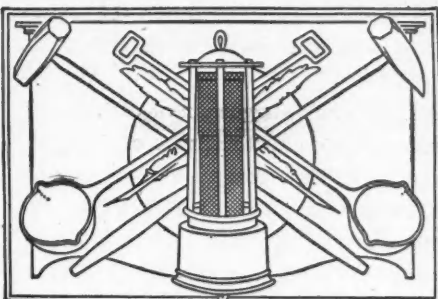


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The Prevention of Mine Accidents

Elsewhere in this issue we publish an abstract of a report recently made by a committee appointed by the American Mining Congress for the consideration of uniform legislation for the purpose of the prevention of mine accidents. The report of the committee is accompanied by two appendices, one showing statistically the disgracefully high percentage of loss of life experienced in metal mining in this country, which industry is at least as fatal as coal mining, and probably is more fatal; the other comprising a draft for a law, which was, of course, the chief work of the committee.

In the preparation of this draft, the committee recognized fully the difficulty, and, perhaps, the impossibility, of outlining a law for uniform adoption by the mining States, which would be of equitable operation in all. The conditions of mining in this great country are so diverse that measures entirely reasonable in one district might be far too harsh and vexatious in another. Moreover, there are many districts in which practices of mining, admittedly dangerous, have become so deeply ingrown, that any enactment suddenly rendering them illegal cannot lightly be made.

The difficulties of drafting a uniform law are increased by some of our constitutional limitations. For this reason many of the provisions incorporated in the laws of foreign countries cannot be introduced here. A legislature cannot delegate its right to legislate and the authority of the mine inspector must be carefully prescribed by the law. It is con-

sequently difficult to guard by legislation against certain dangers. For example, there is the danger of opening a large stope too near the surface, or some other working, running the risk of a breakthrough (an accident that recently happened); or in open-cast mining of working men alongside of a bank too high and too steep, exposing them to the danger of a slide. The entire system of mining by the caving system is subject to risks that cannot be formulated on paper, and, indeed, about the same may be said with respect to timbering in all kinds of mining. We are not yet ready to clothe our mine inspectors with authority to order summarily the suspension of operations that in their opinion may be dangerous, which probably could be done under the police power, and consequently the committee found it necessary to provide for a milder and slower procedure in such contingencies. A consideration of these principles will probably account for what at first sight may appear to be omissions on the part of the committee.

However, the ideas of the committee with respect to legislation are certainly far more advanced than anything existing upon our statute books insofar as metalliferous mining is concerned. The committee proposes no mere code of regulations, offered as suggestions, which may be obeyed or disobeyed largely at the option of the operator and miner, but recommends an actual law, which it thinks will be effective, specifically fixing responsibility and providing for penalties for non-compliance. The enforcement of any law naturally depends upon the means therefor provided, and the

committee is consequently of the opinion that the essential factor toward progress is the provision of an adequate system of mine inspection. We may safely say that at the present time this is not possessed by any metal-mining State in this country. If the report of the committee results in the broadening of the views of legislators in this respect, much will be gained.

The Question of Operating Costs

That there is a feeling among mine operators that cost records should be so kept and reported as to permit of a comparison of the work performed is evident from the recent contributions to the discussion of "Standards of Work." The two main purposes of keeping a record of the cost of operation at mining properties are: (1) The primary object of determining whether the operation is profitable; and (2) whether the operation is being conducted as skilfully and economically as possible under the given conditions. From a glance at company reports, it is evident that the directors are mainly concerned with final results and perhaps comparisons with previous years. This policy occasionally bears fruit in the retention of obsolete methods which a visitor with a fresh viewpoint readily perceives on entering some old mining district. These obsolete and expensive methods are likely to continue as long as the cost records do not offer means of determining whether the operation is being conducted with the highest technical skill. This is a point in which the directors of a mining company are as vitally interested as in merely showing a profitable operating expense and is, indeed, in the line of true conservation.

The letter of David H. Browne on page 589 of this issue calls attention to a point that has been in the minds of metallurgists for many years, i.e., the need of a better basis for smelting costs. The method current at many plants of basing costs upon the pound of metal produced is perhaps a satisfactory and necessary one from the financial viewpoint, but it is entirely inadequate from the standpoint of the operator, as it gives no idea of the character of the metallurgical work, as compared with other plants. One property which may be producing copper at 10c. per lb. is likely to have as efficient

or even more skilful metallurgical work than another that produces copper at a cost of eight cents. Unusually low per-pound costs have been achieved at certain plants, after crediting operating costs with the value of the gold and silver contents of the ore, but the latter have practically no effect upon the operating expenses.

Mr. Browne's suggestion of basing converter costs on the removal of iron affords a suitable comparison of operating costs at a given plant but like the method in common use, i.e., basing converting costs on the pound of copper converted, is open to the objection that it does not afford a true comparison when plants are operating upon different grades of mattes, the high-grade mattes requiring a greater proportionate expense for blowing from white metal to copper. The opportunity of comparing converter costs is entirely lost, however, if an attempt is made to base them upon the tonnage of ore handled in the smelting plant and we trust that some of the readers of the JOURNAL will offer additional suggestions in this connection.

In the matter of smelting costs, there is at present little coördination in the reports of various companies. In most of the company reports received at this office, the smelting costs are reported in terms of cost per ton of ore smelted. A number of companies report the cost per ton of charge smelted and while this affords a better comparison it does not give much idea of the character of the metallurgical work unless other conditions are stated or known. If the fluxing conditions require a difficultly fusible slag to be run, it is evident that the cost per ton of charge smelted is not comparable with that of another plant where fluxes may be cheaply procured to make a rapid-driving slag. Where silica is the principal gangue mineral of the ore to be smelted, the smelting cost may be suitably based upon the ton of silica fluxed. This situation probably prevails at the majority of plants and might afford a suitable basis, but there are many pyritic smelting plants and some reverberatory plants where there is an excess of iron to be removed and the silica is the expensive flux to be supplied to the smelting operations and in this case the basis of cost might be reversed.

For exhaustive consideration, the number of labor hours, the heat units con-

tained in extraneous fuel, the horsepower-hours used, the proportion of fine and coarse material and many other factors would require to be stated. These factors are so numerous that to state all would make the reports of most companies too involved to be intelligently considered by the directors thereof. Some of the factors, however, are absolutely necessary to an intelligent consideration of the character of the metallurgical work performed. It would be interesting to learn the consensus of opinion among metallurgists as to the most practical form in which to express operating costs and we invite our readers to a discussion of this phase of metallurgical work in connection with the discussion already in progress upon standards of mine work.

At the Turning Point

The somewhat oracular statement of Judge Gary as to the purposes of the Steel Corporation in the present situation of the iron and steel markets, given on another page, seems to point to at least a partial renewal of the policy of two years ago. The price-maintenance plan then adhered to persistently for several months proved a failure and its abandonment was followed by an almost immediate improvement in business. The change was so striking that it seemed as if it would prove a lesson that would be heeded in the future. Apparently, however, there is still a tendency to believe in the possibility of regulating markets by some sort of "coöperative action."

Of course, it is possible to keep up prices to a certain extent by such coöperation, if the steel-making interests consent. The other side of the question is that people cannot be forced to buy without the inducement of lower prices. The investment of money in new construction can undoubtedly be checked by high quotations, just as it can be stimulated by the possibility of getting cheap material. It is commonly believed that the iron markets now are in a position to turn either way; and there may be a choice between artificially maintained high prices and idle mills on the one hand, and the open market and active business on the other. There is little doubt as to which would be the judicious course.

CORRESPONDENCE and DISCUSSION

Views, Suggestions
and Experiences of Readers

Comparison of Smelting Costs

What constitutes good smelting practice? It is a well known fact that cheap production of metal is no criterion of excellence. A smeltery producing copper for seven cents per pound may be poorly managed in comparison with another whose costs are 10c. The richness of the ore, the quantity of flux and coke required, the price of labor, the cost of freight—all these must be considered in criticizing a cost sheet. A dollar is no fixed standard. We must get behind the dollar to some uniform basis of comparison.

Take, for example, costs of converter work. We cannot base these costs on a ton of ore smelted, because ore as such is not the material treated in the converter. At one mine it may take 50 tons and at another, 15 tons of ore to make a ton of copper. We cannot use a ton of copper produced as a standard of comparison, because one may be treating a 25 per cent. matte, while another is blowing 40 per cent. matte.

REMOVAL OF IRON AS BASIS OF CONVERTING COSTS

Evidently we must get back to the function of the converter, which is the removal of iron, and incidentally of sulphur. Basing the costs on a ton of iron blown out, gives a much better comparison than any method at present in use. Entering into these costs are labor, power, silica, repairs, etc. We cannot compare the cost of labor in Montana with that in Mexico, but we can compare the number of labor hours used to effect a certain amount of progress. We cannot compare cost of compressed air, because in one case the air may be compressed by the use of expensive fuel, and in another case by cheap water power, but we can compare the horsepower-hours used in either case. So also we cannot compare the cost of repairs as such, but if we consider these repairs as a percentage of the original cost of installation, then the smelter who keeps the installation in order for 5 per cent. of its original cost is doing better work than one using 10 per cent., even if the actual money expended be greater in the first case.

BASES FOR SMELTING COSTS

In cupola smelting also we can make a better comparison by considering what the purpose of the cupola is. The cupola exists solely in order to remove certain

refuse from the ore. It is simply a slag machine. We can run this slag machine with fuel already present in the ore as sulphur and iron, or we can supply foreign fuel in the form of coke. In any case a certain number of kilo-calories, or other heat units, are expended. So also a certain number of labor hours, and a percentage of repairs and supplies enter into the cost of cupola work.

It seems as if mutual agreement could be made among metallurgists to compare results on standard units of measurement. In this way many fallacies would be removed, and a sounder criticism would obtain. We could also secure publication of data now kept secret because of reluctance to disclose the costs of work. Let us get rid of the idea that cost is any criterion of excellence. I grant that smelting plants are built to make money, but money alone is no standard of value, or of skill in metallurgical practice.

DAVID H. BROWNE.

Copper Cliff, Ont., Sept. 15, 1910.

Standards of Work

On seeing Mr. Dolbear's letter in the JOURNAL of Sept. 3, 1910, under the above title, I hoped to find some figures following the suggestion previously made by Mr. Oke. Instead, he throws cold water on the idea. What his purpose may be is hard to see, but it appears to me that he has missed the point. All Mr. Dolbear says is true enough, but when I ask one of my men how many cars he can shovel and tram in a day, if his name begins with D he informs me that that depends on how many times his car jumps the track, whether he has an old or a new shovel, whether he ate ham and eggs or griddle cakes for breakfast, etc., all of which is true enough; but if his name begins with any other letter he replies that he can shovel and tram somewhere between 16 and 24 cars per shift, and I am satisfied with his answer.

WHAT CONSTITUTES A SHIFT'S WORK?

In various mining camps there are various standards of work adhered to by the men. In one camp where square setting is used, it is considered two shifts' work for a pair of men to break down enough ground for a square set and to put the same in. Sometimes they do not succeed in getting this done, but if all goes well and they finish this before the usual time, they do not undertake

to do more. A pair of trammers tramping waste for filling from a chute always report 40 cars as the shift's work. In another camp a hand driller considers four holes a shift's work. If the rock is medium or soft he puts these in 2½ or 3 ft. deep. If the rock is quite hard the holes are shorter; if quite soft he gets these earlier but practically never puts in a fifth hole. The mucker considers it a shift's work to shovel the round broken by the previous shift whether it be much or little. The machine men consider it their duty to put in a 3-ft. round, and regulate the work they do by the conditions. In another mine where stoping is done by 2½-in. piston machines (Golden Cycle), each machine man is expected to put in five 5-ft. holes per shift. Thus for all classes of miners there is a standard of work set in each camp.

If some of the subscribers to the JOURNAL would be generous with data, even though it may seem commonplace to themselves, instead of writing general discussions on the subject, I think some other mine-superintendent and manager subscribers would feel indebted to them.

MINE SUPERINTENDENT.

Silverton, Colo., Sept. 17, 1910.

Coal Dust and Calcium Chloride

In the JOURNAL of July 16, page 130, Floyd Parsons refers to the use of calcium chloride for laying dust in coal mines. In this connection, I may say that calcium chloride has already been tried for a similar purpose, and failed. In 1875 Doctor Dammer, of Berlin, recommended it for freeing roads from dust, but the roads treated with it remained as dusty as ever. The reason it is expected to lay dust is that it is hygroscopic, but because it is hygroscopic it readily becomes a solution, and when in solution it is easily decomposed. Ferrous sulphate soon decomposes it, so do dilute sulphuric acid, magnesium sulphate, copper sulphate, sodium carbonate, potassium oxalate, sodium phosphate, ferric aluminate, and many others. Mr. Belger, of Newcastle-on-Tyne, in the course of his researches on the ankylostoma, found that a 25 per cent. solution of CaCl₂, poured on a sample of crushed rock from the bottoms of three different mines at 25 deg. C., lost 85 per cent. of its CaCl₂ in 48 hours.

Even while it remains undecomposed

and hygroscopic, it may do more harm than good. For when only a little moisture is present, the CaCl_2 may absorb it all and leave none to lay the dust. Indeed, it is to produce dryness that laboratory chemists put it inside the cases of their balances.

Mr. Parsons also says that calcium chloride harms iron and steel only a third as much as plain water does. This is doubtful. Water gives iron a coating of oxide which serves as a partial protection against further oxidation. Calcium chloride forms iron chloride, which does not accumulate in this visible way, but weakens the iron quite as much. The effect of the chlorides is illustrated by the fact that iron disappears as fast on a sea-beach as on a riverside.

It is also doubtful if calcium chloride would be harmless to miners. It has a drying and irritating effect on the skin, especially the perspiring skin, and it would hurt the blisters which mine ponies often have above the heel. It might, however, be useful underground for another purpose, that of making wood less inflammable.

CALDWELL HARPER.

Nenthead, Cumberland, Eng., Sept. 14, 1910.

QUESTIONS AND ANSWERS

INSOLUBLE ANODES

Do you know of any form of insoluble anode used successfully in extracting copper from solutions by electrolysis? Do you know of any recent anode that has proved successful, say, in sulphuric or hydrochloric acid solutions?

H. C. C.

Lead anodes are successfully used in electrolytic copper work for removing excess copper from the electrolyte. Sulphuric and hydrochloric acids have but little effect upon lead. In the manufacture of nascent chlorine and caustic potash, insoluble anodes and cathodes are used. Information relative to the latter might be secured from the Niagara Alkaline Company, Niagara Falls, New York.

CONCENTRATING MOLYBDENITE ORE

In reference to the discussion of the concentration of molybdenite ores, in the JOURNAL of Aug. 6, 1910, page 248, additional information has been sent in by the Ore Concentration Company (1905), Ltd., of London, Eng. This company as yet has no plant at work on molybdenite ore, but states that a number of tests giving excellent results have been made at its works. Treating a feldspar containing 3.40 per cent. molybdenum, an extraction of 93.2 per cent. was made, the tailings assaying 0.25 and concentrates 40.80 per cent. In another experiment on ore, the gangue of which contained magnetite and much garnet, an extraction of 98.1 per cent. was made. In this case

the ore treated contained 2.30 per cent. molybdenite, and the tailings 0.06, and concentrates 51.57 per cent. molybdenum.

TRIPOLI

I should like some information on the formation, market value, mining, preparation, cost of production and various uses of tripoli, a "silicious ooze" derived from the skeletons of animals that existed during the Tertiary period. C. B. F.

Tripoli, correctly termed, is a substance consisting of decomposed impure limestone, extensively used as a polishing material. The name is also frequently given to any kind of silicious material and especially to infusorial silica. The best grades are quoted at $1\frac{3}{8}$ c. per lb. in barrels and retails at $1\frac{1}{2}$ c. per lb. In regard to marketing and preparation a specialist should be consulted.

Annual Report of the Homestake Mining Company

In the annual report of the Homestake Mining Company for the year ended June 1, 1910, T. J. Grier, superintendent, gives brief information on the operations of the company, and the secretary, Fred Clark, gives a financial statement showing the receipts and disbursements.

MINING OPERATIONS TEMPORARILY STOPPED ON ACCOUNT OF STRIKE

Mr. Grier states that everything connected with the operations and development of the property ran smoothly until Nov. 24, 1909, when there was a cessation of all work, excepting that on the hydroelectric power plant on Spearfish creek, due to the refusal of union men to work with nonunion men. On Jan. 9, 1910, operations were resumed at limited capacity with nonunion labor and on March 3, full capacity was reached and continued with operatives of that persuasion.

ORE TO RUN MILLS FOR 20 YEARS DEVELOPED

During the year there were excavated 157 ft. of raises, 14,239 ft. of drifts and 35 ft. of shaft. In the mine 1,824,623 tons of ore were broken. It is also stated that enough ore was blocked out, but left unbroken, to supply the 1000 stamps for 20 years, but no figures are given to support this statement. No information is given in the report as to extractions obtained in the milling operations. The average value realized from the ore milled is stated as \$3.6357 per ton.

Eighty-two per cent. of the 24,000 ft. of water-conduit tunnel on Spearfish creek for the hydroelectric power plant has been excavated and the intake dam is well under way. Lining the tunnel bottom, sides and roof with concrete where needed will soon start and bids for pow-

er-house equipment, etc., have been invited.

DIVIDENDS FOR YEAR IN EXCESS OF PROFITS REALIZED

The secretary's figures show that a balance of \$677,389 was carried over from the previous year. Ore milled netted \$4,498,751, and the receipts for the year were augmented by \$78,856 from the foundry, \$19,395 from wood sales, and various other minor sums bringing the total receipts up to \$5,298,623. Dividends aggregating \$982,800 were paid the share holders (nine payments of 50c. per share each), \$282,044 spent on the Spearfish installation and \$3,552,030 for operating costs. The balance at the end of the year after deducting all disbursements was \$481,748, the actual profits for the year therefore figuring \$787,160 or \$195,640 less than was distributed.

OPERATIONS NETTED 86c. PER TON OF ORE MILLED

Figuring the segregated costs per ton of ore milled from the total costs shown in the report, not including that for the Spearfish hydroelectric plant and the amount paid in dividends, the following figures are obtained: Expense at hoisting plants and shafts, \$0.265; mining, \$1.473; cyaniding, \$0.148; regrinding, \$0.015; milling, \$0.219; slimes treatment, \$0.126; total, \$2.246. To this, however, must be added \$0.626, which item represents the cost charge per ton for other expenses. (In this connection should be noted the rather extraordinary item of \$240,263 for general expense.) This brings the total cost per ton of ore milled to \$2.872 and means that a profit of about 76c. per ton of ore milled was realized directly from the ore and 10c. additional from other sources of revenue.

A segregation of the total mining cost of \$1.473 per ton shows that labor constituted 77.3 per cent. of the expense; powder, 8.9; machinery, 6.3; timber and lumber, 3.9; sundries, 2.3, and candles 0.6 per cent. The cost of coal, coke, oil, paid for damages, etc., constituted the remainder of the mining cost.

Decline in Waihi Shares

LONDON CORRESPONDENCE

The most notable occurrence in the mining market lately in London has been the fall from favor of the Waihi mine, the reason being that, following upon the statement in the last annual report that the value of the ore reserves was somewhat lower than that of the ore crushed last year, a further official statement has been issued within the last few days, intimating that the grade of the ore now to be crushed will be gradually brought down, until at some time before

the end of the year, the value of the output per four weeks will be £68,000 in the place of £74,000, at which it has lately been maintained.

This drop does not appear in itself to be of great extent, but it must be remembered that it will for all practical purposes amount to a deduction of about £50,000 per year from the profits, because with the amount of ore to be crushed remaining the same, the expenses will continue as before. In addition also, the public sees in these statements confirmation that lower grade ore is being met with in depth and that the possibilities of the future become correspondingly contracted.

PERCENTAGE OF SECURITY IN ORE RESERVES INCREASED TO 50 PER CENT

In the JOURNAL of July 23, 1910, comment was made upon the comparatively low proportion of security which the profit in sight gave to the market value of these shares as they stood then, this proportion being only 35 per cent. It has now to be remarked that the fall in the market value has been such that the profit in sight and other securities represent now about 50 per cent., a position which is certainly more justifiable, but though purchase at present prices would yield interest at about 12 per cent., it cannot yet be said that there is much attraction toward such purchase.

Since the commencement of working, in the year 1890, the value of the annual output has regularly increased to that of £970,034 for last year, and the departure from this regularity which will in all probability occur this year, will therefore be the first. Under the circumstances it is natural to ask whether this step marks the passage of the zenith in this mine's life, or whether it marks merely a halt while the proper base for a further advance is secured.

REVIEW OF THE VARIOUS ZONES OF THE MINE

The sequence of values met with in descending enters largely into this question, and a consideration of the variations which have occurred becomes of the first importance. It was found that when the sulphide zone was reached, the ore was better both in gold and silver than it was nearer the surface; and now below this richer zone the contents are diminishing again. It would appear likely that this sequence represents (1) the poorer immediate outcrop; (2) the zone of secondary enrichment; and (3) the zone of primary ore. It is upon the latter and upon the extent of the orebodies in that zone that the future life of the mine depends. It may be hazarded that the next developments in more completely leaving the zone of secondary enrichment, may even strengthen the present depression but there is always hope that in greater depth better ore may again be

obtained, though the possibility of returning to the favored position of the past may be said to be excluded, that is, in so far as the present known orebodies are concerned.

California Oil Situation

LOS ANGELES CORRESPONDENCE

The situation in the California oil industry is becoming intensely interesting. While the matter of the laws governing the disposition of government oil lands is being discussed earnestly at meetings of various bodies of oil men, the price of oil has again become a subject of grave importance. Until quite recently the price of oil has been 50c. per bbl., but reports now come of large contracts at prices as low as 30c. per bbl. These reports cannot all be verified but it is known that the Standard and Associated companies are buying oil in the field for 30c. and that they have cut the price of daily runs in the northern fields. It is known also that these concerns are in need of oil; on the other hand the Independent and Union agencies have a large surplus and are fighting to keep the price up.

LARGE STORAGE UNDERTAKING BY INDEPENDENT AGENCY

It is stated in a letter of the executive committee of the Independent Oil Producers' Agency that arrangements are at once to be made for the construction of reinforced-concrete storage for 15,000,000 bbl. This is the largest storage undertaking in the history of the California oil industry. Although the Standard's reservoirs in the Kern River fields have a capacity in excess of 15,000,000 bbl., these are made of puddled earth and are subject to constant loss through seepage. Another point of interest in this letter is the indication that the demand for storage room will increase despite the active campaign for the sale of oil. Whether or not this selling campaign will result in a further cut in the price of oil is a matter of speculation.

General conditions point toward a curtailment of development and slightly lower prices for some months to come, although it is not probable that prices will decline to the point where it will be impossible for operators to make a small profit. It is probable that a period of lower prices will help the industry by extending the market, and increased sales will have the effect of balancing the amount of cash handled in the industry.

LEGISLATION MOVEMENTS

Two organizations have been effected for the purpose of securing legislation that will relieve the present unsettled condition of affairs. The Bakersfield organization, known as the California Oil Men, is working harmoniously to accomplish

this end. A committee of 32, representing the 10 oilfields of the State, has been appointed and will meet in a few days to determine upon the best course to pursue. The majority of members of this organization are opposed to "conservation."

The meetings of the Western Oil Producers' Association, organized some time ago in Los Angeles, has had several rather stormy meetings. At the last meeting, when the names of the directors elected through balloting by mail were announced, it developed that those comprising the board were in nearly every case anti-conservationists. Amid much excited discussion the secretary of the organization withdrew his name from the membership roll, declaring that he could not be of further use to a body holding views so radically different from those held by him. Only 30 out of a total membership of over 100 attended this meeting. Many operators are members of both of the above organizations, and an attempt will be made to bring them together in the interests of the common cause.

NEW GUSHER IN MIDWAY FIELD

In the meantime the producing capacity of the oilfields is daily growing, although the output shows little change owing to a curtailment by several of the larger companies. Well No. 79 of the American Oilfields Company (Midway field) is gushing with renewed force and is now flowing more than 25,000 bbl. per day. During the last few days this company has brought in another gusher in well No. 56. This well was completed about one month ago and is now flowing 15,000 bbl. per day. The next largest producer, No. 68, is flowing 6000 bbl. Well No. 1 of the Consolidated Midway, in the Midway field, is under complete control by two 10-in. gate valves, and is being held down to about one-half capacity. With open valves this well is capable of flowing 60,000 bbl. per day. Three other wells, all being drilled in gusher territory, are due to come within the next 30 days. This company has five new wells going down in the Kern River fields. The great Lakeview gusher of the Union Oil Company has gradually decreased its output to between 17,000 and 18,000 bbl. per day. Wells Nos. 14 and 17 have been brought in as water producers, each flowing 20,000 bbl. per day.

NEW DISTRICT SOUTH OF BAKERSFIELD

A new oil district has been opened a few miles south of Bakersfield, on property formerly owned by the Midway Union Oil Company. The new company will be called the San Emidio Oil Company and it is reported that it will be backed by the Pittsburg Oil Company. No plans have been made public but a great amount of supplies have been ordered. The necessary buildings are in course of construction and five drilling rigs are being erected.

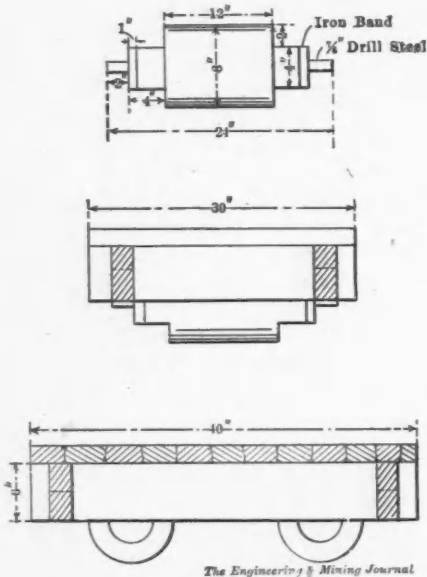
DETAILS of PRACTICAL MINING

Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

Prospectors Wooden Ore Car

By OSCAR G. GALLOHER*

The accompanying sketch shows a simple and easily constructed car which is used in some parts of the Cobalt district to carry the bucket from a prospect shaft to the dump. The only metal parts used are two pieces of $\frac{7}{8}$ -in. drill steel about 24 in. long, and four iron bands 4 in. in diameter and 1 in. wide. The remainder of the car is made of spruce. The body of the car is about 30 in. wide and 40 in. long. It consists of a frame of four 2x6-in. pieces fitted together by in-



PROSPECTORS' MODERN ORE CAR

terlocking joints with a floor of flattened poles laid on it.

An important feature of the car is the wheels. These are made of logs 8 in. in diameter and 20 in. long, cut as shown in the illustration. A hole is bored through the center of each log and a drill steel inserted to act as an axle. The iron bands are placed around the ends as shown.

The car runs on a track of squared poles. A section of this track is also laid on the trap door of the shaft, so that when the bucket is raised the car may be run in under it. The bucket is then lowered to the car, run out and dumped. This car is easily made and saves the miner some heavy packing over bad trails.

*Halleybury, Ont.

Vacuum Receiver for Solutions

By H. T. DURANT*

The vacuum receiver shown in the accompanying sketch may be constructed easily and quickly. The receiver is set between the tank (or whatever vessel holds the water which is to be drained off) and the vacuum air pump. The fittings and connections ordinarily are of iron, but lead or bronze may be used if the solution passing into the receiver is acid. In fact, in this case, the whole of the internal iron must be covered with lead.

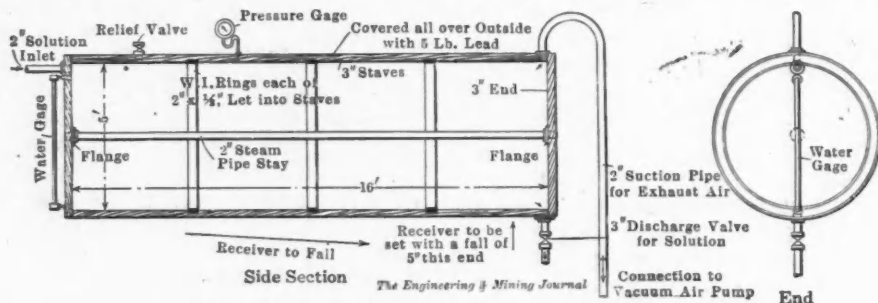
The receiver is an ordinary wooden cylinder closed at both ends. It is stiffened axially by a pipe stay with flange on each end, suitably fastened to the ends of the cylinder. The staves or sides of

One can prevent the lead collapsing internally under reduced internal pressure, if it be arranged that the vacuum air pump suck from both sides of the lead at the same time, so as to get the same pressure on each side of the lead lining. This is effected by a small branch from the suction of the vacuum pump connecting with the space between the iron shell and the lead lining.

A New Method for Unloading Railway Rails

By E. A. WALLACE

One of the best methods for rail unloading is to use an ordinary push car fitted with a rail bent to an inverted-V shape. This rail is fastened to the push car at an angle of 45 deg. with the hori-



VACUUM RECEIVER FOR SOLUTIONS

the receiver are kept in position by wrought-iron rings, recessed about one-quarter of an inch in the staves.

FRAME OF WOOD, LEAD LINED, ENABLES RECEIVER TO BE CHEAPLY BUILT

The outside is covered by a shell of five-pound lead, with all joints to the connections entering the receiver lead burnt, so that they are absolutely airtight. For this reason, as long as the timber is good, the actual workmanship on the joints in the staves and ends can be rough. This receiver is superior to the usual iron- or steel-plate cylinder, as its cost is less, it withstands acids which do not affect lead, and can easily be built upon the spot.

In certain cases it is essential to have an iron receiver lined inside with lead. It is not necessary, however, that the lead lining should be in close contact with the iron receiver, but it should be concentric with and conform to the shape of the iron cylinder, although supported a short distance from the iron.

*Mining and Metallurgical Club, St. Ermins, Westminster, S. W., London.

zontal, and the push car is attached to the rail car with the point of the V-rail forward.

As the rail train moves slowly ahead, the hook end of a rope is caught into the bolt hole in a rail on the car and the clamp at the other end of the rope is dropped over the head of the track rail, causing a rail to be dragged from the car and deflected to the outside of the track by the V-rail on the push car. In practice, as described in *Engineering-Contracting*, Aug. 10, 1910, two rails are unloaded at once, one on each side, and with four ropes the operation is continuous, one pair of ropes being detached and carried forward as the other pair is pulling two rails from the car.

By this method eleven men are required to unload the rails without stopping the car: one man on the car with a lining bar to free the rails; one man on the ground to straighten out any rails lying in a dangerous position; eight men, two to each rope, do the unloading, and one man on the push car fastens the hook into the bolt holes.

An objection to this method lies in the

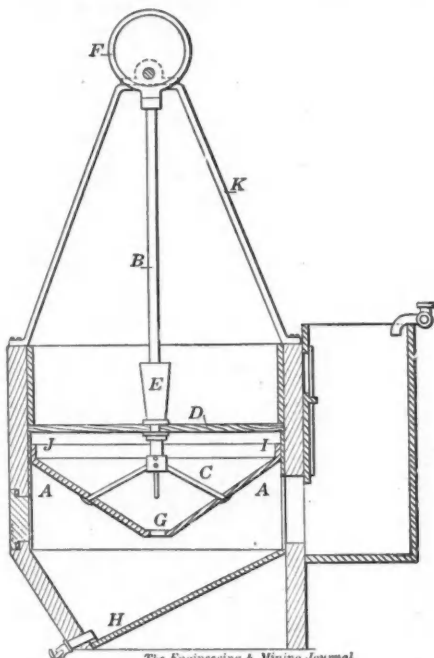
fact that when one car has been unloaded it must be either side-tracked or the push car must be carried around in front of it.

From several records of unloading rails it appears that it costs three times as much to unload rails from a gondola car as it does from a flat car. The cost varies from 1c. per rail under extra favorable conditions to 8.7 cents.

The Doubledee Plunger

By LUCIUS L. WITTICH*

It is reported that the Doubledee hopper-shaped plunger, adapted to any make of jig for treating zinc ores, has proved a success at the mill of the Little Anna Mining Company, on land belonging to the city of Joplin, Mo. So radically



DOUBLEDEE JIG PLUNGER

different is the Doubledee attachment from the ordinary plunger that its work is being watched with keen interest throughout the Joplin zinc and lead district. The device has only recently been patented by M. Doubledee.

The accompanying sketch shows a sectional view of the Doubledee jig tank. In all other jigs in use locally, the plungers are in tanks at one side of the cells and it is the downward stroke that forces the water in the cells upward through the sieve. This plunger A brings the water up with its upward motion. It is claimed that this keeps the ore constantly in motion and that the separation is made more thorough.

The plunger is made of 1/4-in. boiler plate and is attached to the plunger rod B by spider braces C, made of 1 1/2-in. round iron. The plunger rod, 2 1/2 in. in

*Joplin, Mo.

diameter, passes up through a hole in the sieve D and is shielded by a cast-iron guide E, which is funnel shaped and sufficiently large to permit free action of the rod. This rod attaches to the eccentric F, which permits any regulation of the stroke. The eccentric shaft is braced by cast-iron rods K. For heavy loads on the roughing sieves the length of the stroke varies from 1/4 to 1 1/2 in.; for light loads on the cleaning sieves the stroke varies from 1-16 to 1/2 in.; while for extremely heavy loads it goes to 3/4 in. The speed of the stroke also varies. The length of the stroke is much shorter than required on the average jig with ordinary plungers.

In the bottom of the hopper-shaped plunger is an opening G, two inches in diameter, through which the concentrates and fines pass into the hutch H. It is claimed for the invention that a bed on the sieve need be only 1 1/4 in. thick to insure pure concentrates. As material passing over the cells has a tendency to lump at the upper ends I, the greater force has been given to this end by plac-

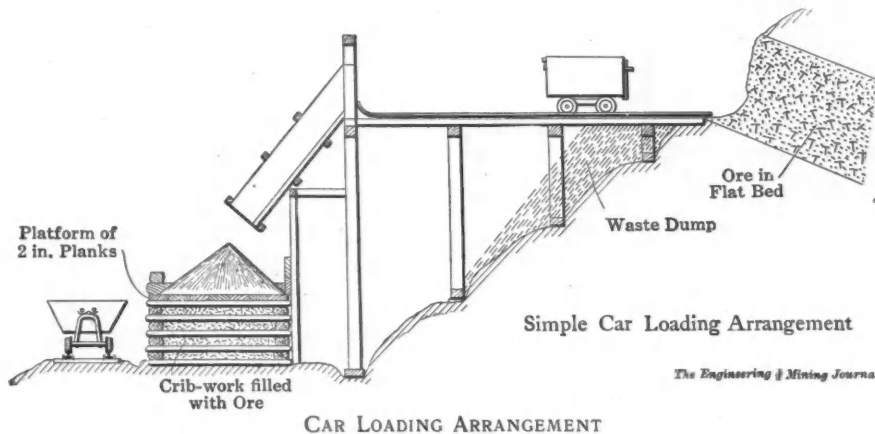
mules will not leave the tub until the shower is turned on, and it seems that this feature is the most enjoyable. The bath is expected to prolong the vigor and vitality of the mules. The driver boys are the only workers in the mine who are not absolutely in sympathy with the innovation, the bath keeping them in the mine 10 to 15 min. longer than they formerly had to stay.

