavior of copper during the last fortnight has been rather startling. From the beginning of February the market was sagging and toward the middle of the month the price declined nearly to 13c. Opinions then were different. Some large sellers thought that the price might go to 13c., or a little lower, with the result that there would be a stimulation of buying and a sharp recovery. Others were pessimistic, believing that the buying power did not exist in this country, while Europe appeared to be satiated. The market remained quiet, however, with no apparent pressure to sell.

This was the situation up to about Feb. 12, when suddenly a big producer began to sell at a recession in price and others followed suit one after another, veritably slaughtering the market with big cuts in price, even down to 12c., thus disposing of an immense quantity. In this the United Metals Selling Company played the biggest part. After about eight days the huge offerings ceased as suddenly as they began and the market price promptly rose again.

The mystery is why these large sales should have been made at this time and at such great concessions. The effect on the stock market was comparatively small, especially in the case of Amalgamated, which for some time past has had the appearance of being pegged. As in the case of some former large sales, a part of the copper recently turned over has gone into the hands of European manufacturers, who were ready to snap it up at bargain prices, while another part has simply changed hands and will be sold again. American manufacturers again failed to take advantage of the situation. The fact is they are still in no position to buy. There are encouraging signs of improvement in some quarters, but no important buying is to be expected from the wire drawers until extensions are again to be made to electric railways, power plants, etc., and these await the general restoration of investment credit and confidence, and moreover the accumulation of savings to be invested.

The Canadian Lead Bounty

Under the Dominion statute, the term in which bounties are paid on lead produced in Canada will expire in June next. This bounty dates from 1899, and up to the end of 1906 the total amount paid was $770,848. Under the present act the bounty is 75c. per 100 lb., but no payments are made when the price of lead in London exceeds £12 10s. per ton. Under this latter clause no payments were made in 1907. The British Columbia producers, who are the chief beneficiaries, are now making efforts, which appear likely to be successful, to secure the passage of a new act to renew the bounty for a term of years; and at the same time they want the limit raised to £18 per ton in London, claiming that there is no profit for them with lead below that price.

The largest sum paid out under the

law in any one year was $330,645 in 1905. In 1906 the total was much less, $96,196, and of this $72,304 was paid to two mines, the St. Eugene and the Sullivan. In all 135 mines have received some bounty, but in most cases the amounts were very small, not more than 10 mines receiving considerable amounts. The St. Eugene and Sullivan mines are owned by two smelting companies—the former by the Consolidated Mining and Smelting Company of Canada, while the latter is a subsidiary of the American Smelting and Refining Company.

The American Smelting and Refining Company

All kinds of rumors respecting the ownership of the controlling interest in this company have been flying around. In spite of repeated denials, these have reiterated that the controlling interest has passed from the Guggenheims. As to where it has passed, stories differ. Some say "Standard Oil," others "Amalgamated," others John D. Rockefeller. Of course the parties concerned in such transactions, if there have been any, will not talk about them until they are ready to do so. The basis for the recent surmises has been the large sales of Smelters on the Stock Exchange during the last six months, and the opinion that Amalgamated ought to have it to fortify its position in the copper industry. As confirmatory of the belief that Amalgamated has been securing a powerful interest in the Smelting company are cited the recent contracts between the Utah Consolidated Mining Company and the Garfield Smelting Company for the smelting of ore; and between the Utah Copper Company and United Metals Selling Company for the sale of the former's copper. However, these are perfectly natural transactions, and on the other hand, there have been no negotiations between the Smelting company and the United Metals Selling Company for renewal of the contract, soon to expire, under which the latter has been selling the copper output of the former.

As to the ownership of the Smelting company, the Guggenheims probably have greatly reduced their holdings; indeed, they may have largely disposed of them, as is the common belief; but if so, it is not believed in well informed quarters that their interest has passed to Amalgamated or any other single hand, but on the contrary is scattered among many hands. This would not necessarily imply any change of management. The Guggenheims have developed a marvellously successful business out of an enterprise which originally was rather disappointing and have ably carried it through several difficult situations. Consequently the stockholders will probably be slow to relinquish their services, even if it were in their power to do so.

Mining on the Comstock

A noteworthy event last week on the Comstock lode was the starting of the Yellow Jacket mill at Gold Hill. While the Kinkead mill has treated ore from the Virginia City mines and the Butters plant has re-treated many tons of the old pan-amalgamation tailings, little ore has been milled in recent years from the Gold Hill mines.

The resumption at the Yellow Jacket is noteworthy not merely because it marks renewed production at a once important mine, but also because of the far-reaching possibilities attending it. At Virginia City, the mining companies on the north end of the Comstock lode are hoping to find bonanza ore again by re-opening the flooded levels below the Sutro adit. On the other hand, at Gold Hill the policy has been to develop milling ore in the upper levels and to follow this ore in the hope of developing rich ore.

Australasian Gold Production

Official returns from most of the States of Australia are slightly above the estimates made by our correspondents before the December returns were received. For the six States of the Commonwealth of Australia the total gold output in 1907 is reported at $65,949,454; to which New Zealand added $9,864,592, making a total of $75,814,046 from the Australasian mines. These returns give the production for two years past as follows, in ounces of fine gold:

	1906.	1907.	Changes.
New S. Wales....	253,987	247,363	D. 6,624
Queensland.....	544,636	457,596	D. 87,040
South Australia.	25,592	26,000	I. 408
Tasmania.....	60,023	66,500	I. 6,477
Victoria..... ...	772,290	695,576	D. 76,714
West'n Australia	1,794,547	1,697,553	D. 96,994
Total commonwealth	3,451,075	3,190,588	D. 260,487
New Zealand....	534,616	477,242	D. 57,374
Total ounces..	3,985,691	3,667,830	D. 317,861
Total value...	$82,384,233	$75,814,046	D. $6,570,187

This shows a total decrease of 8 per cent. The production of Tasmania for 1907 is estimated on nearly full returns, as is that of South Australia. The production of the Northern Territory is included in that of South Australia; and there is at least a suspicion of a gold output there which is not reported. Recent developments indicate that several settlements of Chinese have grown up in the little known country of the Northern Territory, where a considerable number of men are employed in placer mining.

The causes of the decrease in Australasian gold production were sufficiently explained in the article in the JOURNAL of Jan. 4 last, page 60.

ELSEWHERE IN THIS issue is published an article by George A. Denny, a well known mining engineer of London, who was until recently at the head of some very important operations on the Rand. His articles were originally published in the London *Mining Journal*, last summer, and have since been published in pamphlet form, but have not heretofore attracted the attention which they deserve, inasmuch as they call attention to phases of mine valuation and finance that are commonly neglected. We shall publish further extracts from Mr. Denny's paper, deferring comment until then, when we hope that the points which he emphasizes will receive some discussion.

SILVER PRICES, which reached their lowest level at about 52c. late in December, and were 54c. at the opening of the year, have been gradually and steadily recovering. Setting aside one or two abnormal rises due to speculative operations in London, the advance has been nearly 5c., quotations being fairly steady between 56½ and 57c. The advance has been wholly due to the better conditions in India, resulting in large shipments to that country; aided slightly by a demand from China, which has been out of the silver market for over a year.

IN OUR PRELIMINARY report of copper production in the United States in 1907 Lake Superior showed an increase over 1906. The revised reports that we are now receiving show that there were errors in the data as to two companies and the total for Lake Superior will probably be in the neighborhood of 221,000,000 lb., or a decrease from 1906. The revised figure for the United States will probably be in the neighborhood of 885,000,000 lb.

Views, Suggestions and Experiences of Readers

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

CORRESPONDENCE AND DISCUSSION

Functions of the Consulting Mining Engineer

The necessity for proper supervision of all mining operations can call for no question. It is fully as important in the earlier history of a property as at a later stage. I cannot, however, agree with A. H. Rogers' article in the JOURNAL of Feb. 8 in regard to the best means of accomplishing this end. Small properties certainly cannot afford to remunerate an engineer with the salary paid by some of the large companies. If, however, the retainer, per diem fee when at the property, and traveling expense of the consulting engineer are added to the wages paid a foreman in charge, and the resulting sum paid a resident engineer, there will be little difficulty in obtaining a competent man. With a competent resident engineer always on the ground the results should be better than with the occasional visits of an engineer.

In this connection I wish to make a plea for a somewhat large class of engineers. They are men of ability equal to that of many consulting engineers, but financially unable to incur the expense incident to commencing independent practice, men who, in many cases, have had to pay for their own education and who must work for salary for some years before they can accumulate the means to enable them to become consulting engineers. Indeed, it is the possession or non-possession of money rather than the question of ability which allows an engineer to promote himself to the status of consulting engineer instead of remaining in the employ of one company. The salary I have already indicated would be gladly accepted by such men and would give the mine the advantage of continuous supervision. Mr. Rogers has, doubtless, no idea of harming others but, if his view were to prevail, what would be open for these men? Simply the position of "a superintendent on the ground, who may thus be a low-salaried man."

Although discussion of the various causes of failure of many properties is foreign to this question, one cause is sufficiently allied to warrant reference, and it applies equally whether a resident or consulting engineer be employed. I refer to the cases of companies which, after installing a competent resident engineer or after receiving the consulting engineer's report, refuse to allow the proper development of the property. The directors insist on sinking here, tunneling there, installing improper equipment, etc., at their own sweet will. In most cases these directors probably have never seen a mine. Ridiculous as this is, it is only too common. I know of one such instance recently where, after spending a large amount of money, the company has a promising property and has accomplished practically nothing, except the building of a monument of self-evident errors and of a good road to the bankruptcy court. When the company insists on one or more of the directors undertaking the operating financial management, the engineer must be kept closely informed of the conditions and the technical work must, of course, be regulated accordingly.

RESIDENT ENGINEER.

Spokane, Wash., Feb. 12, 1908.

"Silica" and "Insoluble" in Smelter Analysis

In an article on "'Silica' and 'Insolubles' in Smelter Analysis," in the JOURNAL of Nov. 2, E. Kneeland establishes the incorrectness of one method by the use of another which may be equally unreliable. Without actually affirming that his deduction is incorrect, which could not be done without knowing more definitely the composition of the ore, I should like to make some suggestions.

In the first method, i.e., acid treatment and fusion of the "insoluble," if we neglect the sulphur or assume that it is present as insoluble sulphate radical, to the best of my knowledge the calcium fluoride would not be decomposed by the aqua regia. Mr. Kneeland's statement that "the fluorspar would be decomposed by the aqua regia and the fluorine thus liberated, etc.," is not entirely correct. If, however, the sulphur is present as sulphide and in considerable quantities, the following reactions will take place:

$$S + 2HNO_3 = H_2SO_4 + 2NO.$$
$$H_2SO_4 + CaF_2 = CaSO_4 + 2HF.$$
$$4HF + SiO_2 = SiF_4 + 2H_2O.$$
$$3SiF_4 + 3H_2O = 2H_2SiF_6 + H_2SiO_3.$$

The reactions result in the volatilization of the fluo-silicon compounds and consequent loss of silica.

The same losses, however, must apply in the method which he deems correct as shown by the following equations:

$$Na_2CO_3 + CaF_2 = CaCO_3 + 2NaF.$$
$$Na_2CO_3 + SiO_2 = Na_2SiO_3 + CO_2.$$

On solution in water and hydrochloric acid the following reactions take place:

$$NaF + HCl = NaCl + HF.$$
$$Na_2SiO_3 + 2HCl = 2NaCl + H_2O + SiO_2$$
$$4HF + SiO_2 = SiF_4 + 2H_2O.$$
$$3SiF_4 + 3H_2O = 2H_2SiF_6 + H_2SiO_3.$$

As an explanation which agrees with the chemistry here indicated and the statement that there is "a little sulphur present," I suggest that in the wet method the fluorspar was slightly acted upon through the sulphur present, giving slightly low results; and in the direct fusion of the ore the hydrofluoric acid set free attacked the containing vessel forming silica anhydride and precipitating silica with consequent high results. Thus neither result could be correct.

A few items of information would assist very materially in elucidating this matter, the principal of them being: (1) The sulphide content of the ore; (2) whether the silica evaporation was done in a platinum basin; (3) the determination of the total calcium in the ore and that in the "insoluble."

On Mr. Kneeland's own showing this is a matter of vital importance to analysts, and should he give us further and more precise information of his experience, I have no doubt it could be satisfactorily settled.

HARLEY E. HOOPER.

Newnes Junction, N. S. W.

Mechanical Efficiency of Tube Mills

In Mr. Abbé's reply to my communication, in the JOURNAL of Jan. 18, he errs in considering that rolling a tube-mill on rails is equivalent to revolving it on tires as in practice. In the first case only rolling friction is encountered; in the latter both rolling and axle friction, for the wheels upon which the mill rests must be supported on axles in journals. Rolling friction is so insignificant in amount that of course a mill would roll on rails more easily than on either tires of gudgeons, although the balancing of the load were the same. Mr. Abbé's "rule of thumb" explanation is therefore not satisfactory, and I repeat that in a mill supported on gudgeons, the load balances exactly the same as in one rolling on tires, though it has been stated that the balancing was different, and favored the latter style of mill.

I will now go further, and say that with bearings of equal perfection, and with equal lubrication, there should be very

little difference between the power required to drive a mill resting on wheels, and one journaled on gudgeons. Starting with the formula for journal friction $F = W \sin. \phi$, it may easily be demonstrated that if R_1 is the radius of the mill and R_2 of the supporting wheels, and r_1 the radius of the gudgeons and r_2 of the axles of the supporting wheels, then the work done in overcoming axle friction when on wheels is $\frac{R_1 r_2}{R_2 r_1}$ times that done when supported on gudgeons, and this does not take into account the rolling friction of a mill on its supporting wheels, nor the fact that the sum of the pressures on the wheels will be greater than the weight of the mill because the mill acts as a wedge between the wheels. Of course when most of the weight is taken by a central wheel this increase of pressure is unimportant.

Certain conditions of practice may make it desirable to support the mill on wheels, but the statements which I questioned had to do only with theory, and from this standpoint a mill resting on wheels has no advantage over one journaled on gudgeons unless the ratio $\frac{R_1 r_2}{R_2 r_1}$ is less than unity. This of course supposes bearings of equal perfection and equal lubrication. If there is any advantage here it must be remembered that this applies only to a part of the total power required to drive the mill, and that neither mill has any advantage in power required to actually grind the ore.

E. E. WHITE.

Calumet, Mich., Jan. 23, 1908.

Chrome, Molybdenum and Manganese Ores

I am interested in chrome, molybdenum and manganese ores, occurring in California, and I should like to know the value of such ores, f.o.b. Atlantic or Pacific ports, and the names of possible purchasers.

J. M. K.

Golconda, Nev., Feb. 10, 1908.

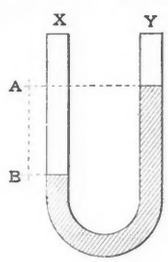
The value of chrome ore, assaying 50 per cent. chromic oxide is $17@20 per ton of 2240 lb. ex ship, New York, Philadelphia and Baltimore, depending upon the quantity, terms of sale, nature of the ore, etc. The principal buyers are the Kalion Chemical Company, Philadelphia, Penn.; the Baltimore Chrome Works, Baltimore, Md.; and the Harbison-Walker Refractories Company, Pittsburg, Penn. The small amount of chrome ore produced and sold in California fetches about $20 per ton f.o.b. mines, but the market for it at that price is small.

Molybdenum ore, guaranteed to contain 90 to 95 per cent. molybdenum, fetches about $400@450 per ton. The Primos Chemical Company, of Primos, Delaware county, Penn., is the largest buyer. The Electrometallurgical Company, 79 Wall street, New York, and DeGolia & Atkins, of San Francisco, are also buyers. The market for molybdenum ore is narrow, and the price is decidedly variable and usually a matter of negotiation in each particular case.

The price of manganese ore depends upon the percentage of manganese and iron, and also the absence of injurious impurities. Ore containing not more than 8 per cent. silica and not more than 0.25 per cent. phosphorus with over 49 per cent. manganese, is worth 30c. per unit for the manganese and 16c. per unit for the iron contents. The Illinois Steel Company, of Chicago, Ill., and the Carnegie Steel Company, of Pittsburg, Penn., are large buyers. High-grade ore, for chemical uses, fetches higher prices.

Manometer Reading

If a U-tube half filled with mercury be subjected to a pressure (an air blast) which causes the mercury in one leg to descend 1 in., and in the other length to rise 1 in., is it correct to say that we have (1) a pressure of 2 in. of mercury, the difference in level of the liquids in the two



legs of the U-tube; or (2) a pressure of 1 in. of mercury, the amount by which the column of mercury has been raised from the zero point. Taking atmospheric pressure at 15 lb. per square inch, corresponding to a column of mercury 30 in. in hight, the first would give the blast pressure as 16 oz. per square inch; the second 8 oz. per square inch.

NOLEM.

Valparaiso, Chile.

Dec. 16, 1907.

The condition stated by our correspondent is shown in the accompanying sketch. The blast pressure is measured by the difference in level between *A* and *B*, because the pressure applied at *X* is sustaining a column of mercury of that hight.

"Gold Bricks" or "Gold Bars"

In the *Canadian Mining Journal*, of Feb. 1, the following item occurs:

"Port Arthur—J. S. Steele, manager of the St. Anthony's Reef gold mine, on Jan. 20, deposited in the vaults of the Port Arthur branch of the Bank of Montreal several gold *bricks*. These were the result of a clean-up at the St. Anthony mill. Forty-five miners are employed at the mine and the mill is running regularly."

The term "gold brick" has become synonymous with "swindle" in all forms. It would be much better to say "gold bars." Any bank suspected of accepting deposits of gold bricks should be liquidated at once, or the depositors may find themselves "gold bricked." The expression "gold brick" had its origin in the practice of gilding bricks with gold leaf for the purpose of swindling by substitution for a brick of metal of similar dimensions for which the "come-on" had paid real money. Therefore, it is to be hoped that editors of mining journals when writing seriously will not get into the habit of referring to the deposit of gold bricks in reputable banks. "Gold bars" is more exact, and does not make the depositor of the banks feel so uneasy.