Simple Carloading Arrangement

By A. LIVINGSTONE OKE*

Some years ago, when I was engineer to a mine in Canada, a discovery of good ore was made on the property. At that time the ore coming from the other mines required a little grading, so the arrangement shown in the diagram was put in and within 48 hours of the time of the discovery we were shipping to the mill.

The orebody is an altered sedimentary, dipping flatly into a hill as shown, but the



The Engineering & Mining Journal

ing the plunger as close as possible to the wall of the cell, while at the lower end J a space from 1/2 to 3/8 in. is allowed.

Concrete Bath Tub for Mine Mules

A concrete bath tub about 40 ft. long and a few inches more than 4 ft. deep has been installed in the Henry colliery of the Lehigh Valley Coal Company at Plains, Penn., for the accommodation of the mine mules. This mine improvement is built at the entrance of the mule barn. The mules are always tired when they conclude the day's work, and it is interesting to note how their fatigue disappears when they strike the bath. The beasts all rush in, crowding each other for the deepest place in the tub. One of the older mules takes such delight in his bath that no amount of coaxing will get him to leave the tub until he has had at least 10 minutes of the fun. Other

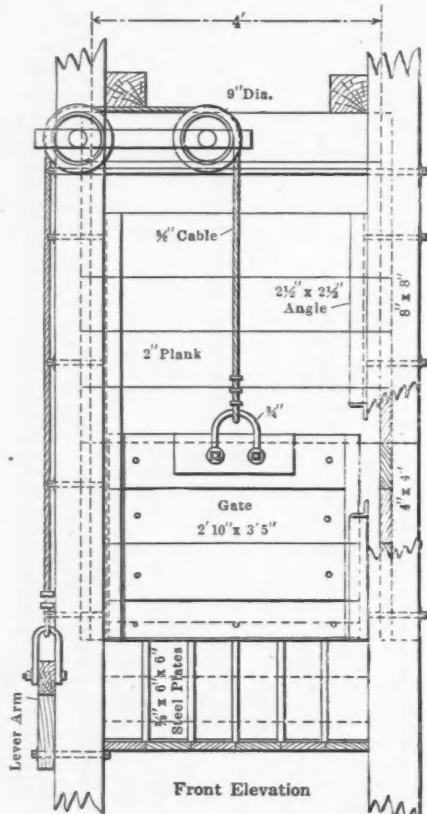
slope of the latter is much less than that indicated by the diagram. An electric tram line follows approximately the outcrop of this strata, at a contour a little below it. This coincidence was useful, as the several mines were tapped by short trestles and bins, or by sidings. The orebodies occur in pockets due to surface enrichment along the outcrop. The shoveling platform was intended as a temporary affair only, but the trestle was for subsequent use with a bin, when the ore developed would warrant its construction. It was found that a train of 10 cars, of two-ton capacity each, could be loaded by four men easily in an hour, at a cost of six to seven cents per ton. With the same cars shoveling from the floor level, the cost would be about 25c. per ton, when iron plates or boards were used to blast down on. The ore was mined in benches with lightly loaded lifters down to a depth where the removal of the overburden was not more costly than that of underground mining.

*Mining engineer, Rodeo, San Juan, Argentina.

Storage Bin Gates

The gate commonly used on the auxiliary underground lump-ore storage bins by the Cheever Iron Ore Company, near Mineville, N. Y., is inexpensive, easily installed and operated.

The body of the gate is made of 3-in. yellow-pine plank held together by an inside lining of $\frac{3}{8}$ -in. steel plate. Wearing pieces of $\frac{3}{8}$ -in. iron are bolted to the sides of the gate where they bear against the angle-iron guides bolted to the bin posts. A cable, attached to a U at the top of the gate, leads over two sheaves and down to a 2x6-in. lever arm of proper length. One man can easily open



GATE USED AT CHEEVER IRON ORE COMPANY

the gate and fill the tram car, and upon releasing the lever the gate closes by its own weight.

Centennial-Eureka Chute Pocket and Gate

Hard silicious ore will quickly cut out the bottom of almost any sort of chute gate or inclined ore pass. The ore at the Centennial-Eureka mine, at Eureka, Utah, is of such a character that it will quickly cut through even a double lagged, inclined, bottom of an ore chute, so a special type of chute in which a bed of rock forms the bottom has been devised.

An ore pocket is formed by building

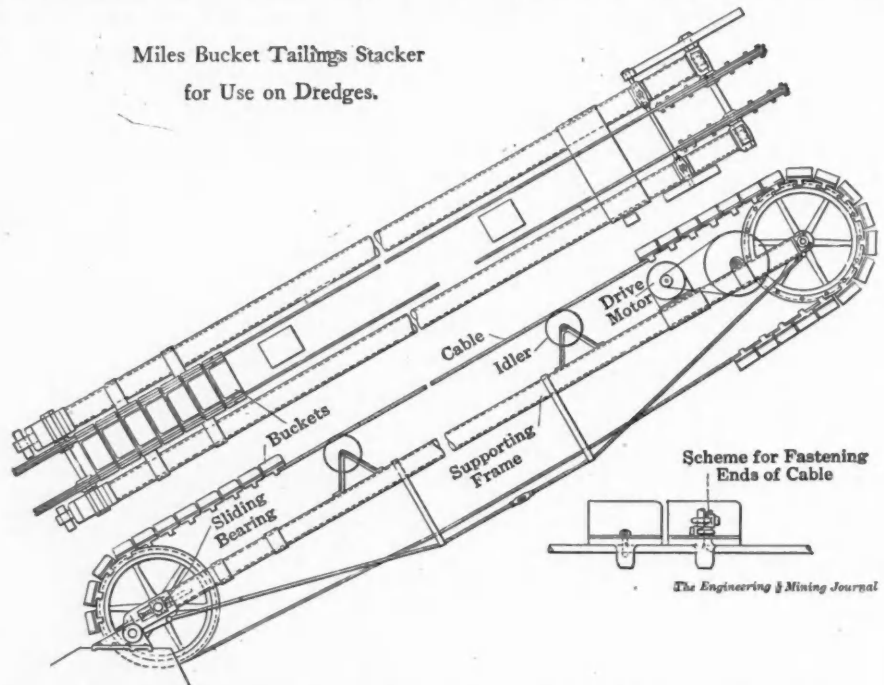
up from the level three sets of square set timbers into which ore from the stopes is delivered. Single 2-in. lagging is used to line the bottom set of the pocket or chute, and this set is filled with waste rock. On the side from which the ore is to be delivered to cars, the posts are notched, the cap being dropped seven inches and placed with the faces 45 deg. from the horizontal. A plank lip is then nailed to the cap; this extends only a short way into the pocket, but far enough into the drift to deliver ore over the edge of a car.

An ordinary gate of planks sliding between wooden guide grooves is used to control the discharge of ore from the pocket. The lip on some of the Centennial-Eureka chutes is 35 in. wide and auxiliary posts are placed under the cap at either side of the lip. The top two

The Miles Tailings Stacker for Use on Dredges

The tailings stacker, drawings of which are shown herewith, was designed by John H. Miles, superintendent of the Folsom division of the Natomas Consolidated of California. It is intended as a substitute for the rubber conveyer-belt type of tailings stacker, now used on almost all dredges in California and in many other fields. The special advantage over the conveyer type claimed for this stacker is for use in cold climates where the buckets will carry frozen material without allowing it to roll back as it does on a belt stacker. The trouble from head pulleys becoming coated with ice and slipping that is commonly experienced with conveyer belts when used in freezing

Miles Bucket Tailings Stacker for Use on Dredges.



sets of the pockets are lined with double 2-in. lagging.

In this construction the waste filling the bottom set of the chute or pocket forms a bed upon which the ore drops and over which it slides in its passage to the discharge gate. The wear from the movement of the ore is all taken up at this point and all trouble with the bottom of the chutes cutting through is eliminated as the waste forms the bottom. Owing to the large cross section of the pocket the movement of ore is slow (if the pocket is not entirely drawn at any time) so the lagging in the upper sets is not subjected to excessive wear, and in fact, seldom has to be renewed. Such a chute pocket is about as satisfactory and as near fool-proof as any to be found, and it has the additional advantage that it can be quickly built from the material used for ordinary mine timbering, and hence usually in stock. As stated, this ore pocket and gate is particularly useful for handling hard, silicious ores.

weather is also avoided, as in this case the stacker is provided with a positive drive.

BUCKETS FASTENED TO STRETCHED CABLES

The Miles stacker is composed of an endless chain of buckets fastened to steel ropes. Above is shown the general idea of the apparatus. The buckets are made of steel plate the size of each and the weight of material used in construction to be governed by the capacity of the dredge; travel to be at a rate of 150 ft. per minute. As shown on the next page each bucket is fastened by a cable clip to two cables, one on each side. These cables pass over the grooved wheel at each end of the conveyer and are driven by pins through these wheels which take hold of the lugs of chairs on which the buckets ride.

By using plow-steel cables that have been thoroughly stretched (cable from bucket ladder lines might be used), it is claimed that there will be little possi-

bility of a change of the pitch of the buckets when once they are set in place. Adjustment of the line is taken up at the lower end by sliding bearings, as shown in the general drawing, the drive being from the upper end by motor, in a manner similar to that used with the rubber conveyor belt on California dredges. The method of fastening the ends of the cable so that they pass smoothly over the drive wheels is also shown.

The main frame of the stacker is made from heavy pipes of a size depending

wear. The assembled sketches also show how these buckets work when passing over the wheel. The wheels are cored to receive the clips which hold the buckets on the cables.

EVIDENT ADVANTAGES AND OBJECTIONS

It is estimated that the first cost of this equipment will be about one-half that of the rubber belt-conveyer type and that the maintenance on it will be considerably less. The liability of ice crowding the rope from the grooves in the

alter the pitch of the buckets, hence, necessitating continual adjustment. This is supposedly avoided by the use of previously stretched cables.

So far as is known, this form of tailing stacker has not had any practical tryout. The possibilities for it, however, seem to be sufficient to warrant its installation, at least on an experimental scale. At present the economical disposal of tailings is one of the vital problems of dredge practice.

Altering the Capacity of a Blast Furnace

BY T. KAPP*

A successful experiment to reduce the capacity of an ordinary lead blast furnace was worked out at Zeehan, in Tasmania. The furnace was 120x42 in. at the level of the tuyeres and 20½ ft. in height from top of crucible to feed-floor level. On the long sides were 7 cast-iron jackets, each having a tuyere 2¾ in. in diameter. The slag tap was at its usual position in one of the short sides and the bullion siphon near the slag tap was the only one of the two siphons used, as the low-grade ore produced a small quantity of bullion.

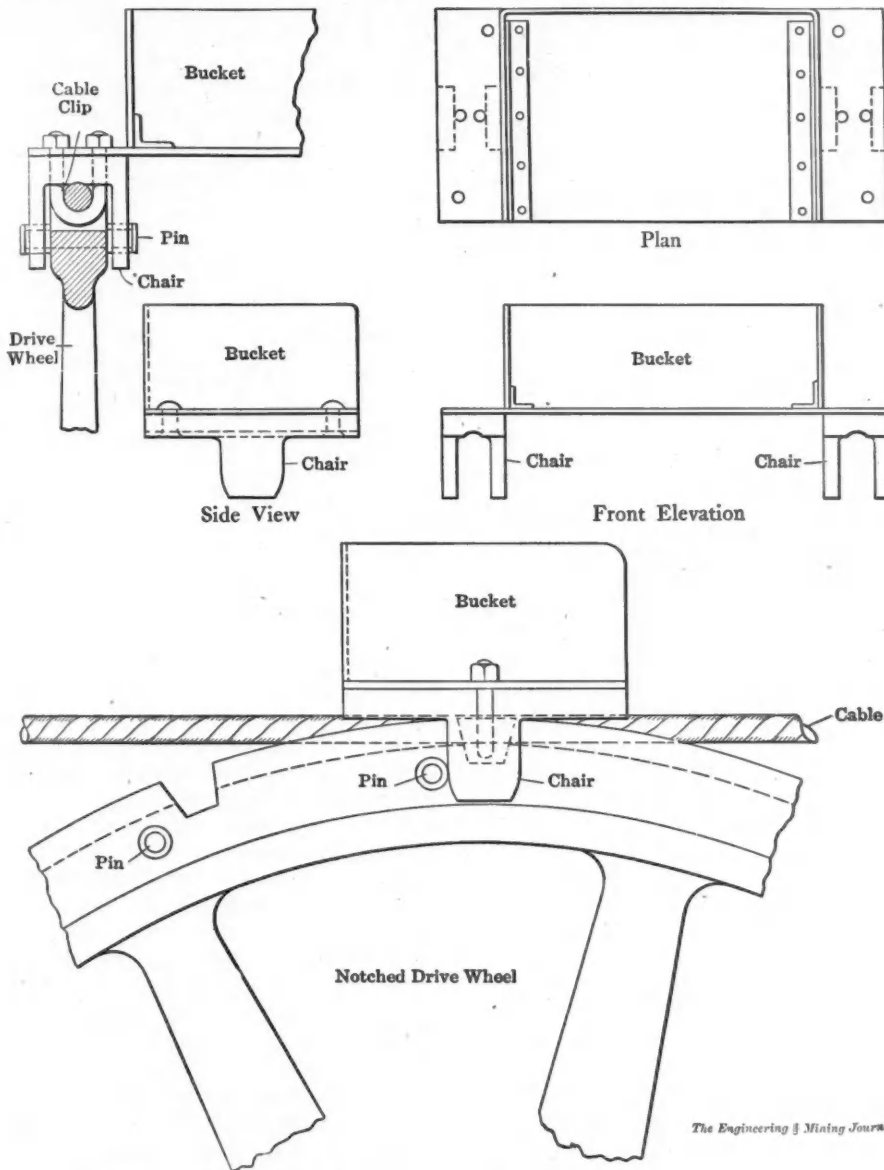
The furnace required 80 tons of ore per 24 hours at a blast pressure of about 25 in. of water. But for a long period the supply of ore was only 50 tons per day, so that it was necessary in order to avoid intermittent smelting and to maintain a regular run of the furnace, to decrease the size of the furnace. This was done by removing two of the jackets on each of the long sides.

To accomplish this a firebrick wall 13.5 in. thick was erected in the crucible parallel to the short sides of the furnace. The clear space of 20.5 in. between this wall and one short side of the furnace was packed solidly with a mixture of fine coke and clay. The short side jackets were then put up in the usual manner and connected to the remaining five side jackets. This shortened the inside length of the furnace by 34 in. The shaft was reduced in size in a similar manner.

This firebrick wall, as well as the coke and clay filling, was supported by rails, which in turn rested on the girders that carried the lining of the two long sides of the shaft. These girders were also supported by two columns standing on the top of the crucible outside of and behind the jackets, on the short side opposite the slag tap.

The modified furnace was in commission for about nine months, giving quite satisfactory results. When the supply of ore had increased to a point that permitted the furnace running to its full capacity, the false wall was torn out and the furnace restored to its original size.

*Consulting engineer, 9 Argyll mansions, Hammersmith road, Kensington, London.



DETAILS OF BUCKET AND DRIVE WHEEL OF MILES TAILINGS STACKER

upon the length and size of the stacker and the load which it must handle. The frame is braced laterally and trussed underneath. The above drawing shows the bucket, which is made of one piece of plate steel with the chairs riveted on each end. These chairs are made of steel castings shaped like gear teeth, to make a rolling contact when working on the pins which drive them. The drive pins in the wheel have manganese or hard-steel bushings on the outside to take the

wheel is small, but can be prevented by placing a stationary tool so as to scrape the ice clear as the wheel revolves. The wear is practically reduced to buckets, pins and lugs, which can be reversed so as to prolong their life. Power should be economized with such a stacker and by operating it on an incline as great as 45 deg., a saving could be made in the length of the apparatus. The objection to the stacker that naturally occurs to one is that stretching of the cables would

International Geological Congress at Stockholm

SPECIAL CORRESPONDENCE

The eleventh International Geological Congress which met in Stockholm during the week Aug. 18-25 was attended by about 800 geologists and mining men. The European delegation naturally was the largest, though there was a good representation from the more remote countries, including about 40 delegates from the United States. In membership it thus established a new record for these triennial meetings and it was correspondingly successful in every other way.

The program for the sessions was elaborate, with much to interest the specialist in the various departments of geology—economic as well as purely scientific—besides a leavening of subjects that had a general appeal. The excursions provided splendid opportunities for studying first hand the classic fields of Swedish geology and mining; and the courtesies and hospitality everywhere extended to the members were a delightful experience, of which the memory will afford a life-long pleasure.

As secretary of the congress, Prof. J. G. Anderson, director of the Geological Survey of Sweden, was largely concerned in its success. The office of honorary president was filled by the Crown Prince Gustave Adolph who presided at the opening session and welcomed the members in a charming address delivered in English. Professor G. De Geer, of the University of Stockholm, served as president of the congress and Prof. H. Bäckström of the same institution as treasurer.

The participants in the different excursions that preceded the meeting and those who came directly to Stockholm were brought together on the evening of Aug. 17 at an informal reception in the Grand Hotel Royal, where Prof. M. A. G. Högbom extended a welcome on behalf of the Geological Society of Stockholm.

INSTRUCTIVE PAPERS PRESENTED AT FIRST SESSION

The opening session in the hall of the Conservatory of Music was given an official character by the presence of the King, who pronounced the formal words pertinent to the occasion. After short addresses by the officers of the preceding congress, relinquishing their duties, and responses by their successors, Professor De Geer presented a paper on "A Geochronology of the Last 12,000 Years." This was perhaps the principal feature, scientifically, of the meeting. Its purport was to show that an accurate record of events since glacial time was to be found in the moraines and lake deposits of Sweden. Professor De Geer has found that the succession of terminal moraines

which can be traced as one goes from south to north in Scandinavia marks the stages of retreat of the ice sheet under the seasonal climatic changes; furthermore, the beds of sands, clays and muds laid down in the lakes present a similar record. The geologist, accordingly, may decipher the elapsed time with almost the certainty that one can find the age of a tree by counting the rings of growth. The study of the glacial deposits on which Professor De Geer based his conclusions has occupied much of his time for the last 15 years. Pres. C. R. Van Hise contributed the second formal paper of the session, a thoughtful and suggestive paper entitled, "The Influence of Applied Geology and the Mining Industry Upon the Economic Development of the World." At the close of the session the members of the congress were received by the King and Queen in the royal palace.

DIVISION OF SESSIONS INTO SECTIONS FACILITATED DISCUSSION

During the following days the sessions were divided into sections, made necessary by the large number of papers that were read. Room for the different sections was provided in the beautiful chambers of the Riksdag, in the ancient hall of Riddarhuset and in the university buildings. The division was made as follows: General and regional geology; petrography and mineralogy; stratigraphy and paleontology; Quarternary phenomena and present day glaciers; applied geology. It was the aim of the executive committee of the congress to limit the subjects of discussion during the sessions to a small range of topics of more or less general importance, a procedure that had much to do, no doubt, with the sustained interest that was manifest throughout the meetings.

The main subjects proposed for consideration were: Pre-cambrian geology; the iron-ore resources of the world and their distribution; the changes of climate following the last period of maximum glaciation; the geology of the polar regions; and the abrupt appearance of the Cambrian fauna. The publication of the proceedings of the congress must be awaited before the complete text of the various papers presented will be available and a proper estimate of their importance can be made.

DEFINITE SCHEME FOR CLASSIFYING PRE-CAMBRIAN NOT APPROVED

In Pre-cambrian geology there were contributions by F. D. Adams, Sederholm Termier, Barrois, Becke, Miller, Coleman,

Kemp, Van Hise and others who have worked in this difficult field of geology in various parts of the world. Interesting comparisons were made between the Precambrian sections presented in different countries, but there was a manifest reluctance toward the approval of any definite scheme of classification for general use.

VALUABLE REFERENCE WORK ON IRON ORE RESOURCES

In connection with the papers and discussions on iron ores it is necessary to call attention to the publication *Iron Ore Resources of the World* which was issued by the congress shortly before the meeting. The work in two volumes of text and one of plates is the combined result of the labors of a large number of geologists and mining engineers who are recognized authorities on the iron-ore resources of the countries on which they have reported. It affords not only a general survey of the distribution of the known supplies of ore, but much specific information regarding the geology, chemical and physical features, production, and other important matters which make it an invaluable book of reference.

POLICY OF SWEDISH GOVERNMENT IN CONSERVING IRON ORES

The opening paper at the session devoted to the consideration of iron ores was read by the Prime Minister M. A. Lindman. The paper emphasized the need for intelligent conservation of mineral resources and explained the policy of the Swedish government in regard to the iron mines of the country. The measures adopted include government participation in the affairs of the exporting mines by ownership of one-half the capital stock, the limitation of the amount of ore that can be shipped from the country for the term of 25 years, and provision for the purchase of the entire shares of the companies on certain conditions at the expiration of that period. Government encouragement has also been accorded to the experiments with the electric furnace for the production of iron which have been conducted at Trollhättan. These experiments have been so satisfactory that a commercial plant is now under construction and will soon be in operation.

The leading iron men of Sweden are sanguine that the larger part of the iron-ore production will, before many years be consumed at home instead of being shipped to Germany, England and the United States as at present.

WORLD'S IRON ORE SUPPLY SUMMARIZED

Prof. Hj. Sjögren presented a statistical summary of the world's ore supply, based on the information compiled for the treatise already mentioned. The statistics indicated a total actual reserve of 22,408 millions of tons, equivalent to 10,192 millions of tons of metallic iron. Of the total America was credited with 9855 millions of tons ore, equivalent to 5154 millions of tons iron. Europe had 12,032 millions of tons ore or 4733 millions of tons iron. Australia, Asia and Africa divided the small remainder. The iron ores of Spain were described in a paper by Ramon Adan de Yarza.

The discussion that followed was participated in by L. de Launay, Beyschlag, Kemp, and J. W. Richards. A proposal was presented for the appointment of an international committee to continue the investigations inaugurated by the Swedish geologists, with the purpose of revising the work so far as needed and also to supplement it with information as to technical conditions in the iron industry of the different countries.

PAPERS PRESENTED BEFORE APPLIED GEOLOGY SECTION

In the section of applied geology there were several interesting papers. A comprehensive description of the auriferous deposits of France, by M. Lyon, may be noticed in connection with the recent revival of the gold-mining industry in that country. Details of some of the promising gold districts of the Philippines were given by H. G. Ferguson. The deposits of radio-active minerals were described by P. Krusch, who also paid attention to the conditions surrounding the production of radium. There were papers by Hj. Sjögren, who dealt with the geological age of the Scandinavian ores, and by J. Keidel, who described recent progress in the geological investigations of Argentina.

The contributions to the other sections were of the high standard expected in an international meeting of scientists. The section devoted to the geology of the polar regions naturally attracted general interest and the audience was repaid by a finely illustrated lecture on the antarctic continent, contributed by David and Priestly, of the Shackleton expedition. The important subject of polar climate in past geologic ages as interpreted in the light of fossil floras was handled by A. G. Nathorst, and the relations between South America and the bordering part of the antarctic continent was discussed by O. Nordenskjöld.

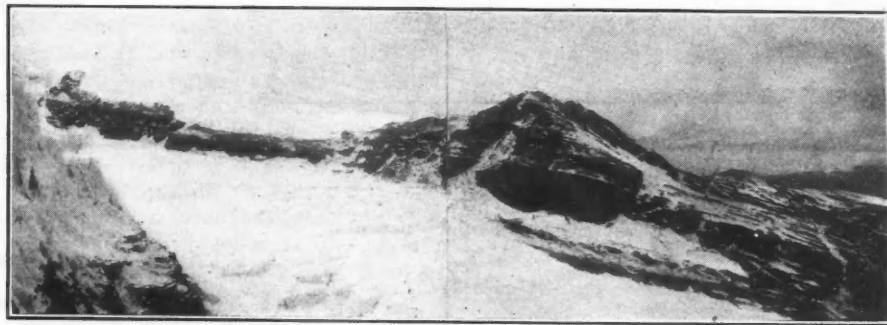
PRESSURE DEMONSTRATED AS IMPORTANT FACTOR IN DYNAMIC METAMORPHISM

In the section of mineralogy and petrography, F. D. Adams presented a notable paper on the influence of pressure on rocks. His experiments, which were

begun in a small way some years ago, have been continued on a larger scale by the aid of a grant from the Carnegie Institution. Not only soft rocks like limestone and dolomite were experimented with, but such hard materials as diabase were made to flow or undergo a rearrangement of their mineral constituents just as happens in the dynamo-metamorphism of rocks in nature. Examples of gneissoid structures were shown that had been produced by pressure at only moderate temperatures and without the assistance of water. From these experiments it would appear that pressure is the essential factor in metamorphism of regional or dynamic character.

AMERICAN AWARDED SPENDIAROFF PRIZE

The question of a standard geological map of the world was under consideration at the congress. Director George Otis Smith, of the U. S. Geological Survey, presented a proposal for a map to be executed on the scale of 1: 1,000,000, but there appeared to be some opposition to the adoption of that standard by other countries. The Spendiarioff prize, which



RINCONDA GLACIER, PERU—SAN FRANCISCO TUNNEL AND MINE BUILDINGS AT THE RIGHT

is awarded by a commission of the congress, was granted this year to John M. Clarke, State geologist of New York, for his work on the "Devonian of Eastern North America."

At the termination of the meetings in Stockholm, most of the members joined the excursions, of which several were offered, for the purpose of visiting the noted places of geological and mining interest in central and southern Sweden. With the other excursions that set out before the meeting and those during the sessions, these field parties afforded exceptional opportunities for acquiring a knowledge of the country and of meeting its enterprising and hospitable people.

A concrete lighthouse is being built at Cape Hichinbrook in Prince William sound, but in general the Federal Government is extremely dilatory in supplying aid to navigation in Alaska, and the number of lighthouses, buoys and beacons compares very unfavorably with those established by the Canadian Government between Vancouver and Prince Rupert.

Bedded Gold Quartz Veins near Poto, Peru

BY E. COPPÉE THURSTON*

It is the purpose of these notes to describe, as far as the limited data obtained will permit, an unusual occurrence of auriferous quartz in the Mount Ananea range of the eastern cordillera of the Andes, district of Poto, province of Sandia in the department of Puno, Peru.

The principal deposits of this type are found in San Francisco hill, an outlying butress of Mount Ananea, at about 16,500 ft. elevation, on the Pacific slope of the range. Mount Ananea is about 20,000 ft., and San Francisco hill about 17,500 ft. high. The axis of the cordillera strikes east and west at this point, the northern being the Atlantic slope.

ROCK FORMATIONS

Gold occurs in thin-bedded veins, lying between dark, nonfossiliferous slates, said to be of lower Silurian age.¹ A section of the range from north to south shows

granite on the northern slope, four or five miles from the summit, upon which rest much contorted beds of mica schist, knotty and spotted schists, and banded quartzite. On the southern slope in San Francisco hill, some spotted schist was seen but the formation is mainly dark-colored slate, of which two varieties were distinguished, a hard, silicious heavy-bedded variety and a fissile, less silicious, thin-bedded kind.

The sedimentaries are much contorted on the northern slope, but as the distance from the granite increases, the movement grows less until, on the southern slope, there is a persistent gentle dip, about 15 deg. toward the southwest. A few miles south of San Francisco hill, the slates give place to shales.

FISSURES FORMED BY PRESSURE

During the uplift, the pressure from the north produced more or less parallel fault fissures, which strike roughly, north-

*Mining engineer, 30 Church street, New York.

¹Boletín del Cuerpo de Ingenieros de Minas del Peru, No. 26, p. 16.

west and southeast and dip 45 to 60 deg. northeast. The different slates were differently affected at the fissure zones; the hard, thick beds were cracked and faulted and the fissile, thin beds were crushed and folded. Opportunity was thus given for the entrance of silicious solutions, which are now seen as massive white granular quartz in and near the fissures, sometimes in tabular form more or less persistent, sometimes of irregular form, but with slight mineralization.

Since the uplift, the erosion has been enormous, but the highest peaks are still ice capped and glaciers are numerous. The topography is precipitous, so the rocks are well exposed where not covered with snow and ice.

GOLD-BEARING BEDDED VEINS

The gold-bearing bedded veins, locally called *mantoa*, vary. The persistence of these veins is remarkable, particularly in view of their small thickness. They are found in the schists on the northern slope of the range and on the

it: visible, pyrite, some stibnite, and occasionally galena and sphalerite. Five per cent. copper is found in the bullion, but its mode of occurrence was not determined.

The proportion of silver to gold in the bullion is about 1:8 by weight. The ore contains about 4 per cent. of concentrates. The free gold was introduced into the veins after the quartz had solidified, probably when it was cracked during the main uplift or shortly afterward. Where such cracks were generated in the wall slates, gold is found in them also, but to slight depths only. There has been practically no oxidation of the ores, the sulphides being found a few feet from the surface.

STRUCTURAL FEATURES

On the northeast side of San Francisco hill at the Poderosa mine, the strata are bent sharply upon one another in a compound fold, the axis of which strikes northeast and southwest and dips slightly southwest, the beds themselves striking

worked, generally oreshoots with the longest dimension down the dip and seldom over 50 ft. wide. Some smaller irregular pockets were also worked. Judging by the distance between workings less than one-quarter of the outcrop exposures could be economically worked. No development was attempted.

A quarter of a mile below the mines, a silicious dike, about 300 ft. thick, crosses the foot of the gorge; on the northwest, the slates of Tarapacá hill cap it, but on the southeast, the outcrop of the dike is exposed where it crosses the lower slope of San Francisco hill. The gold veins do not extend as far as this dike.

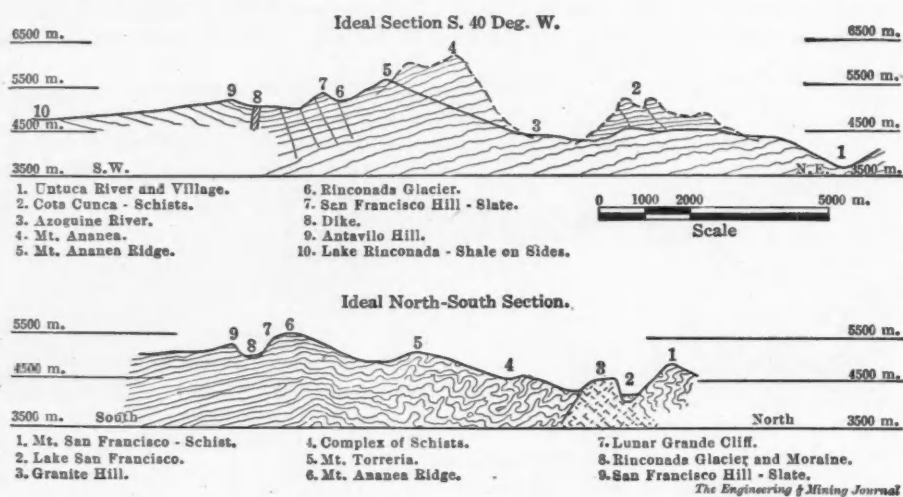
These narrow deposits are not sufficiently rich to be worked at a profit on a commercial scale.

A New Mercury Mineral

Mosesite has been proposed as the name for a newly discovered mercury mineral from Terlingua, Brewster county, Tex., in honor of Prof. Alfred J. Moses, of Columbia University, who first definitely described the interesting mercury minerals found in Texas. The three minerals, montroydite, terlinguaite and eglestonite, were named and definitely determined by Professor Moses, and he also gave a preliminary notice of a fourth new one, later called kleinite. The name, mosesite, would be particularly appropriate as it links the name of Professor Moses with a group of minerals which he first defined.

This mercury mineral is of limited occurrence and has been made the subject of study by F. A. Canfield, W. F. Hillebrand and W. T. Schaller. The results of their studies are recorded in the September issue of the *American Journal of Science*. Complete results were not obtained owing to the limited quantity of the material available. The luster of the mineral is given as adamantine, and the color a rich lemon to canary yellow. The streak and powder are a pale yellow. Mr. Canfield is of the opinion that there are specimens of this mineral in some collections, but they have probably been overlooked or incorrectly labeled. One of the specimens submitted was labeled "terlinguaite," but it was more like kleinite in appearance.

Chemical evidence points to kleinite being a mixture or solution of mercury-ammonium chloride, with a mercuric sulphate and perhaps chloride. There would seem to be an association of similar general character in mosesite, but with a mercurous sulphate or chloride replacing in part or wholly the corresponding mercuric salts of kleinite. The crystals are apparently octohedra of the isometric system and have a tendency to grow together, sometimes in nearly parallel position, and again in widely different positions.



IDEAL SECTIONS OF SAN FRANCISCO HILL, POTO, PERU

southern slope were seen in the cliff of Lunar Grande and in San Francisco hill. They are probably younger than the inclosing slates. I believe they are veins, not beds, and probably antedate the uplift, as they are certainly older than the fissures mentioned above. Numerous white quartz stringers, containing pyrite and a little gold, cut both slates and bedded veins and are probably of the same age as the fissure quartz. In several places, the veins appear to split, but without cutting the slates. A close-linked structure was seen in the lower Zara vein, but this is rare. Evidence of pressure exists in deep striations and, less frequently, gouge along the fault planes but no gouge was seen beside the veins.

CHARACTER OF VEIN QUARTZ

The quartz of the bedded veins is vitreous, medium to coarse crystalline, smoky in color and apparently, darkest where richest. The accompanying minerals are argentiferous gold, much of

northwest and southeast and dipping southwest. The quartz in the saddles formed by this crumpling is rich in places, shows distinctly the later age of the gold and the association with stibnite. It has been worked in open trenches, the richest places in which are now said to be concealed.

On the west face of San Francisco hill the beds strike northwest and southeast and dip about 15 deg. southwest. The dip is into the hill. The strata are crossed by the fissures mentioned before and sometimes thrown by them a few feet upward on the southwest side. The following bedded veins have been distinguished, commencing with the lowest: San Andreas, Zara, Juana, Mantochico, San Francisco, Limeña, Sutcuna, X and several others.

These veins are separated from each other by wide intervals of slate. The Spaniards worked all, except the Juana and Mantochico. The shape of the stopes indicates the shape of the orebodies

Car Distribution to Coal Mines

WASHINGTON CORRESPONDENCE

An important decision has just been made public by the Interstate Commerce Commission in the case of the Hinsdale Coal and Coke Company vs. Pennsylvania Railroad Company. The point at issue concerns the question of distribution of coal cars between mines and the relation thereto of privately owned cars as affecting the distribution of commercially owned cars. In this decision it was contended by the complainant that physical capacity alone is the fair and sound basis for rating coal mines for car distribution. This was not sustained but it was held that the utmost obligation on a carrier under the law is to equip itself with sufficient cars to meet the requirements of the mine for actual shipment. The Interstate Commerce Commission has reaffirmed its previous ruling to the effect that the owner of private cars is entitled to their exclusive use and that foreign-railway fuel cars consigned to a particular mine cannot be delivered to another mine, but on the contrary that all such cars must be counted against the distributive share of the mine receiving them. On the strength of this finding the commission holds that a ruling which had been put into effect by the defendant railway providing that the capacity in tons of such assigned cars should be deducted from the rated capacity of the mine receiving them was illegal and discriminatory.

PRIVATELY OWNED CARS APPLY TO DISTRIBUTIVE PROPORTION

After reviewing the situation as to car distribution developed in the case under consideration, the commission says: "This condition of affairs emphasizes the inequality of a system of distribution that first deducts from the rated capacity of a mine the tonnage represented by the capacity of the cars specially assigned to it, and then uses the remainder as a new basis for determining the proportion of unassigned cars that the mine is to have. The figures presented show that 72 per cent. of all the cars available on the lines of the defendant on the date mentioned were assigned cars, and but 28 per cent. were unassigned cars. Manifestly such a basis of distribution can have but one tendency, and that is, not only to increase steadily the physical capacity of the mines that regularly receive this large percentage of assigned cars, but also steadily to increase their commercial capacity, an advantage which the mines having the benefit of no assigned cars obviously cannot enjoy. With such a large percentage of assigned cars it cannot be doubted that the equipment furnished to some of these mines was sufficient to approximate their ratings, while

the small percentage of unassigned cars makes it equally clear that the mines having no other cars must have fallen substantially short of their ratings.

"We further find that the continuance of that system of distribution for the future would be unlawful on the same grounds. Although the mine owning private cars, or to which company or foreign-railway fuel cars are consigned, is entitled to receive them even though in excess of its ratable proportion of all available coal-car equipment, nevertheless the defendant will be required in the future to count all such cars against the distributive share of the mine so receiving them. It is scarcely necessary to add that the complainant's second request for a finding and for an order requiring the defendant, during the percentage periods, to distribute ratably among operators, according to the actual output capacity of their mines, 'all cars adapted to and used for carrying bituminous coal,' whether company fuel cars, foreign-railway fuel cars, or private cars, must be denied."

SPECIALLY ASSIGNED CARS SHOULD BE COUNTED AGAINST RATING OF MINE

In another complaint involving the complaint of W. F. Jacoby and the Clark Brothers Coal Mining Company against the Pennsylvania Railroad Company, the commission finds that a special allotment daily of 500 railway coal cars to a particular operator for the purpose of supplying foreign steamships with coal was a discriminatory practice so long as they were not counted against the rating of those mines during the car shortage. Reviewing the situation, the commission remarks:

"During the years 1902, 1903 and 1904, the employees of the defendant that were in charge of the distribution of coal-car equipment had special orders for giving to the Berwind-White Coal Mining Company a special allotment of 500 cars daily. That company had contracts for supplying coal for certain steamships sailing from New York harbor. Complaint had been made that these steamers were frequently delayed because of a lack of coal, and the defendant felt that it was warranted in making that special arrangement with the coal mines that had undertaken to supply them with fuel. This preference was the occasion of comment by the commission in its report in the coal and oil investigation. Few, if any, of these specially assigned cars reached the Berwind-White mines in this particular mining district, and therefore it is difficult to determine to just what extent these complainants were prejudiced by that preference of a competing company's operations in another district; nevertheless it was inequitable in principle and undoubtedly so, to some extent at least, in its results, and we see no grounds upon which it can be justified by the commis-

sion. On the contrary, it must be condemned in strong terms as an undue preference of one company and district and an undue discrimination against coal operations in another district."

Notes on the Geology of the Radersburg District, Montana*

BY D. C. BARD†

The Radersburg mining district of Broadwater county, Montana, is reached by stage or automobile line over 11 miles of level road from Toston station, on the Northern Pacific railway. Gold ores have been mined in the Radersburg camp for about 40 years, the first mining being for placer gold. This was later followed by quartz mining of the oxidized ores, which were treated by amalgamation after crushing in small stamp mills and arrastres. Sulphide ores were usually encountered above a depth of 100 ft., and in recent years the demand for ores of this latter type by the smelteries at Butte and Helena has resulted in renewed activity in the district.

ORES IN NARROW FISSURE VEINS IN IGNEOUS INTRUSIVES IN CRETACEOUS

The Radersburg ores occur in narrow fissure veins in porphyritic rocks, the veins usually striking north and south and dipping steeply to the west. They are little faulted. The unoxidized vein matter consists of auriferous pyrite in a gangue of calcite and quartz. Chalcopyrite, sphalerite galena, marcasite, chalcocite and pyrrhotite occur rarely.

The Elkhorn district and the eastern edge of the granite batholith, in which occur the Butte ore deposits, are 14 miles west of Radersburg. Passing east toward Radersburg, a syncline is succeeded by a well developed anticline, across which a section is exposed down to the Algonkian. On the east side of this anticline at the horizon of Cretaceous rocks, the Radersburg mineralization occurs in igneous rocks, or associated with igneous rocks, that have broken through Cretaceous shales, sandstones and limestones. The mineralized zone extends north and south for about 20 miles. The relations of the igneous rocks are complicated and have not been worked out. Some of the andesites and felsites may be surface flows, though most of them appear to be intrusive.

HOT SPRING DEPOSITS PROBABLY ASSOCIATED WITH VEIN MINERALIZATION

Secondary enrichment of the oxidized ores is not marked, and there is no indication of decrease of gold content in the

*Abstract of article published in July, 1910, issue of the *Journ. of the Assoc. of Eng. Soc.*

†Mining engineer, 436 Phenix block, Butte, Mont.

veins at the depth to which they are worked, evidence rather pointing to the contrary. Tertiary lake beds conceal the underlying rocks over much of the camp. In these lake beds numerous hot-spring deposits occur. Evidence points to the fact that these may represent a stage of the mineralization of the producing veins, as both have a calcite gangue and the hot-spring deposits seem to cap veins as a general rule. Traces of gold are also found in the hot-spring deposits.

Gold Park District, California

LOS ANGELES CORRESPONDENCE

Gold Park lies a few miles south of Twenty-nine Palms, near the county line separating San Bernardino and Riverside counties, California. The elevation varies from 3500 to 4200 ft. above sea level. The camp of the Gold Park Consolidated Mines, the chief operator in the district, is accessible by desert wagon roads from various directions; from Palm Springs on the Southern Pacific, or Bagdad on the Santa Fe railroad, the distance is 45 miles. From Indio on the Southern Pacific the distance is about 35 miles.

GEOLOGY

The principal country rocks of the district are of igneous origin and consist chiefly of granites of varying composition and texture. Syenite, apatite, diorite and porphyritic rocks are plentiful. Some quartzite, evidently metamorphosed from a coarse-grained sandstone, appears in places. The country is mountainous and is cut by many cañons. The surface is largely covered by wash and boulders of granite and kindred rocks. Hornblende predominates in the granitic rocks. As far as development has progressed the ore is in the form of free gold carried in a quartz gangue, impregnated in places by iron oxide. Sulphide, consisting chiefly of iron pyrites, is beginning to show at 190 ft. in the Black Warrior shaft. With the exception of the Black Warrior, the veins vary from 1 to 5 ft. wide, averaging a little more than 2 feet.

GOLD PARK CONSOLIDATED OPERATIONS

The Gold Park company owns 52 claims, divided into the Warrior, No. 2 and Main groups. Work at present is being confined to the Black and White Warrior, although leases have been let recently on the Main group. On the Warrior group a quartz vein varying from 40 to 60 ft. in width has been exposed by surface cuts for a distance of seven claim lengths. On the Black Warrior a shaft has been sunk to a depth of 200 ft. and two shifts are working to put it down to the 500 level. The shaft is on the vein and about 1400 tons of ore are now on the dump. Some drifting has been done and the company has decided, on the strength of the ore

showing here and in the leased claims, to erect a mill of moderate capacity. The ore from this shaft goes about \$30 per ton in gold, the bulk of the rock hoisted being ore. This shaft is equipped with a small air compressor and hoist, both operated by gasolene engine.

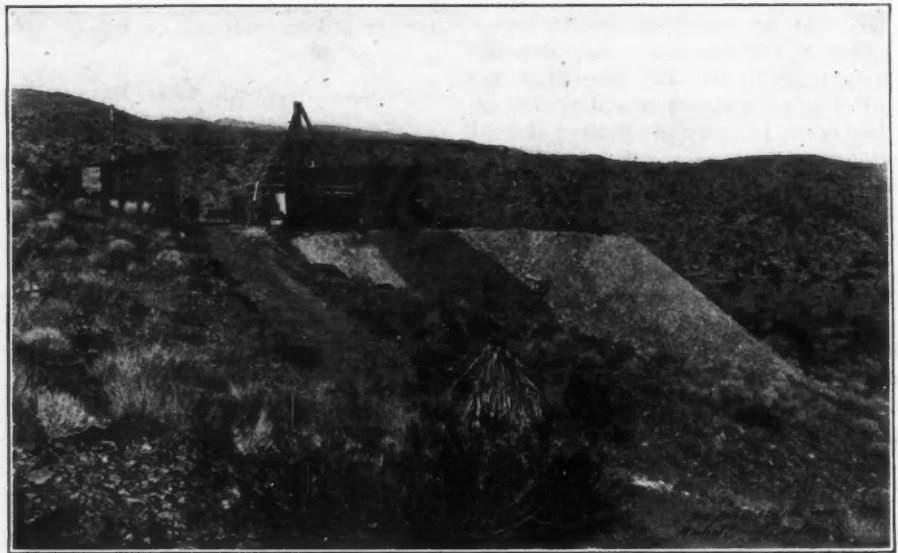
On the Main group leases have been let on the Boss and No. 6 claim. The Boss is developed by three shafts, the deepest being 100 ft. deep. Underground work here has proved the ore to occur in shoots of varying size and tenor. Some rich ore has been encountered, the average being about \$30 per ton. The vein branches on this claim and a shaft has been sunk on each branch and at the fork. Leasers are working in the last-mentioned shaft.

The vein on claim No. 6, Main group, has a north-south strike and dips westerly. A shaft has been sunk 136 ft. on the vein, and is in 2 ft. of ore averaging \$50 per ton for practically its whole

ANACONDA MINE AND MILL

With the exception of the Anaconda, situated 1½ miles west of group No. 2 of the Gold Park company, and possibly a few prospectors, there are at present no other operations in the district. The Anaconda, operated by Edward MacDermott and associates, of Los Angeles, is developed by a shaft 100 ft. deep. Two crews are drifting on the 100 and the ore mined is being sent to the small mill at Twenty-nine Palms. The ore here varies in grade, but by sorting is kept up to about \$30 per ton in gold. About \$1000 per week is being obtained from ore milled.

The mill at Twenty-nine Palms, under the same management as the Anaconda mine, is of the Bryan type and is capable of treating about 20 tons of ore per day. It is planned to add a cyanide department as the tailings from some of the rich ore run comparatively high. The



CALIFORNIA BOY SHAFT, GOLD PARK CONSOLIDATED MINES, CALIFORNIA.

depth. Leasers are working here. Another shallow shaft on this claim shows ore of greater width but much lower gold tenor. For the present the leasers on the Boss and No. 6 expect to haul ore to the mill at Twenty-nine Palms, about 7 miles distant. Arrangements are under way to lease the Atlantic claim of the Main group. This claim is developed by four shafts, the deepest of which is 100 ft., two tunnels, 120 and 218 ft. respectively, and a 150-ft. open cut. No work is being done on group No. 2 at this time. The total development on the property of the Gold Park company consists of nine shafts varying from 65 to 320 ft. in depth, and about 4000 ft. of drifts. Also there are many shallow shafts and cuts. Work at this time is not being conducted on a large scale but future plans indicate a wider range of operations. As soon as more depth is gained in the Black Warrior shaft work will be pushed at this point.

improvement of this mill and the construction of an up-to-date mill and cyanide plant by the Gold Park company should do much toward the development of the district.

Pure Radium

Mme. Curie, who with her husband discovered radium, has now succeeded in collaboration with Prof. Dubiern in obtaining pure radium in metallic form. By using the one-hundredth of a grain of radium salts they produced an infinitesimally small amount of radium itself. This is in appearance a white metal. It rapidly oxidized when exposed to the air. It almost instantly became black.

The metal thus obtained when placed on a piece of iron clung to it tenaciously, and when brought in contact with paper set fire to it. It was also found that it decomposes water rapidly.

The Prevention of Mine Accidents

Proposal of Uniform Legislation by the Several States. Draft for a Law. Emphasis Placed upon the Necessity for Adequate Inspection

REPORT OF COMMITTEE

The committee making this report was appointed at the meeting of the American Mining Congress, at Denver, Colo., in November, 1906. The appointment had in view the drafting of a law for the regulation of quarrying and metalliferous mining under the police laws of the States, with the hope that the uniform adoption of such a law would tend to reduce the number of accidents in mining.

DRAFTING A LAW

The chief work of the committee has been in the preparation of a draft for a law. In the preparation of this draft, the committee has had in mind the preparation of a law that will be effective, and not merely a code of rules and regulations of which the enforcement will be largely optional.

The committee has aimed to fix responsibility upon operator, superintendent, foreman and miner respectively, and the failure on their part to comply with the terms of the law is to be punishable by suitable penalties. The enforcement of the law is charged primarily upon the inspector of mines, who is to be to all intents and purposes a policeman.

The conditions of mining in the various parts of the United States are widely different. The basic laws of the several States also differ to more or less extent. It has been beyond the ability of this committee to draft a law, which it can say with assurance will be equitable under all conditions obtaining in mining in the United States; or will be in conformity with the basic laws of all the States. Consequently, the committee presents its present draft as a preliminary, and invites criticism for its assistance in preparing a final report.

Although the duties of this committee were limited to quarrying and metalliferous mining, the committee suggests that its draft for a law may advantageously be made to apply to all kinds of mining in those States which have no special colliery law.

Coal mining and metal mining do not differ in principle to so great an extent as is popularly supposed. The fundamental rules for safety in metal mining apply also to coal mining, but the latter has dangers peculiar to itself which should be considered in special provisions

in those States where coal mining is extensively carried on.

ADEQUATE SYSTEM OF MINE INSPECTION ESSENTIAL

In the opinion of the committee, the essential steps toward reducing the loss of life in metalliferous mining are (1) a comprehensive and effective law; and (2) an adequate system of mine inspection. The latter is the keynote of progress. Much can be accomplished by an adequate system of mine inspection, even if a comprehensive law be lacking, but no matter how thorough and effective in theory a law may be, it will fail in its purpose unless provision be made for its sincere, impartial and positive enforcement by an adequate system of competent mine inspection.

To secure such a system of mine inspection, the States must appropriate a good deal more money than any has yet done. Each State must have a mine inspector, and he must be provided with a sufficient number of deputies to enable frequent inspections of all operating mines to be made. One inspection of a mine in a year is not enough. The inspector and deputies must, moreover, be provided with proper funds for clerical work, traveling expenses, etc. So far as we are aware, the State of Colorado makes the largest appropriation for inspection of metal mines, its appropriation being \$25,000 per year. Other important mining States appropriate only \$10,000. In the opinion of the committee, such appropriations are utterly inadequate. For States possessing a mining industry of the importance of that in Colorado, Utah, Montana, Nevada, California, and, in fact, all of the States and territories west of the Rocky mountains, an annual appropriation of \$50,000 to \$100,000 per State is necessary. Such expenditures are thoroughly justified by the importance of the end to be gained.

HIGH DEATH RATE IN AMERICAN MINES

At the present time the number of persons killed annually by accident in the metalliferous mines of the United States is probably in the neighborhood of 500, estimating upon the rate of 3.09 per thousand as determined by Frederick L. Hoffman. In many important foreign countries, the death rate is less than 1½ per thousand. We operate in this country at a more intense rate than in many foreign countries, and perhaps our death rate per tonnage of ore produced per man would not compare so unfavorably,

and because of this more intense operation it may be impossible for us to attain the low rates of some foreign countries.

It must be borne in mind that it is not only underground but also overground that accidents are more numerous in this country than in Europe. There is a spirit of recklessness in this whole land that leads people to take risks that the European population avoid. But certainly our mining practice is capable of great improvement with respect to the safety of the miners, and the magnitude of the annual loss justifies a large State expenditure for the purpose of its reduction.

Consequently, the committee emphasizes strongly that the reduction of loss of life in mining is dependent chiefly upon the money that the people of the respective States are willing to spend for the enforcement of their mining laws, and in such expenditures the committee urges great liberality.

It is essential that mine inspection be impartial—absolutely free from all political personal and selfish interests; and, moreover, that it be competent. In its draft for a law, the committee has incorporated, after very careful consideration, qualifications for mine inspectors, which, in its opinion, will provide the essential conditions stated above.

Respectfully submitted.

WALTER RENTON INGALLS, Chairman.

J. PARKE CHANNING

JAMES DOUGLAS

J. R. FINLAY

JOHN HAYS HAMMOND

New York, Sept. 1, 1910.

PROVISIONS OF THE PROPOSED LAW

An Act, relating to metalliferous mines in the State of _____ and to provide for the health and safety of persons employed in and about the same.

Sec. 1. The terms of this act shall apply to all quarries and metalliferous mines in the State of _____ employing more than 10 persons in any period of 24 hours.

Sec. 2. The governor of the State, by and with the advice and consent of the senate, shall appoint an inspector of mines. The inspector of mines shall be at least 30 years of age, a citizen of the United States, a resident of this State for at least one year previous to his appointment, and shall be practically engaged in metalliferous mining, and shall have had at least 10 years' experience in underground mining in the United States of America. The inspector of mines (but not the deputy inspectors) must have been for at least five years in charge of a

NOTE—The entire report is too voluminous for reproduction in our columns. We have confined ourselves to the portions of essentially technical character, omitting the more purely legal and administrative provisions.—EDITOR.

mine, in the United States of America, employing 50 or more men underground, to be qualified for such office.

Sec. 3. All deputy inspectors appointed under the provisions of this section shall be subject at any time to removal by the inspector. The inspector shall also appoint hereafter such additional deputies as the legislature may provide, who shall, when so appointed by the legislature, be in all ways subject to the provisions of this section. In case of vacancy in the office of any deputy inspector caused by death, removal or otherwise, the inspector of mines shall forthwith fill such vacancy. The qualifications of all deputy inspectors shall be the same as those required in the case of the inspector of mines, as set forth in section 2 of this act; excepting, however, that such deputy inspectors shall have been for two years in charge of a mine, in the United States of America, employing at least 25 men underground.

QUALIFICATIONS AND POWERS OF INSPECTORS

Sec. 4. No person shall be appointed to the office of inspector or deputy inspector, nor be qualified to hold the office of inspector or deputy inspector, while an employee, director or officer of any mining, milling or smelting company; or while directly or indirectly connected with any mining company or copartnership operating in this State, either as stockholder, partner, or in any other capacity; or while engaged in private practice as a consulting engineer. The inspector and each deputy must devote his entire time to the duties of their respective offices; and it shall be unlawful for the inspector, or any deputy, to be otherwise employed by the State of _____ or to act directly or indirectly, for or on behalf of any candidate for public office, or for any political party, or receive compensation either directly or indirectly from any candidate for public office or from any political party in the State during the terms of such inspector or deputy inspector.

DUTIES OF INSPECTORS AND POWERS

Sec. 11. It shall be the duty of the inspector of mines by himself or by deputy to visit at least once every two months every mine in the State employing 50 or more men underground; and every other mine at least once every year and oftener if in his opinion the safety of the men employed within the mine so requires.

For the purpose of ascertaining facts in connection with any inspection, inquiry or examination, the said inspector, or any deputy, shall have full power to compel the attendance of witnesses by subpoena, and to take depositions, to administer oaths and to examine, cross-examine and take testimony of such persons as may be deemed necessary for the information of the inspector or his deputies.

Sec. 12. Whenever the inspector shall find any mine, or part of any mine, in an unsafe condition, by reason of any violation of any of the rules or provisions of this act, or in a condition dangerous or detrimental to the life or health of those employed therein, for the same reason or by reason of defects in timbering, mining, ventilation or sanitation, it shall be the duty of the inspector at once to serve or cause to be served a notice in writing upon the operator of such mine, and such notice shall set forth in detail the nature and extent of the defects which render the mine or part of the mine unsafe, dangerous, or detrimental to the life or health of those employed therein, together with the point or place in the mine, or in the workings of the mine, where such defects exist, and such notice shall require such necessary changes to be made in such mine or part of the mine without delay, and within a specified time in the discretion of the inspector, to make the same conform to the provisions of this act.

CARE OF INJURED

Sec. 21.—It shall be the duty of operators, superintendents or anyone in charge of any mine where 10 or more men are employed, to keep at the mouth of the drift, shaft or slope, or at such other place about the mine as may be designated by the inspector, a stretcher and a woolen and waterproof blanket, in good condition, for use in carrying any person who may be injured at the mine. Where more than 200 persons are employed, two stretchers and two woolen and waterproof blankets shall be kept. And at all mines a supply of antiseptic gauze, carbolated vaseline, sponges, soap, carbolic acid, tablets of bichloride of mercury, linseed oil, bandages, suitable towels and a wash basin shall be kept readily accessible for the treatment of anyone injured:

Provided, that in all mines where 500 or more men are employed, a first-aid corps must be organized, consisting of the foreman or foremen, shift bosses, timekeepers and other employees, designated by the superintendent; and it shall be the duty of the operator or superintendent of the mine to cause the organization of such, and to procure the services of a competent surgeon or physician to instruct the members of such first-aid corps from time to time, not less than once in each calendar year, in the proper handling and treatment of injured persons before the arrival of a physician.

STORAGE OF INFLAMMABLE MATERIAL

Sec. 24.—It shall be the duty of the operator or superintendent of each mine to store, or cause to be stored, oils and other dangerously inflammable materials in a covered building, kept solely for such storage, which building shall be

at least 100 ft. from any other building and at least 300 ft. from any powder magazine. The man in charge of such building, who shall be the superintendent, or a person expressly designated by him, shall permit only sufficient oil or other inflammable material to be taken from such building to meet the requirements of one day. If any oil or gasoline storage be so situated that leakage would permit the oil or gasoline to flow within the above specified distance, means to prevent such flow must be provided.

STORAGE OF EXPLOSIVES

Sec. 25.—No blasting powder or any high explosive containing nitroglycerin shall be stored in any mine.

Provided, that nothing in this section shall be construed to prevent the operator of any mine from keeping sufficient blasting powder or other high explosive within such mine to meet the estimated requirements of such mine during the succeeding 24 hours; and provided further that such temporary supply shall not be kept at any place within such mine, where its accidental discharge would cut off the escape of miners working therein.

All blasting powder, or other high explosive, in excess of the temporary supply, required in such mine shall be stored in a magazine placed not less than 300 ft. distant from any shaft, adit, habitation, public highway, public railway, or from the boundary line of any mining property;

Provided, however, that in cases where the location of any mining property makes it impossible to comply with the provisions of this section, the inspector may grant permission in writing to the operator of such mining property to place such magazine in some other place on such mining property, if, in the opinion of the said inspector such location shall not be dangerous to the safety of those employed within such mine.

PROTECTION OF POWDER MAGAZINES

Every magazine where powder or other high explosive is stored as provided in this section, shall be ventilated; and if it be a building above the surface of the ground it shall be provided with a lightning conductor supported on a vertical post standing clear of such magazine, and not nearer than 18 in. from one of the walls thereof and rising at least 6 ft. above the highest point of such magazine; such lightning conductor shall be carried to a properly laid earth plate, set in the ground at a depth below the permanent moisture line of the ground and at a distance of at least 1 ft. outside of the foundation walls of said magazine.

It shall be the duty of the operator to enforce the carrying out of this section and any failure on the part of said operator so to do shall be deemed a violation of this act.

MARKING OF EXPLOSIVES

Sec. 26—It shall be unlawful for the operator or superintendent of any mine to permit the use within such mine of any explosive containing nitroglycerin unless there shall be plainly printed or marked, in the English language, on every original package containing such explosive the name and place of business of the manufacturer of such explosive, together with the date of its manufacture.

BLASTING

Sec. 30—Gang bosses shall be in immediate charge, and responsible for blasting within the mine. It shall be their duty to see that no iron or steel tools shall be used for tamping and all miners are hereby forbidden to use iron or steel tools for such purposes under penalty of a misdemeanor. It shall be the duty of the mine foreman to fix the time of all blasting and firing. Gang bosses and miners about to fire shots shall cause warnings to be given in every direction, and all entrances to the place or places where charges are to be fired shall be guarded while such firing is going on. Failure on the part of gang bosses or miners to comply with the provisions of this section shall be deemed a violation of this act. The number of shots exploding, except in cases of electric firing, shall be counted by the miner firing same. If said miner be not certain that all the shots have exploded, no one shall be permitted to enter the places where such charges were placed, for a period of 30 minutes after the fuses were lighted. Such misfire, occurring at change of any shift shall be reported to the mine foreman, shift boss and to the miner of the following shift.

In the event of shots fired by electricity, then it shall be unlawful for any person knowingly to enter the vicinity of the mine where such shots are fired, until the cable of the firing battery has been disconnected; it shall be the duty of the gang boss or miner in charge of the shot firing to see that all such cables are disconnected immediately after such firing, and to examine, or direct the examinations of such places where shots are fired, before any men are permitted to work therein. All miners shall immediately report to the gang boss, shift boss or mine foreman the finding of any loose wires under or in the rock loosened by such firing, and in such event the mine foreman, or in his absence the shift boss, or gang boss, shall at once order work to cease until such wires have been traced to their terminals. It shall be the duty of the mine foreman to see that no current of higher than 250 volts shall be used when firing by electricity.

It shall be unlawful for any miner to extract or attempt to extract explosives from a hole which has once been charged, but in every such case a fresh

charge shall be inserted above the missed explosive, and the same shall be then detonated. It shall be unlawful for any miner to deepen holes, or any part of holes, left standing or abandoned, and theretofore charged with explosives.

DUTIES OF HOISTING ENGINEER

Sec. 32—The following rules shall be observed by every hoisting engineer employed within this State:

(1) It shall be the duty of every hoisting engineer to keep a careful watch over his engine and over all machinery under his charge.

(2) He shall at all times be in immediate charge of his engine, and shall not at any time delegate any of his duties to any other person, except to apprentices, duly designated as provided in this act; provided, however, nothing herein contained shall be construed to prevent any hoisting engineer delegating to or sharing his duties with any other duly appointed hoisting engineer, or turning over the engine and machinery in his charge to any other such engineer at the end of his shift.

(3) He shall familiarize himself with and use all signal codes for hoisting and lowering as directed to be used in this act.

(4) He shall not run his engine unless the same is properly provided with adequate brakes, indicators and distance marks on hoisting ropes or cables, as provided in this act.

(5) It shall be the duty of the hoisting engineer to exclude every person from his engine room, excepting any person or persons whose duties require their presence therein, and visitors authorized by the superintendent of the mine.

(6) He shall hold no conversation with anyone while his engine is in motion, or while attending to signals.

(7) He must run his engine with extreme caution, whenever men are on the hoisting cage.

(8) He shall not hoist men out of, or lower men into, any mine or shaft at a speed greater than 800 ft. per minute.

(9) He shall inspect all hoisting machinery and safety appliances connected therewith, and all ropes and hoisting apparatus, when and as directed by the mine superintendent, and shall report to him any defects found therein.

(10) After any stoppage of hoisting for repairs or for any other purpose exceeding in duration one hour, he shall run a cage or other conveyance, unloaded, up and down the working portion of the shaft, at least once, and shall not permit the cage or other conveyance to be used until the hoisting machinery and shaft are found to be in safe condition.

(11) He shall do no hoisting in any compartment of a shaft while repairs are being made in the said hoisting compartment, excepting such hoisting as may be necessary to make such repairs.

(12) He shall familiarize himself with and carry out the requirements of rules 7, 8, 9, 10, 11, 12, 19 and 20 of section 37 of this act.

(13) Any hoisting engineer or any person having in charge the hoisting machinery connected with the mine who shall wilfully violate any of the provisions of this section, or any of the rules contained therein, or who shall wilfully violate any of the provisions of rules 7, 8, 9, 10, 11, 12, 19 and 20 of section 37 of this act shall, upon conviction, be deemed guilty of a violation of this act, and liable to punishment accordingly.

(14) The superintendent shall post a copy of this section and the last preceding section in a conspicuous place on the door of the engine house.

HOISTING ROPES

Sec. 33. It shall be unlawful to use in any mine, included within the provisions of this act, any rope or cable for hoisting or lowering either men or material, when such hoisting or lowering is done by any means other than human or animal power, unless such rope or cable shall be composed of iron or steel wires, with a factor of safety determined as hereinafter set forth:

Provided, however, that such iron or steel wires may be laid around a hemp center.

The factor of safety of all such ropes or cables shall in no case be less than five, and shall be calculated by dividing the breaking strength of the rope as given in the manufacturers' published tables, by the sum of the maximum load to be hoisted, plus the total weight of the rope in the shaft when fully let out, plus 10 per cent. of such values, to take account of shock at starting and stopping.

It shall be unlawful to use any rope or cable for the raising and lowering of men, either when the number of breaks in any running foot of said rope exceeds 10 per cent. of the total number of wires composing the rope, or when the wires on the crown of the strands are worn down to less than one-half their original diameter, or when the superficial inspection provided for in this section shows marked signs of corrosion.

All ropes must be superficially inspected once in every 24 hours by some competent person designated for that purpose by the superintendent, and it shall be the duty of the superintendent to cause an examination to be made once in every succeeding three months of a section of such rope or cable, then in use for hoisting and lowering men and materials in such mine. If upon any inspection such hoisting rope or cable is found to be below the requirements set forth in this section, it shall be disused for such purpose, forthwith, and any operator or superintendent using or permitting the use of such hoisting rope or cable for the purpose of hoisting or lowering men

thereafter, shall be guilty of an offense against this act.

CAGES FOR HOISTING MEN

Sec. 34. It shall be unlawful for the operator or superintendent of any mine to permit the hoisting or lowering of men through a vertical shaft deeper than 300 ft., unless an iron-bonneted safety cage be used for hoisting and lowering of such men, but this provision shall not apply to shafts in process of sinking.

It shall be the duty of the operator or superintendent to have all cages used in such shafts, over 300 ft. deep, and in which men are hoisted and lowered, to be constructed as follows: The bonnet shall be of two steel plates, 3/16 in. in thickness, sloping toward each side, and so arranged that they may be readily pushed upward to afford egress to persons therein, and such bonnet must cover the top of the cage in such a manner as to protect those on the cage from objects falling in the shaft.

The cage shall be provided with sheet iron or steel side casing, not less than 1/8 in. thick, or with a netting composed of wire not less than 1/8 in. in diameter, and with doors made of the same material as the side casing, either hung on hinges or working in slides. These doors shall extend at least four feet above the bottom of the cage and must be closed when lowering or hoisting men, except timbermen riding on the cage to attend to timbers that are being lowered or hoisted.

Every cage must have overhead bars of such arrangement as to give every man on the cage an easy and secure handhold. Every cage or skip used for hoisting men must be provided with a safety catch of sufficient strength to hold the cage or skip with its maximum load at any point in the shaft in the event that the hoisting cable should break. The inspector or his deputy must see that all cages and skips are equipped in compliance with this paragraph, and that on all cages the catches are kept well oiled and in good working condition.

Any operator or superintendent of any mine failing to comply with the provisions of this section, within 90 days after its passage, shall be guilty of an offence against this act.

The following general rules shall be observed in and about every mine within this State to which this act applies.

ADDITIONAL DUTIES OF MINE FOREMAN

Rule 1. The operator or superintendent of every mine shall use every precaution to insure the safety of the workmen in the mine in all cases, whether provided for in this act or not, and shall place the underground workings thereof and all that is related to the same under the charge and daily supervision of a competent person who shall be called "mine foreman."

Rule 2. Whenever a mine foreman

cannot personally carry out the provisions of this act, so far as they pertain to him, the operator or superintendent shall authorize him to employ a sufficient number of competent persons to act as his assistants, who shall be subject to his orders, and shall be known as "assistant mine foremen," and they shall be under the direct supervision of the mine foreman and shall carry on the duties of the mine foreman as directed by him, and as prescribed in section 29 of this act.

Rule 3. The mine foreman shall have charge of carrying out or directing the carrying out of his duties as prescribed in section 29 of this act; and any superintendent who shall direct or cause a mine foreman to disregard the provisions of this act shall be amenable in the same manner as the mine foreman.

Rule 4. The mine foreman shall see that all dangerous places are properly fenced off and proper danger signal boards are so hung on such fencings that they may be plainly seen.

Rule 5. No candle shall be left burning in a mine or any part of a mine when the person using the candle departs from his work for the day.

Rule 6. The operator or superintendent of a mine employing more than 50 men underground shall provide, and keep in a readily accessible place, at least two fire fighting helmets to be used in case of emergency.

CAGE RULES

Rule 7. At all mines where hoisting is done by cage or skips from two or more levels a man shall be employed whose duties shall be to load and unload the cage or skip and to give all signals to the hoisting engineer. The superintendent is responsible for the enforcement of this rule.

Rule 8. Any person riding upon any cage, skip or bucket that is loaded with tools, timber, powder or other material, except for the purpose of assisting in passing such material through a shaft or incline, and then only after a special signal has been given, shall be guilty of a violation of this act.

Rule 9. When tools, timber or other materials are to be lowered or hoisted in a shaft, their ends, if projecting above the top of the bucket, skip or other vehicle, shall be securely fastened to the hoisting rope or to the upper part of the vehicle, and all tools, timber or other materials loaded upon a cage must be securely lashed before being lowered or hoisted.

Rule 10. In no case shall a cage, skip or bucket or other vehicle be lowered directly to the bottom of the shaft when men are working there, but such cage, skip or bucket or other vehicle must be stopped at least 15 ft. above the bottom of such shaft until the signal to lower further down has been given to the hoisting engineer by one of the men at the bottom of the shaft, provided, however,

that this rule shall not apply to shafts of less than 50 ft. in depth.

PROTECTION WHEN DEEPENING SHAFT

Rule 11. Persons engaged in deepening a shaft in which hoisting from an upper level is going on shall be protected from the danger of falling material by a suitable covering extending over the whole area of the shaft, sufficient openings being left in the covering for the passage of men, a bucket or other conveyance used in the sinking operations. It shall be the duty of the superintendent of the mine to enforce this rule, and failure so to do shall be deemed a violation of this act.

Rule 12. No hoisting shall be done in any compartment of a shaft while repairs are being made in that compartment, excepting such hoisting as is necessary in order to make such repairs.

Rule 13. Whims in use at or in mines shall be provided with a suitable stopper, or some other reliable device, to prevent running back of the bucket or other conveyance.

Rule 14. No open hook shall be used with a bucket in hoisting. Safety hooks only shall be employed.

Rule 15. All shafts more than 300 ft. deep from which hoisting is done by means of a bucket must be provided with suitable guides, and in connection with the bucket there must be a crosshead traveling upon these guides. The height of the crosshead shall be at least two-thirds of its width. If the crosshead be a type that is not secured to the hoisting rope, a stopper must be securely and rigidly fastened to the hoisting rope at least seven feet above the rim of the bucket.

SIGNALS

Rule 16. Every shaft, if exceeding 50 ft. in depth, shall be provided with an efficient means of interchanging distinct and definite signals between the top of the shaft and the lowest level and the various intermediate levels from which hoisting is being done. The signaling apparatus shall be a cord or wire actuating a knocker, bell or whistle, which may be supplemented by a speaking tube, or telephone, or an electric system.

Rule 17. Special care must be taken to keep the signalling apparatus in good order.

Rule 18. Any person who shall interfere with or impede any signalling in the mine within this State, or who shall knowingly damage any such signal system, or who shall knowingly give or cause to be given any wrong signal within the mine, or who shall ride upon any cage, skip or bucket at a time when signals have been given informing the hoisting engineer that no person is so riding, shall be guilty of a violation of this act, and shall be punished accordingly.

Rule 19. The following signals shall

be used: One bell, hoist (when engine is at rest); one bell, stop (when engine is in motion); two bells, lower; three bells, men on cage about to ascend or descend; four bells, blasting signal. Upon receiving the blasting signal of four bells, the engineer must answer by raising the bucket a few feet and letting it back slowly, and then upon receiving the signal of one bell, he shall hoist the men away from the blast.