HIRAM W. HIXON.

Victoria Mines, Ontario, Feb. 6, 1908.

Vanadium in New Mexico

In the JOURNAL, of Feb. 1, page 246, A. Lawrence Heister reports the discovery of vanadium in paying quantities near Magdalena, N. M. In 1882, I found crystals containing vanadium similar to those described, on the dump of the Torrence mine, Socorro. I do not know whether or not this mine is in operation now. The occurrence was well known 25 years ago. A further search in the Socorro district might lead to other and more valuable discoveries.

EDGAR D. STONE.

Etna, Georgia, Feb. 5, 1908.

Asbestos Slates

According to a German publication a firm in Munich has succeeded in artificially rendering asbestos waterproof, and has put upon the market this new kind of asbestos under the title of asbestos slates. These asbestos slates, it is claimed, are as hard and as strong as the natural slates, and can therefore be laid on wall or roof constructions without any wooden laths being necessary. They are very easily worked, and can be bored, nailed, and cut just like wood, without any danger of splitting. They form a fireproof covering for inside and outside wooden walls, are valuable for insulation work of all kinds, even for electrical purposes; are of great use in building railway carriages as insulating material under the seats; for use in postal telegraphic work for insulating the switches; for covering iron and wooden constructions; for use as fire-proof doors for closing off single rooms in stores, warehouses, etc., for lining wooden doors, and for covering walls and ceilings of all kinds so as to protect them from fire, heat, cold, dampness, disease, germs, and vermin.

New Publications

RHODESIA CHAMBER OF MINES (INCORPORATED), BULAWAYO, TWELFTH ANNUAL REPORT FOR THE YEAR ENDED 31ST MARCH, 1907. Pp. 140. 8x10 in.; cloth. London, 1907: Darling & Son, Ltd.

GEMEINFASSLICHE DARSTELLUNG DES EISENHUETTENWESENS. Prepared by Verein Deutscher Eisenhüttenleute. Pp. 254; illustrated. 6½x9½ in.; cloth. Düsseldorf, Germany, 1907: A. Bagel.

REPORT OF THE STATE BUREAU OF MINES, DENVER, COLORADO, FOR THE YEARS 1905-6. E. L. White, Commissioner. Pp. 127; lliustrated. 6x9 in.; cloth. Denver, Colo., 1907: State Bureau of Mines.

JOURNAL OF THE IRON AND STEEL INSTITUTE, Vol. LXXV, No. III, 1907. Edited by Bennet H. Brough. Pp. 620; illustrated. 5½x8½ in.; cloth. London, 1907: E. & F. N. Spon, Ltd. New York: Spon & Chamberlain.

CONTRIBUTIONS TO ECONOMIC GEOLOGY, 1906. Part II--Coal, Lignite and Peat. M. R. Campbell, Geologist in Charge. Bulletin No. 316, United States Geological Survey. Pp. 543; illustrated. 6x9 in.; paper. Washington, 1907: Government Printing Office.

GEOLOGICAL AND WATER RESOURCES OF THE REPUBLICAN RIVER VALLEY AND ADJACENT AREAS, NEBRASKA. By G. E. Condra. U. S. Geological Survey, Water-supply and Irrigation Paper No. 216. Pp. 71; illustrated. 6x9 in.; paper. Washington, D. C., 1907: Government Printing Office.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Proceedings of the Fifteenth Annual Meeting, July 1, 2, 3, 1907. Volume XV. Edited by Charles S. Howe, Arthur L. Williston and William T. Magruder. Pp. 690; illustrated; 6x9 in.; cloth. Brooklyn, N. Y., 1907: Office of the Secretary.

TWENTIETH ANNUAL REPORT OF THE BUREAU OF MINES AND MINE INSPECTION, OF THE STATE OF MISSOURI, EMBRACING REPORTS OF COAL, LEAD, ZINC AND OTHER MINES FOR THE YEAR ENDING DECEMBER 31, 1906. Pp. 423; illustrated. 6x9 in.; cloth. Jefferson City, Mo., 1908: Hugh Stephens Printing Company.

Contents: Western lead and zinc districts. Eastern lead and zinc districts. Coal department.

THE AMERICAN FERTILIZER HAND BOOK, 1908. INCLUDING A DIRECTORY OF THE FERTILIZER INDUSTRY AND ALLIED TRADES. Pp. 244. 7¾x10½ in.; paper, $3. Philadelphia, 1908: Ware Bros. Company.

This is a useful book of reference to everyone interested in phosphate mining and the manufacture of fertilizers. It comprises valuable directories of the concerns engaged in the allied industries, and much useful information respecting them, including many tables of chemical factors that are here made easily available for reference.

MINERAL RESOURCES OF THE UNITED STATES, CALENDAR YEAR 1906. Department of the Interior, U. S. Geological Survey. Pp. 1307. 6x9 in.; cloth. Washington, 1907: Government Printing Office.

The appearance of this well known work is tardy again, but it is only fair to say that nearly all of its important parts were published as advance chapters at comparatively early dates. Its value would be increased if it had a more systematic arrangement and better editing in various respects. Some of the contributors to the present volume properly give credit to the sources of their information. Others do not.

STEAM TURBINES. Carl C. Thomas. Third edition, revised and enlarged. Pp. 334; illustrated. 5¾x6 in.; cloth, $4. New York, 1907: John Wiley & Sons.

Contents. General principles relating to the action of steam on turbine buckets. Thermodynamic principles involved in the flow of steam. Graphical representation of work done in heat transformations. Calculation of velocity and weight of flow. Velocity as affected by frictional resistances. Experimental work on flow of steam through orifices, nozzles and turbine-buckets. The impulse-turbine. The impulse- and reaction-turbine. Types of turbine and their operation. The marine steam-turbine. Appendix, etc.

JOURNEYS OF OBSERVATION. By T. A. Rickard. Pp. 385, illustrated. 6½x9½ in.; cloth. San Francisco, 1907: Dewey Publishing Company.

This interesting volume consists of two parts, one, "Across the San Juan Mountains," having previously been published separately; the other part, "Among the Mines of Mexico," being an account of a recent journey of the author. It is written in his well-known easy and attractive manner, and as a work of travel is distinguished by the unusual interest of its style, while as an account of mining and metallurgical practice it is noteworthy for the wealth of detail that it presents. The book is excellently printed and is illustrated profusely with superb reproductions of photographs.

STANDARD HANDBOOK FOR ELECTRICAL ENGINEERS. Written and compiled by a staff of specialists. Pp. 1283; illustrated. 4x6¾ in.; leather, $4. New York, 1908: McGraw Publishing Company.

Contents. Units. Electric and magnetic circuits. Measurements and measuring apparatus. Properties of materials. Magnets. Transformers. Electric generators. Electric motors. Batteries. Central stations. Transmission and distribution. Illumination. Electric traction. Electrochemistry. Telephony. Telegraphy. Miscellaneous applications. Wiring. Standardization rules. Tables and statistics.

This book is a companion, in form and treatment, of the well-known pocket-books of Trautwine, Kent and Kidder. It will be warmly appreciated by electrical engineers and all who are interested in applied electricity.

SPECIFICATIONS AND CONTRACTS. By J. A. L. Waddell. Pp. 169. 6x9 in., cloth, $1. New York, 1908: Engineering News Publishing Company.

Contents. Specifications. Examples for practice in specification writing. Engineering contracts. Examples for practice in contract writing. Notes on the law of contracts.

The last portion of this work, viz., "Notes on the Law of Contracts," is by John C. Wait. Both Dr. Waddell and Mr. Wait are well known authorities on their subjects. Dr. Waddell in accepting the invitation of the *Engineering News* to prepare this book stipulated that the price be kept as low as possible, so as to make its purchase no hardship for the students, which has been done. The publisher says, "It is sincerely hoped by all concerned that the work will effectively accomplish the sole object of its writers and publishers, viz., the advancement of the engineering profession in one of its important lines." We think it will do so. It is a good book.

THE ELECTRIC FURNACE. By Alfred Stansfield. Pp. 211, illustrated. 6x9 in., cloth. Price, $2. Toronto, 1907: The Canadian Engineer.

Contents. History of the electric furnace. Description and classification of electric furnaces. Efficiency of electric and other furnaces, and relative cost of electrical and fuel heat. Electric furnace design, construction and operation. Production of iron and steel. Other uses of the electric furnace. Future developments of the electric furnace.

The increasing use of the electric furnace and the certainty of the important position which it is going to take in practical metallurgy will create an extensive literature pertaining to it. Several treatises upon the subject have already been published, the most noteworthy being in French and German. It is gratifying that Mr. Stansfield, who is professor of metallurgy in McGill University, has now presented a work in English, which is not only up-to-date, but also is satisfactory in its treatment of the subject. His work will be a valuable acquisition to those who need to become familiar with the principles of the electric furnace, which is to say all metallurgists.

Corporations in Modern Business

In lecturing at Columbia University on "Corporations in Modern Business" on Feb. 7, George W. Perkins, member of the firm of J. P. Morgan & Co., said that trusts had come to stay, that co-operation had taken the place of competition, and that national control, if in the hands of experts, would be welcome. A part of his talk was as follows:

Perhaps the most useful achievement of the great corporation has been the saving of waste in its particular line of business. By assembling the best brains, the best genius, the best energy in a given line of trade, and coördinating these in work for a common end, great results have been attained in the prevention of waste, the utilizing of by-products, the economizing in the manufacture of the product, the expense of selling, and thorough, better and more uniform service.

We have heard many warnings that, because of the great corporation, we have been robbing the oncoming generation of its opportunities. Nothing is more absurd. The larger the corporation, the more certain is the office boy to ultimately reach a foremost place if he is made of the right stuff, if he keeps everlastingly at it, and if he is determined to become master of each position he occupies.

The great corporation has been of benefit to the public in being able to standardize its wares, so that they have become more uniformly good. Wages are unquestionably higher, and labor is more steadily employed. The corporation is with us; it is a condition, not a theory, and there are but two courses open to us—to kill it or to keep it. If you would kill it you must kill the cause, or the thing will come back to plague you. The principal causes are steam and electricity. If we are not willing to exterminate the cause of corporations, we can never permanently exterminate the corporation itself. There is, then, but one thing left to do, viz., to regulate and control them and to protect ourselves from the worst that is in them.

The corporations of the future must be those that are semi-public servants, serving the public, with ownership widespread among the public, and with labor so fairly and equitably treated that it will look upon its corporation as its friend and protector, rather than as an ever-present enemy, above all, believing in it so thoroughly that it will invest its savings in the corporation's securities and become working partners in the business.

There is scarcely a corporation manager of today, who is alive to his responsibilities, who would not welcome supervision, could he but feel that it would come from the National Government, acting through an intelligent and fair-minded official; but to be faced with the requirement to report to and be supervised and regulated by forty or fifty governments, with varying ideas and laws, of course suggests difficulties that are almost insurmountable obstacles.

The criticism is often made that this would amount to bringing business into politics. That depends. If we had at Washington a Railroad Board of Control, and that board were composed of practical railroad men, would not membership in such a board come gradually to be the goal of railroad men? And does any one for a moment think that, if such a board were composed of practical rail road men, it would be especially partial to railroad interests? Certainly not.

Once on such a board, a man could not fail to recognize the great responsibility and honor of the office, and administer it for the best interests of the public and of the railroads at one and the same time. Thus the business man would merge into the public official, no longer controlled by the mere business view, and would act the part of a statesman, to the improvement of governmental administration, and not to the lowering of its level.

This kind of expert, high-minded supervision would not be opposed by the business interests of the country. What they dread is unintelligent, inexperienced administration. To such rational supervision may we not look forward as a result of the sober second-thought of the people and our legislators—of their calming down from the bitter denunciation of corporations which has been the prevailing outcry for some years?

Foreign Iron and Steel Trade in 1907

The foreign iron and steel trade of the United States in 1907, exceeded that of any previous year reported. Exports were large, notwithstanding the strong home demand, in consequence of which there was less effort to push sales abroad. The figures for the year given below are from the report of the Bureau of Statistics, just issued.

Exports

The total value of the exports for the year of iron and steel, including machinery, was $172,555,588 in 1906, and $197,036,781 in 1907; showing an increase of $24,481,193, or 14.2 per cent. The more important items of the iron and steel exports were as follows, in long tons:

	1906.	1907.	Changes.
Pig Iron	83,317	73,844	D. 9,473
Billets, ingots & blooms	192,616	79,991	D. 112,625
Bars	88,102	98,654	I. 10,552
Wire-rods	5,896	10,653	I. 4,757
Rails	328,036	338,906	I. 10,870
Sheets and plates	110,699	122,696	I. 11,997
Structural steel	112,555	138,442	I. 25,887
Wire	174,014	161,223	D. 12,791
Nails and spikes	59,492	56,827	D. 2,665
Pipes and fittings	141,784	176,831	I. 35,047

The total tonnage exported was 1,302,525 in 1906, and 1,325,740 in 1907. The more important gains were in bars, sheets, and structural steel; the only considerable decrease was in billets, ingots and blooms, and this was largely due to smaller sales of tinplate-bars to Wales.

Imports.

The imports of iron and steel, including machinery, were valued at $34,827,132 in 1906, and $38,789,992 in 1907; showing an increase of $3,962,860, or 11.4 per cent. The more important imports were, in long tons:

	1906.	1907.	Changes.
Pig iron	379,828	489,440	I. 109,612
Scrap iron and steel	19,091	27,687	I. 8,596
Ingots, blooms, etc.	21,337	19,334	D. 2,003
Bars	35,793	39,746	I. 3,953
Wire-rods	17,799	17,076	D. 723
Tin-plates	56,983	57,710	I. 727

The total tonnage imported was 662,358 in 1906, and 577,809 in 1907. The imports of pig iron and of scrap—chiefly steel scrap—were nearly all made in the first half of the year. Other changes were slight.

Iron Ore Movement

The movement of iron ore for the year was as follows, in long tons:

	1906.	1907.	Changes.
Imports	1,060,390	1,229,168	I. 168,778
Exports	265,240	278,208	I. 12,968

Of the imports in 1907, there were 657,133 tons from Cuba; 384,659 from Europe, chiefly Spain; 116,563 from Canada and Newfoundland. The exports were chiefly to Canada.

Imports of manganese ore were 221,260 tons in 1906, and 208,321 in 1907; a decrease of 12,939 tons. These ores came chiefly from India, Spain and Brazil.

Canadian Iron and Steel Bounties

The bounties on iron and steel production paid by the Dominion government during the year 1907 are reported as follows:

	Pig Iron.	Steel.
Dominion Steel	$313,573	$ 479,212
Dominion Steel, wire rods, etc.	.....	412,417
Hamilton Iron	121,422	102,124
Nova Scotia Steel	68,343	115,867
Canada Iron Furnace	13,850	.....
Canada Iron Fur., Midland	32,578	.....
John McDougall & Co.	5,201	.....
Londonderry Iron	43,535	.....
Algoma Steel	177,570	378,699
Deseronto Iron	4,487	.....
Atikokan Iron	17,210	.....
Electric Reduction	235	.....
Lake Superior Iron & Steel	.....	5,711
Ontario Iron & Steel	.....	252
Total	$793,004	$1,512,282

The total amount paid was $2,305,286, which is the largest ever reported for a year. The chief payments were $1,223,202 to the Dominion Iron and Steel Company; $556,269 to the Algoma Steel Company; $223,546 to the Hamilton Iron Company; $179,210 to the Nova Scotia Steel and Coal Company.

Patents Relating To Mining and Metallurgy

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

UNITED STATES AND BRITISH PATENTS

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

COAL AND COKE

COAL-DRILLING MACHINE. Jasper N. Riekles, Altoona, Ala. (U. S. No. 877,597; Jan. 28, 1908.)

COAL-MINING DRILL-POST. Paul Rommes, Pittsburg, Kan. (U. S. No. 879,006; Feb. 11, 1908.)

COAL WASHING—Apparatus for Washing Coal, Ore, etc. Alfred J. Dieseher, Pittsburg, Penn. (U. S. No. 876,268; Jan. 7, 1908.)

COKE BIN and Chute. George F. Hurt, Atlanta, Ga. (U. S. No. 876,559; Jan. 14, 1908.)

COKE-EXTRACTING MACHINE. Sylvester Garner, Covington, Va., assignor to Covington Machine Company, a Corporation of Virginia. (U. S. 875,989; Jan. 7, 1908.)

COKE-LEVELING MACHINE. John S. Ham, Covington, Va., assignor to Covington Machine Company, a Corporation of Virginia. (U. S. Uo. 876,175; Jan. 7, 1908.)

COKE-LOADER. William H. Watt, Greensburg, Penn., assignor of one-half to C. W. Beerbower and T. L. Gribble, Greensburg, Penn. (U. S. No. 877,147; Jan. 21, 1908.)

COKE OVEN — Regenerative Coke-Oven. Evence Coppée, Brussels, Belgium. (U. S. No. 875,896; Jan. 7, 1908.)

COKING PEAT—Kiln for Coking Peat or Similar Material. Martin Ziegler, Beuerberg, Germany, assignor to Oberbayerische Kokswerke und Fabrik Chemiseher Produkte Akt. Geselisehaft, Beuerberg, Germany, a firm. (U. S. No. 876,421; Jan. 14, 1908.)

COPPER

PEAT—Machine for Manufacturing Peat Fuel Robert A. Kellond, Winnipeg, Manitoba, Canada, assignor to Inter-West Peat Fuel Company, a Corporation of Arizona. (U. S. No 878,732; Feb. 11, 1908.)