Rule 20. Special signals in addition to the above may be used in any mine, provided they are easily distinguishable by their sound or otherwise from the foregoing code, and do not interfere with it in any way.

Rule 21. An easily legible copy of the above code, and of any special code adopted in any mine, shall be printed on a board or metal plate not less than 18x18 in., and shall be securely posted in the engine room, at the collar of the shaft, and at each level or station. The superintendent of the mine shall be held responsible for the carrying out of this rule.

TIMBERING, ABANDONED SHAFTS, ETC.

Rule 22. The timbers in all manways in daily use shall be cleaned of all loose rock lodged upon them at least once in every 24 hours. Manways in daily use shall be kept clear of obstructions.

Rule 23. The mouth of every shaft or entry to a mine which, for the time being is out of use, or is used only as an airway, and the approach to every open working other than ordinary prospecting trenches, and all elevated and exposed platforms and gangways, shall be kept securely fenced or otherwise protected.

Rule 24. All abandoned shafts or other abandoned excavations shall be securely covered or fenced;

Provided, however, that in the case of abandoned open cuts fencing only shall be required.

Rule 25. Any person who shall willfully remove, injure or destroy all or any part of any coverings or fences provided for in rules 23 and 24 of this section shall be guilty of a violation of this act and shall be punished accordingly.

LIGHTING

Rule 26. Stationary lights shall be provided for during the working hours at all stations at vertical and incline shafts during the time the same are in actual use; and also at all stations on the levels where hoisting or hauling is effected by means of machinery; and also at night at all working places on the surface, and at the head of any shafts not fenced or covered.

Rule 27. All places where hoisting, pumping or other machinery is erected, and in the proximity of which persons employed in the mines are working or moving about, shall be so lighted that the

moving parts of such machinery can be clearly distinguished.

MANHOLES AND PROTECTION AGAINST MACHINERY

Rule 28. In every mine in which mechanical haulage is employed there shall be at intervals of not more than 100 yards, on each main haulage way, places of refuge, affording a space of at least 2½ ft. in width between the widest portion of the car or train running on the tramway and the side of the gallery.

Rule 29. Every manhole and place of refuge shall be kept constantly clear, and no refuse shall be placed therein, and no person shall in any way prevent access thereto.

Rule 30. All exposed machinery which when in motion would be dangerous to persons coming in contact therewith shall be securely guarded by a fence or railing. All electrical conductors shall be placed so as to protect any persons, so far as is possible, from coming into contact with the same.

Rule 31. No electrical current higher than 250 volts shall be carried by any naked wire in any mine.

PROTECTION AGAINST WATER

Rule 32. No raise shall be allowed to approach within 10 ft. of any portion of a winze, stope or other opening, in which there is a dangerous accumulation of water, unless such winze or stope be first unwatered by bailing or pumping or by means of a bore from the raise.

Rule 33. When advancing a drift, adit level or incline toward a mine working that is suspected to be filled with water, a bore hole must be kept at least 20 ft. in advance of the breast of the drive; and also if necessary in directions laterally from the course of the drive. Such a working place must not exceed six feet in width and such additional precautionary measures shall be taken as may be deemed necessary to obviate the danger of a sudden breaking through of water.

Rule 34. In every mine, where in the opinion of the inspector of mines, there is danger of a sudden inburst of water, such additional raises, drifts, or other workings shall be constructed as are necessary in the opinion of the inspector to ensure the escape of workmen from the lower workings.

LADDER REGULATIONS

Rule 35. The space between the rungs of a ladder shall not exceed 12 inches.

Rule 36. The rungs of a ladder shall in no case be less than three inches from the wall of the shaft, or any opening in which it is used.

Rule 37. Every ladderway constructed and fixed in a vertical shaft more than 100 ft. deep, which may be used for the ascent and descent of persons working in the mine, shall have substantial platforms

at intervals of not more than 20 ft. and the inclination of any ladder or section of a ladder shall not exceed 80 deg. from the horizontal.

Rule 38. All platforms except for an opening large enough to permit the passage of a man shall be closely covered.

Rule 39. Ladders shall project at least three feet above every platform in the ladderway and at least three feet above the collar of the shaft, unless hand rails are fixed at such places.

Rule 40. In ladderways not exceeding 100 ft. in depth, ladders may be fixed vertically; over this depth no vertical ladders shall be used.

Rule 41. Under no circumstances shall any ladder inclining backward from the vertical be installed.

Rule 42. Ladderways shall be provided in all shafts in the course of sinking to within such a distance from the bottom thereof as will secure them from damage by blasting, but from the end of which ladderways chain or wooden extension ladders shall be extended to the bottom of the shaft.

Rule 43. It shall be the duty of the superintendent to enforce the carrying out of rules 35 to 42, and his failure so to do shall constitute a violation of this act.

SHAFT AND WINZE RULES

Rule 44. All stations or levels shall have a passageway around or through the working shaft so that crossing over the hoisting compartment may be avoided.

Rule 45. All sumps shall be securely planked over.

Rule 46. In stopes timbered with square sets, the working floors shall be closely and securely lagged over. Lagging shall be long enough to reach clear across the caps.

Rule 47. Winzes or raises shall not be started in the direct line of a drift, but shall be offset from the drift.

Rule 48. The opening of such offset winze shall be protected by a fence or guard rail not less than three feet nor more than four feet in height above the level of the drift.

Rule 49. Existing winzes opening directly from the floor of a drift or stope must be kept covered by a substantial hatch, or planking, except when in use, at which time passage to persons other than those working at the winze shall be barred off by a substantial rail across the roads of access to the openings.

Rule 50. At all shaft stations a gate or a guard rail not less than three feet nor more than four feet above the floor, must be provided and kept in place across the shaft, except when cage, skip or bucket is being loaded, but this prohibition shall not forbid the temporary removal of the gate or rail for the purpose of repairs or other operations, if proper precaution to prevent danger to persons be taken.

Rule 51. The top of all shafts shall be protected by a gate, so that persons or foreign objects cannot fall into the shaft.

Rule 52. If hoisting be done from greater depth than 100 ft., by means of a bucket, shaft doors must be constructed that will prevent any material from falling into the shaft while the bucket is being dumped.

HOISTING ROPES

Rule 53. Every rope used for hoisting or lowering men or materials shall be securely fastened to its drum and when in use shall never be fully unwound, but at least one full turn shall remain on the drum.

Rule 54. The farther end of the rope shall either be securely fastened within a tapered socket, or else it shall be bound around an oval thimble and then fastened to itself by not less than 12 clamps or bolts.

Rule 55. Every rope shall be treated with oil or some suitable rope compound at least once every month. Such compound must be chemically neutral, and must be of such consistency as to penetrate the strand and not merely cover the surface of the rope.

EXPLOSIVES AND FUSES

Rule 56. Every mine thawing in excess of a daily average of 100 lb. of dynamite shall be provided with a separate building for that purpose.

Rule 57. Dynamite shall not be thawed by any means other than a steam bath or a hot-water device and such thawing device shall not be allowed to become hotter than can be borne by the naked hand.

Rule 58. It shall be unlawful to thaw dynamite by placing it near a fire or steam boiler.

Rule 59. It shall be unlawful to thaw dynamite in a steam bath by using live steam.

Rule 60. It shall be unlawful for any person knowingly to distribute frozen dynamite to any person working in any mine.

Rule 61. No explosive shall be taken into any mine except in a securely covered case.

Rule 62. Detonators shall not be transported in the same vehicle or carried in the same case with dynamite or other explosive.

Rule 63. No fuse shall be used in any mine that burns faster than 1 yd. in 80 seconds and slower than 1 yd. in 100 seconds.

Rule 64. It shall be unlawful for any person to use within any mine any fuse unless the rate of burning be stamped by the manufacturer on the package containing such fuse.

Rule 65. Notice shall be posted at the entrance of every mine stating the rate of burning of the fuse used in such mine. The superintendent shall be re-

sponsible for the carrying out of this rule.

GENERAL RULES

Rule 66. No person in a state of intoxication shall be allowed to enter or loiter about a mine.

Rule 67. All employees shall inform the mine foreman or his assistant of the unsafe condition of any working place.

Rule 68. Wages shall not be paid on any premises used for the sale of intoxicating liquors.

Rule 69. No intoxicating liquors shall be taken into a mine.

Rule 70. Strangers or visitors shall not be allowed underground in any mine unless accompanied by the operator or an official of the mine, or by an employee deputized by such operator or official to accompany them.

Rule 71. Every mine employing more than 25 men shall maintain a suitably equipped wash room which shall at all times be open to the employees of the mine.

Rule 72. Each workman employed in the mine when engaged shall have his attention directed by the mine foreman to the general and special rules provided for in this act.

Rule 73. Any person who does any act wilfully in violation of any of the rules as prescribed in this act shall be guilty of a misdemeanor.

TWO OPENINGS TO SURFACE OF MINES

Sec. 38. It shall be the duty of every operator of every mine within this State, excepting as hereinafter provided, to maintain at least two outlets to the surface from such mine; or an underground communicating passageway between every such mine and some other contiguous mine, so that there shall be at all times at least two distinct and available means of access to the surface to all persons employed in such mine or mines. Such outlets shall not be less than 50 ft. apart and shall, if covered, be provided with separate and distinct and non-connecting houses on the surface.

Where two openings to the surface shall not have been provided as aforesaid, it shall be the duty of the inspector of mines to order in writing, served upon the operator or superintendent of such mine, a second opening to be made without delay by the operator of said mine, and in the event of the operator of such mine failing forthwith to commence and prosecute the making of a second opening within 20 days after the service of said order, or in the event of the inspector deeming any mine having but one such opening to be dangerous to the lives and health of those employed therein, it shall thereupon be the duty of such inspector forthwith to institute an action for an injunction to close said mine, provided for in section 12 of this act.

Provided, however, that section 38 of this act shall not apply in the case of: (a) New workings being opened for the purpose of making a communication between two or more shafts, or to any working for the purpose of searching for or proving ore; (b) or to any mine in which one of the shafts or outlets has temporarily become unavailable for the persons employed in the mine, and in which every effort is being made by the operator of the mine to open such temporarily unavailable outlet, and provided the same is not, in the opinion of the inspector dangerous to the life and health of those employed therein; and (c) mines having workings of less than 100 ft. in depth.

PROVISIONS AFFECTING MINES HAVING BUT ONE OUTLET

Sec. 40. In every mine within this State, where under the provisions of section 38 of this act but one outlet is required, and where a single shaft affords the only means of ingress or egress to persons employed underground, such shaft if more than 200 ft. deep shall be divided into at least two compartments. One of said compartments shall be set aside and used exclusively as a ladderway. Whenever such ladderway compartment shall be covered by a non-fireproof building, it shall be the duty of the operator of said mine to cause said ladderway to be securely bulkheaded at a point at least 25 ft. below the collar of the shaft; and below this bulkhead, if the shaft is situated upon a side hill, a drift shall be driven to the surface; if the shaft containing said ladderway be otherwise situated this drift shall be driven on a level to a safe distance, but in no case less than 30 ft. beyond the walls of the building covering the main shaft, and from such point a raise shall be made to the surface.

The said raise shall be equipped with a ladderway, and it together with the drift connecting with the main shaft shall be kept in good repair and shall afford an easy exit in the event of fire. A failure on the part of the operator of said mine to carry out or cause to be carried out the provisions of this section shall constitute a violation of this act.

OUTLETS NOT TO BE COVERED BY HOUSES

Sec. 41. It shall be unlawful for the operator of any mine within this State, after the passage of this act, to erect any structure over the shaft or outlet of any mine, except head frames necessary for hoisting from such shaft or outlet, and the hatch or door necessary for closing such shaft or outlet;

Provided, however, it shall be lawful to erect a housing of nonflammable and fireproof material over such shaft or adit to protect the men working at such point. In the case of existing houses covering the mouths of shafts or adits, it shall be

the duty of the superintendent of the mine to cause the immediate removal of all inflammable material stored therein, and it shall be the further duty of such superintendent to prohibit the storage of any inflammable material within 30 ft. from the exterior walls of any such existing house or within a like distance from the walls of any housing hereinafter built under the provisions of this section. A failure on the part of any such superintendent to enforce the provisions of this section relative to the storage of inflammable materials, shall be deemed a violation of this act.

It shall be the duty of every operator to provide every adit, the mouth of which is covered by a house or building of any kind, with a door near the mouth of the adit, that can be closed from outside of the building by a pull wire or cable in the event of fire.

LADDERWAYS AS MEANS OF EGRESS

Sec. 42. It shall be the duty of the owner or operator of every mine to provide in addition to any mechanical means of ingress or egress, at least one means of outlet for the miners by means of ladders, from the lowest workings of the mine to the surface. All ladders and ladderways, constructed after the passage of this act, shall be built as prescribed in rules 35 to 42 of section 37 of this act. All floors of sets in stopes and every shaft, winze, raise or incline steeper than 35 deg. from the horizontal through which men are obliged to pass, shall be provided with ladders and ladderways as specified in this section.

INSPECTION OF MINE ROOFS

Sec. 45. In all mines where stoping is done by the opening of chambers, the roof thereof being supported only by the walls of the chambers, or by pillars, it shall be the duty of the superintendent of the mine to detail a competent man to make a frequent inspection of the roof of those parts of the mine where men are employed, and said man so detailed shall be charged with the duty of dislodging any slabs of rock in said roof which have become loose. While such dislodgment is being effected, the floor of the stope immediately beneath such loose rock shall be fenced off, or otherwise adequately guarded.

SAFETY PILLARS

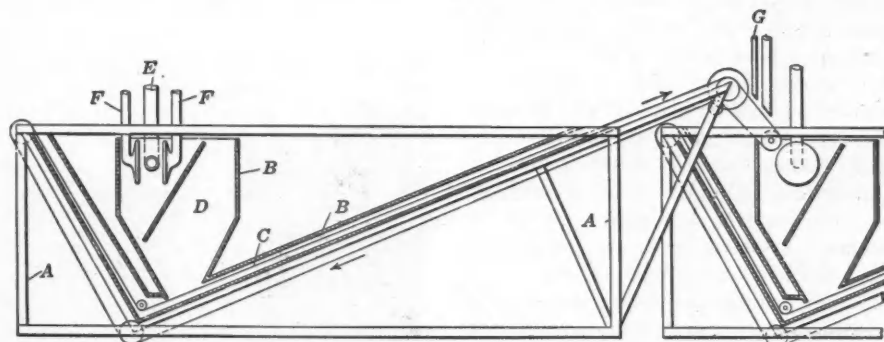
Sec. 46. It shall be the duty of the owner or operator of every underground mine to leave standing on the inside of the boundary line of every mining property, safety pillars the width of which must not be less than 30 ft., measured at right angles from the said boundary line;

Provided, however, that on the application of either owner of adjoining mines, the inspector may give permission in writing to either or both owners to weaken, cut through or work such pillars,

if in the opinion of the inspector the same will not be dangerous to the lives of those employed within either of the said mining properties. Such consent, or a copy thereof, shall be filed in the office of the inspector. The failure of the operator of either or both of such adjoining mining properties to observe the provisions of this section, shall be deemed a violation of this act.

Nichols Slime Filter

A vacuum filter for separating the liquid and solid components of cyanide solutions, has been patented (U. S. Pat. No. 958,272) by H. G. Nichols, of Ymir, B. C., Canada. The apparatus shown in the illustration consists of a framework *A*, supporting a trunk chamber *B* carrying an endless belt *C*, and a settling tank *D* into which is introduced the slime solution through the pipe *E*. A suction pipe or pipes *F* have their nozzles covered with a screen through which is drawn the



THE NICHOLS VACUUM FILTER

clear solution from the settling chamber. Should the solid material cake upon this nozzle screen, the suction in the pipes is stopped and air or water is forced through them.

As the slime is supplied to *D*, the clear liquid is drawn off through *F*, while the solid material falls upon the conveyer belt and is carried out of the apparatus to a similar one, shown at the right in the figure. To facilitate the discharge, water jets *G* wash the material from the belt into the next settling chamber. In practice three units are generally used. In the first, the initial deposition and separation of the solid material is effected, and in the others the solid material is washed and redeposited until it is finally discharged.

Records of the U. S. Geological Survey show that the total gold production of Alaska at the close of 1909 was \$162,066,455, of which \$118,219,757 came from placers and \$44,466,689 from lodes. The records of production begin with 1880.

Blaugas in Portable Cylinders

The production of "blaugas" on a commercial scale was commenced in June at Long Island City, New York, by the Blaugas Company of America. Another plant is in operation at Montreal, Can., and additional plants will be built by subsidiary companies at various centers throughout the country. Blaugas is a compressed, liquified gas, distilled from ordinary gas oil, a byproduct of crude petroleum after the naphtha and lighter oils have been extracted. The blaugas is sold in steel tanks 8 in. in diameter by 4 ft. high, each containing about 20 lb. of gas, the price being 10c. per lb., or about \$2 per tank. It is estimated that this price is equivalent to city gas at about \$1.75 per thousand.

The equipment for using the gas in isolated places consists of a small steel closet holding two bottles of gas and an expansion cylinder to which the house service is connected. The gas gives a brilliant light, and is claimed to be no

more expensive than ordinary illuminating gas. It is used successfully for cooking, heating and power; in fact, for any purpose to which other illuminating gas can be put. Blaugas was invented by Herr Blau, of Augsburg, Germany, and has been used successfully in Germany for several years.

BLAUGAS USED FOR LIGHTING SORTING TABLES AT COBALT MINE

It has already found application in mining work, having been used to light the company's houses of the Nova Scotia mine in the Cobalt district and also to light the sorting tables at this mine. For the purpose of distinguishing between the waste rock and ore, it is claimed that this light is much superior to that of electricity with which the mine was already equipped.

The gas has a high calorific value, about 1800 B.t.u., and may be used in connection with oxygen for welding and cutting metals, similar to the oxy-acetylene welding, and may find extensive use among mines and reduction works in welding broken apparatus.

The Colloseus Process for Making Slag Cement

Process Exploited by the Coltness Iron Company. Essential Feature
the Granulation of the Molten Furnace Slag with Epsom Salts

B Y F. A. T A L B O T*

During the last few years the problem of turning the slag from iron blast furnaces to commercial account has occupied the attention of chemists. The fact that the chemical composition of this waste is similar to that of portland cement, has led to experimenting in this direction. Unfortunately, however, some of these investigations have not been entirely successful, that is, from the all-around point of view.

COLTNESS IRON COMPANY USES COLLOSEUS PROCESS IN SCOTLAND

A few years ago, however, a German chemist, Dr. Heinrich Colloseus, of Berlin, perfected a process for achieving the desired end. The results obtained since the announcement of his discovery have been so satisfactory that several iron-smelting companies have adopted the process in their works, with a view to solving the problem of the slag disposal and incidentally, securing an additional source of revenue. When Doctor Colloseus first announced his process, a Scottish company, the Coltness Iron Company, one of the foremost establishments in the British iron industry, completed arrangements with the inventor for the exploitation of the process at their works, in order to determine its commercial possibilities.

Innumerable experiments were carried out by the company, and as a result it was found possible to manufacture a product equal in every respect to the portland cement. Following these determinations the company decided to establish a new factory, equipped with an elaborate plant for producing the material upon a large scale at Newmains, near Glasgow. In these works time- and labor-saving devices have been adopted and many valuable improvements effected by the company's chemists.

MOLTEN BLAST FURNACE SLAG GRANULATED BY SOLUTION OF EPSOM SALTS

When the blast furnaces are tapped, the molten slag is run off, as shown in the photograph, into large cast-iron ladles of 8 tons capacity made expressly for this work from a special mixture of hematite iron. When the ladle has received its charge of slag, the whole is lifted by an overhead crane and loaded upon the "tippler," shown in the accompanying half-tone. As the name implies this is a device for pouring the slag from the ladle, and as the speed and volume of the flow must be constant, the device is operated by variable-speed electric motors.

*15 Wilbury Crescent, Hove, England.

At this stage the most important operation in the whole process has to be carried out. It consists in obtaining a combination of the molten slag with a solution of magnesium sulphate, or as it is more familiarly known, epsom salts. This sets up such chemical reactions as to entirely change the texture and nature of the slag. The operation is described as "granulating," and is effected by pouring the molten slag in a steady stream upon a revolving drum, at the same time bringing a solution of the magnesium sulphate into contact therewith.

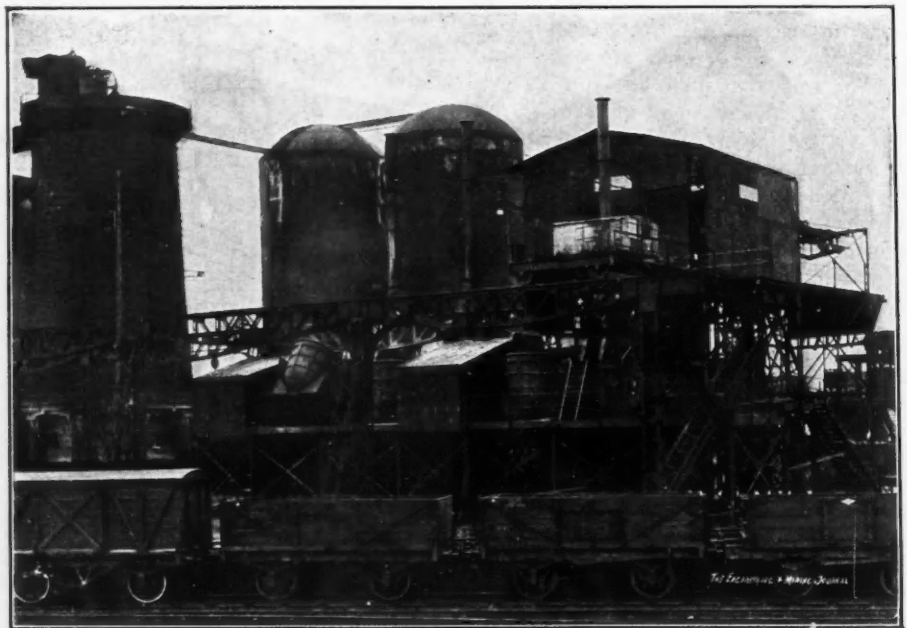
GRANULATING ON DRUM SPRAYED WITH SALT SOLUTION

This drum revolves at 650 r.p.m., has open ends and is fitted with numerous

bucket is filled it is automatically pushed aside, hoisted to an elevated platform, switched on to an aerial cableway and transported about a thousand feet to the store or clinker house, capable of holding about 6000 tons. This quantity is generally held in constant reserve. The aerial traveling bucket upon reaching this point is tripped, and shoots its contents into the building, returning for another charge.

CLINKER CRUSHED IN THE CUSTOMARY BALL MILLS

The clinker is left to cool in this depository for several days. It is then drawn off from the bottom into special buckets of 2800 lb. capacity and carried to the grinding mills. From this point



LADLES FILLED WITH SLAG READY FOR GRANULATION AT COLTNESS IRONWORKS, SCOTLAND

slots. Inside the drum is a conduit through which is sprayed the epsom-salts solution which finds its way to the outer surface of the granulator through the peripheral openings, and at the same time another jet outside the drum sprays the molten mass as it falls. The slag is granulated by the epsom salts solution, assisted by the effect of dropping upon the moving surface. The disintegrated material is coarse and hot. The granulation can be varied both by the speed in pouring and by the revolutions of the drum.

The slag is thrown off the drum as disintegrated, and falls below into iron buckets of 900 lb. capacity. When a

the process is similar to that practised in the manufacture of portland cement. The buckets drop the raw clinker through automatic bottom doors in a large hopper which feeds the material into a primary screw mill. The pulverized mass is then carried by an endless conveyer to hoppers feeding the ball mills. These consist of horizontal cylinders, 10 ft. long by 6 ft. in diameter. Running at 24 r.p.m., they crush the cement under the action of steel balls with which the drum is partially filled.

The material now passes into the tube mills, 23 ft. long by 4 ft. in diameter, running at 34 r.p.m. and charged with

steel balls. The mass is ground until it is so fine that it will all pass through a sieve having 5776 holes per sq.in., and 90 per cent. through a sieve having 32,400 holes per square inch.

A spiral conveyer catches the cement as it issues from the tube mill, carries it to a weighing machine where the weight is automatically recorded and registered. It is then elevated to the top of the building and finally dumped into large hoppers in the storehouse. This building has six of these receptacles and they are so designed that the contents of one can be mixed with that of another, whenever desired.

FILLING, WEIGHING AND CHECKING BARRELS AND BAGS AUTOMATICALLY ACCOMPLISHED

In packing, the material is discharged into four other hoppers, two designed for filling barrels and two for charging sacks. Accurate weighing appliances insure casks and sacks receiving their proper bulk, and when this is done the supply of cement is automatically shut off. When the sacks and barrels are removed, the operation is recorded by means of a dial, so that the work is automatically checked.

Though epsom salts are generally used, it is possible to use with equal facility the salt of other earthly oxides which are soluble in water. In this manner cement specially suitable for certain purposes can be prepared. For example, a cement which effectually resists the action of sea water, is obtained by using a solution of sulphate or chloride of iron.

As the composition of blast-furnace slags varies according to the character of the ores treated, it is only when the chief constituents are present in a certain proportion that the process can be utilized. For instance, a slag containing more than 42 per cent. of lime and not more than 37 per cent. of silica is suitable for the Colloseus process.

The cement thus produced from blast-furnace slag is somewhat lighter in color than that manufactured in the ordinary way. Elaborate tests have proved that the former is equal, if not superior, to the latter, in uniformity of quality, tensile strength, and other requisitions demanded of such a material, both in its pure state or when associated with other gritty substances to form concrete.

EPSOM SALTS ACT AS CATALYZING AGENT UPON THE SILICATES

The chemical reactions that take place from the association of the sulphate of magnesium with the incandescent slag are somewhat complicated and in some instances unknown. Doctor Colloseus found, however, that the epsom salts act as an energetic catalyzing agent in regard to the silicates. This combination causes a further reaction, the apparent result of which is that the acids evolved under

the influence of the high temperature from the aqueous solution of the salts, are in a nascent state, and that reactions take place in combination with the sulphur originally existing in the slag itself.

This results in the greater part of the sulphur being driven off in the form of sulphuretted hydrogen and sulphur dioxide. Through independent laboratory tests and trials the Coltness Iron Company are convinced that the cement prepared by this process is ideal, inasmuch as the molecules are combinations of lime with silica and alumina. Thus the cement possesses the salient feature of setting within a desirable limit of time and contains no superfluous lime.

The experience of the Coltness Iron Company shows that there are no technical reasons why such a practice should not be generally adopted by the steel trade, and that cement works could be profitably associated with iron works. By careful designing and utilizing every possible time- and labor-saving device to displace manual labor, combined with speed and smoothness of running, the cost of manufacture can be reduced to a low figure. At this factory the requisite power is furnished by a 1750-h.p. blast-furnace gas engine. The gas is purified and cleaned so as to secure all the valuable by-products it contains, such as tar oils and so forth. The engine drives a complete electric plant which furnishes power for the various units of the installation. At present nine blast furnaces are connected with the granulators and from 120 to 140 tons of cement are produced per week, though the capacity of the plant is 1000 tons per week.

Gold Road Mine, Arizona

SPECIAL CORRESPONDENCE

The Gold Road mine, operated by the Gold Road Mining and Exploration Company, is situated 24 miles southwest of Kingman, Ariz., and about the same distance northeast of Needles. The principal rocks of the district are of igneous origin. Different varieties of porphyries prevail and these are cut by later intrusions of andesite and rhyolite. The vein is of the fissure type with a southeast-northwest strike and dip of from 80 to 85 deg. to the north. The vein filling is chiefly a hard, compact quartz, stained with iron oxide in places; ribs of sugary quartz occur sparingly. Ore occurs as free gold fairly well disseminated through the 8 ft. of vein matter, although in places richer bunches are found.

The vein has been exposed on the surface for a little more than one mile. The mine is developed by a shaft 835 ft. deep, from which 2000 ft. of stoping ground has been opened. Northwest of the shaft 800 ft. of mineralized ground has been opened by drifts on several levels; this

is followed by 500 ft. of barren ground. Southeast of the shaft the mineralization is persistent for 1200 ft. A total of 7000 ft. of drifting has been done on the different levels. About one-third of the ore broken is being hoisted, the remainder being left in the mine. There are now 75,000 tons of broken ore in the stopes, 20,000 tons developed and 400,000 tons of probable ore. The dump contains about 5000 tons. This ore will all average \$9 per ton in gold with a small amount of silver.

MILL TO BE ENLARGED

The mill consists of 40 stamps, two chilean mills, two 5x22-ft. tube mills, and a cyanide plant. The ore is treated by direct cyanidation. The present equipment provides for the treatment of 200 tons of ore per day, but additions are nearing completion that will increase the capacity to 300 tons per day. At present, only enough ore is being hoisted to keep the mill running at full capacity, but there is ample ore developed to insure as much as the mill will handle at the increased capacity. Both hoist and mill are operated with electrical power furnished by the Desert Water and Power Company, of Kingman. At present, 600 h.p. is required, but this will be increased to 700 as soon as the additions to the mill are complete. The transmission line is 24 miles long. A crew of 150 men is employed in mine and mill.

Water Power at Niagara

The amount of power utilized at Niagara and the principal uses to which it is now put, according to the *Journ. Soc. Chem. Ind.*, July 30, 1910, is shown herewith. Although the information is by no means complete, it may be useful and interesting to some.

	H.P.
Union Carbide Company.....	35,000
Aluminum Company of America.....	10,000
Castner Electrolytic Company.....	8,000
Carborundum Company.....	8,000
Niagara Electro-chemical Company...	6,000
International Acheson Graphite Company.....	2,000
Hooker Electro-chemical Company....	6,000
Oldbury Electro-chemical Company...	2,000
Norton Company.....	2,000

The products manufactured at Niagara Falls today are: Aluminum, sodium, caustic alkali and bleached products derived from electrolytic chlorine, calcium carbide, calcium nitrate, hypochlorite solutions, ozone, oxygen and hydrogen, artificial graphite, artificial emery (carborundum), sodium cyanide, sodium peroxide, potassium and sodium chlorates, phosphorus, ferro and aluminum alloys.

The recrushing plant of the Calumet & Hecla Mining Company is completed and has been operating to its full capacity since January, 1910. The rate of production on the grade of material now treated is about 2,000,000 lb. of copper per year, and the cost about 4.75c. per pound.

Smelting at Nishni Tagil in the Ural Mountains

Odd Combination of Crude Methods and Modern Practice Employed.
Workmen Devoid of Ambition Despite 8 Hour Day and Bonus System

B Y F . W . D R A P E R *

The district of Nishni Tagil, the property of the estate of the late P. P. Demidoff, Prince San Donato, is one of the oldest land grants in the Urals, having been conveyed by Peter the Great to the founder of the house of Demidoff about 200 years ago. It derives its name from the Tagil river which flows through the property. The district comprises 2150 square miles on the eastern slope of the Ural mountains, about 75 miles north of the city of Ekaterinburg, and is rich in mineral deposits. At the present time there are eleven iron-smelting works, one copper smeltery and extensive platinum placers in operation.

The district is the largest single producer of platinum in the Ural mountains. Some gold is found in the placers and gold lodes are known to exist but are not worked. During the summer months about 26,000 workmen are engaged in the district in operations directly or indirectly connected with metal production.

THREE CLASSES OF ORE MINED

The copper mines are located on the outskirts of the town of Nishni Tagil, which is the center of activity in the district and the seat of the principal offices. The ore, the greater part of which is oxidized, occurs along a contact between diorite and limestone. A standard-gage railway of a mile and a half in length, belonging to the Demidoff estate, connects the smeltery to the mine. These mines, for a long time famous for their beautiful specimens of malachite, are called Rudyansky and produce the following three classes of ore:

1. Pyritous ores from the northern part of the deposit, consisting of disseminated chalcopyrite with a good deal of magnetite.

2. Iron ores from the middle part of the deposit, consisting of a mixture of oxidized copper ore with considerable iron oxide and red clay.

3. Talc ores from the southern part of the deposit, consisting of yellow clay, and containing, for the most part, small lumps of oxidized copper ore with some sulphides.

At the present time the mines are able to produce about 100,000 tons per year, made up of 25,000 tons of pyritous ore, 50,000 tons of iron ore, and 25,000 tons of talc ore. The ores contain from 3 to 3.5 per cent. of copper and are without any value in gold or silver. The ac-

companying table gives the average analysis of the various classes for 1909.

ECONOMICAL HANDLING OF MATERIAL

The ore is brought from the mine to the smeltery in special broad-gage cars, provided with hinged bottoms sloping from the center toward the side. Two wooden trestles extend into the ore shed about 10 ft. above the floor, so that the unloading of the cars is rapid and inexpensive, although shoveling is necessary for almost the entire quantity. Each kind is dumped in a separate heap, no attempt being made to bed the ore. Owing to its clay character, most of the ore contains a good deal of moisture, usually as high as 10 per cent., and as the shed is not inclosed, the heaps freeze in winter, requiring much additional labor.

ORE ROASTED IN KILNS

The pyritous ores are roasted, although this class of ore comes in such solid

GOOD GRADE OF COKE USED

The coal comes from the Luneffsky mine, belonging to the Demidoff estate, which is situated northeast from Tagil about 100 miles and connected therewith by railway. Most of the coke comes from Donetz in South Russia, costing, including transportation losses, \$11.50 per ton, and contains about 12 per cent. ash, but is very satisfactory. A poor grade of coke can be made from Luneffsky coal at a much lower cost per ton, but it is of such poor quality that at present it is not used.

Luneffsky coal contains 5 to 6 per cent. sulphur and 25 to 30 per cent. ash, the latter containing 40 to 45 SiO₂, 40 Al₂O₃, 15 FeO and 1.5 to 2 per cent. CaO + MgO. Luneffsky coke from washed coal contains 3 per cent. sulphur and 25 per cent. ash. The silicious character of the ash, however, is no detriment, as the ores are basic.

ANALYSIS OF RUDYANSKY ORES FOR 1909.

Class of Ore.	SiO ₂ , Per Cent.	FeO, Per Cent.	Al ₂ O ₃ , Per Cent.	MnO, Per Cent.	CaO, Per Cent.	MgO, Per Cent.	S, Per Cent.
Pyritous ore	18.47	45.32	8.05	8.06	4.50	2.28	4.13
Iron ore	24.21	43.67	10.39	0.88	1.52	1.93	2.13
Talc ore	46.57	20.35	14.19	1.28	1.16	2.20	1.43

lumps that only about three-quarters of one per cent. of sulphur is eliminated. The roasting is confined mainly to the surface of the lumps and extends into any cracks which may exist. It would hardly seem profitable to roast the ore for so slight a removal of sulphur, and the reason assigned is that the ore does not smelt well in the raw state; but I could find no ground for such a contention. The roasting is done in low, continuous kilns, using a large amount of waste wood for fuel, as the quantity of heat furnished by the oxidation of the sulphur is very small. It requires the equivalent of one cord of wood for each ten tons of ore.

The kilns are rectangular shafts with sloping bottoms higher in the center than at the sides, where the roasted ore is withdrawn. They are so arranged that the ore from the mines is dumped directly into them to a depth of 6 ft. from broad-gage ore cars running over the top of the kilns. The ore as it is needed for making up the charges is drawn from the kilns by the charge wheelers.

Coal and coke are brought over the company's own line from a junction with the Perm railway, about 3 miles distant.

ARRANGEMENT OF THE ORE YARDS AND COMPOSITION OF THE CHARGES

The ore is dumped in separate heaps on the ore yard, which extends the whole length of the plant behind the blast furnaces. The coal and coke pockets are at one end of the ore yard and fuel is transferred from this general storage to small bins just behind the furnaces, by means of small side-dump buggies holding about one ton each. From these bins it is shoveled by the charge wheelers into the charge barrows. All handling both of ore and fuel has to be done by shovel.

To this ore yard are brought, by horse and cart, all fowl slag and secondary by-products which require resmelting. The handling of this material is by contract, and costs 50 to 55 cents per ton.

The charges, consisting of 75 to 80 per cent. of ore, 20 per cent. of fowl slag, secondary by-products, etc., and 5 to 10 per cent. of flux, are made up by the wheelers on the plates in front of the furnaces. The flux used is limestone, but usually none is required, although the furnacemen clamor for permission to use

*Superintendent, Arizona Smelting Company, Humboldt, Ariz.

it whenever the furnace works slowly or badly.

SHAFT FURNACES AND A SPECIAL DESIGN OF REVERBERATORY USED

The smelting is done partly in brick shaft furnaces of the same type that has been in use for a century or more, and partly in a reverberatory furnace of patented design originated by Lebedeff and Pomarantseff.

The shaft-furnace plant consists of 36 furnaces, three of which are of special design for smelting roasted matte to black copper. The ore-smelting furnaces are built up entirely of red brick except for two heavy fire-brick blocks at the front where the slag flows out. The bottom is a mixture of ground quartz and fire clay tamped into place and inclosed by a sheet-iron cylinder. The upper half of the shaft is also inclosed in sheet iron, while the boshes are held by vertical pieces of old rails and scrap iron of various shapes, bound with iron bands.

Each furnace is 4 ft. 8 in. in diameter at the tuyeres, 5 ft. 6 in. at the top of the boshes (4 ft. above the tuyeres) and 5 ft. 10 in. at the feed floor. The total height from the tuyeres to the feed floor is 7 ft. 4 in. and the distance from the tuyeres to the bottom of the crucible is 2 ft. 5 in. Each furnace has 12 tuyeres arranged symmetrically except in front over the slag tap, where there are none. The top is closed by a hood which can be raised or lowered, and connects through a sliding joint with a low stack. No dust chamber is provided at any of the furnaces.

Such a furnace smelts on an average 1100 poods or 20 tons in 24 hours with a blast pressure of 0.5 in. Hg at the furnaces and uses from 22 to 25 per cent. of its weight of a mixture of Luneffsky coal and Donetz coke. Of the total fuel used about 80 per cent. is coal, but only the lump coal can be used in the furnaces; the undersize below 1 in. is used under the boilers. The coke is used mainly to aid in correcting irregularities and in starting the furnace after cleaning out sows. Owing to the character of the walls, it is necessary to charge all fuel in the middle and all ore around the outside. The fuel is not broken at all; in fact, lumps up to a foot or more in size are thrown carefully in to avoid breaking. Any fines in the fuel tend to remain unburned and to accumulate in the bottom of the furnace, increasing the formation of sows. Such a furnace costs from \$450 to \$500 complete, or when only the walls require rebuilding, \$150, and has a life of 100 to 300 days, depending largely on the skill of the furnacemen.

TANDEM ARRANGEMENT OF SETTLERS

Each furnace is provided with a so called forehearth consisting of a small settling basin about 24 in. deep and 24 in. in diameter in front of the slag tap,

and a second smaller basin about 3 ft. distant and connected with the first by a channel. From the second basin the slag flows continuously into little wrought-iron pots on two wheels. These hold about 1 cu.ft. of slag and when full are wheeled to iron plates outside the building, where the slag is dumped out and allowed to cool. When cold the slag is broken and loaded by hand into side-dump cars, and hauled by horses to the dump about one and a half miles distant. This work is all done by contract, costing five and one-half cents per ton for breaking and loading, one and one-half cents for transportation to the dump and one-half cent for track maintenance, or a total of seven and one-half cents per ton, for handling this slag.

The furnaces are charged only after long intervals. The charge is allowed to sink until the shaft is about half full. Then the blast is cut off and the whole crew go to the feed floor to throw in the charge which has in the meantime been brought in by the wheelers. The amount of fuel and, even to a considerable extent, the quantities of the various ores in the ore mixture are left to the individual furnacemen, who have become very expert in the handling of the furnaces. They aim to keep noses of from 4 to 6 in. in front of each tuyere, thus insuring a protective lining of sufficient thickness to prevent burning out the walls. The intermittent character of the operation also assists in preserving the walls.

BONUS SYSTEM EMPLOYED

Each furnace has a crew of six men per 8-hour shift, who perform all operations, including bringing charges and removing slag to the cooling plates. They receive, in addition to wages, a premium for tonnage smelted above a certain limit, which is placed so low that they can hardly fail to receive something above their wages. Under such circumstances it is supposed that the men will keep each furnace up to maximum capacity, but unfortunately the Russian workman is totally devoid of ambition to provide beyond the pressing needs of the day, and as long as these are satisfied he prefers to take life easy rather than to increase his income by harder work. When the furnace is full the head man examines his tuyeres, punching them if necessary, and then turns on the blast.

The tuyeres are thin iron pipes ending in a conical nozzle, which fits into a thimble set in the brick wall of the furnace; the tuyere pipes are sometimes connected with the nipples of the bustle pipe by tuyere bags, which are usually missing, when the pipe is simply shoved up over or into the nipples, depending on its size. Little care is exercised in keeping the tuyeres tight, with a consequent loss of a large percentage of the blast. The pressure is 1 in. of Hg

at the blowers, but only $\frac{1}{2}$ in. at the furnaces. The total blast furnished is 60,000 cu.ft. per min. of which 20,000 is delivered by an old piston blower and the balance by No. 8 Roots blowers.

INTERMITTENT OPERATION OF THE FURNACES

The charging of the furnaces takes place about every two and a half hours, and about one hour is lost from the time the blast is cut off until slag is again running into the pots. All slag remaining in the outer basin is lifted out each time and goes to the foul-slag yard. The actual time that the blast is cut off is about 30 minutes, and it requires another 30 minutes after the blast is put on, to get the furnace started and the settling basin full.

There is a gradual growth of sow on the bottom of the furnaces, which consists of a little metallic iron with a good deal of unburned coal and half-melted ore, and every 48 hours the furnace must be stopped to clean out the crucible. To do this the blast is stopped and the furnace allowed to stand a short time until the half-melted layer just above the tuyere level has cooled enough to form an arch and support the charge. Then all matte and slag are tapped out as clean as possible and the breast of the furnace broken in. The sow is cut out with steel bars, great care being taken not to disturb the arch which is supporting the charge in the shaft. When all is clean, the space is filled with lumps of coke thrown in by hand and the breast closed with the fireclay blocks which form the tympan for trapping the blast. These blocks are of special shape, manufactured at the works, and sometimes last 48 hours, but generally have to be renewed every 24 hours. No water cooling is used anywhere about the furnaces. This intermittent shutting down of the furnace requires four hours from the time the blast is shut off until the slag is again running, and it produces much material for resmelting.

The matte is allowed to accumulate in the furnace. It is tapped once in 24 hours from the bottom of the first settling basin, which is directly connected through the slag notch with the crucible of the furnace. As the level of the matte in the furnace rises it forces the slag to cut out the top of this slag notch and generally the slag-brick blocks have to be replaced each time the matte is tapped. About one ton of matte is obtained from each tap, and about $1\frac{1}{2}$ per cent. of bottoms and 13.5 per cent. of foul slag are produced. The remainder of the slag on the charge comes from the black-copper furnaces.

Each time the matte is tapped much foul slag is made as the furnace is allowed to empty itself, no attempt being made to plug the tap hole when the slag appears.

THE REVERBERATORY FURNACE

The reverberatory furnace designed by Lebedeff and Pomarantseff is fired with wood and arranged with checker-work regenerators. The essential feature of the furnace is the use of down-draft fireboxes. The direction of the flame is reversed every two hours, and in order to lessen the quantity of fuel in the firebox, about 15 minutes before reversal no fuel is charged. Even then there is considerable waste, due to wood remaining in the firebox when the valves are changed.

The hearth of the furnace is 27.3 ft. long and 16.8 ft. wide, while the fireboxes are each 3.08 ft. wide by 12 ft. long. This gives a ratio of hearth to firebox area of 12.4 to 1. Ore is charged at each end of the hearth and slag and matte are tapped from the middle. Slag is tapped at intervals and after granulation with water is removed by horses and carts. It is considerably richer than that made by the shaft furnaces, due largely to the short distance between the ore heaps and the slag tap.

This furnace smelts 58 tons per day, using one cord of wood for 2.92 tons of ore. The wood must be carefully dried and of best-quality pine, with very little birch. With green wood the tonnage smelted falls off very rapidly.

ROASTING THE MATTE

The first matte contains from 32 to 35 per cent. copper and is roasted 11 times in heaps. This brings the sulphur down to 5 or 6 per cent. The first two or three fires are made with heaps containing about 20 tons, and the remaining fires with heaps of 80 to 100 tons, made by combining a sufficient number of the smaller heaps.

This roasting is a very expensive and tedious process, the copper being tied up for three months or more in the heaps and being subject to serious leaching losses by rain water, as well as by the repeated handling in the open air of the friable partly roasted matte.

The total fuel consumption is about 2600 cords of wood for 4120 tons of matte, or 0.63 cord per ton. For the earlier fires, branches and chips may be used, but for the later ones, good, sound pine or birch is required.

Experiments with blast roasting of the matte have given very good results and will shortly replace the heap roasting entirely and will bring about an important reduction in costs.

PRODUCTION OF BLACK COPPER

The roasted matte is then smelted in small brick shaft furnaces, the charge consisting of 90 to 95 per cent. of matte and 5 to 10 per cent. of ore, slag, etc. The absence of ores high in silica makes it necessary to run a very basic slag. The old furnace bottoms from the rebuilding of ore-smelting furnaces make a suitable flux, but they are limited in quantity.

About 2 per cent. of the charge consists of slag from the refining furnaces.

The products obtained are black copper, white metal and slag. About 57 per cent. of the copper present in the charge is obtained as black copper, which assays 95.38 per cent. copper. The balance of the copper is in white metal, furnace bottoms and slag. The annexed table shows the distribution of the copper.

CONSTRUCTION OF THE BLACK-COPPER FURNACES

These shaft furnaces are of a different design from the ore-smelting furnaces. The walls are vertical and the cross-section trapezoidal with rounded front corners. The back wall is 7 ft. long on the inside, the front wall 6 ft. and the distance between them 4 ft. The furnace is entirely inclosed in riveted iron plates and the eight tuyeres are all placed in the ends and front corners. The back has no tuyeres and there are none over the tap hole. When in operation the breast is left open, thus losing a great quantity of blast. The management offered no explanation for this except that it is customary.

The slag flows continuously through an arrangement of settling basins similar to that on the ore furnaces. The crucible, constructed of brasque, holds about 100

the pole and is thrown off to one side. This is repeated until all matte is removed. The copper is removed in the same way, but in order to hasten the operation, water is sprinkled over the surface and a line of ashes laid across the center to keep it liquid at that point and thus enable the crust to be taken off in two parts. Each half is lifted, this time on iron bars, using the rim of the basin as a fulcrum, and is slid on to a slag pot. When two or three pieces are on the pot, it is wheeled to a sunken tank of water and the copper slabs dumped in.

Such a furnace smelts about 23 tons of charge in 24 hours and uses from 20 to 23 per cent. of Donetz coke. Charging is by column, fuel along the back wall and matte and flux over the tuyeres.

The labor required is one furnace man, four helpers and two slag wheelers per eight-hour shift. The premium system also obtains, the men receiving a bonus for extra tonnage smelted and for fuel economy.

REFINING

The black copper is refined in gas-fired regenerative furnaces. As the copper is free from As, Sb, Bi, the principal impurity being Fe, the refining is easy and rapid. Each furnace treats in 24 hours four charges, weighing 3650 lb. The length of the hearth is 9 ft. 6 in. and the

DISTRIBUTION OF COPPER IN THE PRODUCTS.

Material.	Weight, Lb.	Per Cent. by Weight.	Per Cent. Copper.	Total Copper Content, Lb.	Per Cent. of Total Copper.
Black copper	54,058	16.5	95.38	50,394	57.1
White metal	45,902	14.0	61.93	28,425	32.7
Bottoms, cleanings, etc.	6,397	2.0	6.00	384	1.4
Slag	221,263	67.5	3.48	7,696	8.8
	327,620	.....	.....	86,899	100.0

poods of copper, which is tapped every 6 or 8 hours, yielding 80 to 100 poods of copper.

When the furnace is ready to tap, the blast is shut off and the entire contents of the furnace are tapped into a shallow circular basin previously dried and lined with ashes. This basin is about 4 ft. in diameter and 18 in. deep, inclosed in cast-iron plates.

From the basin any surplus material flows to a series of cast-iron molds, although most of the copper remains in the basin, but occasionally with big taps it may fill the first five or six molds of the series. These are examined immediately in order to break apart the pigs of copper before they are cold.

REMOVAL OF THE WHITE METAL AND COPPER

Most of the white metal and slag will be in the molds, but there is always a layer of white metal floating on the copper in the basin. As soon as a thin layer has chilled over the surface of this matte it is lifted up by thrusting a wooden pole under it. It folds down over each side of

width 8 ft. 3 in., with a skimming door on one side and a ladling door on the other. Oxidation is by means of air blast supplied through two galvanized-iron tuyeres tipped with cast-iron nozzles and inserted through the ladling door.

From 4463 tons of black copper, 215 tons of slag were produced, assaying about 40 per cent. copper.

As the copper contains no precious metals, it is ladled into wire bars or other forms as desired. When ready to ladle, if for subsequent rolling into sheets, a little phosphorus is added, the amount being 2 to 3 grams of phosphorus for each 36 lb. of copper.

The fuel used is mostly branches, refuse wood and turf. Calculating this as nearly as possible to an equivalent quantity of good wood, it gives 4835 lb. of copper treated per cord of wood. One foreman, four helpers, and one laborer are required per eight-hour shift.

According to United States Minister Sherrill, the Hansa Sociedad de Minas produces six-sevenths of the output of tungsten ore in Argentina.

Use of Explosives in British Coal Mines

The investigation of mine explosions undertaken by the United States Geological Survey includes a careful examination of the various explosives used in mining operations with a view to determining the extent to which the use of such explosives might be responsible for the occurrence of holocausts. Reports indicate that the preliminary investigation made it clear that all explosives intended for use in mines where either gas or dry inflammable dust is present in quantity, or under conditions which are indicative of danger, should be subjected to rigid tests.

In view of the activity displayed in this particular direction—a list of “permissible explosives” having been published by the United States Geological Survey—it may be appropriate to summarize the requirements of the British Government as embodied in the explosives-in-coal-mines order, and also to give the composition of the different explosives permitted.

THE EXPLOSIVES ORDER

Under section 1 of the order dated Feb. 10, 1910, the use of explosives, other than “permitted explosives,” is prohibited in seams (also the communicating shafts or drifts in process of being driven) in which dangerous quantities of inflammable gas have been found within the previous three months. This prohibition extends to coal mines which are not naturally wet throughout, permitted explosives only having to be used on roads and in dry and dusty parts of the mine (also communicating shafts in drifts in process of being driven).

Section 2 sets forth the conditions to be observed in such coal mines or parts: (a) Charges have to be fixed by a competent person called the shot-firer, who is appointed in writing by the owner, agent or manager, and whose wages do not depend on the mineral output. (b) charges have to be placed in properly drilled shot holes, must have sufficient stemming, and in each case consist of cartridge or cartridges of one description of explosive only. (c) cartridges have to be marked in the manner set forth in the schedules. (d) cartridges have to be fired by efficient electrical apparatus inclosed to afford reasonable security against gas ignitions, or by a permitted igniter fuse. (e) In firing, a cable not less than 20 yards in length has to be used, the shot-firer himself coupling up the cable to the charge before coupling the cable to the firing apparatus. He is required first to see that persons in the vicinity have taken proper shelter, and in the event of a misfire he must immediately disconnect the cable from the firing apparatus. (f) The electrical firing apparatus must

be provided with a removable handle or safety plug or push button, to be placed in position or operated only when the shot is required to be fired and released immediately after firing, the handle or safety plug to be in the personal custody

COMPOSITION OF PERMITTED EXPLOSIVES.

INGREDIENTS.	PARTS BY WEIGHT.	
	Not More Than.	Not Less Than.
Ammonite*		
Nitrate of ammonium.....	89	87
Di-nitro-naphthalene.....	13	11
Moisture.....	0.5	.....
Arkite*		
Nitro-glycerin.....	56	51
Nitro-cotton.....	4	3
Nitrate of potassium.....	23	21
Wood-meal.....	8	6
Chalk.....	0.5	.....
Oxalate of ammonium.....	16	14
Bellite*		
Nitrate of ammonium.....	95	92
Di-nitro-benzol.....	8	5
Moisture.....	0.75	.....
Bobbinite*		
Nitrate of potassium.....	66	63
Charcoal.....	20.5	18.5
Sulphur.....	2.5	1.5
Rice or maize starch.....	9	7
Paraffin wax.....	3.5	2.5
Moisture.....	3	.....
Carbonite*		
Nitro-glycerin.....	27	25
Nitrate of barium.....	36	30
Nitrate of potassium.....	36	30
Wood-meal.....	42	39
Sulphuretted benzol.....	0.5	.....
Carbonate of sodium.....	0.5	.....
Carbonate of Calcium.....	0.5	.....
The wood-meal to contain not more than 20 per cent. and not less than 10 per cent. by weight of moisture.		
Monobel powder*		
Nitrate of ammonium.....	82	78
Nitro-glycerin.....	11	9
Wood-meal (dries at 100 degrees C.).....	10	8
Moisture.....	2.5	0.5
Rippite*		
Nitro-glycerin.....	62.5	59.5
Nitro-cotton.....	4.5	3.5
Nitrate of potassium.....	20	18
Oxalate of ammonium.....	11	9
Castor oil.....	1.5	0.5
Wood-meal (dried at 100 degrees C.).....	5.5	3.5
Moisture.....	1	.....
Roburite No. 3*		
Nitrate of ammonium.....	89	86
Di-nitro-benzol.....	13	9
Chloro-naphthalene.....	2	.....
Moisture.....	0.5	.....
The chloro-naphthalene to contain not more than one part of chlorine.		
Westphalite No. 1*		
Nitrate of ammonium.....	96	94
Resin.....	6	4
Moisture.....	9.5	.....

of the shot-firer on duty. (g) Each explosive has to be used in the manner and subject to conditions prescribed in the schedules. (h) When two or more shots are fired in the same place, and are not fired simultaneously, the shot-firer must examine for gas immediately before firing each shot; he must not fire until the place and all contiguous places within 20 yd. are free from gas and safe for firing.

Section 3 prohibits the use of any explosive in main haulageways and intakes beyond 100 yd. of the coal face unless all workmen have been removed from the seam in which the shot is to be fired, and from all seams communicating with the shaft on the same level, except the men engaged in firing the shot, and other persons (not exceeding ten) necessarily engaged in attending to furnaces, boilers, engines, machinery, etc., or in inspecting the mine—or unless a permitted explosive is used as required by section 2, and the roof, floor and sides of the road or intake, within a distance of 20 yd., is at the time of firing thoroughly wet, either naturally or from the application of water.

DETONATORS MUST BE UNDER CONTROL OF MANAGER

In accordance with section 4, detonators must be under the control of the owner, agent or manager, or person appointed in writing by the same. They may be issued only to shot-firers or other persons authorized in writing, who must keep the detonators, until about to be used, in a locked case or box separate from other explosives.

Mines of clay and ironstone are exempted from sections 1, 2 and 3 of the order; also shafts in course of being sunk from the surface, or deepened, or drifts and other outlets being driven from the surface, except as provided in section 1. The order applies to each seam in a mine as if it were a separate seam.

Conditions regulating the manner of use and manufacture and marking of each explosive are given and must be observed. Altogether the explosives in the first schedule number 62, and it is claimed that during the time the order has applied to the mines of Great Britain, the death-rate from explosions has been reduced one-half or more. Selecting the ten most commonly used of the permitted explosives, they consist of mixtures as shown in the accompanying table, the name of the explosive being designated by an asterisk.

ONE POUND OF EXPLOSIVE USED FOR EVERY SEVEN TONS OF COAL MINED

In the year 1908 there were 275,540,745 tons of mineral raised from British mines, and it was ascertained that 23,586,132 lb. of explosives were used. About 33.9 per cent. of the weight of explosives was of permitted explosives, the remainder being gunpowder, etc. The estimated number of shots fired was 39,725,748, and thus approximately 0.6 lb. of explosive was used for each shot, and 1 lb. of explosive for every 7 tons of mineral. About 15,656,243 shots were fired by electricity, 577,589 by permitted

ignited fuse, 10,839,267 by other fuse, and 12,652,449 by squibs.

The permitted igniter fuse (Bickford's) is cited in the second schedule of the explosive order. It consists of a tube of tinned iron or steel, closed at one end, and containing a mixture of chlorate of potassium and sugar pressed into a pellet not exceeding 100 mg. in weight, in close contact with a hermetically sealed glass capsule containing concentrated sulphuric acid. A length of specially prepared colliery fuse is fitted into the open end of the tube, the fuse being securely attached to the tube and the joint being cemented by a tape. The fuse consists of a core of gunpowder in weight not exceeding 6 gm. per meter, traversed by two threads and inclosed by: (1) a layer of jute yarn; (2) a layer of jute yarn laid in the contrary direction; (3) a layer of tape; (4) a layer of tape laid in the contrary direction; (5) a layer of jute yarn secured by a suitable varnish. The three outer layers are specially treated with a fire-proofing composition.

Spitzbergen Coal Mining

Consul-General Henry Bordewich, of Christiania, Norway, furnishes the following information concerning the coal mines at Advent Bay, in the arctic island of Spitzbergen, in which Americans are interested:

The steamer "Munroe," belonging to the coal-mining company, passed Tromso, northern Norway, bound for Spitzbergen with supplies, on May 18, and on May 30 entered that port on its return trip, having accomplished the voyage in 12 days.

The officers report that among the 100 men who have passed the winter at work in the company's mines at Advent Bay there has been little sickness. The winter was unusually mild, and the work progressed under the most favorable conditions. About 8000 tons of coal, pronounced of excellent quality, have been extracted and made ready for market. The excavations are now so deep that work in the mines can be carried on regardless of weather and seasons. Suitable buildings have been erected, and substantial wharves are under construction. All concerned appear to be well satisfied. It is stated that, owing to the mild weather, the whole west coast of Spitzbergen all the way to Advent Bay is free of ice, and that the snow had disappeared from the mountains as early as May.

The F. Krupp Company, employed on May 1, 1910, according to U. S. Consul-General Richard Guenther, in its various works at Essen, Rheinhausen, Annen, Magdeburg and Kiel, 62,145 work people and 6840 officials, clerks, etc., a total of 68,985 persons as against 63,540 the year before.

Coal Briquetting in the United States

More briquets were made¹ in the United States in 1909 than in any preceding year. Sixteen briquetting plants were in operation, but five of them were only working experimentally and two of these were making briquets from peat. The total product in 1909 was 139,661 short tons, valued at \$452,697, an increase over the output of 1908 of 49,303 tons, or more than 54 per cent., in quantity, and of \$129,640, or 40 per cent., in value.

This output is insignificant compared with that of Germany, where 18,000,000 tons of briquets are made every year, but it shows that the briquet industry is at last getting started in the United States. The conditions in Germany, however, are

ing, lignite, coke breeze and peat; and with the increase in the use of by-product recovery coke-making processes and the mining out of the more accessible high-grade coals the briquet industry must surely find a larger market and make a greater output.

Storage Battery Extension to Colliery Power Plant

SPECIAL CORRESPONDENCE

In a paper presented at the forty-second general meeting of the institution of mining engineers, in London, on June 2, William Maurice said that in 1908, the double-shift system was established at Hucknall collieries (Nottingham), and about this time developments at No. 1

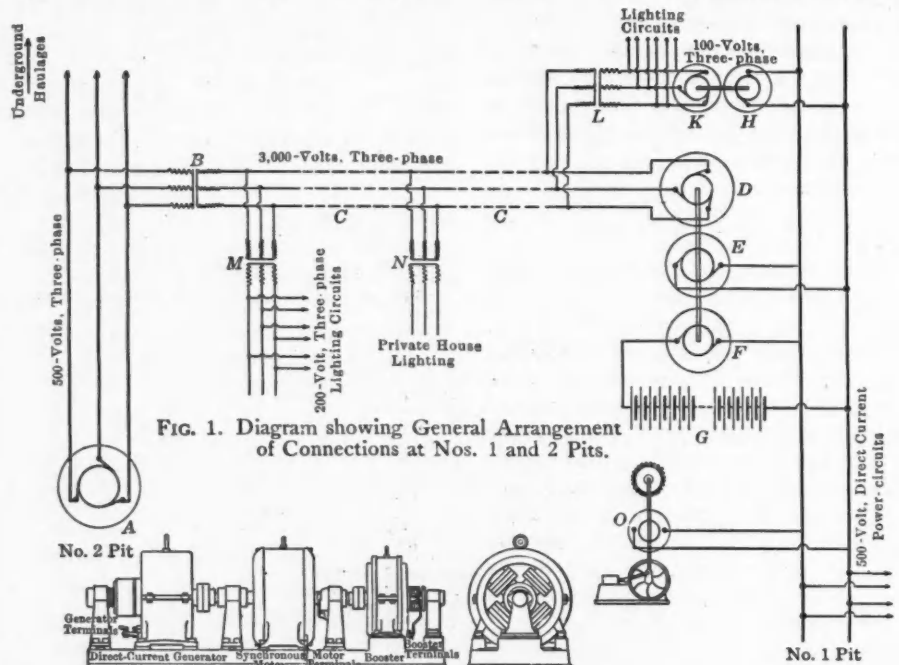


FIG. 1. Diagram showing General Arrangement of Connections at Nos. 1 and 2 Pits. FIG. 2. Side Elevation of Rateau Turbo-alternator Set. FIG. 3. End Elevation of Rateau Turbo-alternator Set. *The Engineering & Mining Journal*

ARRANGEMENT OF ELECTRICAL EQUIPMENT AT HUCKNALL COLLIERIES

very favorable to the success of the industry. Labor is cheaper, coal is dearer, and the wasteful "beehive" coke oven is unknown, for coal is coked in retort ovens supplied with by-product recovery equipment, which yields a large output of coal-tar pitch that is available for use as binding material for making briquets.

OBSTACLES TO THE BRIQUET INDUSTRY

In the United States the briquet industry is held back by the large supply of cheap natural fuel, by the high cost of labor, and by attempts to exploit secret processes for which extravagant claims are made but which have failed to make good. The material available for briquet making is abundant, consisting of anthracite culm, slack coal available for cok-

mine demanded the supply of considerably more power than was available. The intention was to dismantle everything

CAPACITY AND DISCHARGE RATE OF BATTERY.

Capacity, Ampere Hours.	Rates of Discharge, Amperes.	Duration, Hours.	Final Electromotive Force, Volts per Cell.
400	40	10	1.83
330	110	3	1.80
236	236	1	1.75

THE FULL CAPACITY IF THE BOXES WERE FITTED WITH 13 PLATES EACH WOULD BE:

Capacity, Ampere Hours.	Rates of Discharge, Amperes.	Duration, Hours.	Final Electromotive Force, Volts per Cell.
600	60	10	1.83
492	164	3	1.80
353	353	1	1.75

steam-driven (except the winders), and to erect new screening appliances and to increase the number of coal cutters.

¹"Coal Briquetting in the United States in 1909," by Edward W. Parker, U. S. Geol. Surv.

The problem to be solved lay in determining which was the most economical way of providing the required power.

DIRECT-CURRENT ADOPTED

The direct-current system was adopted on the ground that it would be less costly to install, lower in running charges, and more satisfactory in operation. The bulk of the extra power was required for coal cutting and the fact that direct-current

mands of coal cutters, haulage and other motors, and it also extended over hours in each day and days in each week when the generating station, at No. 2 pit was idle. The only way, therefore, of effectively utilizing the spare power was to provide means for storing and equalizing it.

TRANSMITTING THE SPARE POWER

In order to transmit the spare power to No. 1 pit, a 90-kw. transformer was

compounded direct-current generator; a Lancashire automatic reversible booster for regulating the working of the battery has been coupled on the same shaft.

DETAILS OF THE GENERAL SYSTEM

The accompanying diagrams illustrate the general system. Looking at Fig. 1, the general arrangement of the plant will be seen, A being the three-phase generator at No. 2 pit, B the step-up-trans-

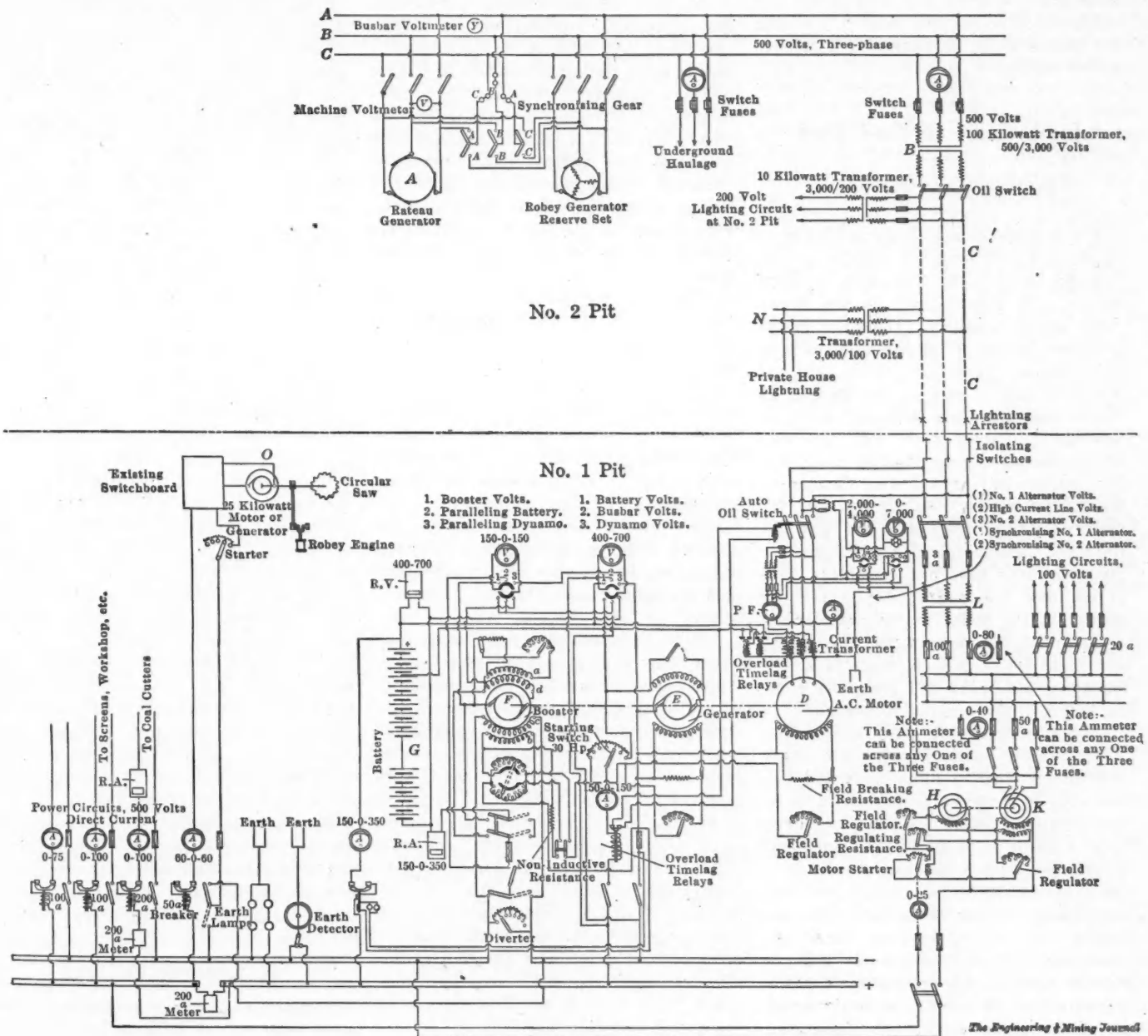


FIG. 4. DIAGRAM SHOWING CONNECTIONS AT NOS. 1 AND 2 PITS

coal cutters were already in use had to be taken into account.

Ultimately the problem became one of how to utilize the spare power of a Rateau turbo alternator. This was not a constant quantity, the haulage was ranging frequently from no load to near the full load of the generator. The power load at No. 1 pit was of a widely fluctuating character, owing to the intermittent de-

put down at the generating station, stepping up the pressure from 500 volts (the pressure of the generator) to 3000 volts, at which latter pressure the power is transmitted by a bare overhead wire to No. 1 pit, distant about 1 1/4 miles. At No. 1 pit, there has been installed a converting set, consisting of an 80 kilo-volt-ampere 3000-volt synchronous motor, direct coupled to a 500 volt, 100 ampere level

former, C the overhead line, and D, E, F, the converting set in the substation at No. 1 pit, consisting of the 3000-volt synchronous motor D, coupled to the direct-current generator E, and to the automatic booster F, the last named being connected in series with the battery G.

Figs. 2 and 3 show an outline drawing of the set, while Fig. 4 is a diagram of connections.

THE STORAGE BATTERY

The storage battery consists of 240 Tudor type cells, 9 plates per cell, but fitted in glass boxes of size sufficient to contain 13 plates as provision for a 50 per cent. increase in storage capacity. The table herewith gives the capacity and discharge rate of the battery as now working and the extra capacity obtainable by adding four plates per cell.

The installation has been in daily operation for a year and a half, with entirely satisfactory results, and it is hoped will serve to point out one way of meeting the ever-growing demands on a colliery power station.

Explosibility of Coal Dust

WASHINGTON CORRESPONDENCE

The recently created Federal Bureau of Mines has just issued a bulletin on the explosibility of coal dust, with chapters by J. C. W. Frazer, Axel Larsen, Frank Haas and Carl Scholz. The bulletin was prepared by the Technologic Branch of the United States Geological Survey, which is now a part of the Bureau of Mines, and therefore will be known as Geological Survey Bull. 425, but will be distributed by the Bureau of Mines. The author of the bulletin, George S. Rice, chief mining engineer of the Bureau, goes fully into one of the most serious and most perplexing problems that the coal mines have had to contend with in the last few years. He traces the growth in the belief in the explosibility of coal dust, summarizes the experiments and mine investigations that have established this belief and gives the present status of preventative measures.

In the introduction, Mr. Rice says: "Only within comparatively few years has the dry dust of bituminous and lignitic coal been generally recognized as an explosive agent more insidious, threatening and deadly to the miner than firedamp. Firedamp carries its own flag of warning—the 'cap' in the safety lamp—but coal dust, though visible, does not attract attention until present in large quantities. Firedamp is of local occurrence and except in notable and exceptionable cases is controllable by careful manipulation of the ventilating currents. If by mischance a body of firedamp is ignited in a mine, the force of the explosion is terrific, but the effect is localized unless dry coal dust is present, or unless (as it rarely happens) an explosible mixture of methane gas and air extends through large areas of the mine. In a dry mine, dust accumulates everywhere, and the blast from the ignition and combustion of bituminous dust may traverse miles of rooms and entries and wreck structures at the entrance of the mine. The comparative potential destructiveness of gas

and of bituminous dust is strikingly shown by the history of the Pennsylvania anthracite mines. These mines not infrequently have large inflows of gas, and the resulting mixtures of gas and air have sometimes been ignited, yet no such wide sweeping explosions have taken place, despite the presence of dry anthracite dust, as have happened in excellently ventilated bituminous mines."