MATTE SMELTING — Bessemerizing or Conversion of Copper Mattes Into Blister Copper. John D. Burgess, Tucson, Ariz., assignor of two-thirds to Augustus Taylor and William H. Taylor, Jr., San Franeiseo. (U. S. No. 877,292; Jan. 21, 1908.)

OXIDIZING SOLUTIONS—Oxidizing Means for Solutions. William B. McPherson, Los Angeles, Cal., assignor to Non-Acid Copper Extracting Company, Los Angeles, Cal., a Corporation of California. (U. S. No. 877,445; Jan. 21, 1908.)

GOLD AND SILVER

AMALGAMATOR. John S. Marquette, Baltimore, Md., assignor of one-half to Peter J. Nelson, Baltimore, Md. (U. S. No. 879,825; Feb. 18, 1908.)

CYANIDING APPARATUS—Apparatus for Automatieally Discharging Ore-Pulp Sands and Other Material From Tanks. Jeremiah C. Winehell and Howard H. Winehell, Monte Vista, Colo. (U. S. No. 875,876; Jan. 7, 1908.)

FILTER-LEAF. Hiram W. Blaisdell and Harry A. Brooks, Los Angeles, Cal. (U. S. No. 875,687; Jan. 7, 1908.)

PRECIPITATION—Process of Precipitating Metals. John E. Greenawalt, Denver, Colo. (U. S. No. 876,346; Jan. 14, 1908.)

SLIME TREATMENT—Proeess of Treating Slimes. Charles Butters, Berkeley, Cal. (U. S. No. 879,080; Feb. 11, 1908.)

SLIMES-FILTER Apparatus. Edwin M. Clark, Los Angeles, Cal., assignor to Edwin M. Clark Slime Fliter Company, Los Angeles, Cal., a Corporation of South Dakota. (U. S. No. 877,631; Jan. 28, 1908.)

GRAPHITE

DISINTEGRATING PROCESS—Method of Disintegrating Graphite. Edward G. Acheson, Stamford township, Welland county, Ontario, Canada. (U. S. No. 875,881; Jan. 7, 1908.)

IRON AND STEEL

BLAST-HEATING APPARATUS. John W. Nesmith, Denver, Colo., assignor to Colorado Iron Works Company, Denver, Colo. (U. S. No. 879,302; Feb. 18, 1908.)

FURNACE CHARGING-BOX. Gustav A. Hassel, McKeesport, Penn., assignor to Pittsburg Steel Foundry, Pittsburg, Penn., a Corporation of Pennsylvania. (U. S. No. 876,640; Jan. 14, 1908.)

STEEL RAILS—Method of Improving Steel Rails. Robert A. Hadfield, Sheffield, England. (U. S. No. 879,634; Feb. 18, 1908.)

TITANIUM

ALLOYS—Proeess of Produeing Alloys or Mixtures of Metals With Purifying or Seasoning Elements. Auguste J. Rossi, New York, N. Y., assignor to Titanium Alloy Manufacturing Company, New York, N. Y., a Corporation of Maine. (U. S. No. 877,518; Jan. 28, 1908.)

ZINC

ZINC OXIDE—Proeess of Obtaining Zinc Oxide from Zinc Ores. Henry L. Suiman, London. England. (U. S. No. 875,866; Jan. 7, 1908.)

MINING—GENERAL

HYDRAULIC BORING PROCESS. Jaeob Kirschniok, Zabrze, Germany. (U. S. No. 878,208; Feb. 4, 1908.)

TUNNELING—Method of Tunneling in Rock. Joseph P. Keane, Wallace, Idaho. (U. S. No. 877,779; Jan. 28, 1908.)

ORE DRESSING

CONCENTRATING APPARATUS. Perie T. Hambrie, Sutter Creek, Cal., assignor of one-half to Wilton E. Darrow, Sutter Creek, Cal. (U. S. No. 878,879; Feb. 11, 1908.)

CONCENTRATING-TABLE. John C. Fisher, Houghton, Mieh., assignor of one-fourth to Frank L. Van Orden, Houghton, Mieh., and one-fourth to Henry Fisher, Lake Linden, Mich. (U. S. No. 879,250; Feb. 18, 1908.)

CONCENTRATOR—Centrifugal Concentrator. Edward Hearing and Fred A. Dudley, Kellogg, Idaho. (U. S. No. 876,642; Jan. 14, 1908.)

CONCENTRATOR—Dry Ore-Conecntrator. George Tolmie, Ogden, Utah, assignor of one-fourth to Dennis E. Gleason, Ogden, Utah. U. S. No. 879,069; Feb. 11, 1908.)

CONCENTRATOR Martin P. Boss, San Francisco, Cal. (U. S. No. 878,861; Feb. 11, 1908.)

CRUSHER AND PULVERIZER. Milton F. Williams, St Louis, Mo, assignor to Williams Patent Crusher and Pulverizer Company, St. Louis, Mo., a Corporation of Missouri. (U. S. No. 877,876; Jan. 28, 1908.)

CRUSHER AND PULVERIZER. Milton F. Williams, St. Louis, Mo., assignor to Williams Patent Crusher and Pulverizer Company, St. Louis, Mo., a Corporation of Missouri. (U. S. No. 878,921; Feb. 11, 1908.)

CRUSHING MILLS—Feeding Mechanism for Crushing Mills. Frederick B. Pettengill, Burbank, Cal., assignor of one-half to Samuel L. Kistler, Los Angeles, Cal. (U. S. No. 879,581; Feb. 18, 1908.)

JIGGING — Water-Eeonomizer for Jigs. Thomas Rowe, Dollar Bay, Mieh. (U. S. No. 875,850; Jan. 7, 1908.)

MAGNETIC CONCENTRATION—Apparatus for Magnetieally Concentrating Ores. Henry Leighton, Seattle, Wash. (U. S. No. 877,439; Jan. 21, 1908.)

ORE-CONCENTRATOR. Petrus Härdén, Stockholm, Sweden, assignor to Metallurgiska Aktiebolaget, Stockholm, Sweden, a Corporation of Sweden. (U. S. No. 876,713; Jan. 14, 1908.)

ORE-CRUSHING MACHINE. John B. Albers, Los Angeles, Cal. (U. S. No. 876,892; Jan. 14, 1908.)

ORE-SEPARATOR. Aaron Custer, Monroe, Iowa; John Custer administrator of said Aaron Custer, deeeased. (U. S. No. 877,411; Jan. 21, 1908.)

ORE TANK—Revolving Ore-Tank. Allen J. Garver, Clarkston, Wash., assignor to himself and Jonathan McAssey, Clarkston, Wash. (U. S. No. 876,539; Jan. 14, 1908.)

METALLURGY—GENERAL

CASTING METAL. Robert C. Totten, Pittsburg, Penn. (U. S. No. 878,691; Feb. 11, 1908.)

REDUCTION PROCESS — Metallurgical Process. Franz von Kügelgen and George O. Seward, Holcombs Rock, Va., assignors, by mesne assignments, to Eleetro Metallurgical Company, a Corporation of West Virginia. (U. S. No. 878,966; Feb. 11, 1908.)

MINING MACHINERY AND APPARATUS

CORE-DRILLING APPARATUS. Coleman A. Terry, New York, N. Y. (U. S. No. 878,909; Feb. 11, 1908.)

DREDGING APPARATUS—Flexible Joint for Dredger-Pipes. Manuel R. Peacock, Oakland, Cal. (U. S. No. 875,844; Jan. 7, 1908.)

DREDGING APPARATUS—Ore Dredging and Separating Apparatus. Isaac Stevenson and John Cook, Port Chalmers, New Zealand. (U. S. No. 878,575; Feb. 11, 1908.)

DREDGING BUCKET—Triangular Dredging-Bucket and Hoist for Same. Charles H. Gunn, Marysville, Cal. (U. S. No. 878,526; Feb. 11, 1908.)

DRILL—Sink-Shaft Drill. John P. Karns, Boulder, Colo., assignor to The J. P. Karns Tunneling Machine Co., Bouider, Colo. (U. S. No. 879,822; Feb. 18, 1908.)

ELECTROPNEUMATIC DRILL. Olin S. Proctor, Denver, Colo. (U. S. No. 879,828; Feb. 18, 1908.)

HAND ROCK-DRILL. Christian F. Paul, Jr., Peekskill, N. Y., assignor to The Paul & Kreuger Roek Drill Company, a Corporation of New York. (U. S. No. 878,152; Feb. 4, 1908.)

HOISTING—Rope-Drum of Hoisting-Engines. Theodor Matzke, Distein, Germany, assignor to Sieg-Rheinische Hütten Aetiengeselisehaft, Freidrieh-Wilhelms-Hütte, Germany. (U. S. No. 876,072; Jan. 7, 1908.)

HOISTING APPARATUS. Elbridge S. Colley, Portland, Me., assignor, by direct and mesne assignments, to Colley Company, Portland, Me., a Corporation of Maine. (U. S. No. 876,040; Jan. 7, 1908.)

MINER'S SHOVEL. David B. Lewis, Bisbee, Ariz. (U. S. No. 877,574; Jan. 28, 1908.)

ROCK-DRILL. Rolland S. Trott, Denver, Colo. (U. S. No. 875,869; Jan. 7, 1908.)

ROCK-DRILLING MACHINES—Support for Roek-Drilling Machines. Christian F. Paul, Jr., Peekskill, N. Y., assignor to The Paul & Kreuger Roek Drill Company, a Corporation of New York. (U. S. No. 878,153; Feb. 11, 1908.)

METALLURGICAL MACHINERY AND APPARATUS

ANNEALING-FURNACE. James A. Herrick, Philadelphia, Penn. (U. S. No. 876,182 and 876,183; Jan. 7, 1908.)

ANNEALING FURNACE—Metal-Annealing Furnaee. Richard H. Ward, Youngstown, Ohio. (U. S. No. 878,840; Feb. 11, 1908.)

ANNEALING FURNACE—Muffle or Furnaee for Annealing. Alfred Smallwood, London, England, assignor to The Incandeseent Heat Company, Limited, London, England. (U. S. No. 874,039; Dec. 17, 1907.)

BLAST-FURNACE FEEDER—Mechanical Ore-Feeder for Blast-Furnaees. Frederick S. Sanderson, Queenstown, Tasmania, Australia, assignor to The Mount Lyell Mining and Railway Company, Limited, Melbourne, Australia. (U. S. No. 879,839; Feb. 18, 1908.)

ELECTRIC FURNACE—Means for Obtaining Thin Liquid Dross in Electric Furnaces for Metallurgical Purposes. Hermann Röchling and Wilhelm Rodenhauser. Völklingen-on-the-Saar, Germany. (U. S. No. 877,739; Jan. 28, 1908.)

Personal

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

F. L. Bosqui, of San Francisco, has been at Goldfield, Nev., on professional business.

Dr. W. A. Hendrix, of Denver, Colo., has been visiting Goldfield, Nev., on professional business.

George V. K. Greene has opened an office as consulting engineer at No. 150 Nassau street, New York.

N. F. Clark, of New York, consulting electrical engineer of the Calumet & Hecla mine is a visitor at the property.

James Chynoweth is in the Globe district, Arizona, visiting the Superior & Boston property, of which he is the president.

Godfrey D. Doveton, of Denver, Colo., has returned to Mexico City from Cuautla, having entirely recovered from his recent illness.

Thomas F. Cole, has returned to Duluth after attending the directors' meeting of the Calumet & Arizona held in Calumet recently.

Capt. W. Murdock Wiley, who has extensive mining interests in Guanajuato, Mexico, is on a visit to Salisbury, North Carolina.

Frank E. Lloyd, of New London, N. C., has been appointed manager of the Parker gold mines in Stanley county, North Carolina.

E. C. Taylor, formerly of Houghton, Mich., has left for Globe, Arizona, to assume his new position as chief clerk of the Miami Copper Company.

Clinton R. Peterkin has returned to New York, after some time at the properties in which he is interested near Urique, Chihuahua, Mexico.

H. R. Hinds, president of the Hinds Consolidated Mining Company, is on a visit to the company's properties at Santa Barbara, Chihuahua, Mexico.

W. B. Devereux, Jr., of the firm of W. B. Devereux & Sons, New York, has left for the new gold camp at Rawhide, Nevada, to inspect properties there.

Bailey Willis, of the United States Geological Survey, has been delivering a special course of lectures on the Paleogeography of North America, at the University of Illinois.

C. E. Durand, of New York, is in Mexico, where he expects to spend six weeks examining properties in the Urique district of Chihuahua and the Choix district of Sinaloa.

R. C. Shaw recently resigned his position as general manager of the Montezuma mines, at Montezuma, Costa Rica, on account of severe illness. He is now at Summerville, S. C., resting and gradually recovering his health.

Herbert C. Hoover, of London, will shortly retire from the firm of Bewick, Moreing & Co., being succeeded in the firm by W. J. Loring. After a vacation Mr. Hoover, we understand, intends to engage in mining on his own account.

Jos. B. Tomlinson, of the firm of Tomlinson & Norton, El Paso, Texas, is reporting on a gold-copper property for the Utah Mining Company. The property is located 100 miles southwest of Casas Grandes, on the Aras river, in the State of Chihuahua, Mexico.

Samuel Sanford, formerly on the editorial staff of the ENGINEERING AND MINING JOURNAL, and later with the United States Geological Survey, is now engaged on the extension of the Florida East Coast Railroad to Key West, and is also preparing a report for the Survey on the hydrography of southern Florida.

The Travelers Insurance Company, of Hartford, Conn., has given the American Museum of Safety Devices and Industrial Hygiene a gold medal to be awarded to the most meritorious device for increasing the safety in mines and mining. The Jury of Award for 1908 consists of Charles Kirchhoff, Prof. Henry A. Munroe, of the School of Mines, Columbia University, and W. R. Ingalls.

J. E. Spurr and W. Rowland Cox have organized the firm of Spurr & Cox (Inc.) to conduct expert mining work in various branches. G. H. Garrey, former geologist United States Geological Survey, and late geologist American Smelters Securities Company, is also a memer of the firm. Other engineers permanently connected with the organization include W. D. Blackurn, topographic engineer, C. W. Dodge, formerly of the United States Geological Survey, M. B. Evans and J. H. Farrell. The firm has offices in Denver, New York and Mexico City.

Obituary

Peter Brown, a retired furnace builder and iron manufacturer, died at Allentown, Penn., Feb. 3, aged 83 years. He built many blast furnaces in Pennsylvania, New York and New Jersey.

J. K. Bougher, of Philadelphia, died at Palm Beach, Fla., Feb. 12, aged 68 years. He was for a long time president of the J. W. Paxson Company, miner and shipper of molding sand. He was also president of the Lumberton Sand Company and the Welsh Mountain Mining and Kaolin Manufacturing Company.

Lewis Hazelins Taylor died at High Bridge, N. J., Feb. 19, aged 97 years, He was born at High Bridge in 1811, and during all his active life was connected with the iron works which were established at High Bridge by his father, and are now owned by the Taylor Iron and Steel Company. He was president for a number of years, and on his retirement from active work was made honorary president. A fact, very unusual in American experience, is that Mr. Taylor died in the house in which he was born, having lived there nearly a century.

Daniel L. Demmon died suddenly in Boston, Mass., Feb. 19, aged 76 years. He entered business in Boston in a banking office nearly 60 years ago. Later he became interested in coal properties in Pennsylvania, and afterward in the copper mining enterprises of Lake Superior. He had been connected with the Franklin Mining Company for more than a quarter of a century, and was secretary and treasurer, as well as a director, of the company. He held similar offices in the National Mining Company and in the old Tecumseh Copper Company. He had been connected as an officer with several other mining companies besides those named, including the Pewabic, Mesnard, Huron, Pontiac, etc., and also was largely interested in railroad properties.

Societies and Technical Schools

American Society of Mechanical Engineers—The March meeting will be held March 10, in the Engineering Societies building, New York. The meeting will be addressed by Dr. Charles P. Steinmetz, professor of electrical engineering, Union University, Schenectady, N. Y., the subject being, "The Steam Path of the Steam Turbine."

American Institute of Electrical Engineers—This society has appointed a committee on Forest Preservation, of which Prof. Charles H. Porter, of the Massachusetts Institute of Technology, is chairman. The board of directors of the institute has passed resolutions urging "that the attention of the National and State governments should be called to the importance of taking such immediate action as may be necessary to protect the headwaters of important streams from deforestation, and to secure through the introduction of scientific forestry and the elimination of forest fires the perpetuation of a timber supply."

Industrial

The general offices of the International Steam Pump Company have been removed to 115 Broadway, New York.

The Barrett Manufacturing Company, 17 Battery place, New York, is making a mineral roofing, called amatite, of which it offers to send samples upon application.

The Way's Pocket Smelter Company, South Pasadena, Cal., has been reorganized, and is getting out an improved type of its portable outfit for prospectors and others.

Philip J. Nash has taken charge of the sales department in Chicago of the Ernst

Wiener Company, of New York. Mr. Nash has been long in the industrial railway business and is both a technical and practical man. The offices are located at 863 Monadnock building.

The directors of the Harbison-Walker Refractories Company, Pittsburg, have elected Vice-President H. W. Croft president to succeed the late S. C. Walker. Hay Walker is now vice-president. William Walker has succeeded S. C. Walker on the board of directors.

The Foust Jig Company, of Joplin, Mo., has been incorporated to manufacture the Foust automatic jig. This is a jig of large capacity and automatic discharge for which good results are claimed. The Virginia mill at Baxter Springs, Kan., has installed several of these jigs.

The John A. Roebling's Sons Company, Trenton, N. J., intends to rebuild its rope shop which was recently destroyed by fire, the construction of the buildings and machinery to be carried on by the company's engineering and construction force. The boilers and engines have been arranged for.

The Cleveland Pneumatic Tool Company has recently established agencies with the International Engineering and Machinery Company, of Mexico City, and also with the Robertson-Lucas Company, of El Paso, Texas. Both of these companies will carry full stocks of rock drills and accessories.