THE COURRIÈRES DISASTER CAUSED A CHANGE IN OPINION

Mr. Rice reviews the experiments into the explosibility of coal dust in foreign countries and dwells at considerable length upon the attitude taken in France by the engineers, who, until the great disaster at Courrières in 1906, which cost 1000 lives, did not believe that coal dust would explode without the presence of firedamp. Since that terrible disaster, a testing station has been established in France and now the French engineers are fully convinced of the dangers of coal dust.

"The coal-dust question in this country," continues Mr. Rice, "cannot be said to have awakened widespread interest among mining men until the terrible disasters of December, 1907, which resulted in the death of 648 men. In response to a demand by those interested in coal mining throughout the country, Congress, in 1908, made an appropriation for the investigation of mine explosions. The United States Geological Survey was charged with the investigation. A testing station was at once decided upon and was established at Pittsburg, Pennsylvania.

"While it is probable that for several years the leading mining men in the country have believed in the explosibility of coal dust without the presence of firedamp, yet until the public demonstrations were given at the testing station at Pittsburg, during 1908-09, and reports were received of similar tests made abroad, a large proportion disbelieved. These tests were so convincing to those who saw them, and such general publicity has been given to them, that it is now exceptional to find a mining man who does not accept the evidence of the explosibility of coal dust. The question of the day no longer is 'will coal dust explode?' but 'what is the best method of preventing coal dust explosions?'"

CONCLUSIONS ON DUST PROBLEM

The following are some of the tentative conclusions of Mr. Rice on the dust problem:

"That coal dust will explode under some circumstances, both in the presence of firedamp and without it, is now generally accepted by mining men. The writer fully agrees with this and takes the following views of the explosibility of dust and the conditions necessary for explosion.

EFFECT OF VOLATILE COMBUSTIBLE MATTER

"Experiments at Pittsburg indicate that under ordinary conditions the dust must be from coal having at least about 10 per cent. of volatile combustible matter, though in certain foreign experiments, it is claimed explosions were obtained with charcoal dust.

"Dusts with higher percentages of volatile combustible matter are more sensitive, ash, moisture contents, and size being constant. This view is based partly on the preliminary experiments at Pittsburg and on the results of experiments of M. Taffanel and other foreign investigators. Where there is a large amount of dry coal dust, judging from the Pittsburg experiments, a humid atmosphere has little effect on ignition of dust or propagation of an explosion. A long continuance of the humid conditions renders the coal dust moist and inert, but the presence of moisture in the air at the moment of explosion is not sufficient to prevent an explosion; that is, not enough moisture is carried by the mine air to reduce materially the temperature of the flame. Fully saturated vapor at 65 deg. F., an ordinary mine temperature in this country, weighs 6.78 grains per cu.ft. (15.5 grams per cu.m.) Coal dust suspended in such a saturated atmosphere in a cloud of moderate density weighs, say, 200 grams per cu.m. At the figures given, the weight of vapor is but 7.8 per cent. of the weight of dust. The Pittsburg experiments with wetted dust showed that several times this percentage of moisture in the dust, in addition to a nearly saturated atmosphere, was required to prevent propagation.

"Probably with a low dust density, the relative humidity of the air would be an important factor in tending to prevent the initiation of an explosion. However, the great purpose of artificially humidifying mine air is that it may serve as a vehicle for carrying water to the dust."

Mr. Rice concludes by reviewing the various remedies that are offered for the coal-dust problem, giving the good and bad points of each.

A Substitute for Steel

A new alloy was proclaimed by Elwood Haynes, of Kokomo, Ind., before the American Chemical Society in session at San Francisco, on July 16, 1910. It is stated that the new metal is an alloy of cobalt and chromium. It is said not to oxidize, will take an edge comparable with steel, retains its luster and takes a hard polish.

Pocket knives and a razor have been made of this, and fruit knives are said not to tarnish from contact with the juices of the fruit. The cost is greater than steel, but in its practical utility it is expected to have a large advantage.

Report on Coal Tests Made by Canadian Experts

SPECIAL CORRESPONDENCE

The Summary Report of the Mines Branch of the Canadian Department of Mines of 1909 contains a preliminary report by Dr. John Bonsall Porter, of the coal tests, undertaken by himself and Professor Durley at McGill University, Montreal, begun in 1907. These tests have now been completed and a detailed report is in course of preparation. Doctor Porter gives a general statement of the character and scope of the work, embodying some of the conclusions reached, and particulars as to the known extent and qualities of the Canadian coalfields.

The coals subjected to tests included samples from nearly all the Canadian mines already developed and in a condition to place their output upon the market; upward of fifty samples of about 10 tons each being secured. These were subjected to coal-washing, boiler and gas-producer tests, as well as coking trials. Chemical determinations were made as to the various constituents of each sample in addition to physical determinations of the fusion temperature of ashes, specific gravity, porosity and strength of cokes, and the calorific values of solid and gaseous fuels. Special investigations were also made on the determination of sulphur in coal, determination of volatile matter in coal and coke, solubility of coal in water, determination of physical values of coke, weathering of coal, etc. The thoroughness and extent of the work is indicated by the fact that each complete test of a coal involved over 400 separate determinations.

DETERMINING WHETHER A COAL WILL COKE OR NOT

It has hitherto been difficult to answer the question as to whether a certain coal would make a good coke without conducting a series of oven trials on a large and costly scale. Even a full-sized experimental oven is unsuitable for such work, as its operation differs much from that of an oven surrounded by others. The only safe course has been to send a considerable quantity of each coal to a bank of ovens and to test it under standard conditions, repeating the operation if necessary with different coking periods to reach a definite conclusion. It was considered impossible to carry out costly tests of this character upon upward of fifty different samples; therefore, an extended investigation was undertaken at the works of the Dominion Iron and Steel Company, Sydney, N. S., with a view to developing some reliable method of working on a small scale. These experiments, supplemented by tests on various types of ovens in different places, led to a sat-

isfactory conclusion; and it is now possible to test coals in lots of, say, 50 lb., the resultant cokes being in every way similar to those produced in commercial ovens and in most cases indistinguishable from them.

COKING TESTS

The method in brief is as follows: The sample of coal, which should be as fresh as possible, is crushed, washed, if necessary, and slightly moistened in some cases, and is thus brought to the condition in which it would normally go to the ovens. It is then put into rectangular boxes of heavy sheet iron, each holding say 50 lb. These are freely perforated to permit the escape of gas, the perforations being blanked with paper to prevent the egress or ingress of coal. The boxes are weighed and placed in an oven which is being charged, as a part of the regular charge, and are coked under normal conditions. On the withdrawal of the charge the boxes are quenched as promptly, yet as lightly as possible, and are then dried and weighed before opening. In addition to the trials to determine whether the coals would or would not coke, a series of tests was made to determine the effects of moistening, compressing, etc., also of different temperatures and the duration of the coking period.

SUBDIVISION OF CANADIAN COALFIELDS

The report presents some very general conclusions respecting the characteristics of the products of the great coalfields of Canada, which may be roughly grouped into four divisions, their respective coal contents being estimated as follows:

1. Maritime provinces—bituminous coal, 10,000,000,000 tons.
2. Central Plains and Eastern Rocky Mountains, including Manitoba, Saskatchewan, Alberta, and a portion of British Columbia—anthracite, 400,000,000 tons; bituminous, 80,000,000,000 tons; lignite, 80,000,000,000 tons.
3. Pacific Coast and the Western Mountains, including most of British Columbia and the Yukon—anthracite, 10,000,000 tons; bituminous, 2,000,000,000 tons; lignite, 1,000,000,000 tons.
4. The Arctic-Mackenzie basin—lignite only, 500,000,000 tons.

The Nova Scotia coals are similar to the ordinary grades of English and Scotch, though on the average they may have a little more ash and considerably more sulphur than the British seams of the same thickness. Most of them make fair coke, and on the whole may be taken as being fair to good steam coals and excellent for domestic use. The largest part of Canada's coal supply is from this source.

The coals of section 2 are enormous

in quantity and many of them of excellent quality. Some of the best Crows Nest coals are admirable in every respect. These coals are all of comparatively recent age geologically (Cretaceous) and, except the lignites, which occur chiefly in the plains, are found in the main uplift of the Rocky Mountains, in beds much tilted and often irregular. The coals are consequently less uniform in quality than they would otherwise be, and many of them carry large quantities of ash, either inherent, or as an unavoidable mixture from mining operations.

The various seams are largely exploited; the anthracite by the Canadian Pacific Railway near Banff, the bituminous by many companies, most of them operating near the Crow's Nest Pass branch of the Canadian Pacific Railroad, and the lignites in numerous places in the provinces of Alberta, Saskatchewan and Manitoba. The bituminous coals are quite variable, ranging from high-grade steam coals down. Some make admirable coke, others will do so if washed free from excessive impurities, and others, which do not coke well or will not coke at all, are useful for steam and domestic purposes. The greater part are still unexploited, lying to the north of present lines of traffic.

COAL DEPOSITS ON PACIFIC COAST

The Pacific Coast coal deposits are best developed in Vancouver Island where they have been mined for many years and also in Graham island to the north where mining has not yet begun. Smaller but important fields have been found in many localities. The Vancouver Island coals are more or less normal bituminous and some of them coke well. Others are largely lignite, or lignitic bituminous, some of them coking well, but mostly unsuitable for metallurgical uses. They are in general well adapted for domestic purposes and for use as steam coal. Their impurities vary greatly, but on the whole they resemble the coals of the second division.

A New Aluminum Alloy

The British firm of Vickers Sons & Maxim have announced that it will put on the market in October a new aluminum alloy, which is to be called duralumin. It is the discovery of the company's chief chemist, Mr. Weeks, who claims it is as strong as steel, while its weight is one-third that of brass, or only slightly heavier than aluminum. It can be rolled, drawn, stamped and forged and is less subject to corrosion than any other aluminum alloy.

The Stavely Coal and Iron Company, in the Nottingham district in England, is preparing plans for a large plant for the manufacture of slag cement.

MINING AND METALLURGICAL PATENTS

A CLASSIFIED LIST OF NEW INVENTIONS

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

BRIQUET PRESS. John T. Davis, Oakland, Cal., assignor to Davis Briquet Company, Oakland, Cal. (U. S. No. 967,617; Aug. 16, 1910.)

COAL CUTTING—Improvements in Coal-Cutting Machines. William Purdeu, Mansfield, Eng. (Brit. No. 20,330 of 1909.)

COAL-MINING APPARATUS. Andrew Powell, Uniontown, Penn. (U. S. No. 968,881; Aug. 30, 1910.)

COKE—Improvements in Coke Ovens. Walther Hiby, Crigglestone, near Wakefield, England. (Brit. No. 4069 of 1910.)

FIRE DAMP—Device for Indicating the Presence of Fire Damp by Means of a Selenium Cell and a Safety Lamp. Heinrich Freise, Bochum, Germany. (Brit. No. 9543 of 1910.)

SAFETY LAMPS—Improvements in Miners' Safety Lamps. Laidler & Sons, and James McLoughlin, Durham, Eng. (Brit. No. 17,405 of 1909.)

SCREEN—Coal Screen. Hiram B. Sackett, Chicago, Ill. (U. S. No. 969,659; Sept. 6, 1910.)

COPPER

EXTRACTION—Electrolytic Process of Extracting Metals from Their Ores. William E. Greenawalt, Denver, Colo. (U. S. Nos. 968,651, 968,652 and 968,845; Aug. 30, 1910.)

GOLD AND SILVER

AGITATOR AND DISINTEGRATOR. Thomas Edwards, Ballarat, Victoria, Australia. (U. S. No. 967,743; Aug. 16, 1910.)

AMALGAMATOR. Natale Simon and Eugene E. Thibault, Butte, Mont., assignors of one-third to Edwin P. Sulter, Butte, Mont. (U. S. No. 968,888; Aug. 30, 1910.)

CYANIDING—Fluid-Distributing Pipe for Ore-Treatment Vats. Charles Edwin Draper Usher, Johannesburg, Transvaal, assignor to Adair-Usher Process, Ltd., Johannesburg, Transvaal. (U. S. No. 965,767; July 26, 1910.)

GOLD-SAVING RIFFLE. Carl Erickson, San Francisco, Cal. (U. S. No. 967,745; Aug. 16, 1910.)

GOLD-WASHING AND SEPARATING MACHINE. Edmund Randolph, Jacksonville, Fla. (U. S. No. 968,883; Aug. 30, 1910.)

PRECIPITATION APPARATUS. Thomas Edwards, Ballarat, Victoria, Australia. (U. S. No. 967,744; Aug. 16, 1910.)

SLIME TREATMENT—Improvements in or Relating to the Separation of Liquids from Finely Divided Materials such as Gold Slime. A. Swan, London, Eng. (Brit. No. 25,809 of 1909.)

TUBE-MILL LINING. Sidney Sherman Osborn, Germiston, Transvaal. (U. S. No. 965,730; July 26, 1910.)

IRON AND STEEL

BLAST FURNACE. James Scott, Pittsburg, Penn. (U. S. No. 964,885; July 19, 1910.)

BLAST-FURNACE Charging Apparatus. George L. Collord, Birmingham, Ala. (U. S. Nos. 967,328 and 967,329; Aug. 16, 1910.)

CEMENT FROM SLAG—Apparatus for Producing Cement. Hermann Passow, Blankanese, Germany, assignor, by mesne assignments, to the Atlas Portland Cement Company, New York, N. Y. (U. S. No. 964,805; July 19, 1910.)

DESULPHURIZING STEEL—Improvements in the Treatment of Steel for Desulphurizing and Deoxidizing Purposes. R. H. Wolf, New York City. (Brit. No. 18,962 of 1909.)

DIRECT PRODUCTION—Improvements in the Direct Production of Iron and Steel from Oxide Iron Ores. William S. Simpson and Howard Oviatt, London, Eng. (Brit. No. 9163 of 1909.)

MANGANESE STEEL—Manufacture of Manganese Steel. Winfield S. Potter, New York, N. Y. (U. S. Nos. 968,601 and 968,602; Aug. 30, 1910.)

MANUFACTURE OF IRON-NICKEL-COPPER ALLOYS. Gulliam H. Clamer, Philadelphia, Penn. (U. S. No. 965,871; August 2, 1910.)

REDUCING FURNACE—Furnace for Reducing Metallic Oxides. Charles Morris Johnson, Avalon, Penn., assignor to Crucible Steel Company of America, Pittsburg, Penn. (U. S. No. 964,871; July 19, 1910.)

REDUCTION PROCESS—Method of Reducing Metallic Oxides. Charles Morris Johnson, Avalon, Penn., assignor to Crucible Steel Company of America. (U. S. No. 964,868; July 19, 1910.)

REFINING—Process of Refining Iron. Josy Flohr, Rodange, Luxemburg, assignor to Société Anonyme des Hauts Fourneaux J. Forges, Dudelange, Luxemburg. (U. S. No. 968,758; Aug. 30, 1910.)

LEAD, ZINC AND OTHER METALS

ALUMINA—Method of Producing Pure Alumina. Ottokar Serpek, Niedermorschwiller, near Dornach in Alsace, Germany. (Brit. No. 17,611 of 1909.)

LEAD—Apparatus for Refining and Desilverizing Lead. George Powell Hulst, Omaha, Neb. (U. S. No. 965,464; July 26, 1910.)

TIN—Improvements in Apparatus for the Treatment of Metalliferous Slimes. James M. Holman, John L. Holman and Joseph Coad, Camborne. (Brit. No. 16,936 of 1909.)

SODIUM—Process of Treating Ores. Philip A. Emanuel, Aiken, S. C. (U. S. Nos. 957,755 and 957,756; May 10, 1910.)

ZINC—An Improved Method and Furnace for the Reduction of Zinc. A. R. Lindblad and O. Stalhane, Ludvika, Sweden. (Brit. No. 25,979 of 1909.)

ZINC—Apparatus for Charging the Retorts of Zinc and Other Analogous Furnaces. Emile Dor-Delattre, Liege, Belgium. (U. S. No. 969,254; Sept. 6, 1910.)

ZINC—Electrolyte and Method of Electrodepositing Zinc. Edward F. Kern, Knoxville, Tenn., assignor of one-half to Percy S. Brown, New York, N. Y. (U. S. No. 967,200; Aug. 16, 1910.)

ZINC—Improvements in or Relating to the Manufacture of Oxide of Zinc for Smelting. R. W. E. MacIvor, Waldemar Hommel, and the Metals Extraction Corporation, Ltd., London. (Brit. No. 19,386 of 1909.)

ZINC—Improvements in the Extraction of Zinc from Zinc Sulphide Ores. Imbert Process Company, New York. (Brit. No. 28,487 of 1909.)

NONMETALLIC MINERALS

CRYOLITE—Process of Making Artificial Cryolite. Gerhard Loesekann, Hanover, Germany. (U. S. No. 969,381; Sept. 6, 1910.)

FELDSPAR—Process of Rendering Potash Compounds Soluble. Franklin R. Carpenter, Denver, Colo., assignor to American Iron and Steel Alloys Co., Denver, Colo. (U. S. No. 959,841; May 31, 1910.)

MAGNESITE—Method of Preparing Powdered Magnesite. Joseph Leese, Manchester, England. (U. S. No. 968,669; Aug. 30, 1910.)

PETROLEUM—Obtaining Petroleum Products. Herman Frasch, New York, N. Y., assignor to Standard Oil Company, Bayonne, N. J. (U. S. No. 968,760; Aug. 30, 1910.)

PYRITES—Improvements in and Connected with the Smelting of Pyrites and Other Sulphide Ores. A. Hagenmiller, Tarica, Peru. (Brit. No. 9958 of 1909.)

MINING—GENERAL

CANDLESTICK—Folding Candlestick. Geo. Winchester, Black Bear, Idaho. (U. S. No. 961,190; June 14, 1910.)

COMPRESSED AIR—Improvements in Dis-

tributing Devices for Compressed Air Tools, Rock Drills and the Like. Armaturen-und Maschinenfabrik "Westfalia" Gesellschaft, of Gelsenkirchen, Germany. (Brit. No. 10,228 of 1910.)

DRILL—Electromagnetic Drill. Frank E. Baney, Smelser, Wis., assignor of one-half to James E. Kennedy, Platteville, Wis. (U. S. No. 968,729; Aug. 30, 1910.)

DRILL-FEEDING MECHANISM. Daniel Shaw Waugh, Denver, Colo., assignor to Denver Rock Drill and Machinery Company, Denver, Colo. (U. S. No. 969,319; Sept. 6, 1910.)

DRILL HOLES—Apparatus for Testing Drill Holes. Matthias Garvey, Mineville, N. Y. (U. S. No. 965,808; July 26, 1910.)

DRILL SHARPENER. Richard A. Schmidt Bayard Station, N. Mex. (U. S. No. 969,081; Aug. 30, 1910.)

HOISTING ENGINES—Controlling Apparatus for Hoisting Engines. Clarence R. Welch, Butte, Mont. (U. S. No. 965,779; July 26, 1910.)

PROPS—Improvements in or Relating to Props for Mines. August Winz, Essen-Rutten-scheid, Germany. (Brit. No. 13,188 of 1910.)

ROTARY MINING DRILL. George G. Barker, Upland, Penn., assignor of one-half to William C. Alexander, Media, Penn. (U. S. No. 966,377; August 2, 1910.)

TUNNELING MACHINE. George A. Fowler, Denver, Colo. (Brit. No. 16,319 of 1909.)

VENTILATION—Mine-Ventilating Apparatus. William Dunn, Wheatland, Penn. (U. S. No. 963,002; June 28, 1910.)

ORE DRESSING—GENERAL

CRUSHING—Improvements in Combined Ball and Tube Mills. Joseph E. Kennedy, New York. (Brit. No. 6464 of 1910.)

DRY SEPARATOR. Adam Weir Ringland, McAlester, Okla. (U. S. No. 968,984; Aug. 30, 1910.)

GRIZZLY. Herbert A. Corliss, Grants Pass, Ore. (U. S. No. 969,603; Sept. 6, 1910.)

JIGGING MACHINE for Dressing Ores. Henry Richard Hancock, Burnside, South Australia, Australia, assignor to Allis-Chalmers Company, Milwaukee, Wis. (U. S. No. 965,294; July 26, 1910.)

MAGNETIC SEPARATORS—Improvements in and Relating to Magnetic Ore Separators. Friedrich W. Carl Stachow, Brussels, Belgium. (Brit. No. 3314 of 1910.)

ORE CONCENTRATOR. Ulysses S. James, Newark, N. J., assignor to James Ore Concentrator Company, Newark, N. J., a Corporation of New Jersey. (U. S. No. 968,951; Aug. 30, 1910.)

SEPARATION—Ore Separating or Concentrating Machine. Walter R. Lins, Philadelphia, Penn. (U. S. No. 962,575; June 28, 1910.)

METALLURGY—GENERAL

ALUMINOTHERMIC REDUCTION PROCESS—An Improved Method of Obtaining Soluble Slag in the Aluminothermic Reducing Process for the Production of Metals. Josef Buchel, Vorarlberg, Austria. (Brit. No. 16,958 of 1909.)

ELECTRIC FURNACES—Means for Regulating Electrodes in Electric Furnaces. James Henry Reid, Newark, N. J. (U. S. No. 968,603; Aug. 30, 1910.)

ELECTRIC SMELTING—Method of Utilizing the Gases Resulting from Reduction Operations Carried Out in Electric Furnaces and Electric Furnaces for Carrying Out the Same. A. Heigerstein, Vienna, Austria. (Brit. No. 24,498 of 1909.)

ELECTROLYSIS—Method of Reducing Ores. Frederick M. Becket, Niagara Falls, N. Y., assignor to Electro Metallurgical Company. (U. S. No. 967,159; Aug. 16, 1910.)

ROASTING, CALCINING, ETC.—Improvements in or Relating to Furnaces for the Roasting, Calcining, Smelting and Treatment of Ores, and Which Are Also Applicable for the Reheating of Billets and for the Heating of Metals Generally. Leonard A. Smallwood, Birmingham, England. (Brit. No. 14,812 of 1909.)

PERSONAL

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

Herbert Carrichael, of Victoria, B. C., provincial assayer, has gone to England on a two months' visit.

J. L. Saint Dizier has resigned as manager of the Encinillas Mines of Santa Rosalia, Chihuahua, Mexico.

S. R. Heakes, general manager of the Kerr Lake mine, Cobalt, Ont., has gone to New York for medical treatment.

Anton Eilers, who has been spending the summer in Germany, will be home shortly before the end of September.

H. E. Schlieff, of Berlin, Germany, recently investigated the tungsten deposits in Stevens county, Washington.

George E. Farish, who has spent the summer examining placer ground in Alaska, is now on his way to Durango, Mexico.

Howland Bancroft has left Washington for Arizona, where the next four months will be spent in studying the geology in the Ray quadrangle.

Byron C. Slinning, of Chicago, is now in Texas constructing a dam and hydroelectric power plant at Marble Falls on the Colorado river.

Dr. W. G. Miller, provincial geologist of Ontario, has returned to Toronto, Ont., from attending the Geological Congress, at Stockholm, Sweden.

M. S. Davys, for years an active mine owner and manager in West Kootenay, recently left Nelson, B. C., on his return to his home in England.

S. M. Thorne, formerly of the Silver Leaf mine, has succeeded J. W. Astley as engineer of the Peterson Lake Mining Company, of Cobalt, Ontario.

William Cooper, general manager of the Capital Mining and Tunnel Company, Georgetown, Colo., will retire Sept. 30, after nine years' service with the company.

W. C. Thomas, formerly manager at Boundary Falls, B. C., for the Dominion Copper Company, and since resident in Salt Lake City, Utah, has gone to live at Vancouver.

Martin Nordegg has returned to Toronto, Ont., from the Canadian West, where he has been engaged in connection with the operations of the German Development Company.

A party including Ambrose Monell, Capt. J. R. DeLamar, and Charles L. Dennison, of New York, have been making an inspection of the Dome property at Porcupine, Ontario.

E. S. Mendels, agent of the Curb market in New York, has been appointed a delegate to represent the Stock Exchange

at the meeting of the American Mining Congress, at Los Angeles.

Richard Newsam, of Peoria, has been appointed manager of the rescue stations which will be established in Illinois by the commission appointed under the recent session of the Legislature.

Leo G. Smith, formerly of the Bucyrus Steel Casting Company, Bucyrus, O., has been appointed manager of the steel plant of the Canada Iron Corporation, at Londonderry, Nova Scotia.

Claude T. Rice, formerly of the editorial staff of the JOURNAL and lately editor of the *Mines and Methods*, has resigned from the latter position and has rejoined the JOURNAL as special correspondent.

Marshall D. Draper and John Gross have formed the firm of Draper & Gross, to carry on a general engineering business in mining and metallurgy, with offices at 746 Equitable building, Denver, Colorado.

Walter H. Bunce, late of the Hercules mines, has been appointed general superintendent of the Sunnyside mine at Silverton, Colo. H. Y. Russell succeeds Mr. Bunce as general superintendent of the Hercules mine.

Dyke V. Keedy, of the firm of Dietz & Keedy, of Boston, is at present in Nova Scotia examining copper properties for Boston interests. Carl F. Dietz, of the same firm, has left Boston for Denver and New Mexican points on professional business.

W. L. Coulson, manager of the Canadian Collieries (Dunsmuir), Ltd., operating the Dunsmuir coal mines on Vancouver island, B. C., is examining Rocky mountain coal properties in northwestern Alberta for the MacKenzie & Mann syndicate, Toronto, Ontario.

Rupert K. Stockwell has resigned his position as construction engineer for the United States Smelting, Refining and Mining Company, at Salt Lake City, Utah, and is now assistant general superintendent of the Alpha Portland Cement Company, at Easton, Pennsylvania.

Robert Musgrave, who, since his retirement from the management of El Tigre mine, Sonora, Mexico, has been on a six months' holiday, has gone to Sultepec, Mexico, for the Exploration Company of England and Mexico. His brother, Edward C. Musgrave, is now of the firm of Kerr & Musgrave, Mexico City.

Sprague, Keyes & Jackson, consulting engineers, 88 Broad street, Boston, have been engaged by Bailey-Wood Coal Company, of Woodbay, W. Va., to draw up specifications and plans, also to purchase the machinery for the power plant and ventilation of the mines. This work will be under the direct supervision of Timothy W. Sprague.

Dr. J. J. Darlington, chief sanitary officer of the United States Steel Corpora-

tion, recently spent 10 days in the Birmingham district, and in addition to visiting the various plants of the Tennessee Coal, Iron and Railroad Company, met the sanitary and health officers of Birmingham and a number of physicians to whom he delivered an address on sanitation. Dr. Darlington visited the new town of Corey.

J. McEvoy, of Toronto, Ont., and R. G. Drinnan, of Vancouver, mining engineers engaged by a syndicate including Hon. George A. Cox, Hon. Robert Jaffray and Sir Henry Pellatt to prospect for coal in the west, report the discovery of an extensive deposit, equal in quality to that of the Crows Nest mines. It is situated along the main line of the Grand Trunk Pacific railway, west of Edmonton and north of the Brazeau collieries, and embraces several thousand acres.

The firm of Carpenter, Brennon & Ryan, mining engineers, Mexico City, has been dissolved by mutual consent, the partners desiring to devote more time to their individual interests. Alvin B. Carpenter will look after his personal interests in Mexico, California and the Lake Superior country. John C. Brennon retains his headquarters in Mexico City. E. P. Ryan has become manager of the International Machinery and Engineering Company, with office in Mexico City.

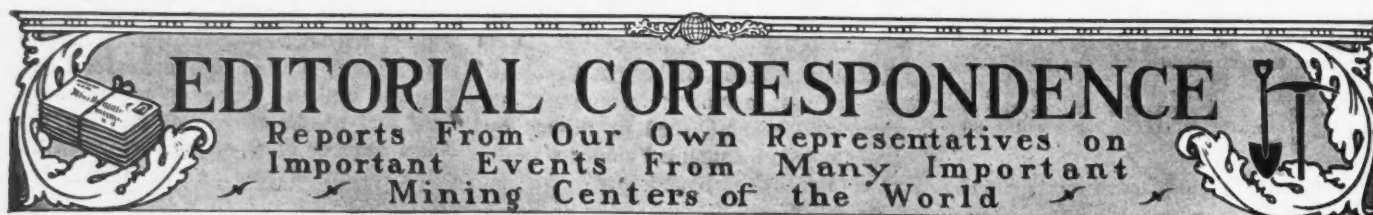
OBITUARY

Penrose H. Hibbard died at Copperhill, Tenn., Sept. 12. He was born at Columbus, O. For a number of years he had been connected with the Tennessee Copper Company.

SOCIETIES and TECHNICAL SCHOOLS

Mining and Metallurgical Society of America—The following have been elected to membership in the Mining and Metallurgical Society of America: Henry S. Drinker, President Lehigh University; Walter Fitch, Eureka, Utah; John T. Fuller, Murfreesboro, Ark.; Prof. L. D. Huntton, of Sheffield Scientific School; Sidney J. Jennings, New York; Benjamin B. Lawrence, New York; R. Van A. Norris, Wilkes-Barre, Penn.; J. A. Van Mater, New York.

California State Miners' Association—The California Miners' Association, for many years an active factor in the mining industry of the State, did not hold an annual convention this year, and it has even failed to appoint delegates to the American Mining Congress, at Los Angeles. It does not appear that San Francisco will be officially represented at the congress. Lack of financial support, and of interest among the mining communities of the interior, are the causes of this inactivity of the association, which did good work for mining interests for a long period.



EDITORIAL CORRESPONDENCE

Reports From Our Own Representatives on
Important Events From Many Important
Mining Centers of the World

San Francisco

Sept. 16—Now that the Western Pacific railroad has been opened for passenger as well as freight traffic, there is renewed activity in the mining sections of Butte, Plumas and Lassen counties, east of Oroville to the summit of the Sierra. Marysville and Oroville are now on a transcontinental line. Territory formerly only reached from these places by freight teams is now open to rail transportation and the population will naturally increase, bringing added business.

The ascent of the Sierra from the west is accomplished by virtually a 1 per cent. grade for 100 miles from Oroville to the summit. All along the North Fork of the Feather river is the scene of early-day placer mining, with occasional quartz camps, and all this country is experiencing a revival. Lack of cheap transportation has kept the country back and prevented extensive mining development and the investment of capital. In addition to the counties named, Sierra county will also be benefited materially.

With modern methods many mines long closed can be profitably operated, and some of the old gravel deposits can be reworked. There are known deposits of gold, iron and copper that have never been worked, which can now be utilized. The extensive deposits of copper ore around Taylorville and Genessee, on which development has been going on for some years, will from now on be a source of profit. Thousands of tons of ore have been made ready for shipment by the new road. The copper area is an extensive one, but there is only one small smeltery in the district, and most of the miners depend on shipping their ores.

There are along the railroad north of Oroville a few large quartz mines in operation, but there are hundreds being worked on a small scale by men without capital. It has heretofore cost so much to equip properties in this region, that there has been small encouragement for people to make extensive mining investments unless exceptionally rich ore was found. The finding of unusually rich ore in so many old mines in the Alleghany and Forest sections of Sierra county in the last two years, has attracted much attention in those northern counties, and now that a railroad traverses them numbers of other old properties will be reopened. Prospectors have gone into these fields in numbers so that doubtless many new mines will be found and opened. The whole section is on the eve of prosperous development.

Denver

Sept. 17—The local papers have printed columns about the discovery of carbonate of zinc ores in apparently worked-out mines at Leadville, and stating that in the Hilltop, on the Mosquito range, a year ago the manager found that "what looked like country rock was high-grade carbonate of zinc." Then came a similar discovery in the Robert E. Lee; and now S. D. Nicholson, manager of the Western Mining Company, is reported to have made an investigation in the Maid and Henrietta, Wolfstone and other properties; "with the result of revealing enormous masses of carbonate and silicate of zinc, which had been heretofore supposed to be barren rock." It is further stated that this latter ore averages 45 per cent. zinc, can be shipped direct to the smelteries, and that the discoveries made as above will make a production by the first of the year of 5000 tons per month. It is stated that thousands of tons of this new grade of ore were found standing alongside the worked-out orebodies of the Maid of Erin, Adams, Henrietta, Wolfstone, Mahala, Morning and Evening Stars, Waterloo and Big Chief, and that the average width of the ore is 6 ft. If all this is true, what an interesting commentary on the mineralogical perspicuity and technical ability of the hundreds of mining engineers, managers and superintendents who have been connected with or examined these properties during the past 20 or 30 years. It hardly seems possible that even the ordinary intelligent working miner would pass by 6 ft. of high-grade zinc ore as country rock, not to mention the mine manager, who should always have the motto, "Crosscut and assay," pasted in his hat, and who, in this case, if all said be true, must have totally ignored a very important part of his work. Later reliable reports tend to confirm this interesting discovery.

At Cripple Creek, 26 judgments have been obtained against Teller county in the favor of a large number of mining companies for money paid for taxes. These taxes were paid under protest, on the grounds that they were too high, as each company's property was non-producing. The amount to be refunded is \$3666 with interest at 10 per cent., and court costs in each case, a total of about \$4500.

It is now given out in the local press that the Malm electrochemical plant at Georgetown, erected at a cost of \$200,000, will be ready to run in 60 days.

Butte

Sept. 20—The recent visit of Attorney General Wickersham to Butte and Anaconda has directed attention to the suit which the United States Government instituted against the Anaconda company several months ago for the purpose of remedying the alleged smoke evil of the Washoe smeltery at Anaconda. The attorney general made a brief visit to the plant and the farm lands which the smoke is alleged to have damaged, and on the trip was accompanied by attorneys representing all parties interested. Unless the Government and the Anaconda company can come to some agreement for the lessening of the evil effects of the smoke it is probable that the litigation will be long drawn out and will eventually reach the U. S. Supreme Court.

Members of the miners union throughout the State are taking active part in the party conventions now being held, so that their interests before the coming legislature may be represented. There have been several matters upon which the unions have desired legislation, particularly with reference to the ventilation of mines and the enacting of an employers' liability act.

While the injunction recently issued against the Butte-Balaklava company in the suit brought by the Anaconda company has caused work to be stopped on a portion of the property, yet development work is progressing steadily on the other veins and will continue unaffected by the litigation. The court has modified the injunction issued so as to allow the Butte-Balaklava company to timber the workings in the disputed territory but has refused for the present to make the injunction reciprocating so as to enjoin the Anaconda company from mining on the same veins.

Salt Lake City

Sept. 20—Working forces have been increased at the Bingham mine of the United States Smelting, Refining and Mining Company, and shipments will be raised from 260 to 350 tons daily. A part of this ore is treated by the Huff electrostatic process at the Midvale zinc plant, the daily capacity of which is approximately 50 tons. It is proposed to increase this capacity. At present there are five furnaces smelting lead ore at Midvale.

The aerial tramway at the Centennial-Eureka mine is not being used, as ore is handled through the Holden tunnel,

which cuts the shaft near the 500-ft. level. Timber, coal and supplies are sent in through the tunnel. The new electrical pumping equipment on the 2200 level has been tried. Work on the 1700-ft. water column caused shipments to be suspended for about a week. The water which was being pumped was a few degrees warmer than the shaft, causing the pipes to expand and buckle between the 1600- and 1800-ft. levels. This has been repaired, and normal shipments were resumed Sept. 12.

A list of coal lands in Kane, Iron and Washington counties which have been surveyed and classified according to value, has been received at the United States land office. The minimum price is \$15 per acre, and the maximum, \$25. On lands, more than 15 miles from the railroad, which may by the construction of a railroad be brought within this distance, the selling price will be doubled.

A decision regarding a leasing partnership in the Tintic district, has recently been given by the supreme court, which reverses the finding of the lower court, and orders a judgment for the plaintiff. R. Nelson and Henry Matsch entered into a partnership in July, 1905, to work a lease in the Bullock-Beck mine at Eureka. On account of a rule of this company, that leasing contracts must be with individuals, the settlements were made in Matsch's name. In September, 1907, Nelson left to take charge of other mining operations, agreeing to pay Matsch for managing the partnership during his absence. When time for settlement came, Matsch offered Nelson \$500 for his interest in the partnership, and represented that Nelson's share for September would be about \$500, also agreeing to make good, if the total received by Nelson was less than \$1000. The offer was accepted. It developed, however, that Matsch had struck exceptionally good ore, which had brought in additional receipts. Nelson brought suit for his share in the district court, but lost. He appealed the case, and received a judgment of \$1290.

The standing cable of the Highland Boy tramway at Bingham broke at one of the tension stations, Sept. 13, and distributed buckets along the line.

Duluth

Sept. 17—There seems to be a slightly pessimistic view here with reference to iron-ore shipments, a number of operators claiming that the output is hardly up to last year's shipments. However, Government figures and statements of those who are shipping ore rather than trying to buy mineral lands indicate that business is equally as good as last year, and unless there should be a sudden curtailment toward the close of the season, shipments should slightly surpass those of last year.

Work is progressing rapidly on the

\$10,000,000 U. S. Steel plant. One power plant and two other permanent buildings are completed. Foundation work for other large buildings is well under way. About 300 men are employed on the buildings and site. The plant is southwest of Duluth, seven miles from the Union station.

The Northwestern Fuel Company is spending a large amount of money in improving its coal dock and acquiring more storage space. When this is completed, the dock will have cost \$1,500,000 and will be one of the largest coal docks in the world, having, it is said, a capacity of 1,000,000 tons.

No ore will be shipped from the Cuyuna range this year. It was anticipated that shipments would be made from the Kennedy mine, but traffic arrangements were such that it was deemed best to withhold shipments. The Kennedy mine has about 40,000 tons of ore in the stock pile and will continue work all winter.

Cobalt

Sept. 19—Control in the Cobalt Power Company has been purchased by David Faskin, president of the Hydraulic company. Although these two companies were formerly very closely identified, operations in the future will be carried on practically under one management. The Cobalt Power Company has a plant with a capacity of 3000 h.p. and it is supplying eight out of the 13 concentrators operating in the district.

Shipments from Cobalt for August, totaled 3099 tons, and consisted of 35 cars of high-grade ore and 63 of low-grade. This is the highest tonnage for any month of 1910, and shows an increase of 800 tons over the corresponding period for 1909.

The directors of the Buffalo mine have decided to double the capacity of the cyanide plant, which is now treating about 30 tons a day. Some slight changes will be made in the flow sheet of the concentrator which will give the additional tonnage to be treated by cyanide. It is expected that the operating costs, and the consumption of cyanide will be materially reduced and a better extraction obtained.

Good progress is being made with the construction of the new wagon road between Charlton on the Temiskaming & Northern Ontario railway and Elk Lake. About 100 men are at work and the road is being rapidly pushed to completion, so as to be in readiness for winter travel. In addition to shortening the distance between Charlton and Elk Lake to 20 miles the new road by avoiding extensive muskegs will afford a good highway for vehicles at all seasons, whereas the old road was impassable during the spring and fall. It is expected that it will considerably cheapen freights to and from the Gowganda and Elk Lake districts.

Toronto

Sept. 21—A report has recently been issued by the Mines Branch of the Dominion Government covering recent gold and silver discoveries in Ontario and Quebec. The report states that of the samples taken, the great majority of them contained practically no ore of value. Many of these were taken in northern Ontario and the conclusion they lead to is entirely erroneous. The sampling included areas in the townships of Bucke, James, Lorrain and Larder, and although these sections were staked in the boom days of the camp, nothing of importance has ever been found on them and practically no work is now being done. There is a large and promising field open for the efforts of the officers of the Government without going into those sections that hold out practically no promises of making good.

The Railway Commission has ordered a sweeping reduction of freight rates on the White Pass & Yukon railway, giving terms as favorable as the shippers could hope for. The commission further ordered that the railway must cease discriminating against other companies in favor of the Atlas Mining Company, owners of the Pueblo. They are required to file with the commission before Nov. 1 the tariff showing the discriminatory rate heretofore existing, and the new tariff giving carload rates of \$1.75 per ton on ore and concentrates from Cariboo to Skagway.

T. W. Gibson, provincial deputy minister of mines, who recently returned from a visit of inspection to the Hastings County district, Ontario, states that the mining industry there has received a great impetus owing to new finds of iron and talc deposits. A promising talc deposit is being operated at Madoc by George Gillespie. The talc, which is of good quality is being milled to the amount of 700 or 800 tons per month. Some shipments of fluorspar have been made to Chicago from a recently found deposit, worked by Stephen Wellington and associates. Pittsburg interests are actively concerned in iron-ore deposits and have secured several options. The Nichols Chemical Company has sunk another shaft at the pyrites mine, and are doubling the capacity of the sulphuric acid plant at Sulphide.

Mexico City

Sept. 16—The American interests in Mexico have generally taken an active part in the very elaborate centenary celebrations which have been held in all parts of the Republic this month and particularly in Mexico City. The American colony has been represented in the official affairs at the Capitol and in most of the mining camps the day of *Dies y Seis de Septiembre* has been an event.



THE MINING NEWS

Reports of New Enterprises, New Machinery,
Installations, Development Work and Property
Transfers The Current History of Mining

Alaska

The U. S. assay office at Seattle has received another \$170,000 shipment of gold from Alaska, \$160,000 coming from Fairbanks, and \$10,000 from Sitka.

Major W. P. Richardson, road commissioner for Alaska, states that a road will be built to the Haiditarod as soon as possible, now that the permanency of the camp has been established.

Beatson—According to Stephen Birch, president, this company expects to increase the output to 4000 tons monthly.

Bonanza—This company expects to begin shipping copper over the Copper River & Northwestern by Jan. 1, 1911.

Yukon Basin—This dredging company has sold its claims near Dawson.

Treadwell—The cyanide plant under construction will be completed soon, after which time the concentrates which have been treated at Tacoma will be handled on Douglas island.

Alabama

Anniston Iron Company—The rebuilding of old Woodstock furnace at Anniston has been completed and it will go into blast Sept. 25. The furnace is practically new and has a capacity of 250 tons of iron daily.

Arizona

GILA COUNTY

Live Oak—The attempt of the minority stockholders to get control of the company failed when stockholders at a meeting in Bisbee elected to the directorate Henry Hovland, H. A. Smith and S. A. Kauffman, the latter a large Chicago stockholder. The election of these men frustrates a reported plan to transfer the property to the Lewisohn interests who control the Miami and Keystone adjoining.

Miami—The subscription to the 60,000 shares of new stock, recently offered, which closed last week, was a great success, the shareholders taking 58,000, leaving only 2000 for the underwriters.

Cactus—C. W. Pritchett, general manager and consulting engineer of the Cactus Copper Company and the Summit Mining Company, arrived in Globe, Sept. 15, and will outline plans for the development of both properties.

Superior & Boston—The company has resumed the sinking in the McGaw shaft, which is 847 ft. deep with the bottom in quartzite. At 812 ft., where the station

was cut for the eighth level, the shaft passed out of a zone of shattered limestone into quartzite. On the eighth level a crosscut is being driven to open the Great Eastern vein from which much ore has been shipped.

National Mining Exploration—It has become known, in connection with the strike instituted by the employees of the company, Sept. 10, when the pay checks failed to arrive, that President N. L. Amster, of the Arizona Commercial Copper Company, holds the National company's note for \$100,000 due Sept. 24 and secured by mortgage bonds on the company's property which is the connecting link between the two groups of claims owned by the Arizona Commercial Copper Company. Operations at the National shaft are at a standstill.

Arizona-Michigan—On Monday, Sept. 12, underground work was discontinued, except the sinking of a winze on the Old Dominion fault from the crosscut from the Telfair shaft southeastward on the 500-ft. level. The local management assigns no reason for the curtailment.

Old Dominion—The company has been opening United Globe territory through the Old Dominion mine proper for several years, and it has succeeded in opening a big body of high-grade ore. Electricity will probably be installed underground.

MARICOPA COUNTY

Vulture—The cyanide mill, completed in August, is running regularly, with a capacity of 100 tons per day.

California

The smelting situation in Shasta county appears to be serious, the opposition to the smelting operations being not so much from the farmers as from the U. S. Forest Service. The Bully Hill works have been permanently closed, while the Balaklala is closed pending development of the plant to employ the Cottrell process. What success this plant will have remains to be seen. The Mammoth has installed a baghouse, which enables two furnaces to keep in operation, but it is feared that the company with its present installation may not be able to operate any more furnaces.

AMADOR COUNTY

Bunker Hill—The recently opened ore-body on the 1590 level of this mine at Amador City. E. H. Harrington, superintendent, is about 8 ft. wide, 4 ft. of which is estimated as \$8 ore, 2 ft. \$10, and the rest of higher grade.

Alpine—The new company operating this mine at Plymouth, John L. Henry, president, has bought machinery. The mine has been closed for 30 years and one of the shafts is 700 ft. deep.

BUTTE COUNTY

Banner—This mine near Oroville, which 15 or 20 years ago was worked by an English company has been purchased by William Johnson and Richard and James Philips, of Hartford, Conn., will be started at once. It is expected that the lost vein will be found.

CALAVERAS COUNTY

Robert B. Parks has agreed to purchase from J. E. King for \$85,000, the Hudson, William R. Bulger, Last Chance and Magee quartz mines, and a three-fourths interest in the Mountain King claim in Madame Felix district.

Calaveras Copper—The pumping plant of this company at Copperopolis has been burned. Rebuilding has begun.

Lightner—The sale of this mine at Angels is announced. The reported price is \$250,000. A new shaft will be sunk and the property operated on an extensive scale.

ELDORADO COUNTY

The Eureka slate quarry at Slatington, under bond to an English company, will probably be started in October. The quarry is equipped with machinery, including an aerial tram.

The Portland Cement Company has decided to open and work the limestone deposit near Cool and is putting in machinery which will cost \$150,000 and include an aerial tramway to Auburn.

INYO COUNTY

Skidoo—A shoot of milling ore putting more than 5000 tons in sight is being developed. July report shows net profits from mining and milling operations amounting to \$7798.

PLACER COUNTY

Davenport—A St. Louis company, through Charles F. Haanell, has bought the property of N. E. Davenport near Auburn, the 5-stamp mill being included, for \$50,000.

Big Oak—This mine, near Colfax, idle for many years owing to litigation, will be reopened by S. D. Valentine, of San Francisco, J. L. Bryson, of Towle, and others.

Lost Emigrant—This mine at Donner, Frank Morgan, superintendent, recently lost its hoisting equipment by fire. A tunnel will now be run to open the mine.

SIERRA COUNTY

Keystone—This mine near Sierra City has been reopened and the stamp mill started.

Sierra Buttes—Rich ore has been uncovered in this old mine and 20 stamps will be started immediately and 40 more as soon as they can be put in order.

Brandy City—Piping has begun in this property after two years of work by a large force on a 9-mile flume and a dam to retain the débris. George F. Taylor is superintendent, and Henry Spaulding foreman.

Gunn—This company is carrying on development at the mine, seven miles from Gibsonville, and machinery and supplies are being hauled. The vein is supposed to be the same as that in the Plumas-Eureka and Jamison. W. W. Dyer, of Goldfield, is interested.

Independence—This mine has been pumped out and a 3-ft. vein of promising ore disclosed. The shaft will be sunk.

Alleghany—This company, at Alleghany, Frank Frymire, superintendent, is continuing work at Balsam flat, and also opening some new quartz claims farther up the ridge.

Cremorne—An important discovery has been made in this mine on Wolf creek, five miles from Alleghany. The vein is a wide one, carrying high-grade arsenical pyrite. The mine is owned by Thomas Ransome and the Phippen family of Forest.

Sailor Boy—A. B. Call, superintendent of the Reese Ravine and Sebastopol claims, has secured a bond on this adjoining mine at Deadwood.

Howland Flat—S. T. Featherston and partners, who lately found rich gravel at this place, are sinking an incline on the strike.

Bullion—At this property near Sierra City, Charles R. Thompson, who has it under bond, has struck such hard rock in the tunnel that he is considering putting in a compressor and power drills to make better progress.

Gravel—Bell & Dolan are opening a gravel mine on Rock creek a mile south of what is known as the City of Six.

Highland—This producing property, at Etna Mills, J. M. Tethrow, superintendent, has been sold. A mill will be installed.

TUOLUMNE COUNTY

Mazappa—The mill at this mine will be started at once and operated by steam on account of short water.

Tarantula—A 20-stamp mill has arrived at Chinese for this mine and as soon as it is in place development will be carried on. Good ore has lately been found.

Jumper—At this property, Stent, several mine buildings are being moved and

repaired so that operations may be resumed in the mine.

SONOMA COUNTY

Culver-Baer—Since the installation of the two-ton pipe furnace at this quick-silver mine, much mercury has been produced. Now the company has purchased from the old Bogle mine a 24-ton Scott furnace with complete equipment.

YUBA COUNTY

Red Cross—It is reported that very rich ore has again been found in this mine a short distance north of Dobbins. There is a 2-stamp mill on the property.

Colorado

CLEAR CREEK AND GILPIN COUNTY

In the Freeland district, John Owen, of Idaho Springs has taken a bond on the Oneida, Rustler and Maximum claims and a lease on the Mendick mine. Operations will be begun.

Tobin—Work on the tunnel has been suspended owing it is said to unfavorable smelting rates. C. L. Tingle is manager.

LEADVILLE—LAKE COUNTY

Robert Emmet—This mine, in Stray Horse gulch, Frank Zaitz, lessee, is shipping 2000 tons of zinc-sulphide ore each month. The ore is hauled by wagon to the railroad.

Evelyn, Excelsior and Catalpa—These mines, on Carbonate hill, are sending 40 tons of iron ore daily to the smeltery.

Garbutt—The lessees on this Breece Hill mine are shipping 75 tons of ore daily.

SAN JUAN DISTRICT

Ore which assays 2.65 oz. in gold across a 6-ft. vein has been found outcropping in Niagara basin above Eureka, on the extension of the parallel vein of the O. K. group. Ore running 0.44 oz. gold and 90 oz. silver was discovered on a vein 400 ft. from this which outcrops 40 ft. wide on the ridge between Niagara and Burns gulches.

Frank Hough—Word comes from this Hinsdale County mine that the winze being sunk from the 400 level has entered the oreshoot at 500 ft., and that it is richer than in the levels above, yielding about 80 oz. silver, 40 per cent. copper, and about \$10 gold per ton. The mine shipped 225 tons of ore in August.

Silver Ledge—In this San Juan county mine, a new vein of solid ore, 6 ft. in width, has been entered. The mill is turning out the usual quantity of lead and zinc concentrates.

Kankakee—The main working tunnel is in 600 ft., and a continuous vein of gold tellurides has been opened for 200 ft. in length.

Bagley—Charles Gagner, manager, is working 17 men, and is putting up a raise of 600 ft. to connect with the Red Cloud

shaft, which is down 400 ft. This work will open up large bodies of milling ore.

Sunnyside—The management of this gold mine has passed into the hands of Walter H. Bunce, formerly manager of the Hercules and prior to that, of the American Nettie, at Ouray.

Oom Paul—This Ouray County mine, in Red Mountain Park, near Ironton, has been bonded and leased to P. Corbly and Alexander Gould, who have already opened an oreshoot, and have shipped a carload that is said to be worth \$80 per ton.

Kansas City—This mine in Georgia gulch is shipping its lower grade ore to make room for the extraction of more of the high-grade gray-copper ore. The ore-body is variable and has reached a width of 6 ft. of solid gray copper.

Georgia Rose—This group east of the Kansas City has encountered good galena and gray-copper ore in the Early Morn tunnel.

Hamlet—This mine which suspended operation temporarily on account of the death of Manager Lloyd, has resumed and is drifting on the discovery on the sixth level.

TELLER COUNTY—CRIPPLE CREEK

El Paso Consolidated—The net production and royalties of this company's lessees for the last three months is as follows: June, \$38,233 production, royalties, \$10,532; July, production, \$33,482, royalties, \$8085; August, production, \$26,000, royalties \$6400. The drill hole from the bottom of the El Paso shaft to connect with the crosscut from the deep drainage tunnel has been abandoned, and a raise is being put up to connect the two instead.

Henry Adney—A shipment of 617 lb. of ore from this Beacon Hill mine netted, it is said, \$7404, the average yield being \$12 per lb. It was hand-sorted ore, and came from a knife-blade seam at a depth of 385 feet.

United Mines—The August production of this company was 1400 tons of 1-oz. gold ore.

Free Coinage—The August production of the Bull Hill properties of this estate was 900 tons of 1-oz. gold ore.

Coriolanus—This mine, on the saddle between Battle and Squaw mountains, idle for seven years, is now leased, and it is reported that 2-oz. gold ore has already been opened up.

Mary McKinney—This mine, leased to the Western Investment Company, produced 663 tons in August, of an average value of \$20 per ton.

Vindicator Consolidated—The August output is given at 3000 tons of a gross value of \$193,500. A third compartment is to be put in the main shaft at once, to facilitate the production, of which it is

stated very large reserves have been blocked out. The company has paid \$2,182,500 in dividends.

Gold Sovereign—The entire Gold Sovereign property, on Bull Hill, has been leased for three years to the Union Leasing Company, of Cripple Creek. The lease takes effect Dec. 19, 1910.

Idaho

COEUR D' ALENE DISTRICT

The prospectors who lost all their mining improvements such as buildings, tools, powder, provisions and trails, in the recent forest fires in this region, are preparing to petition congress, acting through Senator W. B. Heyburn, of Idaho, to permit them to hold their property this year without doing the annual assessment work.

Gold Hunter—Eight feet of galena ore, the richest ever encountered in the Mullan district, has been struck at 20 ft. below the main tunnel level.

Surprise—The company will start the shipment of lead-silver ore and is hauling high-grade carbonates to the railroad.

Callahan—The leasers have shipped six carloads of ore from this lead mine on Sunset peak, making a total of 30 cars.

Alice—A year's lease has been granted Joe Carson by the Alice company. The Alice has shipped \$50,000 worth of ore since January.

Bear Top—The raise between the Nos. 3 and 2 levels has broken through into the upper tunnel and will facilitate stopping. The raise is 467 ft. long. The Bear Top is a lead-silver producer.

Independent—Rich gravel is being taken from the placer claims near the Clearwater river. Wallace men have taken up all desirable ground in the vicinity.

Snow Storm—Manager Mowry has announced that no dividend will be paid by the company for September.

Snowshoe—The directors who are closely identified with the Snowstorm Mining Company have decided to expend \$25,000 in running a 1600-ft. tunnel to gain greater depth on the vein.

Indiana

DAVISS COUNTY

Interest is manifested at the Martin-Suddeth coal mine, a few miles east of Washington, because a 52-in. vein of bituminous coal has been touched at 160 ft. below the present working vein of the mine which is 42 ft. below the surface. The discovery is regarded as remarkable.

GREENE COUNTY

As the result of a gas explosion caused by a defective miner's lamp in Vandalia mine No. 10 near Linton, Sept. 14, two

miners were killed and five seriously injured. There were 300 men working in the mine, but they had been changed a few hours previously to another part of the mine and this prevented a disaster. The mine did not catch fire and the shaft was soon working. Experts in the mine-rescue work under the direction of the U. S. Bureau of Mines immediately upon receipt of news of the accident hurried from the rescue station at Urbana, Ill., equipped for service.

Kansas

The production for August was 4,940,700 lb. of blende and 457,820 lb. of lead concentrates, with a total value of \$108,232.

Tiawagh—This mill at Galena, after being blown down three times, has been completed and will start operations soon.

S. H. & S.—This company, at Badger, is installing large pumps to handle the water, which is much stronger since the United Zinc Company quit.

Michigan

COPPER

Quincy—No. 9 shaft is down 800 ft. and the drift from the 500-ft. level has encountered rich bunches of copper-bearing rock.

Houghton—This company's shaft is well established in the lode. The collar will be concreted, and when this is finished sinking will go forward without interruption.

Oneco—No. 9 drill hole has encountered copper at 1500 ft. and No. 10 hole at 305 ft. The lode exposed by No. 10 hole is well mineralized and is believed to be the same as that encountered in the drilling at the New Baltic company.

Indiana—No. 9 drill hole is nearing the depth at which it is calculated that it will reach the Indiana lode, and the character of the formation corresponds with that exposed in No. 2 hole just above the copper-bearing portion.

Algomah—The drill at this property has passed through the lode with the first hole and the core taken shows the formation to be about 35 ft., but carries very little copper and that in the form of ore. The drill has been moved to a point west, where the second hole will go down to cut the lode at 1000 ft. The shaft is down 55 ft. and is bottomed in ore.

Superior—This property is opening copper ground on both sides of No. 2 shaft. During August an average of about 450 tons of rock were shipped to the mill daily and yielded 28 lb. copper to the ton.

Isle Royale—Operations at "A" shaft, opened in search of the Baltic lode, are confined to drilling for the breast of the south drift at the 700-ft. level. At the main mine an improvement in the copper contents of the rock has been noted.

Adventure—The vertical shaft sinking to open the series of copper-bearing lodes is down 870 ft., and it is calculated that the first of these lodes will be reached at 950 ft., or in about a month.

Minnesota

It is reported that the International Harvester Company, holding an option for a lease on land in section 11-46-29 Cuyuna district and having three drills at work, has encountered a body of rich bessemer ore, exceeding in quality anything yet found on the Cuyuna, while on the Thomas Feigh land in section 10-46-29, held under lease by the C. M. Hill Lumber company, drilling explorations for more than a year have failed to disclose the limits of the ore.

The Soo railway is extending its lines toward these ore deposits. The Soo line has reached Deerwood, and will be extended from there along the south range to Brainerd.

Roy—The shaft about three miles east of Tower, is down 100 ft. A drift to the northeast now extends 60 ft. and is in a rich orebody. Machinery, including an air compressor for sinking to 600 ft. is on the way.

Morton—The circular concrete shaft is now down to bedrock, 190 ft. The last 8 ft. were built in as an underpinning, it not being possible to make the shaft shell settle. This work was done under an air pressure of 42 lb. per square inch.

Buffalo & Susquehanna—The Winston-Dear Contracting Company has four steam shovels at work stripping this mine for the Rogers, Brown Iron Company. About 20 acres are being stripped, an average of 147 ft. R. A. Angst, Hibbing, is superintendent.

Scranton—This Pickands-Mather mine will not make any shipments this year. The shaft was only recently completed, and work of opening levels is in progress. It is to be all underground workings, the overburden being 150 ft. A number of new buildings are now being planned and construction will begin this fall. Robert Murray, Hibbing, is superintendent.

Oliver—The work of moving the machine-shop equipment from the Sellers mine to the new shops south of Hibbing is now completed. The ground formerly occupied by the offices and shops is being cleared of buildings preparatory to stripping.

Missouri

The total production for August was 47,019,490 lb. of blende, 3,730,960 lb. of calamine and 6,995,595 lb. of lead concentrates with a total value of \$1,162,819.

Little Mary—This mill at the new Neck City camp produced 255,030 lb. of blende the first week it ran. The new camp produces on an average of 350 tons a week.

Pole Star—The mill of this company, at Zincite, burned last week.

Nevata—The No. 4 mine, as the old A. C. Maria mine is now called, seems to be making a success of the thin sheet ground encountered south of Webb City. This is the only mine in that vicinity that has been able to operate successfully.

Swedish-American—This company, operating the old Hyde Park mine at Porto Rico, is installing electric pumps. As the majority of the sheet-ground mines in that vicinity are not operating, the water is getting pretty strong.

Montana

BUTTE DISTRICT

Butte Central—W. L. Creeden, the engineer now making a report on the property, will have his report completed soon and future operations will then be decided. At present 30 men are employed. On the 500-ft. level, 300 ft. east of the crosscut, 7 ft. of clean shipping ore have recently been cut. Work on the proposed mill will not be begun until the engineer's report has been received.

Anaconda—At the Gagnon mine the new four-compartment perpendicular shaft is down 900 ft. Sinking progresses at 90 ft. per month. Considerable water has been encountered. The spur to the Stewart mine is nearly completed. At the Never Sweat mine about 720 tons are being hoisted daily from the 1600- to 2200-ft. levels. On the 2400-ft. level the orebodies have not been reached, and on the 2500-ft. level a station has been cut. At the Anaconda mine about 400 tons are being hoisted daily from the 400- to 800-ft. levels. From below the 800-ft. level, owing to the old fire in the stopes, no ore is being hoisted through the Anaconda shaft.

GRANITE COUNTY

Joseph Terry, who has a lease on the tailings of the Pyrennes mine, has erected a small cyanide plant on the ground and has worked over 1200 tons of tailings running about \$6. A saving of approximately \$5.20 per ton was made. J. N. Durbin and Frank Jackson are leasing on the Southern Cross tailings and will treat them in the Glenn mill. On the Rock mountain Company Lone Star claim a strike has recently been made.

MADISON COUNTY

Metzel Placer—The claims in Barton gulch are being worked by E. C. Hosmer, who has just made his first cleanup. He is also operating the Copperville group of quartz claims, which carry copper and silver.

MISSOULA COUNTY

Iron Mountain—The management states that the new mill will be in operation by Nov. 15. On the 1850-ft. level the orebody has been opened 125 ft., and is from 10 to 30 ft. wide.

Nevada

The Western Steel Corporation of Irondale, Wash., has purchased for \$200,000 the iron-ore deposits in Lyon and Storey counties. The sellers were James W. Smith and Alfred Merritt, of Duluth. The property was under option to H. Harri-man when he died. The ore will be shipped to San Francisco by rail and thence to Irondale by water.

Comstock—It is authoritatively reported from San Francisco that the effort of the Lewisohn interests of New York to get the majority of the shareholders in the various Comstock companies to deposit their stock, pending the framing of a plan to consolidate all the Comstock mines, failed. Apparently the San Francisco contingent would rather hold their stock and submit to frequent assessments than to forego the opportunity to speculate in these stocks.

Comstock Tunnel Company—The trustees were reelected at the annual meeting. The report stated that some of the important Comstock mines have passed to the larger shareholders of this company.

ESMERALDA COUNTY

Combination Fraction—The company is still running the Nevada Goldfield Reduction Company 20-stamp mill on a good grade of ore. A fair proportion of the gold is recovered on the plates, and the ore is then concentrated and the tailings slimed and cyanided.

Goldfield Annex—A radical change in the formation of the southwest crosscut on the 1025-ft. level is said to indicate the approach to the rich oreshoot being worked by the Consolidated company in adjoining ground.

Goldfield-Alamo—This Lucky Boy company has opened 2½ ft. of galena ore at 750 ft., which is said to carry 338 oz. of silver and 60 per cent. lead.

Phoenix—Half a ton of amalgam is on hand at the Klinker mill, ready to be re-torted.

LANDER COUNTY

Material for the new 100-ton mill at Kimberly is arriving at Battle Mountain. The equipment includes 20 stamps and will be adapted to concentration and amalgamation.

NYE COUNTY

Original Bullfrog—Arrangements have been made with the Goldfield Consolidated to mill Original ore, with a guaranteed extraction of 95 per cent. This will obviate the necessity of sorting out the high-grade as has been done.

Tonopah—The most important development is the intermediate drift, following the Mizpah fault vein, just above the 300-ft. level. The face shows 5 ft. of the richest ore mined for some time.

Montana-Tonopah—The annual meeting was held in Salt Lake City, Sept. 13. The report shows a gratifying condition of the property. The company has a balance of \$200,000 with no indebtedness.

WHITE PINE COUNTY

Nevada Consolidated—Operations in the Eureka (Copper Flat) and Liberty mines are proceeding without hitch. Curtailment of production went into effect in August, as planned, and the production of copper in concentrates was about a million pounds less than in July. Stripping of the Liberty orebody is in progress. The bottom of the steam-shovel pit in the Eureka orebody is now 50 ft. below the level of the Nevada Northern railway track. In taking out the lower part of the orebody the pit will have a maximum depth of about 200 ft. below the railway level. In the extraction of the ore to that depth, or more, there will be no trouble under the present system of mining, either in engineering respects or because of the circumscription of property lines. The tracks to the bottom of the pit will, of course, be laid in a spiral as is the conventional practice at Rio Tinto, in the Lake Superior iron region and elsewhere. This problem has been greatly simplified for Nevada Consolidated since the Eureka and Liberty orebodies have been definitely proved to connect. In working both together it will be possible to lay out longer stretches of track and consequently secure easier grades.

Giroux—The directors of this company have recently made a statement respecting operations at the mine, but while dwelling upon the excellence of the new shaft that has been sunk, etc., complete silence respecting the ore development of the mine is preserved, although that is precisely the matter that the stockholders would like to know about.

New Jersey

The Orchard iron mine at Wharton operated for two years by the Wharton Steel Company has been permanently abandoned by reason of the prohibitive cost with increasing depth.

New Mexico

Chino Copper Company—This company now claims to have 23,000,000 tons of ore indicated by drilling. It is thought that the average grade is 2.63 per cent. copper. The average thickness of the ore so far indicated is 97 ft. and the average thickness of the overburden is 76 ft. It is considered that fully 40 per cent. of the ore may be dug by steam shovels. In milling a 70 per cent. extraction (36 lb. per ton) is expected. The mill will be erected about 10 miles from the mine. It is designed in three units, each of which will handle approximately 1000 tons per day. The ratio of concentration is expected to be about 12.5 : 1. At the end of

August the ore development was estimated at 25,223,000 tons, averaging 2.64 per cent. copper.

SOCORRO COUNTY

Mogollon—The reorganization has been effected. The first work will be advancing the east drift from the crosscut tunnel on the Little Charlie and retimbering the shaft on the Cooney mine.

North Carolina

Piedmont Tin Mining Company—This company, which has been working for some time on a small scale in Lincoln county, has let a contract for a tin-smelting furnace to have a capacity of six tons of ore daily.

Ohio

Buck Coal Company—Work has been begun on a new mine near Salem, where the company holds 2400 acres, carrying the Pittsburg No. 8 seam. The office is at Salem; Dr. M. J. Buck, of Pittsburg, Penn., is president.

Oklahoma

The production for August was 3,355,320 lb. of blende and 403,410 lb. of lead concentrates with a total value of \$65,891.

Only six mines are operating in the Miami camp, and if the operators do not get together on the water question there soon will be only two or three running. At the present time the water is being handled by two companies, and these are having a hard time to cope with it and will either quit or have to have help.

Golden Hen—This mill, at Miami, has been sold and will be removed to the Quapaw camp.

Oregon

BAKER COUNTY

Quartz Basin—George Hemler, who owns this group, is equipping and will develop.

Rainbow—At a recent strike ore assaying \$25 per ton was encountered. This mine is yielding about \$12,000 per month.

Ben Harrison—Preparations are being made for the installation of machinery at this mine, and to start underground work.

Pennsylvania

People's Coal Company—The new Oxford breaker, near Scranton, is completed and will go into operation about Oct. 1. It is equipped with shaking screens, on plans designed for the company.

Taylor Colliery—The concrete building for the new breaker is nearly completed and the installation of the machinery will soon be begun. The breaker will have a capacity of 2500 tons a day. The colliery is near Scranton, and is owned by the Delaware, Lackawanna & Western Company.

Pennwood Coal Company—John C. Ogle, of Somerset, Penn., has been appointed receiver on application of some of the creditors. The company was organized four years ago, and bought the holdings of several small companies in the Somerset district.

Texas

Wakefield Iron and Coal Land Improvement Company—This company, of Milwaukee, Wis., some time ago obtained control of a large tract of land in the Llano district, about 100 miles northwest of Austin. During the past year the company has conducted extensive exploration work by means of diamond drills, and it is said that it has proved an orefield of such extent and high grade as to warrant the erection of blast furnaces. The company has a capital stock of \$250,000. The plans for a furnace are said to have been drawn. There is a good prospect of the Llano iron ore field being placed in direct touch with the Thurber coalfields, situated to the north about 150 miles. It is also claimed that there are extensive deposits of good coking coal within less than 100 miles of Llano. Two or three railroads are now projected into the Llano section from the north and west.

Utah

BEAVER COUNTY

A company is being formed to establish a traction engine freighting line between Milford and Beaver City. It is expected to haul ore from mines of the Star district.

South Utah Mines and Smelters—The first carload of concentrates from the reconstructed mill has been received at the International smeltery. Other shipments are on the way.

Cedar Talisman—A cave containing some ore has been broken into on the 500 level.

JUAB COUNTY

Yankee—The shaft has reached 990 ft. Waste will be dumped in the cave encountered a few weeks ago. This will save hoisting from the 900-ft. level for some time. A crosscut will be driven to prospect underneath the cave.

Iron Blossom—Ore is being shipped from several points on the 500-ft. level, and a good tonnage is being developed. It is said to have been opened for 1500 ft. Ore has recently been opened on the 600 level.

King William—Work was started Sept. 8, from the 1000-ft. level of the Eagle & Blue Bell. Another drift will be driven from the 500-ft. level soon.

Utah Consolidated—Some iron ore with lead has been found in the new cave.

Diamond Queen—Work will soon be started on this group in the south end of the district. A tunnel 300 ft. long, and small shaft have been driven.

Gold Chain—Connections have been made on the 300-ft. level with the Ophongo, which will be operated through the Gold Chain. Shipments this week amounted to five cars. Development is being kept ahead of production.

Black Jack—Work is being done on the 1000-ft. level, in search of the vein opened some time ago by the Ophongo.

Grand Central—Some changes have recently been made in the working force. Sixty miners have been released. August Wetterstrom has been appointed superintendent.

Eagle & Blue Bell—Less than 170 ft. separate the bottom of the new shaft, and the raise from the 1000-ft. level. Progress in the raise has been slow on account of bad air.

Sioux Consolidated—Sixty-seven cars of ore were settled for during August, giving returns of \$49,393. Sixteen cars in September, brought \$10,094. Sept. 1, there was a balance of \$84,648 in the treasury, with bills payable of \$11,422.

Mammoth—Work is being done on the 1000-ft. level and below. Pending repairs to the hoisting equipment, ore is being hoisted by a donkey engine from the 1000-ft. level. On this level drifting is being continued into the Don Pedro claim in which the Mammoth is a half-owner, and in which the Gold Chain opened a body of good ore on the upper levels.

SALT LAKE COUNTY

Utah Metal—A visit of inspection to the tunnel and property is now being made by eastern directors. E. P. Jennings has recently been engaged as consulting engineer. It is planned to begin work on two orebodies already opened on the Bingham side. Leasers have been mining lead ore on this side during the last month.

Bingham Copper—Mineralized country rock carrying lead has been encountered in the tunnel.

North Bingham—Sinking of the shaft has been suspended.

Wasatch-Utah—New stamps have been installed. There are now five 1050-lb. stamps in operation, one Wilfley table, and one Isbell vanner. The mill is worked two shifts daily on gold ore, which is said to run from \$20 to \$50 per ton. The property is near the mouth of Big Cottonwood.