The Western Electric Company, Hawthorne, Ill., is issuing a bulletin describing the Beck flaming arc light, with its recent developments and with full data covering performance. Lamps as now manufactured are suitable for use on either alternating or direct currents and have been so greatly simplified in construction that but little skill is required in operating.

The Lackawanna Steel Company reports for 1907 gross earnings amounting to $33,011,410; other income, $607,664, making a total of $33,619,074. Operating expenses were $26,388,016, leaving a net balance of $7,231,058. Payments from net were: General expenses and taxes, $799,604; sinking fund and depreciation, $1,731,981; interest, rentals, etc., $2,255,627; total, $4,787,212, leaving a surplus of $2,443,846 for the year. Unfilled orders on the books Dec. 31 amounted to 203,741 tons of material. The net surplus for the year was over 7 per cent. on the capital stock.

An order has just been placed by the Lehigh Valley Coal Company for a 28-ft. engine-driven ventilating fan, of the same design and capacity as two previously installed at its Henry colliery, which have proven successful in continuous service. The official test of these fans showed an efficiency of nearly 80 per cent. under normal working conditions, with a delivery of 476,000 cu.ft. of air per minute, as against 300,000 cu.ft. guaranteed by the builder of the unit, the Allis-Chalmers Company, at whose works in Scranton, Penn., the new fan and engine are under construction.

The Robins New Conveyor Company, which has been recently incorporated, will be operated under the management of Thomas Robins, who founded the Robins Conveying Belt Company in 1896 and was president of that concern until March, 1907, when its management passed into other hands. The position of chief engineer in the new company is filled by C. Kemble Baldwin, who has served in the Robins Conveying Belt Company in the same capacity for the last seven years. The offices of the company are at 38 Wall street, New York and 1240 Old Colony building, Chicago.

Robt. F. Carr and several of his associates in the Dearborn Drug and Chemical Works, have purchased the holdings of the estate of the late Wm. H. Edgar, and at a meeting of the stockholders, followed by a meeting of the directors, the following officers were elected: Robt. F. Carr, president and general manager; George R. Carr, Grant W. Spear, vice-presidents; Wm. B. McVicker, vice-president and Eastern manager; J. D. Purcell, assistant general manager; W. A. Converse, assistant secretary and chemical director; R. R. Browning, assistant treasurer; A. E. Carpenter, superintendent. C. M. Eddy's holdings were also taken over, he desiring to devote all of his time to his personal business interests. The new officers have long been connected with the company.

Trade Catalogs

George V. K. Greene, consulting engineer, 150 Nassau street, New York, desires to receive catalogs of mining machinery from the various makers.

Receipt is acknowledged of the following trade catalogs and circulars:

Wagner Electric Manufacturing Company, St. Louis, Mo. A Phase of the Panic. Pp. 4, illustrated, paper, 6x9 inches.

Standard Steel Works, Philadelphia, Penn. Steel Tires; Causes of Defects and Failures. Pp. 38, illustrated, paper, 6x9 inches.

John A. Traylor Machinery Company, Denver, Colo. Centrifugal Sand Pumps. 4 page folder, illustrated, paper, 6¼x9¼ inches.

Park Drop Forge Company, Cleveland, Ohio. Nos. 1 and 2. Short Stories About Steel. Pp. 8 and 12, illustrated, paper, 4½x7 inches.

Jeffrey Manufacturing Company, Columbus, Ohio. Jeffrey Rubber Belt Conveying Machinery. Pp. 48, illustrated, paper, 6x9 in.; October, 1907.

Sweetland Filter Press Company, 314-315 Merchants' Trust Building, Los Angeles, Cal. The Sweetland Filter Press. Pp. 16, illustrated, paper, 6x9 inches.

Baldwin Locomotive Works, Philadelphia, Penn. Record No. 64. Locomotives Built for the Central Railroad of Brazil. Pp. 32, illustrated, paper, 6x9 in.; 1908.

Wood Drill Works, 30-36 Dale Avenue, Paterson, N. J. Wood Rock Drills, Mining, Tunneling and Quarrying Machinery. Pp. 28, illustrated, paper, 6x9 inches.

Baldwin Locomotive Works, Philadelphia, and Westinghouse Electric and Manufacturing Company, Pittsburg. Electric Locomotives, Mine and Industrial. Pages, 40; illustrated. Paper, 7x10 in. 1908. This handsomely illustrated catalog contains some valuable notes on the use of electric locomotives for mining and industrial work. Tables of performance and other notes are given which will be a serviceable aid to the engineer in selecting the type of locomotive best suited for the work.

Cutler Hammer Clutch Company, Milwaukee, Wis. Lifting Magnets. Pp. 32, paper, 3½x5 in. This little booklet is a reprint of an illustrated article which appeared in *Cassier's Magazine*; it is printed in the form of a miniature magazine, and traces briefly the development of the lifting magnet, illustrates the different kinds of magnets used for handling pig iron, metal plates and other classes of material and explains, by an easily understood analogy, how the magnetic lines of force support weights ranging to 10 tons.

Construction News

Joplin, Missouri—The Hornet Mining Company intends to put a concentrating mill on its property. Address at Joplin.

Columbia, Tennessee—The Phœnix Phosphate Company proposes to put up works for drying phosphate and preparing it for market. J. O. Griffith, 1460 Monadnock block, Chicago, Ill., is president and general manager.

Anthony, Florida—The Compagnie Generale des Phosphates de Floride is preparing to put in a large plant on its phosphate property, including two double log washers, steam shovel, two locomotive engines, mining cars, etc. P. Jumeau, Anthony, Fla., is the general manager of the company. The headquarters are in Paris, France.

McAlester, Oklahoma—The McAlester Portland Cement Company is planning to construct a 1250-bbl. portland cement plant, the land for which has been secured. The plant will cover about 10 acres, and the company plans to spend about $75,000 for the erection of the buildings and $300,000 for the mechanical equipment. The company has been temporarily organized by the election of C. N. Gould, president; A. C. Farmer, vice-president; H. E. Swan, secretary and treasurer, and J. F. Riley, treasurer.

Special Correspondence from Mining Centers

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

REVIEWS OF IMPORTANT EVENTS

San Francisco

Feb. 19—The Northern Power and Water Company has explained its plans for a new power and water system to the landowners of the North San Juan region, in Nevada county. The company already owns the great water systems of the North Bloomfield Mining, the Eureka Lake and the Milton companies, in which systems are included the large bodies of water behind the Bowman dam, the Weaver, the Faucherie, Jackson, French and other dams, originally portions of the water system intended for hydraulic mining. Some of the ditches have of late years been utilized for carrying water supply for irrigation, but flumes, etc., are in bad repair, and many thousands must be spent to rehabilitate the systems. The promoters of the enterprise intend to form an immense chain of artificial lakes or reservoirs; they will carry water to the cities about San Francisco bay as a primary project, but incidentally will install a great electric plant at a dam to be built below Sweetland, and then pick up the water again and carry it to the valley. It is also intended to dredge Shady creek for gold. There are thousands of acres of abandoned hydraulic diggings or pits of great depth which will be utilized as storage basins. If the proposition is carried out, it will mean that the town of Sweetland will be covered by water, and may also mean the removal of Sebastopol from the map. Another great lake is planned for the vicinity of the Ray ranch, where it is proposed to put in a huge concrete barrier, 100 ft. wide on top. This will back the water up for seven miles, or as far as Cherokee. The water systems already owned by the company are the most extensive in the State, and the object is to utilize them to a much larger extent than at present, by combining them all in one system. The company gives notice that the people of the sections referred to must give the plan needed encouragement, and meet the corporation in a fair manner, without charging excessive prices for necessary lands; otherwise the ditches and flumes will be allowed to go to ruin and the water will be diverted into Bear river, higher up, and conveyed to the valleys by another route. The corporation called a meeting of the citizens and its own representatives, so the matter could be plainly set forth in advance. The people of San Juan ridge are those most directly interested. Many mines are to be started up again if the plans carry.

Governor Gillett, of this State, has gone on to Washington to urge upon Chairman Burton, of the River and Harbor committee, the favorable consideration of the bill of Representative McKinley for an appropriation of $4,000,000 to dredge out certain portions of the Sacramento river. According to the plan, California is to contribute an equal amount. The bill is in line with the recommendation of the California Débris Commission, which is opposed to the construction of any more dams or settling basins at hydraulic mines, but favors dredging out the channel and widening the mouth of the river, at the same time deepening it and raising the river banks with the débris dredged from the bottom.

The supervisors of Butte county let a contract to fill in the approach to a new bridge for a specific sum. The contractor supposed he could mine the ground first by dumping several thousand yards of earth into sluice boxes and sluicing it down behind a retaining wall, so as to form the approach. When he found that the supervisors would not permit him to handle the ground in that manner, and that he was unable to get any gold in moving it, he threw up the contract. It is very seldom that contractors expect to get gold out of the ground itself when moving it for bridge approaches.

The organization of a mining company, regularly incorporated with a subscribed capital of only 40c. is a novelty worth noting, especially when the mine is now being worked vigorously. The Bangor Gold Mining Company, incorporated at Oroville, Butte county, Feb. 13, with a capital stock of $10,000 divided into 100,000 shares of 10c. each. The directors and subscribers are: William Brown, Gridley, one share, 10c.; R. E. Taylor, Gridley, one share, 10c.; C. W. Slater, Bangor, one share, 10c.; A. A. Andrews, Oroville, one share, 10c. These men are members of a company that worked a mine on the Blue Lead, at Bangor, about 16 years ago. They encountered too much water. The mine is now being developed on a plan that drains the water. It is probable that the new people want to buy the mining property of the above named men, and that the incorporation is merely to meet the legal requirements.

Some of the old hydraulic mines near Placerville, in El Dorado county, are yielding unexpected profit from the sale of quartz boulders to the glassmakers in San Francisco. A track has been laid to a siding on the railroad. The boulders shipped to the glass companies are nearly pure silica. A lower grade material is also being sold to the smelting companies for flux.

Salt Lake City

Feb. 21—At the annual election of the Daly West Mining Company the retiring board of directors, consisting of J. E. Bamberger, W. S. McCormick, Frank J. Hagenbarth, H. G. McMillan and William H. Dickson, was re-elected. The receipts for the year 1907, including $451,319 on hand at the beginning, amounted to $1,228,764; the disbursements amounted to $923,696, leaving a balance, Dec. 31, of $305,057. This also includes the reserve fund of $8,982. Since incorporation the company has paid to shareholders $5,877,000 out of $11,975,117. During the 12 months 24,856 dry tons of ore were shipped or treated, of which 8,521 tons were crude ore shipped direct to the smelters. From this were produced 243,061 lb. copper, 2,289,598 lb. lead, 360.56 oz. gold, and 367,531 oz. silver, which sold for $242,959 net. The concentrates shipped amounted to 7480 tons, from which were produced 229,250 lb. copper, 4,211,972 lb. lead, 305.05 oz. gold, and 407,968 oz. silver, bringing $366,404 net. Miscellaneous ores sold amounted to 8855 tons, and from them was produced 201,579 lb. copper, 1,584,895 lb. lead, 284.30 oz. gold, and 266,563 oz. silver, and the company received $162,315. The crude ore assayed: 43.13 oz. silver, 0.0423 oz. gold, 14.43 per cent. lead, 1.4 per cent. copper; the net average value per ton was $28.51. The concentrate averaged per ton 54.54 oz. silver, 0.0408 oz. gold, 1.53 per cent. copper, the net value per ton being $48.85. The miscellaneous ores assayed per ton 30.10 oz. silver, 0.0321 oz. gold, 9 per cent. lead, and 1.14 per cent. copper; the average value was $18.33. The new board will organize with the the same officers as last year. J. E. Bamberger is president.

The annual report of the Daly Judge Mining Company, covering its operations at Park City during the calendar year 1907, shows that the receipts from the sales of ores amounted to $492,790, while the income from other sources ($5635 for interest earned and $5570 advanced by the Grasselli Chemical Company, with whom the company has contracted to sell its zinc output) make the total receipts for the year $504,175. At the beginning of the year the company had on hand $269,038, and on Dec. 31 the balance was $127,655. The expenditures of

the company, including dividends Nos. 1 and 2, amounting to $224,850, were $645,558. The ore extraction for the year consisted of 76,914 tons, 7933 of which were shipped direct to the smelter and 68,981 tons treated in the company's mill. The total operation costs in the handling of the 76,914 tons of ore is stated to be $4.87 per ton. The crude ore sold at $19.48 per ton, and contained per ton 16.05 oz. silver, 0.056 oz. gold, 18.61 per cent. lead, 0.33 per cent. copper, 14.80 per cent. zinc, 14.06 per cent. iron. The concentrates assayed per ton 16.30 oz. silver, 0.058 oz. gold, 31.08 per cent. lead, 0.19 per cent. copper, 7.98 per cent. zinc, 21.27 per cent. iron, and sold for $29.10 per ton. The zinc middlings assayed per ton 6.30 oz. silver, 0.025 oz. gold, 3.70 per cent. lead, 26.13 per cent. zinc, 19.15 per cent. iron, and sold for $3.43 per ton. The iron middlings assayed per ton 6.20 oz. silver, 0.04 oz. gold, 7 per cent. lead, 0.22 per cent. copper, 9 per cent. zinc, 32.08 per cent. iron, and sold for $7.96 per ton. The physical condition of the property is reported very satisfactory, and developments during the year, although handicapped for several causes, has resulted in showing up considerable new ore. The electric haulage system recently installed in the mine is now in operation.

The stockholders of the Silver King Consolidated Mining Company have authorized the sale of the properties of the corporation to a new company of the same name to be organized under Utah laws with assessable stock. The old corporation operated under Wyoming laws. Some months ago the corporation became involved heavily financially, and a receiver was appointed. It is stated that the receiver will soon be discharged and development work resumed at Park City where the mine is located.

Feb. 25—Officials of the United States Smelting, Refining and Mining Company, in a petition filed with the Federal court for a modified decree permitting the operation of the smeltery at Bingham Junction, declare that the company has solved the smoke problem. It is stated that the process which the company proposes to employ involves the introduction of zinc oxide fumes in the flues; the sulphuric acid in the smoke combines with the zinc to form zinc sulphate, which is caught in bags in the baghouse without damage to the fabric. It is claimed that the gases from both blast furnaces and roasters can thus be passed through the baghouse, removing all deleterious substances, before the gases are allowed to escape into the atmosphere. The company has applied for a patent on the process. The farmers of the valley in the vicinity of the smelting works, met on Feb. 25 and, it is believed, will approve the company's application.

Denver

Feb. 21—The Chipeta tunnel, just north of Ouray, is now being driven ahead at the rate of about 11 ft. per day. This tunnel is being driven to intersect the American Nettie quartzite at depth. The vein is expected to be reached inside of another 300 ft.; the adit is at present about 2000 ft. long.

The early history of the American Nettie mine is interesting. When first discovered, the outcrop was marked by a series of caves in the quartzite cliffs, about 1200 ft. above the Uncompahgre river, the caves being formed by the oxidation of more or less segregated bodies of auriferous pyrite in the quartzite, which was intersected by a large fault fissure having its vertical course across the sedimentary and metamorphic strata, and which is supposed to be responsible for the mineralization. The quartzite, which is overlaid by shale, and above that by porphyry, has a pitch downward and into the mountain, and in the American Nettie is credited with having produced gold to the value of $1,500,000. The ores were at first a red iron-stained material resembling limonite, carrying free gold, and later on, when they got further into the mountain, auriferous iron pyrite.

It is reported that the Golden Cycle Mining Company in the Cripple Creek district intends to develop its veins at depth where they pass from the breccia area into the granite of Big Bull hill, on which it has purchased claims. It has been well established that the important veins of Bull hill proper do extend on their strike out of the volcanic basin, or breccia area, into the granite of Big Bull hill, but as yet they have not been found to contain pay ore in the latter. The only veins which have paid in the granite are the Gold Coin and the Strong. Should any veins prove to contain pay ore at great depth after they enter the granite of Big Bull hill, the hitherto recognized gold-bearing area of the district will be greatly extended.

The report of the manager for the United Gold Mines Company shows that during the past year there were granted, on different portions of the property, 75 leases, of which 25 are in more or less active operation. These lessees shipped 4231 tons of ore, of the gross value of $123,351; the freight and treatment costs amounted to $35,977.21; the lessees received $60,643.78; and the company received as royalty, $26,066.99. In addition to this amount, the company received by settlement of the Londonderry suit, $35,155.91, which makes a total income for the year from all sources of $61,222.90. The company's treasurer now has on hand $55,889.17.

While the size of the Cripple Creek drainage adit has not been materially changed under the new contract, the shape of it has been varied from 10 ft. high by 6 ft. wide, to 6 ft. high by 10 ft. wide, with a concave water-way 6 ft. wide and 3 ft. deep, thus providing for the anticipated big flow of water.

The competition between the chlorination mills and cyanide mills for the Cripple Creek ores continues. The United States Reduction and Refining Company, owning and controlling the chlorination plants, now announces a further reduction on the low-grade ores of the district. The charge for freight and treatment was formerly $4.50 on ores assaying one-half ounce gold or less per ton. The new rate is $3.50 for ores up to $8 in gold per ton, leaving the $4.50 rate to apply only to ores assaying between $8 and $10 per ton. The $3.50 rate is the lowest ever made for the treatment of Cripple Creek ores, and will no doubt bring into the market a big tonnage of ore lower in grade than has yet been shipped. The reason for this reduction, in addition to the keen competition between the rival process mills, is that the present milling capacity is in excess of the production of the camp. But owing to the reduction in treatment charge, the tonnage of ore, heretofore unprofitable, that will be mined, ought to be sufficient to keep the mills running at full capacity. Furthermore, in the mining of this low-grade, and heretofore worthless, material, bodies of higher grade ores will probably be found, for which the treatment charge is much higher. On the whole, therefore, the $3.50 rate on $8 ore is an excellent business policy.

Toronto, Ont.

Feb. 20—By an order-in-council issued Feb. 14, the Canadian Government has remitted the royalty, imposed in 1903, on the output of iron-mining locations on Dominion lands for a period of 20 years. The royalty is retained on other minerals.

There are prospects that an abundant supply of natural gas will soon be secured in the Riding mountains district, Manitoba. The government party, working 18 miles north of Neepawa, struck gas at 150 ft. in such quantity that when ignited flames shot 20 or 30 ft. into the air; the gas burned out in a short time. Experts say that deeper sinking will produce plenty of gas.

A warrant has been issued for the arrest of Luther W. Spear, Toronto, promoter of the Bonanza Consolidated Mines and the Crawford Mining Company, on complaint of D. W. Warner, vice-president of the Bonanza. Spear left Toronto a month ago for New York, promising to return in a few days, but failed to do so. It is charged that Spear has been selling stock extensively upon fraudulent representation and has received in subscriptions, mostly in small sums, about $50,000, for which he has not accounted to the company. The Bonanza was otherwise known as the Northern Ontario & Quebec Mining Syndicate and was intended to be the parent organization of a number of subsidiary companies. Its properties are in the Larder Lake district.

Mining News from All Parts of the World

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

THE CURRENT HISTORY OF MINING

Arizona

YAVAPAI COUNTY

The situation has materially changed for the better during the last 30 days. There are now a number of mines in operation and more commencing right along. Yavapai seems to have about recovered from the recent shock. Within another 60 days the old standard of activity should have been reached in this county. There will be a number of installations of new machinery in the near future. The Logan Copper Company will install a compressor and air drills. The Mountain Gold Mining Company a mill of 50 tons capacity. The Mt. Elliot Consolidated Mining Company, 10 additional stamps, an air compressor, power drills and additional pumps; the H. J. Beemer Company, two hoists, an additional air compressor, drills, pumps and reduction plant.

Octave Mining Company—On Feb. 17, A. F. Hurley, superintendent of the mine, deposited in the Prescott National Bank a bar of gold bullion weighing 84 lb., the clean-up from the battery and cyanide plant for the first 15 days of the month. The mill is running to its full capacity. About 200 men are employed about the mill and mine.

Mt. Elliot Consolidated Mines Company—This company is making regular shipments of bullion to the mint. On Feb. 15 it shipped a $3,500 bar, the result of 15 days' run of its 10-stamp mill. Up to this time the mill has only been operated 12 hours per day.

Arizona Power Company—This company has commenced work opon its power plant at Fossil Creek in the eastern part of the county. It owns one of the best water-power locations in the Territory. It is estimated that from 2500 to 5000 h.p. can be generated when the plant is complete. This plant will be of great benefit to the mines of this country, owing to the difficulty of obtaining fuel.

Little Jessie—The 20-stamp mill from the old Catoctin mine is being moved to this mine. The mill is an excellent one and was never used to any extent. The Little Jessie has an ample quantity of ore to supply its increased milling facilities. The mine is situated about 2 miles from McCabe.

Arizona Smelting Company—During the past week this company has been paying off the labor indebtedness. It is reported that the smelter will resume operations within a short time.

Logan Copper Company—This company will install an air compressor and air drills in the near future. Its shaft has reached a depth of about 200 ft., and the ground has become too hard for economical hand work.

California

BUTTE COUNTY

Kimberlite—At a depth of 92 ft. from the surface blue ground or kimberlite has been struck by the Keystone drill in the property near Oroville which is supposed to bear diamonds, though no gems have yet been found.

CALAVERAS COUNTY

Copper—A number of residents of Milton, headed by Judge Donner, are developing a copper lead in the Bunds place in the Black Hill district.

EL DORADO COUNTY

Excelsior—El Dorado Water and Deep Gravel Company has 36 men at work in the gravel mine at Placerville and has a 10-stamp mill crushing the gravel.

Sherman—Thomas Clark, formerly of the River Hill Mining Company, has 20 men at work on this property. A new hoist and new 10-stamp mill are to be installed.

INYO COUNTY

Ballarat—At this old camp high-grade ore has recently been mined by M. Clay, and arrangements are being made to ship it.

Casa Diablo Mining Company—The new milling plant of this company has been put in operation. In the Dry Bone claim there is a small vein which will average $100 per ton.

Ubehebe—In this district some good lead and copper mines are being developed. The Butte group, particularly, is yielding fine lead ores, carrying silver.

IMPERIAL COUNTY

Golden Cross—This mine, which was formerly within the boundaries of San Diego county, and which was a large producer for years, is being examined by representatives of the American Smelting and Refining Company.

MARIPOSA COUNTY

Clearing House—At this mine, near the confluence of the South Fork with the Merced river, a 10-stamp mill is being put up by the Egenhoff Brothers.

Hites Cove—A 10-stamp mill is kept busy on ore from this old mine and a cyanide plant is being installed to work the tailings.

Cornet—This mine at Jerseydale has been bonded from D. Heaton by Fred McCall and J. L. Mahoney.

NAPA COUNTY

Belle Union—Plans are being made to reopen this old quicksilver mine near Rutherford. It has been closed down for over 30 years.

NEVADA COUNTY

Aurora Mining Company—This recently incorporated company, H. B. Skewes manager, is sinking a two-compartment shaft on Randolph Flat. The mine is equipped with hoist and pumps.

Christopher Columbus—This old mine near the Idaho-Maryland, Grass Valley, has been bonded to H. Westcott, who will reopen it at once.

PLUMAS COUNTY

Arcadia—A rich strike is reported on the main shaft at 500 ft. in this mine at North Cañon. The ledge is 3 ft. wide, and the property is owned by D. McIntyre, of Greenville, and others.

SAN BERNARDINO COUNTY

Hart—At this new camp a number of leasing companies have started work and many new discoveries have recently been made. On the Oro, where the original strike was made, an adit has been started to tap the ledge lower down. In this camp miners get $4 to $4.50 per day, carpenters $6 and laborers $4. Some very high-grade ore has been taken out of some of the locations.

Long Horn—This camp is 50 miles east of Victorville; the property there is owned by Los Angeles people. A 10-stamp mill is being put up.

SHASTA COUNTY

Butte Hill Copper and Smelting Company—This company at Kennett has entered into a contract with the Holt & Gregg Company for a supply of 100 tons of lime rock per day, to be used in smelting operations at Delamar. This is taken to indicate that the smelter may be blown in at a very early date. After a large supply of limestone has been delivered the daily amount will be diminished to about what the daily consumption will be.

Colorado

LAKE COUNTY—LEADVILLE

Iron Silver Mining Company—On Feb. 17, forty men were put to work at the Tuscon shaft on Iron hill. It is expected that the company will soon employ the usual number of men. This mine probably employs more men than any other individual mine in the camp. It is probable that the Moyer mine, belonging to this company, will soon be re-opened. Since the mine was shut down, the shaft has been re-timbered from top to bottom and the mine is now in good condition for resumption.

O'Donovan Rossa—Ore has been found at this mine on the southwest slope of Carbonate hill, near California gulch. About a year ago John R. Curley took over the management of this property and started to sink a shaft. Prospecting from the old shaft, sunk to the east of the Pendery fault had discovered no ore of any consequence. Mr. Curley enlarged this old prospect shaft, and sunk it to a depth of 583 ft. Drifts were then driven west from the shaft and, at a distance of 260 ft. ore was found. The ore is a "manganese iron" carrying a small percentage of lead and some silver. The extent of the orebody is not known for the drift is only in ore for about five feet. The drift will be extended to cut the fault where it is thought ore will be found.

Lord Ranch—Conrad Czarra, of Chicago has purchased this property, south of Leadville. Several prospecting shafts will be sunk and, if the ground prospects favorably, a dredge will be installed. J. P. Wood is in charge of this work.

Miller—This group of claims on Champion mountain in the Lackawanna Gulch district has been worked steadily during the past winter. W. H. Harrison and his associates sank a shaft on the south side of the mountain where they encountered a good vein of gold ore but just after the ore was struck the shaft was flooded and so had to be abandoned. An adit was started on the west side of the mountain to tap the shaft and drain the water which stopped the working. The adit is now directly under the shaft, and the ore has also been cut in this adit. A mill has been erected on the property.

Indiana

Attorney-General Bingham has decided that it is necessary for mining companies incorporated under the laws of other States to obtain permission to do business in Indiana and incidentally to pay at least the minimum incorporation fee of $25.50 before they can even solicit stock subscriptions in the State. Heretofore foreign mining corporations have not regarded it as necessary to obtain permission to transact business in the State. The Indiana incorporation law provides that before any incorporation for profit shall be permitted to exercise any of its corporate powers in the State it shall be required to comply with the provisions of the act.

Sunday Creek Coal Company—This corporation, of Ohio, has been admitted to do business in Indiana. The company proposes to invest $20,000 in the State. The Indiana office will be in the Traction Terminal building, Indianapolis.

VIGO COUNTY

Shirkie Coal Mining Company—This company, of Terre Haute, has incorporated to open up a new mine. Edward Shirkie, J. K. Dering, J. E. Hitt and R. R. Hammond, directors.

Michigan

COPPER

Michigan—Shaft C has entered the producing list, thus giving this property three producing shafts. Drifts from C shaft on the Calico lode are opening up a settled formation running well in stamp rock. Work is to be resumed at the company's stamp mill early in the spring. Construction work was suspended last fall due to unsettled market conditions. This mill is being payed for out of the earnings of the company.

Mohawk—Three of the four heads at the mill are doing regular duty, stamping about 2200 tons of rock daily. At the mine all the shafts are in first class condition and sinking is going on in all five. No. 1 shaft is down to the sixteenth level, No. 2 to the fifteenth, No. 3 to the eleventh, No. 4 to the twelfth and No. 5 to below the seventh level.

Ojibway—Excellent progress is being made in sinking both shafts on this property and in all probability, drifting to cut the Kearsarge lode will be started in the course of a few weeks. Several fissure veins carrying considerable copper, have been encountered on the way down. These shafts are being sunk in the footwall about 40 ft. behind the vein.

Keweenaw—This company is expected to become a producer about July 1.

Dollar Bay Wire Mill—The copper-wire drawing mill, operated by the Tamarack Mining Company, has resumed operations after a two months' shut down. About 40 men are employed.

Missouri

ZINC-LEAD DISTRICT

Hornet Mining Company—This company has been organized, the incorporators being residents of Enid, Okla., Granby and Joplin, Mo.; the capital stock is $50,000. The company has taken a lease of 15 acres on the Shumaker land, southeast of Joplin and just west of the Bumble Bee mine. Two shafts are down 180 ft. and in ore. A mill is to be put up soon.

Kalitan Mining Company—This company has been incorporated with $50,000 capital stock. R. A. Kerr, of Duluth, is president; R. D. Pitkin, of Joplin, secretary and manager. The mill is nearly completed.

Old Dominion Mining Company—This company has sub-leased 30 acres of its Iroquois lease west of Joplin. This includes several shafts and the mill.

Plymouth—This company, at Sarcoxie, recently made its first turn-in, consisting of 18,070 lb. zinc ore. It is the second producing mine at Sarcoxie.

Sharpsburg—This company's mill was recently destroyed by fire, the loss being $6000. The mill was near Prosperity.

Nevada

ESMERALDA COUNTY—GOLDFIELD

At present about 600 men are working at the mines; of these about 100 men are said to be members of the Western Federation of Miners, about 200 are members of the newly organized Nevada Miners' Union and the rest are non-union miners, many of whom have been brought from Utah. Many of the striking miners have gone to Rawhide. Vice-President Mahoney, of the Federation, has come to Goldfield from Denver.

Goldfield Consolidated—About 430 men are employed at the different properties. At the Combination the usual tonnage is being mined and development work is being done on the 310-ft. level and some of the other levels . At the Mohawk good ore has been found in the winze being sunk from the 450-ft. level. Three boarding houses are run by the company, one at Milltown and two, the Jumbo and the Red Top, at Jumbotown. Boarding at these company houses is optional.

Florence Annex—Ore is being mined in the winze from the third level and from the raise being driven from the fourth level to connect with the winze. On the fifth level a crosscut is being driven to the vein. The shaft is 520 ft. deep.

Mohawk-Jumbo—Work has been resumed and 16 miners are clearing up the mine preparatory to stoping. During the shut-down there have been several caves in this mine. The lease has 3 months and 11 days to run after mining is resumed.

Florence Mining and Leasing Company—Twelve miners are now working at the lease. Considerable drifting will be done on the 400-ft. and 500-ft. levels.

Pollard Florence—The shaft is 500 ft. deep; a station has been cut at that point. Crosscuts are being driven on this level.

NYE COUNTY—BULLFROG

Golden Scepter—A crosscut has been started west from the bottom of the 80-ft. inclined shaft. The crosscut from the

300-ft. level is to be extended further so as to develop four well-defined veins that have been prospected near surface.

Tramps Consolidated—A strong vein has been cut by the crosscut from the 300-ft. level of the Denver shaft. The vein was cut at a distance of 17½ ft. The crosscut has penetrated the vein 10 ft. and is still in mineralized material. This vein, which is on the 300-ft. level of the winze is 600 ft. below surface. Ore is being sacked from the 300-ft. level of the winze on the Denver property. The pay-shoot is said to be 3 ft. wide.

Pioneer Bullfrog—The crushers, cyanide tanks and a 30-h.p. engine for the new mill have arrived. In the adit a raise has been started near the winze; this will be continued to surface.

Gold Bar—The 10-stamp mill has been running for several days.

Mayflower—The vein on the 400-ft. level has been developed for 115 ft. along its strike and then a crosscut was driven from wall to wall. This shows the vein to be 22 ft. wide; the ore is said to be of good milling grade.

Homestake—The foundations of the mill are practically completed and the placing of machinery has begun.

Gold Bullfrog—One of the wells is furnishing 25,000 gal. per day and the second well is supplying more water than can be pumped with the present equipment. The mill is now running; stoping began last week. Sinking is to begin soon. More machinery is to be added to the mill.

Storey County

According to the superintendents' reports, for the week ending Feb. 15, the water in the Consolidated Virginia shaft was 92 ft. below the 2350-ft. station and in the Combination shaft was 228 ft. below the measuring point.

Ophir—On the 2100-ft. level from the north stope 154 cars of ore were mined and from the northeast sill-floor drift 13 cars. On the 2200-ft. level in No. 2 northeast stope from the winze station 100 cars of ore were mined and from the northeast sill-floor drift driven from the south drift 90 cars of ore. One carload of first-class ore and one carload of concentrates were shipped to the Selby smelter. To the Kinkead mill 314 tons of ore were sent.

Consolidated Virginia—Development work is confined to the 2250-ft. and 2350-ft. levels where driving is being done.

Ward Shaft Association—The 2475-ft. station is being cut and is almost ready for timbers. This is to be a pump station.

Yellow Jacket—Only the west half of the mill has been running during the week; about 100 tons of ore were crushed per day. All the machinery is working well and the other half of the mill is ready to start. At the mine the Sagebrush level is being cleaned out. On the 900-ft. level some ore of fair grade has been mined from the east crosscut. From the workings driven from the raise of the 1000-ft. level some low-grade ore has been mined. On the 1100-ft. level, stoping is being done in the gold vein on the south end of the mine. Two shifts have been worked during the week and about 1000 tons of ore have been hoisted.

Silver Hill—Prospecting has been continued on the different levels. About 100 tons of ore were hauled to the mill.

Crown Point—About 20 tons of ore were mined in the raise started about 80 ft. north of the south endline.

Nye County—Tonopah

The ore shipments from Tonopah mines for the week ending Feb. 6, as reported by the Western Ore Purchasing Company, amounted to 5611 tons. The Tonopah Extension shipped 138 tons; MacNamara, 150; West End, 40 tons. From Gold Mountain, 3 tons were shipped. The Tonopah company sent 3230 tons, the Belmont company 950, and the Montana-Tonopah 1100 tons to the mills.

Belmont—Much development work is being done on the 700-, 800-, 900- and 1000-ft. levels and ore is being mined from these levels. The ore in the Occidental claim continues to look promising; a streak of high-grade ore in this vein is now 14 to 18 in. wide. The Mizpah vein on the 1000-ft. level, which was cut in the No. 5 north crosscut, is about 5 ft. wide and contains some shipping ore. The vein cut by No. 6 north crosscut on this level also contains some shipping ore, but most of the ore is of milling grade.

Tonopah Midway—At a depth of 100 ft. a station has been cut in the winze sunk from the 835-ft. level, but no development has been done at that point as the winze will be sunk to a depth of 200 ft. before drifting on the vein begins. The winze is 120 ft. deep. This vein is being developed on the 835-ft. level, where the drift has followed the vein for over 300 ft. In the upper levels ore is being blocked out for future mining. The south crosscut on the 435-ft. level is being driven ahead in a promising formation in which several narrow stringers of ore have been found.

Tonopah—At the Silver Top claim, the Valley View vein is being developed on the 240-, 340- and 440-ft. levels. In the Mizpah claim ore is being mined from all the levels down to the 600-ft. level. On the 600-ft. level most of the ore comes from the main Mizpah vein. Considerable prospecting is being done on the 900-ft. level. At the Red Plume shaft, on the west end of the company's property, waste is now being hoisted. This will relieve the Mizpah hoist, so that more ore can be hoisted in the future through the Mizpah shaft.

Montana Tonopah—On the 460-ft. level a body of good ore, 8 ft. wide, has been cut about 200 ft. east of the shaft. On the 600-ft. level this vein has also been developed. A crosscut will be driven on the 3d or 500-ft. level to cut this vein. On the 600-ft. level driving is being done on the Martha vein; the drift is being driven northeast following the vein at a point about 950 ft. west of the shaft. About 600 ft. from the shaft a drift is being driven west on the MacDonald vein.

Jim Butler—Only development work is being done owing to present inability to ship to the smelters. The results of the trial run of Jim Butler ore at the Belmont mill are not known as yet. If satisfactory, the company will ship to that mill. Most of the development at present is being done on the 250-ft. and 400-ft. levels of the Curtis claim and on the 500-ft. and 600-ft. levels of the Wandering Boy claim. On the 600-ft. level a crosscut has been driven northeast from the shaft, so as to develop the vein cut on the 500-ft. level. This crosscut is 300 ft. long at present. Seven air drills are running in the mine.

North Star—Good ore is being mined on the 950-ft. level. In the drift following the fault on the 1250-ft. level, a vein about 4½ ft. wide has been found, but the rock assays little. The drift is now being driven to follow this vein.

West End Consolidated—The usual tonnage is being mined from the 400-ft. level. On the 200-ft. level considerable prospecting is being done. The work of outlining the apex continues.

MacNamara—This property has begun to make regular shipments of ore. Most of the prospecting and mining is confined to the 300-ft. level. The ore being mined comes from the two raises on this level. No stoping has begun as yet. About 12 tons of ore are hoisted each day.

New Mexico

Grant County

Steeple Rock District—Renewed activity is reported from this district, which has been idle for 25 years. The district includes the old Carlisle mine and a number of other steady producers of the past. The ores of the camp carry gold, silver and copper.

Drill Prospecting—Systematic prospecting by means of deep boring machines is becoming popular in the southern camps. Machines of the percussive type are used to greater extent than diamond drills, but the latter are coming into use with depth. The success of the Azure Mining Company in drilling is noteworthy in this respect. A combination machine built by the Cyclone company is used. Both fissure veins in granite, and lenticular de-

posits of copper ore in the monzonite porphyry have been found. The percentage of copper is small, 2 to 4 per cent., but the ore is said to be free from undesirable elements. The cost of putting holes down to about 300 ft., taking cores at intervals, and churning the rest of the holes down, is placed at an average of 50c. per ft.; and the entire cost, including all fixed charges, and the repairs, is less than a dollar.

LINCOLN COUNTY

Carrizozo District—Machinery has arrived for the Guy Gifford Company which will begin extensive development. The Buster Brown property will also be developed during the year, and the Vera Cruz company has announced its intention to erect a cyanide plant within six months.

New York

CLINTON COUNTY

The ore separator and concentrator building at Lyon Mountain was destroyed by fire Feb. 7, and the machinery badly damaged. The property is owned by the Delaware & Hudson Company.

WAYNE COUNTY

Wayne Iron Company—This company will soon begin the stripping of some ore property which it controls with the view of placing ore on the market the coming season. The company has acquired about 600 acres of ore land, and it is estimated that the property will produce from 3,500,000 to 4,000,000 tons of ore. The company expects to be able to get out 1000 tons per day. The property is located about 75 miles from Buffalo, and it is the intention to sell the output to Buffalo, Tonawanda and Hamilton, Ont., furnaces, and to some of the Eastern furnaces. The ore runs about 45 per cent. in iron, is non-bessemer and high in silicon, and furnace tests have shown it to be largely self-fluxing, owing to a high percentage of lime. It contains no manganese and practically no alumina, and it is claimed that it will require no treatment for handling at the furnaces. As the earth capping varies from only 6 to 30 ft. in depth, the property can be opened up cheaply. The men most prominently interested in the mining company are J. H. Bartow, John Mitchell, W. H. Becker and John A. Donaldson, all of Cleveland, Ohio.

South Dakota

LAWRENCE COUNTY

Connie-May Morris—The shaft is now down 60 ft. and two crosscuts have been started, east and west, following direction of the outcrop on the surface.

Hercules — Superintendent Engelhardt has been ordered to double the force of miners and push development work on this Ruby Gulch property.

Quick Action—Robert F. Tackabury has commenced proceedings in the United States court against the Chicago, Burlington & Quincy Railroad Company for possession of this property and damages.

Two Bears—Work will soon be recommenced on this old property near Galena, which has been idle since 1893. The old shaft is 365 ft. deep.

Echo—A station is being cut in the tunnel and an electric hoist will be installed to sink a shaft several hundred feet to tap the veins that outcrop on the surface.

Fortunate—The main shaft is down 200 ft. and the company is preparing to develop more extensively a lot of new ground just purchased.

North Homestake—The mill will resume crushing this week after a six months' shut-down. It has now operated with electricity and has numerous improvements in the treating process. A new orebody has just been opened up in the mine.

South Homestake—The shaft has been sunk about 260 ft. and is still going down through stringers of good ore. Drifting is being continued east and west and more men will be put to work this month.

PENNINGTON COUNTY

George—These old placer diggings near Rockerville are to be worked extensively this summer by Pittsburg capitalists, who have just purchased an interest in the ground and will install a hydraulic plant.

Hill City Electric Power and Mining Company—C. H. Kamman and associates of Hill City, who are interested in the Gold Medal property, have organized this power company and will tap Spring creek with a flume to supply mines in this section with power. This is the only attempt to use electricity in the Southern hills for mining purposes.

Ideal—A stamp mill, with cyanide annex, is to be erected as soon as the plant can reach here. The adit is in 300 ft. and will be driven 600 ft. more. Three ledges containing free milling ore have been opened and partially developed.

Williamson—The only iron ore mined in the Black hills is now coming from this property west of Rapid City. It is being shipped in small carload lots to Denver.

Gopher — Superintendent Arundel has purchased a gasolene hoist and will develop the property near Hill City more extensively at once.

Utah

BEAVER COUNTY

Cactus—The management is considering the matter of driving another long adit which will develop the mine 400 ft. below the present adit.

Horn Silver—On the 700-ft. level and in the northern part of the mine, high-grade silver ore has been found.

JUAB COUNTY

Black Jack Consolidated—This company has decided to drive an adit 1900 ft. long to develop the mine at a depth of 300 ft. The entrance will be convenient to the tracks of the Eureka Railway.

King William—This company has arranged to operate its property through the Eagle & Blue Bell mine. By driving from the lower workings of the Blue Bell, the King William orebodies can be reached within a few hundred feet.

Tintic Smelter—Construction work is progressing satisfactorily and the plant will be ready for commission shortly after May 1.

Yankee Consolidated—The directors of this company have purchased the property of the Mountainview Mining Company. The capital stock of the Yankee company has been increased from 500,000 to 1,000,000 shares, the Mountainview shareholders accepting 350,000 shares of this new stock in payment for their holdings.

Park City Shipments—The shipments for week of Feb. 21 amounted to 746,740 lb.; the Daly Judge shipped 374,000 lb. and the Silver King, 372,740 pounds.

Canada

BRITISH COLUMBIA—BOUNDARY

Granby—This company is now operating all of its furnaces and is smelting about 3200 tons of ore per day. It is said to be the intention of the management to enlarge the smelting capacity further by lengthening the present furnaces.

BRITISH COLUMBIA — CROW'S NEST PASS

The Canadian Pacific Railway has undertaken the development of important coal areas as a means of supplying their locomotives in the West. The Hosmer Mining Company has been organized, the leading men in which are prominent Canadian Pacific officials, and will begin coal-mining operations at Hosmer, in the Crow's Nest area, some eight miles from Fernie. Eight seams in all will be opened, the product being brought to the surface by one slope. A steel tipple is to be erected at once, and modern machinery installed under the direction of W. H. Aldridge, consulting engineer. The company hopes to begin the actual work of raising coal early next year and is providing for a daily output of 3000 tons.

NOVA SCOTIA

Dominion Iron and Steel Company—The work of drilling to locate ore has been begun on the iron areas recently secured from the New Brunswick Iron Company at Lepreaux, New Brunswick.

Nova Scotia Steel and Coal Company—The directors report of this company stated that the business of the past year

was the largest in the company's history. The steel shipped aggregated 53,632 tons being an increase of 25 per cent. over the output of the preceding year. The coal output showed a decrease on account of No. 3 colliery being worked by single-shift. Profits for 1907 were $944,790, as compared with $960,281 for 1906. The total amount to the credit of the profit and loss account on Dec. 31, 1907, was $2,125,574. The total assets were $13,810,881. Shipments of coal for January were 47,750 tons as against 38,729 in January, 1906.

Nova Scotia Steel Company—This company's report for the year 1907 shows net earnings of $944,791. Interest on bonds was $266,886; sinking fund and depreciation, $244,428; total, $511,314, leaving a net balance of $403,477. From this dividends were paid amounting to $82,400 on preferred and $299,256 on common stock; a total of $381,656, leaving an undivided surplus of $21,821 for the year.

Ontario—Cobalt District

Ore shipments—Shipments of ore for the week ending Feb. 8 were as follows: Drummond, 52,340 lb.; King Edward, 62,370; La Rose, 42,452; Nipissing, 63,920; O'Brien, 191,060; Temiskaming & Hudson Bay, 66,000; Watts, 61,700; total, 539,842 pounds. Shipments of ore for the week ending Feb. 15 were Buffalo, 63,750 lb.; Coniagas, 65,440; Drummond, 40,000; Kerr Lake (Jacobs) 42,610; La Rose 59,390; McKinley-Darragh, 386,420; Nipissing, 64,200; O'Brien, 130,750; Temiskaming & Hudson Bay, 66,000; Trethewey, 115,080; Watts, 61,700; Total, 967,640 pounds.

Calverly-Wettlaufer — Superintendent Grover is pushing development with a force of 15 men. A crosscut to the east at the 80-ft. level has been run 60 ft., in which distance four veins have been tapped carrying cobalt, niccolite and silver.

City of Cobalt—Drifting has been started on the second level at a depth of 145 ft. The company has on hand 100 tons of ore, partly high-grade, and is arranging for shipments.

Little Nipissing—An important discovery was made Feb. 8 on the portion of the Peterson lake property recently leased and now operated by the Little Nipissing Company. This consists of a 3-ft. vein showing solid smaltite and niccolite with native silver in places and assaying 6000 oz. silver or more to the ton. The vein is situated east of the Bonanza or No. 49 vein of the Nipissing Mining Company.

Kerr Lake Crown Reserve—A continuation of the rich vein on this property has been found about 60 ft. from the original workings.

Badger—A good strike was recently made in the shaft on No. 9 vein. The shaft was put down on a calcite vein showing only smaltite on the surface, but at 72 ft. the vein, which is 4 to 8 in. wide at this level, contains considerable native silver, argentite and niccolite.

Temiskaming Mining Company—At a meeting of shareholders, held on Feb 15 at Toronto, a dividend of 3 per cent. on the new stock was declared, and arrangements were completed whereby the new company, capitalized at $2,500,000, takes over the old one, the capitalization of which is $1,000,000, at the rate of two and one-half shares of new stock to one of old.

Larder Lake Proprietary Goldfields, Ltd.—A petition for the winding up of this company's affairs has been filed in court by Thomas H. Brooks, manager of the company, who claims $8474 for salary, expenses and money loaned. The total liabilities are placed at about $19,000 and a judgment for $933 is standing against the company. Claims for wages amount to $3500. A quantity of ore has been mined but none has been milled and work was discontinued last October.

Ontario—James Township

York Location—A 4-in. vein of native silver, considered one of the best strikes yet made in the district, has been found on this property.

Ontario—Manitou Lake District

Paymaster—A vein of rich ore has been encountered in crosscutting at the 300-ft. level. The samples taken out show visible free gold.

Ontario—Sturgeon Lake District

St. Anthony—Another consignment of gold bars, valued at about $10,000, which was the result of the latest clean-up, was taken to Port Arthur early in February.

Mexico

Chihuahua

Rio de Plata—This company in the Guazapares district under the management of D. W. Shanks, is making a saving of something over 60 per cent. of the values in the concentrates, but expects soon to have the new mill in such shape as to catch up 75 per cent. in the concentrates, which are now contracted for with the American Smelting and Refining Company. The tailings are being stored for future cyanide treatment; the first 12 bars derived from the experimental plant netted the company $15,000.

Jalisco

Cuale—Belgian capital is said to contemplate opening this old mining camp. The plans include the generation of electric power and the construction of a railway from Cuale to Las Penas, a Pacific port. In Spanish colonial days the mines of the district were worked extensively for silver-sulphide ores.

El Oro—A circular has been issued to the shareholders of El Oro Mining and Railway Company and the Somera Gold Mining Company containing the following announcement: "At the last annual general meeting the chairman suggested that, for the purpose of adjusting the question of the ownership of the veins encountered on the 1000-ft. level, it would be wise to set aside a strip of the Somera claim, adjoining the west boundary of the El Oro property, and to operate all the veins contained therein, except the San Rafael, for the joint account and benefit of the El Oro and Somera companies. In the light of further development that has taken place since that date, the directors are of opinion that the better plan to pursue is to reunite the companies and for the El Oro Mining and Railway Company, Ltd., to take over and acquire the property of the Somera Gold Mining Company, Ltd. The general scheme of amalgamation and the agreement giving effect thereto will be submitted as soon as possible to the shareholders of both companies for approval."

Nuevo Leon

Compania Carbonifera y Irrigatora de Nuevo Leon—A new company has been formed in England which, it is reported, will take over the property of this company including 15,000 acres of coal land. A force of engineers is exploring the fields and making surveys for a railroad.

Sinaloa

Tajo Mines Company—This company has placed an order with the General Electric Company for the electric equipment of its mines in the Rosario district. The order includes a three-phase, 60-cycle, 2300-volt revolving-field generator of 150 kw. capacity, nine oil-cooled transformers, and three 440-volt induction motors of 15, 35 and 75 h.p. capacity with starting compensators.

Sonora—Nacosari

Belen Copper Company—The Medbery 30-ton furnace and roaster is to be blown in about March 1 at the mine west of Cumpas. This is to treat the ore that is too low to ship to the smelters.

Minneapolis Copper Company—This company, near the Belen and Transvaal mines is working a small force on development work.

Moctezuma Copper Company—Wages are to be reduced at the works on March 1. At the Pilares mine the campaign of development work instituted a few months ago is being followed up and the opening of the new concentrator will witness the most active campaign in the history of the camp.

Greene-Cananea Company—Old employees of the company report receiving letters asking them to be in readiness to take their old positions in the immediate future.

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, Feb. 26—In the East the coal trade remains quiet, both for anthracite and bituminous. Mild weather and light demand for steam coal continues to restrict sales and production.

In the West the main topic of discussion is the projected combination of Illinois and Indiana mines. The leaders in this are the officers of the Deering and the O'Gara companies, of Chicago, and it seems to have its origin with the railroad companies, which divested themselves of coal-land ownership through the medium of those companies.

The Deering company board of directors is composed of Rock Island Railroad men. The O'Gara Coal Company, operating a number of mines in Illinois and two mines in Indiana, is a Big Four enterprise. These companies, and possibly others, will form the basis of the scheme. The proposed company is to follow the form of the United States Steel Company. This would mean that the various companies would retain their separate corporate existence, but each would report to a parent company. This central company would allot orders to the best advantage for distribution, etc. There would be economies in the purchase of material and in the sales department. The mines where production costs most would be shut down, and in times of extreme dullness the output would be confined to relatively few mines and these the ones whose cost of production is the lowest. It is thought that this plan will be evolved within the next two months.

It is the understanding that the railroads owning coal mines in Indiana have by no means abandoned the idea of forming a big company to take over the properties when the Government enforces the law prohibiting such ownership by railroads. It is also the plan to bring a test case in the court on the validity of the act.

Coal Traffic Notes

Tonnage originating on Pennsylvania Railroad lines east of Pittsburg and Erie, year to Feb. 15, in short tons:

	1907.	1908.	Changes.
Anthracite.....	660,884	658,927	D. 1,957
Bituminous.....	4,794,401	3,938,680	D. 855,721
Coke.....	1,765,145	875,939	D. 889,206
Total.....	7,220,430	5,473,546	D. 1,746,884

Average daily tonnage, 153,626 in 1907, and 118,990 in 1908; decrease, 34,636 tons.

Coal receipts at St. Louis for the year ended Dec. 31 were 7,582,209 tons in 1906, and 8,145,308 in 1907; an increase of 563,099 tons.

Bituminous coal and coke shipments, Pennsylvania and West Virginia, year ended Dec. 31, short tons:

	Coal.	Coke.	Total.
Balt. & Ohio.....	26,686,636	5,310,082	31,996,718
Buff., Roch. & Pitts.	7,195,555	588,805	7,784,360
Penn. lines, N. Y. C.	8,436,576	76,560	8,513,136
Pitts. & L. Erie.....	10,891,062	4,925,396	15,816,458
Norfolk & Western.	12,384,643	2,523,219	14,907,862
Total.....	65,594,472	13,424,062	79,018,534
Total, 1906.....	59,505,033	13,459,279	72,964,312

In addition Baltimore & Ohio carried 974,524 tons anthracite in 1906, and 1,020,274 in 1907; increase, 45,750 tons.

New York

Anthracite

Feb. 26—Prepared sizes are inclined to be scarce and fairly active. The stocks of this class of coal, which were in evidence a few weeks ago, now seem to be well used up, which naturally stimulates the demand. Among the small sizes pea coal is in good demand and is scarce; buckwheat No. 1 is none too plentiful and is well sought after. Rice and barley are in small demand, the latter being almost a drug on the market. Prices are as follows: Broken, $4.75; egg, stove and chestnut, $5; pea, $3.25@3.50; buckwheat No. 1, $2.75@3; buckwheat No. 2 or rice, $2.15@2.25; barley, $1.75, all f.o.b. New York harbor.

Bituminous

The market for soft coal seems to be somewhat improved; inquiries have been coming in more frequently for steam coal and also for contracts for the coming season. One of the noticeable features has been the increased inquiry for slack coal. Several large companies report a small number of contracts; in spite of the fact that the railroads have not yet announced their through rates; hence these contracts have been based on prices f.o.b. mines, subject to the rate when announced.

In the far East business has not improved to any extent. Along the Sound business has improved to a limited extent. New York harbor trade shows no change from last week. Good grades of steam coal bring $2.50@2.60 per ton f.o.b. New York harbor ports.

Transportation from mines to tide is quicker and car supply is far above all requirements. In fact some companies are delivering cars which have not been asked for. In the coastwise trade vessels are in excellent supply, above the demand. Freight rates are still a matter of agreement between the parties concerned and are nominally quoted at 65c. to Boston and equivalent points. We hear of charters as low as 60c. per ton.

Birmingham

Feb. 24—There is a decided improvement in the coal production in Alabama. The Tennessee Coal, Iron and Railroad Company is now getting some coal from shaft No. 12, the new mine in the western part of the Pratt mines division. It is announced that a little later convicts will be employed at this shaft. Other mines in this State, which have been shut down for several weeks, are being started up. During the past week two batteries of coke ovens, 150 ovens in all, were lighted.

Chicago

Feb. 24—Conditions of the wholesale coal market are in general better than a week ago. The storm of last week delayed transportation greatly. Stocks were, in many cases, doubled when the resumption of normal traffic began. But this effect was of brief duration. The market has been most influenced by lessened coal consumption due to the slackening of business. Weather conditions of course affect domestic coals.

Western coals hold to about the same prices as last week, this week's quotations being for the products of Illinois and Indiana mines $1.90@2.50 for prepared sizes; $1.60@1.75 for run-of-mine and $1.30@1.40 for screenings. Brazil block brings about $3 and is steady, though the demand is reported light.

Eastern coals are a little easier, despite the storm, the tendency of consumers being to change to less expensive western coals. Smokeless brings $3.10@3.50 for run-of-mine, and $4.05 for Pocahontas or New River. Hocking is stationary at $3.15 with buying about normal; Pittsburg No. 8 brings $2.80 for ¾-in. lump. Youghiogheny is a little short of needs at $3.15 for ¾-in. gas.

Anthracite has profited out of the weather conditions but the supply of anthracite is so great—except of nut coal—that only a perfunctory interest attaches to the market.

Pittsburg

Feb. 25—Trade has slowed down considerably, and the railroad mines in this district are not operating to more than 30

per cent. of capacity. Prices remain on a basis of $1.20 a ton for mine-run coal at mine for current business, but on contract 5c. less is being done. Slack remains strong at 80c. The river coal mines are being run in full, and there are plenty of coal boats and barges in the pools. A number of Pittsburg coal operators went to Indianapolis last night to participate in the conference for the purpose of reviving the inter-State agreement if possible. Both sides express confidence that a satisfactory agreement can be reached.

Connellsville Coke—New business has declined and prices are low. For strictly Connellsville furnace coke $1.75 is quoted for prompt delivery, but on contract $1.85 @1.90 is quoted. In foundry grades the minimum price is $2.35, but on contract some sales have been made at $2.50. The *Courier* in its report for the week gives the production at 189,018 tons. The shipments amounted to 7059 cars distributed as follows: To Pittsburg, 3121 cars; to points west of Connellsville, 3478 cars; to points east of Connellsville, 460 cars.

Foreign Coal Trade

Imports and exports of coal in Germany, year ended Dec. 31, in metric tons:

Imports:	1906.	1907.	Changes.
Coal	9,253,711	13,729,296	I. 4,475,585
Brown coal	8,430,441	8,963,103	I. 532,662
Total	17,684,152	22,692,399	I. 5,008,247
Exports:			
Coal	19,550,964	20,017,688	I. 466,724
Brown coal	18,759	22,065	I. 3,306
Total	19,569,723	20,039,753	I. 470,030

Imports of coke in 1907 were 584,221 tons; of briquets, 195,404 tons. Exports of coke in 1907 were 3,792,580 tons; of briquets, 437,574 tons. In 1906 the total exports of coal exceeded the imports by 1,885,571 tons; in 1907 the imports were in excess by 2,652,646 tons.

Imports and exports of coal and coke in Belgium for the year were, in metric tons:

Imports:	1906.	1907.	Changes.
Coal	5,358,789	5,273,015	D. 85,774
Coke	352,306	360,667	I. 8,361
Exports:			
Coal	4,972,340	4,732,384	D. 239,956
Coke	856,475	863,799	I. 7,324

The imports are chiefly from Germany, and the exports to France.

Iron Trade Review

New York, Feb. 26—Business revives too slowly to require special note, the changes from week to week being slight. In pig iron a little new business has come from the pipe foundries, which seem to have more work on hand than any others. Some city contracts have been let, which will increase their requirements.

In finished material the only change is found in some building contracts in the East which are in the market, but these are all of moderate size. Expert estimates of the finished material capacity at work vary between 45 and 50 per cent. of that employed at the same time last year.

There have been rumors of price reductions on both pig iron and some finished products. These are difficult to trace, and must be taken as reports only. It is quite possible that some pig iron of doubtful grade has been taken at low prices, but no large sales are known to have been made.

A few rail orders are reported, but the railroads generally are holding back, not only on rails, but also on all other new material.

The United States Steel Products Export Company—the export branch of the Steel Corporation—has closed contracts for 100,000 tons of tin-plate bars for Welsh mills. English papers report that the price made is 90s., or $21.60 per ton, delivered at Swansea, Wales.

Birmingham

Feb. 24--While all sales that are being made by the Alabama pig-iron manufacturers are in small lots, there is a general expression that conditions are looking up. The shipments are about equal to the make. The home consumption has been cut down a little by the shutting down of the cast-iron pipe plant of the United States Cast-iron Pipe and Foundry Company at Bessemer, but it is announced that the plant of the same company located at Anniston will be started up within the next 10 days. The Alabama ironmakers are still holding firmly for $13.50 per ton, No. 2 foundry. The smaller producers, who are selling their product right along, are holding to the same quotations as the larger manufacturers. There is much confidence noted in all offices as to the future. Two blast furnaces went into operation during the past week, one belonging to the Sloss-Sheffield Steel and Iron Company and the other to the Central Iron Company at Holt, in Tuskaloosa county. All orders for iron are being filled right on time. The foundry and machine-shop business is still rather slow.

Chicago

Feb. 24—The iron market is still very dull, though probably better in the last week, everything considered, than in the preceding week.

Inquiries seem to be increasing, but are numerous compared with actual contracts clinched. The orders of today run from carload lots to 300 tons; the smaller lots are more numerous than the larger, by far. Buying is still on short time between order and delivery.

Southern No. 2 iron brings $13@13.50 Birmingham, or $17.35@17.85 Chicago. Northern brings, for No. 2, $18@18.50. Lower prices are rumored, but there are no well-authenticated sales.

Coke is a little more in demand though far from lively at $5.25 for the best Connellsville.

Philadelphia

Feb. 26—The well authenticated information of further shadings in pig iron outside of this territory, and particularly in Virginia and Alabama, has had the effect of checking some promising business in eastern Pennsylvania irons. There is even more unrest and uncertainty today than a week or two ago. The lower rates recently made by a few sellers have not brought out anticipated business. Prices of pig iron are nominal.

Steel Billets—Lower prices made within a week have uncovered demand for moderate lots for early delivery. The market is shaky and buyers pretend to believe that there will soon be a general cut.

Bars—Bar-iron orders were booked at a fractional shading. Our mills are not getting much business.

Sheets—Today's summary of conditions does not permit much to be said.

Pipes and Tubes—A few small buyers have sent in orders for second quarter. The big concerns are not getting busy.

Merchant Steel—The buyers are making purchases, but very small.

Plates—Orders are showing themselves from sources that have been holding back for weeks. Some old jobs are now to be pushed.

Structural Material—Contractors say in substance that they look for lower prices and that business will not come forward until the policy of keeping up prices is done away with.

Scrap—The demand for scrap has once more fallen to small sales, mostly local. The mills are not buying.

Pittsburg

Feb. 25—There do not seem to be any particularly favorable reports in the iron and steel markets this week. Despite the strong efforts being made to keep up prices in the different lines, considerable shading is being done and in some finished material low prices continue to prevail. Reports of the operation of mills lately have been conflicting, but upon a careful investigation it can be stated that the plants of the United States Steel Corporation in this district are not running to more than 50 per cent. of capacity and the independent concerns are doing less. New orders are confined to small lots for early delivery, and to bring out the business it is necessary to shade prices.

Pig Iron—Sales of the week will aggregate 10,000 tons. There was but little bessemer iron, the sales being confined chiefly to basic and malleable. Basic and foundry iron are quoted at $16, Valley furnaces, but malleable iron has advanced and sales have been made at $16.25 and higher. A feature of the market was the sale of 400 tons of standard bessemer at $18, the "official" quotation. It was for a special purpose, however. While

sales of standard bessemer have been made as low as $16.75, there has been a strengthening of prices and but few sales, and in small lots only, have been made at even $17. No sales of gray forge are recorded and it is not likely that $15, Valley furnaces, can be shaded.

Steel—A cutting of rates on both bessemer and open-hearth billets is noted this week, but the transactions are on conversion deals which put the price around $26.75, the "official" price remaining at $28. Sheet-bars are still being held at $29 and tank plate is weak at 1.70c. Merchant-steel bars quoted at 1.60c. may be shaded.

Sheets—The sheet market is not satisfactory. Cuts have been made of about $2 a ton, but the regular prices are 2.50c. for black sheets and 3.55c. for galvanized for No. 28 gage.

Ferro-Manganese—Prices have dropped about 50c. a ton and for prompt delivery $46.50 can be done.

Dusseldorf, Germany

Imports and exports of iron and steel in Germany for the full year were, in metric tons:

Imports:	1906.	1907.	Changes.
Iron and steel	690,081	813,104	I. 123,023
Machinery	79,734	88,913	I. 9,179
Total	769,815	902,017	I. 132,202
Exports:			
Iron and steel	3,619,796	3,432,707	D. 187,089
Machinery	296,094	332,023	I. 35,929
Total	3,915,890	3,764,730	D. 151,160

Metal Market

NEW YORK, Feb. 26.

Gold and Silver Exports and Imports

At all United States Ports in Jan. and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Jan. 1908..	$ 444,200	$10,880,460	Imp. $10,436,260
" 1907..	2,450,072	3,270,505	" 820,433
Year 1908..	444,200	10,880,460	" 10,436,260
" 1907..	2,450,072	3,270,505	" 820,433
Silver:			
Jan. 1908..	4,148,844	3,468,716	Exp. $680,128
" 1907..	4,766,965	3,657,041	" 1,109,924
Year 1908..	4,148,844	3,468,716	" 680,128
" 1907..	4,766,965	3,657,041	" 1,109,924

Exports from the port of New York, week ended Feb. 22: Gold, $40,180 to West Indies; silver, $558,305, chiefly to London. Imports, gold, $252,419, from Panama and Central America; silver, $34,928, chiefly from South America.

Specie holdings of the leading banks of the world Feb. 22 are reported as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York	.....	.....	$258,374,800
England	$193,705,660	.....	193,705,660
France	551,827,995	$180,808,800	732,636,795
Germany	165,515,000	68,595,000	234,110,000
Spain	78,515,000	129,335,000	207,850,000
Netherlands	38,453,500	21,553,500	60,007,000
Belgium	19,373,335	9,685,665	28,060,000
Italy	182,375,000	23,250,000	205,625,000
Russia	580,060,000	29,375,000	609,435,000
Aust.-Hungary	232,145,000	62,145,000	294,290,000
Sweden	19,510,000	.....	19,510,000
Norway	7,665,000	.....	7,665,000
Switzerland	16,520,000	.....	16,520,000

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

The movement of specie through the port of San Francisco for the year ended Dec. 31 is reported as follows:

Imports:	Coin.	Bullion.	Total.
Gold	$860,753	$2,644,804	$3,505,557
Silver	210,683	3,125,695	3,336,378
Exports:			
Gold	17,596	3,996	21,592
Silver	722,786	2,953,869	3,676,655

Imports of gold were in excess of exports by $3,483,965. Exports of silver were $340,277 in excess of imports.

Silver Market

SILVER AND STERLING EXCHANGE.

Feb.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	Feb.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
20	4.8675	56¼	25 15/16	24	4.8670	55⅝	25 1/16
21	4.8675	55⅞	25¾	25	4.8690	55⅞	25 3/16
22	.....	....	25⅞	26	4.8675	55⅝	25 1/16

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

Silver is barely steady, and outside of the ordinary routine of operations, there is no feature. Firmness and weakness seem to alternate every few days, without any positive movement in either direction.

Mint purchases of silver Feb. 13-24 were 600,000 oz., prices ranging from 57.775 to 56.036c.; average, 56.758c. per ounce.

Messrs. Pixley & Abell report silver shipments from London to the East for the year to Feb. 13:

	1907.	1908.	Changes.
India	£1,738,110	£ 866,188	D. £ 871,922
China	.....	451,400	I. 451,400
Straits	76,300	.....	D. 76,300
Total	£1,814,410	£1,317,588	D. £ 496,822

Imports for the week were £6000 from New Zealand and £248,000 from New York. Exports were £66,300 to India.

Indian exchange has been easy, but the average price paid for Council bills in London has been unchanged at 15.91d. per rupee.

Other Metals

Feb.	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.
20	12⅜ @12¾	12¼ @12½	57¼	28⅜	3.70 @3.75	4.80 @4.85	4.65 @4.70
21	12⅜ @12⅝	12⅜ @12⅝	58⅛	29	3.70 @3.75	4.80 @4.85	4.65 @4.70
22	.....	.....	.....	....	.....	.....	.....
24	12¾ @13	12½ @12¾	58	29	3.70 @3.75	4.80 @4.85	4.65 @4.70
25	12¾ @13	12½ @12¾	58⅛	29	3.70 @3.75	4.80 @4.85	4.65 @4.70
26	12¾ @13	12½ @12¾	57⅝	28¾	3.70 @3.75	4.80 @4.85	4.65 @4.70

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

Copper—The low prices which were established last week attracted European and Chinese buyers, and a large business was done at advancing figures, but the volume gradually diminished. There was also a slightly better demand in this country, but domestic consumers are still buying only from hand to mouth. At the close we quote 12¾@13c. for Lake, and 12½@12¾ for electrolytic in cakes, ingots and wirebars. The average for casting copper during the week is 12¼@12½c.

The standard market in London advanced rapidly in sympathy with the higher prices for refined sorts, and on Feb. 21 spot copper reached £58 17s. 6d., and three months' copper £59, and large transactons took place. The market closes quieter with spot at £57 12s. 6d., and three months' at £58. Refined and manufactured sorts we quote: English tough, £53 10s.@54 10; best selected, £60 10s.@61 10; strong sheets, £63 10s.@64 10.

The Utah Copper Company has made a contract with the United Metals Selling Company, whereby the latter disposes of its output. The Selling Company has been doing this previously, but no contract existed.

The Buffalo Brass Rolling Mills, of Buffalo, N. Y., producing sheet copper, have gone into operation.

Exports of copper from New York and Philadelphia for the week were 5058 long tons. Our special correspondent gives exports from Baltimore for the week at 1107 long tons.

Copper Sheets and Wire—The base price for wire is 14½c. per lb. For sheets, cold rolled or hard, 19c.; hot rolled or soft, 18c. per pound.

Tin—The London market has been very firm, the price at one time reaching £131 5s. for spot, and £131 5s. for three months. It closes dull at £128 15s. for spot, £128 for three months.

As far as the domestic situation is concerned, a premium on spot has again been established, owing to the fact that the largest part of the tin which has already arrived and is still to come in in the near future is to go to the chief consumer of the metal in this country. The price asked at the close for near-by tin is 28¾ cents.

Exports of tin from the Straits in January were 4669 long tons in 1907, and 5233 in 1908; an increase of 564 tons.

Lead—A little business has been done at the last prices, 3.75@3.75c. New York.

The London market has been quiet and

closes at £14 for Spanish lead, £14 2s. 6d. for English lead.

Spelter—The smelters have further curtailed their production, because at the prices ruling at present for ore and spelter they cannot make both ends meet. There has been a fair demand for the metal from day to day at last prices, 4.80 @4.85c. New York, 4.65@4.70c. St. Louis.

The European market is firm, and the close is cabled at £21 7s. 6d. for good ordinaries, £21 12s. 6d. for specials.

An agreement for the regulation of production has been effected among the German producers of spelter. It is intended to be the nucleus of a convention among all the European producers. Meetings of the Silesian producers were held at Kattowitz, and of the Silesian and Rhenish producers at Frankfurt. Giesche's Erben, an important Silesian company, was not represented at the meetings, but it is understood that it will work in harmony with the convention.

Zinc Sheets—The base price is $7 per 100 lb.—less discount of 8 per cent.—f.o.b. cars at Lasalle and Peru. The freight rate to New York is 27.50c. per 100 lb.

Antimony—The market is dull and weak. A small amount of business is being done for immediate needs. The foreign situation is reported to be somewhat stronger. Prices are 9@9¼c. for Cookson's, 8¾@9c. for Hallett's and 8@8½c. for ordinary brands.

Aluminum—The current price for No. 1 ingots, in ton lots, is 33c. per lb. For rods and wire, No. 0000 to 10, base price is 38c. For sheets, No. 13 to 24, B. & S. gage, base price is 40c. Tubes, 1¼ to 3½ in., base 50c. Higher prices are charged for small lots.

Cadmium—The price is $1.25 f.o.b. Cleveland in 100-lb. lots. A higher price is asked for smaller lots.

Nickel—For large lots, New York, the chief producer quotes 45@50c. per lb. according to size and terms of sale. For small quantities, 50@65c., same delivery.

Quicksilver—New York quotations are $45 per flask for lots of 100 flasks or over, and $46 for smaller orders. San Francisco quotations are $44.50@45.50 for domestic orders; for export nominal, at about $1.50 lower. The London price is £8 5s. per flask, with £8 3s. 9d. quoted from second hands.

Platinum—There were no new developments in the platinum market. Quotations remain $28 per troy oz. for hard platinum, $25.50 for ordinary, and $17 for scrap.

Missouri Ore Market

Joplin, Mo., Feb. 22—The highest price paid for zinc was $40 per ton, on an assay base of $36@38 per ton of 60 per cent. zinc. The average price was $35.28. The highest price paid for lead was $52.50 per ton, f.o.b., an advance of $1 per ton over the previous week, the same as the zinc price. Medium grade ore sold at $50@52 per ton, and the average price of all grades was $49.58 per ton.

Inclment weather reduced the week's output and was partially responsible for the increased activity of the purchasing agents for their companies, resulting in reducing the stock in the bins approximately 1000 tons.

Following are the shipments of zinc and lead ore from the district for the week ending Feb. 22:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	2,933,720	491,660	$65,097
Joplin	2,622,280	204,420	53,621
Duenweg	510,070	275,540	16,068
Galena	723,420	96,000	15,421
Oronogo	610,510	.....	11,606
Aurora	453,030	.....	6,670
Alba-Neck	320,770	.....	6,255
Badger	152,510	50,240	4,219
Prosperity	100,200	89,910	4,050
Spurgeon	194,550	20,050	2,704
Granby	220,000	30,000	2,625
Baxter-Quapaw	139,650	.....	2,443
Peoria	124,120	.....	1,240
Carthage	62,640	.....	1,221
Sarcoxie	58,320	.....	991
Reeds	29,640	.....	503
Wentworth	42,140	.....	420
Totals	9,297,570	1,257,820	$195,154
8 weeks	59,511,490	8,493,450	$1,255,843
Zinc value, the week, $164,031;		8 weeks,	$ 1,051,102
Lead value, the week, 31,123;		8 weeks,	204,741

Average ore prices in the Joplin market were, by months:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1907.	1908.	Month.	1907.	1908.
January	45.84	35.56	January	83.58	46.88
February	47.11	.....	February	84.58	.....
March	48.66	.....	March	82.75	.....
April	48.24	.....	April	79.76	.....
May	45.98	.....	May	79.56	.....
June	44.82	.....	June	73.66	.....
July	45.79	.....	July	58.18	.....
August	43.22	.....	August	59.54	.....
September	40.11	.....	September	53.52	.....
October	39.83	.....	October	51.40	.....
November	35.19	.....	November	43.40	.....
December	30.87	.....	December	37.71	.....
Year	43.68	.....	Year	68.90	.....

Wisconsin Ore Market

Platteville, Wis., Feb. 22—The highest price paid this week for zinc ore was $38.50 on a basis of $37 per ton of 60 per cent. zinc. The tonnage reported is the highest recorded since the recent curtailment. Old producers at Highland and other points are getting into the lists again, while several newly equipped properties at Platteville, Cuba City and Benton will help to swell the shipments from now on. A comparatively large tonnage of lead ore was sold this week on a base price of $24 per thousand for 80 per cent. lead, although no shipments are reported, due mainly to bad condition of the roads.

The new electro-static separator at Platteville is about ready to make a test run and has taken samples with a view to buying low grade or sulphury blende concentrates. Producers of such ore, unequipped with roasting equipment, who have been practically without a market since the Mineral Point Zinc Company discontinued buying, are awaiting with interest the outcome of the electrical method of separation. If it proves a success it practically assures a market at all times in this field for concentrates of zinc carrying a high percentage of iron.

Shipments for the week ended Feb. 22 were:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	483,530	.....	.....
Mineral Point	483,000	.....	.....
Galena	240,000	.....	.....
Livingston	220,000	.....	.....
Benton	216,410	.....	.....
Highland	124,900	.....	.....
Hazel Green	83,200	.....	.....
Linden	55,400	.....	.....
Total	1,906,440	.....	.....
Year to Feb. 22	9,700,280	125,000	.....

Chemicals

New York, Feb. 26—The general market continues dull and little business is being done. Spring inquiries have been coming in, but these have not yet developed into orders.

Copper Sulphate—There has been a moderate demand recently, but the spring orders from agricultural sources have not yet come into the market. Prices remain at $5.50 per 100 lb. for carloads and $5.75 for smaller lots.

Nitrate of Soda—The market holds firm but is not active. Prices are for 95 per cent. 2.42½c. for 1908 delivery; 2.40@2.45c. for 1909; and 2.40c. for 1910. The 96-per cent. grade sells 5c. per 100 lb. higher.

Mining Stocks

New York, Feb. 26—The general stock market this week has fluctuated between comparatively narrow limits. It has been entirely a professional market, and apparently no group of operators has cared to make a decided move.

The curb market has been dull and with no special interest. The copper shares showed no considerable movement in either direction, and trading was not heavy. The largest business was in Cobalt stocks, but in these there was no excitement.

The Federal Mining and Smelting Company has declared the usual quarterly dividend on the preferred, but passed that on the common stock. This had some effect on American Smelting, but it was only slight.

Boston

Feb. 25—Continued improvement in mining-share prices is to be noted. In places there has been more or less activity, yet it is still a dull condition of affairs.

Amalgamated rose over $5 during the week to above $50 per share, with but $1

net reaction. Particular strength is noted in Butte Coalition and North Butte on the expectation of an early resumption of mining at these properties. The former has practically passed its dividend. The last quarterly payment was but 15c., against 50c. three months ago.

The sudden death of Treasurer Daniel L. Demmon, of the Franklin mine, had but little effect on the stock. It declined fractionally to $7, but has recovered to $8. Mohawk receded $2.50 to $45 on reports of another cut in the dividend.

The curb has been firm with no particular feature. Balaklala is selling around $2.25. Over 90 per cent. of the stock has been deposited under the plan of reorganization.

STOCK QUOTATIONS

NEW YORK	Feb. 25
Name of Comp.	Clg.
Alaska Mine	⅛
Am.Nev.M.&P.Co.	....
Amalgamated	49⅜
Anaconda	32
Balaklala	2
British Col. Cop.	4¼
Buffalo Cobalt	....
Butte & London	....
Butte Coalition	18
Butte Cop. & Zinc	....
Cobalt Contact	....
Colonial Silver	⅛
Cum. Ely Mining	7⅛
Davis Daly	3½
Dominion Cop	2⅛
Douglas Copper	5⅞
El Rayo	1⅝
Foster Cobalt	.61
Furnace Creek	.23
Giroux Mine	3½
Gold Hill	⅝
Granby, New	....
Greene Gold	⅞
Greene G. & S	½
Greenw'r & D.Val.	.75
Guanajuato	2⅛
Guggen. Exp.	149½
Hanapah	20
McKinley Dar.	.75
Micmac	3⅝
Mines Co. of Am.	1⅜
Mitchell Mining	⅛
Mont.Sho.C.(New)	2¾
Nev. Utah M. & S	3⅞
Newhouse M. & S.	7
Nipissing Mines	6⅜
Old Hundred	¾
Silver Queen	⅞
Stewart	⅞
Tennessee Cop'r	26⅞
Union Copper New	1⅛
Utah Apex	4¼
Utah Copper	....
West Columbus	....

N. Y. INDUSTRIAL	
Am. Agri. Chem.	....
Am. Smelt. & Ref.	58⅜
Am. Sm. & Ref., pf.	89¾
Bethlehem Steel	13¾
Colo. Fuel & Iron	16
Federal M. & S.,pf.	....
Inter. Salt	11
National Lead	41
National Lead, pf.	....
Pittsburg Coal	....
Republic I. & S.	15⅝
Republic I.& S.,pf.	66
Sloss-Sheffield	39⅛
Standard Oil	487
Tenn. C. & I.	....
U. S. Red. & Ref.	....
U. S. Steel	28
U. S. Steel, pf	91⅛
Va. Car. Chem	16½
Va. I. Coal & Coke	....

ST. LOUIS	Feb. 21		
N. of Com.	High.	Low.	
Adams	.30	.20	
Am. Nettie	.04	.02	
Center Cr'k	2.25	1.75	
Cent. C. & C.	66.00	62.00	
C.C. & C. pd.	76.00	73.00	
Cent. Oil	100.00	90.00	
Columbia	6.00	3.00	
Con. Coal	22.00	20.00	
Doe Run	140.00	125.00	
Gra. Bimet.	.25	.20	
St. Joe.	16.00	14.00	

BOSTON	Feb. 25
Name of Comp.	Clg.
Adventure	2
Aliouez	28
Am. Zinc	....
Arcadian	3¾
Atlantic	....
Bingham	1½
Boston Con	14⅜
Calumet & Ariz.	99
Calumet & Hecla.	617½
Centennial	23½
Con. Mercur	.37
Copper Range	59¾
Daly-West	....
Franklin	8
Greene—Can	8¼
Isle Royal	20⅛
La Salle	14
Mass	3
Michigan	7
Mohawk	51⅛
Mont.C.&C. (new)	.90
Nevada	9¼
North Butte	49⅜
Old Colony	....
Old Dominion	34¾
Osceola	80
Parrot	16¾
Phoenix	....
Quincy	82
Rhode Island	3¾
Santa Fe	....
Shannou	10¾
Superior	17
Tamarack	65
Trinity	13½
United Cop., com.	6
U. S. Oil	10
U. S. Smg. & Ref.	....
U.S.Sm. & Re.,pd.	38
Utah Con	37
Victoria	4
Washington	....
Winona	....
Wolverine	....
Wyandotte	....

*Ex. Div. †Ex. Rights.

BOSTON CURB	
Ahmeek	....
Ariz. Com	....
Black Mt.	3¾
East Butte	....
Hancock Con	....
Keweenaw	....
Majestic	1⅝
Raven	1 3/16
Shawmut	.48
Superior & Pitts	12½
Troy Man	....

LONDON	Feb. 26		
Name of Com.	Clg.		
Dolores	£1	3s	9d
Stratton'sInd.	0	2	6
Camp Bird	0	13	3
Esperanza	1	2	6
Tomboy	1	8	9
El Oro	1	1	10½
Oroville	0	12	0
Somera	..	..	.
Utah Apex	..	..	.
Ariz. Cop.,pfd.	..	..	.
Ariz. Cop.,def.	..	..	.

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

NEVADA STOCKS. Feb. 26.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.	Name of Comp.	Clg.
TONOPAH STOCKS		Golden Sceptre	...
Belmont	1.31½	Homestake King.	.55
Extension	1.12½	Montgomery Mt.	.09
Golden Anchor	.05	Mont. Shoshone C.	2.75
Jim Butler	.39	Original Bullfrog.	.04
MacNamara	.33	Tramp Cons	.23
Midway	.70	MANHAT'N STOCKS	
Montana	1.90	Manhattan Cons.	.20
North Star	.15	Manhat'n Dexter.	.10
Tonopah & Cal.	...	Jumping Jack	.07
Tono'h Mine of N.	5.00	Stray Dog	.10
West End Con	.30	Indian Camp	.06
GOLDFI'D STOCKS		GREENW'R STOCKS	
Adams	.06	Furnace Creek	...
Atlanta	.30	Greenwater &D.V.	...
Blue Bell	.10	Green'rCop.M.&S.	...
Blue Bull	.18	United Greenwa'r	...
Booth	.24	MISCELLANEOUS	
Columbia Mt	.21	Golden Boulder	.09
Comb. Frac	.69	Haysoed	.30
Cracker Jack	.09	Lee Gold Grotto	.10
Dia'dfield B. B. C.	.19	Nevada Hills	3.05
Goldfield Beimont	.15	Nevada Smelting.	.87½
Goldfield Con	4.81½	Pittsburgh S. Pk.	1.27
Goldfield Daisy	1.04	Round Mt. Sphinx	.29
Goldfield Mining.	...		
Great Bend	.37		
Jumbo Extension	.42		
Jumbo Mining	...		
Katherine	.06		
Kendall	.16		
Laguna	...		
Lone Star	.11		
Lou Dillon	...		
May Queen	.09		
Mohawk	...		
Oro	.12		
Red Hill	.29		
Red Top	...		
Roanoke	.07		
Sandstorm	.30		
Silver Pick	.28		
St. Ives	.40		
Triangle	.09		
BULLFROG STOCKS			
Amethyst	...		
Bullfrog Daisy	...		
Bullfrog Mining.	.10		
Bullfrog Nat. B.	.12		
Gibraltar	.11		
Gold Bar	.36		

COLO. SPRINGS	Feb. 21
Name of Comp.	Clg.
Acacia	6¾
Black Bell	....
C. C. Con	4½
Dante	7½
Doctor Jack Pot	6¾
Elkton	52
El Paso	31
Findlay	34
Gold Dollar	7
Gold Sovereign	3¾
Isabella	36¾
Index	....
Jennie Sample	....
Jerry Johnson	9
Mary McKinney	32
Pharmacist	....
Portland	1.05
Un. Gold Mines	....
Vindicator	....
Work	15

New Dividends

Company.	Payable.	Rate.	Amt.
Amalgamated	Feb. 24	$0.50	$765,440
American Coal	Mar. 2	1.25	62,500
Cambria Steel	Feb. 15	0.75	450,000
Camp Bird, Ltd	Feb. 3	0.24	246,800
Doe Run	Feb. 15	0.50	29,531
Dolores, Ltd	Feb. 27	0.15	59,400
Federal Smg., pfd	Mar. 16	1.75	210,000
Gt. Nor. Iron Ore	Mar. 16	1.00	1,495,720
Hinds Consolidated	Feb. 27	0.02	100,000
Homestake	Feb. 25	0.50	109,200
Jeff. & Cl'f. C. & I., pfd	Feb. 15	2.50	37,500
Mammoth	Feb. 25	0.05	20,000
Mexico Con. M & S	Mar. 10	0.25	60,000
Mines Co. of Am	Feb. 25	0.02	40,000
National Lead, pfd	Mar. 16	1.75	265,820
N. S. St. & Coal, com	Apr. 15	1.50	74,814
N. S. St. & Coal, pfd	Apr. 15	2.00	20,600
Providence S. J	Feb. 1	5.00	30,000
Quincy	Mar. 23	1.50	165,000
Republic I. & S., pfd	Apr. 1	1.75	357,296
Sloss. Sheff., com	Mar. 2	1.25	125,000
Standard Oil	Mar. 14	15.00	14,550,000
Tenn. Copper Co	Feb. 15	1.25	218,750
Vindicator Con	Jan. 25	0.04	60,000

Assessments

Company.	Delinq.	Sale.	Amt.
Blue Bell, Cal	Feb. 15	Apr. 15	$0.01
Butler-Liberal, Utah	Feb. 15	Mar. 6	0.01
East Tintic, Utah	Jan. 14	Feb. 9	0.01
Enterprise, Nov	Jan. 9	Feb. 17	0.05
Imlay, Nov	Jan. 24	Feb. 10	0.01
Ingot, Utah	Feb. 17	Mar. 7	0.01
Lucky Dutchman, Nev	Jan. 16	Feb. 8	0.01
Moduff, Utah	Jan. 3	Feb. 4	0.01
Nevada Superior, Nev	Jan. 24	Feb. 21	0.05
New Stockton, Utah	Feb. 26	Mar. 18	0.02½
Pacific Tin Mines, Alaska	Feb. 17	Mar. 23	0.02
Penn. Con., Cal	Jan. 13	Jan. 29	0.10
Posey Canyon, Utah	Jan. 7	Jan. 25	0.01
Spanish Ridge, Cal	Jan. 15	Feb. 5	0.02
Sunflower, Cal	Jan. 30	Mar. 30	0.05
Tetro, Utah	Feb. 21	Mar. 17	0.03
Wabash, Utah	Jan. 17	Feb. 8	0.12
West Tonopah, Nev	Jan. 16	Feb. 15	0.03
Wild Goose, Alaska	Feb. 1	Mar. 16	0.10
Zeibright, Cal	Jan. 6	Feb. 1	0.05

Monthly Average Prices of Metals

AVERAGE PRICE OF SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68.673	55.678	31.769	25.738
February	68.835	.....	31.852	.....
March	67.519	.....	31.325	.....
April	65.462	.....	30.253	.....
May	65.981	.....	30.471	.....
June	67.090	.....	30.893	.....
July	68.144	.....	31.366	.....
August	68.745	.....	31.637	.....
September	67.792	.....	31.313	.....
October	62.435	.....	28.863	.....
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.

AVERAGE PRICES OF 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	.....	25.236	.....	107.356	.....
March	25.065	.....	25.560	.....	106.594	.....
April	24.224	.....	25.260	.....	98.625	.....
May	24.048	.....	25.072	.....	102.375	.....
June	22.665	.....	24.140	.....	97.272	.....
July	21.130	.....	21.923	.....	95.016	.....
August	18.356	.....	19.255	.....	79.679	.....
September	15.565	.....	16.047	.....	68.375	.....
October	13.169	.....	13.551	.....	60.717	.....
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.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27.380	July	41.091	.....
February	42.102	.....	August	37.667	.....
March	41.313	.....	September	36.689	.....
April	40.938	.....	October	32.620	.....
May	43.149	.....	November	30.833	.....
June	42.120	.....	December	27.925	.....
			Av. year	38.166	.....

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6.000	3.691	19.828	14.469
February	6.000	.....	19.531	.....
March	6.000	.....	19.703	.....
April	6.000	.....	19.975	.....
May	6.000	.....	19.688	.....
June	5.760	.....	20.188	.....
July	5.288	.....	20.350	.....
August	5.250	.....	19.063	.....
September	4.813	.....	19.775	.....
October	4.750	.....	18.531	.....
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.

AVERAGE PRICE OF 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	.....	6.664	.....	25.938	.....
March	6.837	.....	6.687	.....	26.094	.....
April	6.685	.....	6.535	.....	25.900	.....
May	6.441	.....	6.291	.....	25.563	.....
June	6.419	.....	6.269	.....	25.469	.....
July	6.072	.....	5.922	.....	23.850	.....
August	5.701	.....	5.551	.....	21.969	.....
September	5.236	.....	5.086	.....	21.050	.....
October	5.430	.....	5.280	.....	21.781	.....
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.