Baby McKee—Active development will be commenced on this property. Much ore is said to be blocked.

Columbus Extension—The first shipment of two cars of ore is on the market.

Alta-Oxford—This new corporation formed by Sandy interests has let a contract for driving its tunnel. It is intended to work through the winter.

Utah Copper Company—The Copper-ton mill has been abandoned and dis-

mantled. Eight of the 12 sections of the Magna mill have been remodeled, and the other four will be completed before the end of October, giving the remodeled mill a capacity of 12,000 tons of ore per day. The Arthur mill will be similarly remodeled. The construction of the Bingham & Garfield Railway is rapidly proceeding.

SUMMIT COUNTY

Little Belt—Good progress is being made in building the new mill, and installing the equipment.

Ontario—Leasers have lately encountered high-grade ore, and have doubled their working force. Development will be done on a larger scale.

Daly-West—One hundred men were laid off Sept. 10. Much development in search of new orebodies is being done on the lower levels.

Virginia

The Southern Manganese Mining Company has been organized to mine at Harrisonburg. At the Toncray copper mine, at Floyd, the vein has been cut in the 125-ft. level. Work will be continued.

Washington

OKANOGAN COUNTY

Q. S.—The lower crosscut is in 350 ft. A. M. Dewey is president.

SPOKANE COUNTY

Tungsten King—Rich ore has been found on this property at 400 ft. The product from this plant is running from 60 to 70 per cent. tungstic acid.

Canada

ONTARIO

Shipments from Cobalt for the week ended Sept. 12 were as follows: Buffalo, 62,140 lb.; Colonial, 44,580; Crown Reserve, 141,450; Hargraves, 60,000; McKinley-Darragh, 242,390; Nipissing, 192,180; O'Brien, 66,270; Standard, 46,910; Temiskaming, 60,000; Trethewey, 41,050; total, 957,910 pounds.

A private company has proposed to build a customs concentrating plant at Elk Lake.

Big Six—This Elk Lake property has been leased on a royalty for five years. W. R. Mowery will start underground work in a short time.

Silver Cliff—A shaft is being sunk from which the ground under Cross lake will be prospected. The King Edward, the adjoining property is also sinking.

Crown Reserve—This Cobalt company will discontinue the shipment of low-grade ore after Oct. 1. The plant in the rockhouse is being enlarged and the low-grade ore will all be concentrated.

Hargraves—The Kerr Lake vein has been picked up at the 300-ft. level and shows 6 in. of rich ore.

Townsite—A decided improvement has lately taken place on this property. An extension of the main vein has been found on the 150-ft. level and four new surface veins, carrying high-grade ore have also been discovered. The management expects to ship regularly.

Coniagas—Since the addition to the mill started, 175 tons per day is being treated. This is the highest tonnage for any mill in the camp.

Temiskaming—Report for August shows that 251,963 oz. of silver were produced at a cost of 22,014.

Hudson Bay—All the concrete work for the new mill has been completed, and the frame is being erected. The mill is expected to be running by 1911.

Kerr Lake—The production for August amounted to 200,000 oz., 130,000 oz. of which came from No. 7 vein. The rate of production could be readily increased if necessary.

Swastika—A five-stamp mill and a small cyanide plant will be installed at the Porcupine mine.

Gates—A shipment of 20 tons of high-grade has been sent out by the Montreal river from this Gowganda mine. Recent developments on the 140-ft. level have shown a large body of ore, and the property promises to become a steady producer.

Mexico

CHIHUAHUA

Buen Pastor—A strike of 180-oz. silver ore is reported at depth of 275 ft. in this property adjoining the Promontorio mine in the Cusihiuriachic camp. There is said to be a large tonnage available.

Santa Eduwiges—An important ore discovery is reported at this Parral mine owned by the Parral-Chihuahua Mines Company.

Tres Hermanos—As the result of a 40-day mill run a bar of gold bullion valued at \$17,000 was shipped to Chihuahua and similarly good runs are in prospect from the high-grade ore recently encountered.

Syncline—This Santa Eulalia company has sunk its shaft over 100 ft. and the results are given as encouraging. This company is financed mainly by local parties.

HIDALGO

Santa Gertrudis—W. J. Cox, advisory engineer, reports operations have been greatly retarded for want of power, but that an ample supply for both mining and milling requirements will shortly be available. The developments on the 17th level, and also above that level are of a most satisfactory character. A winze has been sunk to the 18th level and this level will be opened as rapidly as possible. The Guadalupe mill is now running, the capacity of which is about 7000 tons per month. The new mill of 600 tons daily

capacity is now in course of construction, and should be completed by March, 1911.

SONORA

Mexican Metals Company—The Arizpe Mines Company at a meeting has voted to consolidate with this company. The Arizpe company has 7000 acres in the Cananea district. The Mexican Metals Company has property in the same district and also a smeltery. The engineering staff of the Mexican Metals Company includes W. Spencer Hutchison, of Boston, Angus R. Mackay, of Montreal, Canada, and Charles T. Tryon, of New York.

Africa

RHODESIA

It has been decided to make a full geological survey of Southern Rhodesia, and the work will soon be begun, under charge of H. B. Maule, who was formerly in British East Africa, but has been recently attached to the Geological Survey of Great Britain. It is uncertain whether the survey will be commenced in Matabeleland or Mashonaland, and this point will be decided when Mr. Maule shortly meets Sir William Milton, the administrator of Southern Rhodesia.

Asia

INDIA—DECCAN

Hutti Nizam—The production of this mine, the only one operating in the Deccan, was 1405 oz. gold in August and 10,077 oz. for the eight months ended Aug. 31; a decrease of 3230 oz. from last year.

INDIA—MYSORE

Kolar Goldfield—Gold production in August is reported at 45,529 oz., being 72 oz. less than in July. For the eight months ended Aug. 31 the total was 354,556 oz. bullion in 1909, and 363,321 oz. in 1910; an increase of 8765 oz. The bullion reported this year was equal to \$6,758,863 or 326,989 oz. fine gold.

Australia

NEW SOUTH WALES

Gold production in August was 25,420 oz.; for the eight months ended Aug. 31 it was 152,321 oz., or \$3,148,475 in value.

QUEENSLAND

Gold production in August is reported at 30,400 oz.; making a total of 279,234 oz., or \$5,771,767, for the eight months ended in August.

WESTERN AUSTRALIA

The gold report for August shows: Exported, 17,969; mint returns, 98,432; total, 116,401 oz. For the eight months ended Aug. 31 the total was 1,051,787 oz. in 1909, and 969,773 oz., or \$20,045,208, in 1910; a decrease of 82,014 oz. this year.

THE MARKETS

Current Prices of Metal, Minerals, Coal and
Stocks, Conditions and Commercial Statistics

Coal Trade Review

New York, Sept. 21—Coal trade in the East is in better condition than for some time past. A fair business is being done, and prices are improving. Car supply and transportation are good.

In the West the signing and closing of contracts in the districts recently on strike has been completed, and mines are going to work. The Illinois mines resume slowly, as many of them are not in good condition and it will take some time to put them in shape for full production.

Outside of those districts business is generally good, production being active, while prices have generally advanced. Some complaints are heard of short supply of cars and slow transportation.

Car Distribution to Mines—It is stated that the Baltimore & Ohio is preparing to adopt a new system in distributing coal cars to mines on its line. Heretofore the company has been calling a car a car, no matter how much difference there was in the capacity. Under the new method a 30-ton car will be the unit. A wooden car will be classed as a car and a steel car will be classed as a car and one-half. The new system will go into operation in October.

COAL TRAFFIC NOTES

Coal and coke tonnage originating on all lines of the Pennsylvania Railroad Company east of Pittsburg and Erie, eight months ended Aug. 31, short tons:

	1909.	1910.	Changes.
Anthracite.....	7,113,191	7,235,063	I. 121,872
Bituminous.....	24,746,053	26,793,789	I. 2,047,736
Coke.....	7,017,377	9,260,048	I. 2,242,671
Total.....	38,876,621	43,288,900	I. 4,412,279

The total increase this year to date was 11.3 per cent.

Coal and coke tonnage of Chesapeake & Ohio railway in July, the first month of the fiscal year, in short tons:

	Coal.	Coke.	Total.
New River.....	675,029	26,302	701,331
Kanawha.....	611,473	4,036	615,509
Kentucky.....	59,257	.....	59,257
Connecting lines.....	6,474	3,029	9,503
Total.....	1,352,233	33,367	1,385,600
Total, 1909.....	1,109,446	34,813	1,144,259

Total increase this year, 241,341 tons, or 21.1 per cent. Deliveries this year to points west of mines, 875,753 tons coal and 17,815 coke; points east, 105,016 tons coal and 11,331 coke; tidewater, 370,579 tons coal and 4221 coke. Anthracite to line points, 885 tons.

Coal production in West Virginia for the fiscal year ended June 30, 1910, is reported at 52,895,935 long tons—or 59,-

243,447 short tons—showing an increase of 11,287,219 long tons, or 27.1 per cent., over the previous year.

Coal production of Iowa for the fiscal year ended June 30, 1910, is reported at 7,222,480 short tons, a decrease of 123,773 tons, or 1.7 per cent., from the previous year.

Coastwise shipments of coal from leading Atlantic seaports, seven months ended July 31, long tons:

	Anthracite.	Bitum.	Total.	PerCt.
New York.....	8,491,525	6,454,729	14,946,254	60.8
Philadelphia	1,184,691	2,683,512	3,868,203	15.7
Baltimore.....	145,298	2,062,039	2,207,337	9.0
Newp't News	.....	1,691,431	1,691,431	6.8
Norfolk.....	.....	1,902,960	1,902,960	7.7
Total.....	9,821,514	14,794,671	24,616,185	100.0
Total, 1909.	9,910,088	13,547,521	23,457,609	.....

Total increase this year, 1,158,576 tons, or 4.9 per cent. New York includes all the New York harbor shipping ports.

New York

ANTHRACITE

Sept. 21—Demand is steady, perhaps a little over the usual run for steam sizes. Some rain has relieved the water situation at the collieries. August production showed a good increase over July.

Schedule prices for large sizes are \$4.75 for broken and \$5 for egg, stove and chestnut, f.o.b. New York harbor. For steam sizes, current quotations are: Pea, \$2.95@3.25; buckwheat, \$2.15@2.50; No. 2 buckwheat, or rice, \$1.65@2; barley, \$1.35@1.50; all according to quality, f.o.b. New York harbor.

BITUMINOUS

The trade continues to improve, and sales are larger all around. Gas coals are being taken freely and besides the tidewater trade there is a considerable movement to the West. Low-volatile steam coals are also selling pretty well. Quotations are unchanged, gas coal selling at prices which realize \$1@1.05 at mines for run-of-mine and 65@70c. for slack. Good steam coals bring \$2.50@3, according to quality, f.o.b. New York harbor.

Transportation is good, coal coming through to tide on about schedule time. Car supply is better. The water trouble at the mines has generally been settled by the coming of rain.

In the coastwise market there is no change. For large vessels from Philadelphia quotations are: Boston, Salem and Portland, 55c.; Portsmouth, 60c.; Lynn, Newburyport and Bath, 65c.; Bangor, 75c.; Gardner, 85c. From New York harbor small boats get 50@55c. to Boston and Portland, 30@40c. to Providence and the Sound.

Birmingham

Sept. 19—The activity in the coal-mining section of Alabama will keep up all through the winter. There are enough orders in hand and in sight to warrant this statement. Car shortage is reported in some sections of the district. There is a good home consumption of coal but the shipments are extraordinarily heavy. Coal prices have advanced more than 25c. a ton during the month.

Much progress has been made on mine No. 13, the new shaft of the Tennessee company near Ensley. The coke demand is also strong and there is a steady operation at all coke ovens which are in condition.

Chicago

Sept. 20—Following the settlement of the labor troubles in Illinois and the resumption of work at most of the mines of the State, there has been a good deal of selling of coal on future deliveries from these mines. Prices have fallen and risen again, with a realization of the difficulties in the way of getting coal to market, in large quantities soon from the Illinois mines, and with the discovery that the production of the Indiana mines has fallen off since many of the men employed in them have returned to their regular work in Illinois. The feeling among consumers now seems to be generally one of security and there is no eager pressing for deliveries, since it is believed that the normal output from the Illinois mines, when it comes, will reduce prices. The sale of Eastern coals is falling off. Railroad delays are foreseen by some in the coal trade but in general the market rests easy under the prospect of a resumption shortly of normal conditions.

Lump and egg from Illinois and Indiana mines are selling, in carlots, for \$2.65@3.25; run-of-mine for \$2.20@2.40 and screenings—in somewhat less demand—for \$2.20@2.40. Smokeless, which should be sent cautiously to this market for the next week or two, brings \$3.95 for lump and \$3.30 for run-of-mine, and Hocking remains steady and in good demand at \$3.25 for 1¼-in. lump. Anthracite is moving slowly.

Cleveland

Sept. 19—Local demand for coal is good, but supplies are uneven and short car supply is making trouble. Operators in the Lake trade are surprised at the large increase in coal shipped to the Northwest, shown by the September statement.

Middle district coal brings \$2.15 for 1 1/4-in., \$1.90 for 3/4-in., \$1.80 for run-of-mine, \$1.55@1.70 for slack, all f.o.b. Cleveland. No. 8 and Cambridge districts, 5 to 10c. higher. Pocahontas quotations have been withdrawn, owing to difficulties in making delivery, caused by lack of cars.

Indianapolis

Sept. 19—Although the prospects of a reduction in prices of coal at the mines seemed natural on account of the settlement between miners and operators in competing fields, it is evident from the record of last week's operation that the resumption of mining in Illinois has had no depressing effect on either the prices or output at the Indiana mines. There has been no check to the high tide of prosperity in the Indiana coal industry. The Indiana operators are somewhat concerned about the low stage of water in the Ohio river which affects transportation to the Southern cities where Indiana coal has found a valuable market. The price of both steam and domestic coal is 50c. a ton higher than a year ago. It is predicted that this difference will be increased as winter approaches, since the operators insist that there is a short supply everywhere.

Saturday was semi-monthly pay day at the mines and the pay roll was very heavy. The average pay a man received was \$75, and for several months an average miner has been earning upward of \$125 a month. Several thousand Illinois miners have been in the field at work but the majority have returned to Illinois.

Pittsburg

Sept. 20—The local coal market is practically unchanged, Lake shipments being heavy and local demand moderate. Two important interests in the Greensburg-Latrobe field have replied to the request for an arbitration that the strike is practically over and would never have amounted to anything but for the work of professional agitators. We continue to quote Pittsburg coal at mines at \$1.20@1.22 1/2 for mine-run and nut, \$1.30@1.32 1/2 for 3/4-in., \$1.45@1.47 1/2 for domestic 1 1/4-in. lump and 75@82 1/2 c. for slack.

Connellsville Coke—The market has been almost bare of transactions, but shipments keep up satisfactorily on old contracts and prices as far as developed are steady, being for standard grades: Prompt furnace, \$1.60@1.65; contract furnace, \$1.75@1.85; prompt foundry, \$2.10@2.25; contract foundry, \$2.25@2.50 at ovens.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ending Sept. 10 at 341,734 tons, a decrease of 1000 tons, and shipments at 3766 cars to Pittsburg, 5557 cars to points west and 883 cars to points east, a total of 10,206 cars.

St. Louis

Sept. 19—This week the first Carterville which was mined since the strike came in, most of it being mine-run; it was disposed of at about \$1.60 per ton f.o.b. mines. Operators preferred to load mine-run for the first 10 days while cleaning up their mines. The little lump which came in was disposed of at \$2 per ton, mines. The most peculiar part of the situation was that since operations had been resumed at Carterville the price of coal has advanced and the market is much stiffer than it was just preceding the resumption of operations.

The majority of this tonnage is being shipped to the Northwest. St. Louis dealers and industries do not care to pay this price for coal. This consequently leaves the fifth and ninth districts in possession of the St. Louis market and as a consequence the price of Standard coal has remained firm.

The weather has been unusually cool for this time of year. It has made the dealers think seriously of the fall trade and consequently the demand for domestic sizes is strong. A number of dealers will probably be caught as quite a few have gone ahead taking orders at cheap prices, expecting the market to drop.

The railroads continue to be the heaviest buyers of coal. All conditions point to a steadily advancing market on all sizes with the exception of screenings.

Following are current prices in the St. Louis market:

	Mine.	St. Louis.
Illinois, Standard:		
6-in. lump and egg.....	\$2.00	\$2.52
2-in. lump.....	1.85	2.37
Mine-run.....	1.60	2.12
Screenings.....	1.20	1.72
Trenton:		
6-in. lump and egg.....	2.50	3.02
3-in. nut.....	2.00	2.52
Staunton or Mt. Olive:		
6-in. lump.....	2.00	2.52
2-in. nut.....	1.60	2.12
Mine-run.....	1.65	2.17
Screenings.....	1.50	2.02
Carterville:		
6-in. lump or egg.....	2.00	2.67
3-in. nut.....	2.00	2.67
Mine-run.....	1.60	2.07
Screenings.....	1.25	1.92
Pocahontas and New River:		
Lump or egg.....	1.90	4.40
Mine-run.....	1.55	4.00
Pennsylvania Anthracite:		
Nut, stove or egg.....	.....	6.95
Grate.....	.....	6.70
Arkansas Anthracite:		
Egg or Grate.....	2.35	5.35
Coke:		
Connellsville foundry.....	.....	5.40
Gas house.....	.....	4.90
Smelting.....	.....	4.15

East St. Louis, Ill., prices are 20c. per ton less than St. Louis prices on soft coal.

Anthracite—The market continues active and the tonnage will probably be heavier than usual this year, owing partly to the natural increase and partly to the fact that a number who have been selling Arkansas anthracite and high-grade soft coal will probably return to anthracite.

FOREIGN COAL TRADE

British Coal Trade—Exports of fuel from Great Britain, with coal sent abroad for use of steamships in foreign trade, eight months ended Aug. 31, long tons:

	1909.	1910.	Changes
Coal.....	41,173,734	40,813,771	D. 359,963
Coke.....	721,094	570,969	D. 150,125
Briquets.....	999,515	1,037,742	I. 38,227
Total exports.....	42,894,343	42,422,482	D. 471,861
Steamer coal.....	12,930,655	12,739,619	D. 191,036
Total.....	55,824,998	55,162,101	D. 662,897

Imports are very small, only 2419 tons in 1909, and 22,791 tons this year.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of Welsh coal as follows, on Sept. 10: Best Welsh steam, \$3.90; seconds, \$3.78; thirds, \$3.60; dry coals, \$3.60; best Monmouthshire, \$3.54; seconds, \$3.42; best steam smalls, \$2.04; seconds, \$1.80. All prices are per long ton, f.o.b. shipping port, cash in 30 days, less 2 1/2 per cent. discount.

IRON TRADE REVIEW

New York, Sept. 21—More new business has developed in iron and steel, but the orders coming in are mainly for short deliveries, none remaining beyond the fourth quarter. There are inquiries for next year, but neither buyers nor sellers seem ready to make any heavy commitments running beyond December. The condition of the stock market, the railroad rate agitation and political considerations all help to hold back buyers for the future; while sellers claim that they are unwilling to make long contracts on present prices. Each party naturally exaggerates its side of the question; but the fact remains that trade is generally on a short-time basis. At the same time users of steel and iron are carrying small stocks almost universally, and are consequently frequent buyers, though on a moderate scale.

Estimates are not always reliable, but some things can be seen. The Steel Corporation is running about two-thirds of its blast furnaces. The steel mills generally are said to be working to about 75 or 80 per cent. of capacity. This, it must be remembered is the enlarged capacity; two or three years ago the present volume of business would have been well up to the ability to handle it promptly. It would seem as if prophets and commentators on the trade were making comparisons of the present, not with the business of past years, but with the greater trade which they have expected to see, and for which manufacturers have prepared at great cost.

The weak point in the trade is, without doubt, the disinclination to contract for future deliveries. In part this is the result of the various uncertainties above

referred to; but in large part also it is due to the price situation. The Steel Corporation and other large producers will not contract ahead on the present level of values, claiming that it is too low. On the other hand large users and manufacturers either cannot see a reason for higher prices, or believe that any material advances will limit their trade with the ultimate consumer. The market looks as if it might drift into almost the condition it reached under the price-maintenance policy of the early part of 1909. If the apprehension of a renewal of that policy were removed, there would soon be better business and a livelier market.

The week has shown more buying of pig iron. In seaboard territory the chief business has come from foundries and pipe works; the former taking chiefly Northern iron, and the latter Southern pig. In the Central West both foundry and basic have been sold. Prices remain low, and orders are chiefly for fourth-quarter delivery.

In finished material small orders for structural steel are still plenty, and some large contracts are in sight. Wire products are selling well, but other business has not been heavy. Some moderate orders are coming from the railroads for rails, bridge work and equipment. In all this business short deliveries are the rule. Some rails have been sold for export, including 25,000 tons for Australia, 10,000 tons for Brazil and some other small orders for South America.

In New York, Sept. 20, Judge Gary, chairman of the United States Steel Corporation, gave out the following statement for publication:

"There is no justification for the statement purporting to originate in Pittsburg that a wide-open cut in prices of steel is likely to occur before the end of the week. It is well known that the new business offered at the present time, though quite large, is less than the total producing capacity. If the railroad companies were buying as much as usual, or up to their necessities, the mills would be crowded.

"There has been a shading of prices of some of the commodities by a few of the smaller producers. However, the principal manufacturers are disposed to maintain fair prices and to cooperate so far as they may legally and properly do so. As usual, there has been an effort for stock jobbing or other improper purposes, to exaggerate greatly, if not misrepresent, the facts.

"On the whole, the steel business should be considered satisfactory, and I see no reason to expect any change in this respect. Indeed, there has been a slight improvement during the last few days. Our export business is exceedingly good, being at the rate of at least 25,000 tons per month in excess of the export business of last year."

Baltimore

Sept. 19—Exports for the week included 154,800 lb. zinc dross to Liverpool. Imports included 320 tons ferromanganese from Rotterdam and 713 tons from Liverpool; 540 tons manganese ore from Antwerp; 16,750 tons iron ore from Cuba.

Birmingham

Sept. 19—General conditions are much better than they have been for several weeks. There have been a number of sales made during the past two weeks, while a steady inquiry is being received that promises to result in business. So far there has been no inclination to sell iron at present prices into next year. The quotations are firmer again, \$11.50 being asked for No. 2 foundry iron. The first part of the month saw iron selling at \$11 per ton and it is understood now that there has been quite a tonnage sold. The larger consumers, the cast-iron pipemakers are sounding out the market so far as the next-year iron goes. It is announced that the reduction of the accumulated stocks of iron is going on and the next inventory will show the stocks greatly reduced. The make in this section has been increased by the blowing in of another furnace and it is announced that two more will shortly be started. The Sloss-Sheffield Steel and Iron Company has one of its city furnaces in operation now, making five in all going, two at North Birmingham, one in this city and two at Sheffield. The Tennessee company has five of its six Ensley furnaces in full operation.

Cleveland

Sept. 19—Furnaces are taking ore slowly. In view of the heavy August tonnage and the crowded condition of the lower docks, it is predicted that the movement for the rest of the season will be light. The Steel Corporation has given notice that contract boats will be released Nov. 15 at latest.

Pig Iron—Some foundry has been sold in small lots. There is little inquiry and the market is dull. No. 2 foundry is quoted \$14.50@14.75, Cleveland.

Finished Material—Small structural orders continue to be the main business doing. Quotations on shapes, plates and bars are pretty firmly held at 1.40c., Pittsburg base, but sheets are badly cut.

Chicago

Sept. 20—Buying of pig iron continues to be almost wholly of small lots for last-quarter delivery. The usual reluctance to crossing the imaginary line dividing the years is manifest already and promises to be more prominent. Some few good-sized contracts are being made for 1911 delivery but inquiries are still much more plentiful than orders. As for several weeks past the average user of iron is

content to buy 30 to 90 days ahead, in lots ranging from a carload to 500 tons, and to watch the market closely for signs of change. Selling agents are asking about 50c. more for 1911 deliveries than the quotations for the last quarter—\$16.50@17 for Northern No. 2, \$11@11.50 Birmingham (\$15.35@15.85 Chicago) for Southern No. 2 and \$18.50@19 for Lake Superior charcoal iron. The number of small sales continues large and they are widely distributed, making the aggregate tonnage large. On iron and steel products the market continues firm with no decided changes and leading lines such as structural materials and wire materials showing a fair and even demand.

Philadelphia

Sept. 21—The chief features of interest during the past few days are inquiries for 1911 delivery. The disposition of pig-iron makers is not to encourage such deliveries by concessions and there has only been a little business done. A little yielding on the part of makers on late-delivery orders would bring them a large volume of business. The general tone of the market is stronger than a week ago but there is an abundance of iron for all demands. Today's quotations are \$15 for Southern No. 2 X foundry and \$16 for Northern; Southern gray forge is offered at \$14.50 and Northern forge can be had for only a trifle more. Basic is strong at \$15 with a higher figure quoted for optional delivery.

Steel Billets—Several small lots of billets have been ordered within the last few days merely to cover some new work and immediate delivery is required.

Bars—Country stores report an improved distribution but mills throughout the State are not booking orders of any importance. Quotations are unchanged.

Sheets—Sheets continue weak and additional shadings are reported on black and galvanized sheets. Incoming orders are small.

Pipes and Tubes—Handlers of merchant pipe report a sharp improvement in retail lots for immediate delivery. Quite a batch of orders has reached the mills for pipe to be furnished in some cases as late as midwinter. Tubes remain at former discount with the usual heavy consumptive demand.

Plates—New business in plates has been restricted to small orders from shipyards, boiler shops and in one or two cases from car builders.

Structural Material—Manufacturers have been figuring on considerable business which they think will shape into orders next month. A fair September business has been done with builders in this territory at full retail prices.

Scrap—Sales of scrap have been restricted to small quantities of cast scrap, borings and other inferior grades.

Pittsburg

Sept. 20—There has been no further improvement in the steel trade; if anything business is not altogether as heavy as early in the month, and the general attitude of the trade is clearly one of less hopefulness. At the same time, there is really a large tonnage of business being placed. In certain lines there is a larger tonnage going on books and being shipped from mills than the average in 1906-7, but there are some offsets, the two chief ones being, first, that rail tonnage for the year was light and new buying by the railroads is light; and, second, that several classes of big work which have been taking steel steadily upon old contracts are about to play out or pass to a reduced rate, including car and shipbuilding and fabricating work. It is not certain that the total rate of production will decrease in the next 30 or 60 days, but in some quarters this is feared; if it does, it will be on account of the playing out of these lines.

Prices of steel products continue to be very well held in the circumstances, for usually when mills are indifferently well filled with business and are not selling as much as they ship the tendency is distinctly for prices to decline. The week shows no material loss in prices, but shading of outside mills in plates and shapes is somewhat more in evidence. While the plate market is still quotable at 1.40c., Pittsburg, a price of 1.35c. on narrow plates has become more general. This is not a new price, however, for in August there was a considerable tonnage of narrow plates sold at 1.35 cents.

Pig Iron—The market has continued quiet. Basic is quotably lower. A sale of 1200 to 1500 tons a month for last-quarter delivery to a steel plant a short distance below Pittsburg has aroused much discussion as the exact price, which is believed to have been very low, could not be ascertained, and it seems fair to quote the minimum of the basic market 25c. less than a week ago. Bessemer has been held at the former figure by a sale of 1000 tons. Foundry has moved slowly, but at former prices. The inquiry of a radiator company for 42,000 tons of foundry iron for delivery spread over next year, a few thousand tons being for western Pennsylvania plants, has not led to business, and the inquiry is regarded as put out merely to sound the market. Stocks of pig iron at merchant furnaces in the Valleys and western Pennsylvania are estimated at 290,000 tons, chiefly foundry and basic. This would be about 10,000 tons per furnace, or a little over a month's run. We quote at Valley furnaces, 90c. higher delivered Pittsburg: Bessemer, \$15; basic, \$13.50@13.75; foundry, \$14; malleable, \$14; forge, \$13.25 per ton.

Ferromanganese—The market is quiet, the lowest open quotation being \$29.50,

Baltimore, for prompt, freight to Pittsburg being \$1.95.

Steel—Shipments on old contracts are good, but new business is rather light. While Pittsburg and Youngstown mills do not quote under \$24.50 at mill for bessemer billets and \$1 more for sheet bars, odd lots in middle hands sometimes are offered at less, and some mills removed from Pittsburg name lower delivered prices than the Pittsburg basis would make, so that the market stands quotable about as follows: Bessemer billets, \$24@24.50; sheet bars, \$25@25.50; open-hearth billets, \$25.50@26; sheet bars, \$26@26.50; forging billets, \$28.50@29; rods, \$28@29 per ton.

Sheets—Tonnage is fairly good but the additional cutting noted last week continues, equal to \$4 to \$5 on black and \$5 to \$6 a ton on galvanized, from nominal prices of 240c. for black, 350c. for galvanized, \$1.70 for painted corrugated and \$3 for galvanized corrugated.

BY TELEGRAPH

Pittsburg, Sept. 21—The Steel Corporation and large independents are holding a conference in New York today to discuss reductions on some finished steel products on account of shading by some smaller independent concerns. This shading, however, is no new thing, and it is doubtful whether the reductions will be made. The leading Pittsburg steel men are all in New York.

Corrigan, McKinney & Co. have covered their October requirements by buying 25,000 tons furnace coke at \$1.60 at ovens. They have also bought part of their November and December coke at a slightly higher price.

METAL MARKETS

New York, Sept. 21—The metal markets continue to show little improvement, though it is rather uneven in character; price changes have been small, except in some special lines.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Aug. 1910..	\$3,150,423	\$12,818,606	Imp. \$ 9,668,183
" 1909..	9,230,273	5,348,757	Exp. 3,881,516
Year 1910..	53,495,605	42,489,786	" 11,005,819
" 1909..	89,726,392	28,754,235	" 60,972,157
Silver:			
Aug. 1910..	4,755,708	4,119,362	Exp. 636,346
" 1909..	4,494,552	3,190,988	" 1,303,564
Year 1910..	36,934,397	29,815,770	" 7,118,627
" 1909..	38,903,584	29,979,133	" 8,924,451

Exports from the port of New York, week ended Sept. 17: Gold, \$200; silver, \$545,322, principally to London. Imports: Gold, \$72,045; silver, \$87,095, from the West Indies, Central and South America.

Gold—In the absence of any special demand prices on the open market in London were unchanged at 77s. 9d per

oz. for bars, and 76s. 5d. per oz. for American coin.

Platinum—Business is improving and prices have advanced. Dealers are now asking \$34@34.50 per oz. for refined platinum and \$39@40 per oz. for hard metal. In part the advance is due to higher prices in Europe; in part also to increased demand from the jewelry trade, in which the use of platinum is becoming more the fashion.

SILVER AND STERLING EXCHANGE

Sept.	15	16	17	19	20	21
New York....	53 1/4	53 1/2	53 3/4	53 3/4	53 3/4	53 3/4
London	24 1/2	24 1/2	24 1/2	24 1/2	24 1/2	24 1/2
Sterling Ex.	4.8625	4.8620	4.8615	4.8615	4.8605	4.8605

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Silver—The market has remained steady on good demand from the Indian bazaars; and closes higher at 24 3/4 d. in London.

Copper, Tin, Lead and Zinc

NEW YORK

Sept.	Copper.		Tin.	Lead.		Zinc.	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.		New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
15	12 1/2 @12 3/4	12.30 @12.40	34 3/4	4.40	4.27 1/2 @4.30	5.55 @5.60	5.40 @5.45
16	12 1/2 @12 3/4	12.30 @12.40	34 3/4	4.40	4.27 1/2 @4.30	5.55 @5.60	5.40 @5.45
17	12 1/2 @12 3/4	12.30 @12.40	34 3/4	4.40	4.27 1/2 @4.30	5.55 @5.60	5.40 @5.45
19	12 1/2 @12 3/4	12.25 @12.35	34 3/4	4.40	4.27 1/2 @4.30	5.55 @5.57 1/2	5.40 @5.42 1/2
20	12 1/2 @12 3/4	12.25 @12.35	34 3/4	4.40	4.27 1/2 @4.30	5.52 1/2 @5.57 1/2	5.37 1/2 @5.42 1/2
21	12 1/2 @12 3/4	12.25 @12.35	34 3/4	4.40	4.27 1/2 @4.30	5.52 1/2 @5.55 1/2	5.37 1/2 @5.40

The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Sept.	Copper.		Tin.		Lead.		Zinc, Ordinaries.
	Spot.	3 Mos.	Spot.	3 Mos.	Span-ish.	Eng-lish.	
15	54 1/2	55 1/2	159 1/2	158 1/2	12 1/2	12 1/2	23 1/2
16	54 1/2	55 1/2	159 1/2	158 1/2	12 1/2	12 1/2	23 1/2
17	.....	.....	.....	.....	.....	.....	.....
19	54 1/2	55 1/2	159 1/2	158 1/2	12 1/2	12 1/2	23 1/2
20	55	55 1/2	158 1/2	157 1/2	12 1/2	12 1/2	23 1/2
21	54 1/2	55 1/2	156 1/2	156	12 1/2	12 1/2	23 1/2

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper.

Copper—Business during the last week has been very dull, total sales probably falling short of 10,000,000 lb. The busi-

ness that has been taken, chiefly for foreign delivery, has been at concessions in price, and in this at least five of the agencies have participated. A small amount of business in electrolytic for domestic delivery realized a little less than 12.35c., cash, New York, but sales for foreign delivery were made upon terms running down to 12.25c., basis New York, while some transactions in second-hand copper were reported upon even lower terms. A moderate business in Lake was done at $12\frac{1}{2}$ @ $12\frac{3}{4}$ c., but some small sales of fancy brands were made at a slight premium. In spite of the lower prices at which copper has been booked during the last fortnight there has been no selling pressure on the part of the larger interests. At the close Lake copper is quoted at $12\frac{1}{2}$ @ $12\frac{3}{4}$ c., and electrolytic copper in cakes, wirebars and ingots at 12.25@12.35c. Casting copper is being offered on basis of $12\frac{1}{8}$ @ $12\frac{1}{4}$ cents.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 14c. base, carload lots at mill.

Transactions in the standard market, although of fair volume, did not influence quotations very much one way or the other. The close is cabled as steady at £54 15s. for spot, and £55 10s. for three months.

Refined and manufactured sorts we quote: English tough, £57 5s.; best selected, £59@59 5s.; strong sheets, £67@68 per ton.

Visible stocks of copper in England and France, including copper afloat from Australia and Chile, on Sept. 15 were 95,660 long tons; a decrease of 1860 tons as compared with the Sept. 1 report.

Exports of copper from New York for the week were 9941 long tons. Our special correspondent gives the exports from Baltimore for the week at 3881 tons.

The Ray Consolidated concentrates are to be smelted by that company, which is now erecting smelting works. The blister copper has been contracted to the American Smelting and Refining Company for refining at Perth Amboy. The Chino Copper Company has made a contract with the American Smelting and Refining Company for the smelting of its concentrates and the refining of the copper. The concentrates will be smelted at El Paso, to which plant converters will be added, and the blister copper will come to Perth Amboy. All of this copper will be sold by the Guggenheim agency.

Tin—On the lower level which has been established the market in London remained fairly steady until Sept. 20. Today, Sept. 21, brought a further decline. Spot tin was neglected and transactions took place mainly in three months tin. The close is cabled as dull at £156 10s. for spot, and £156 for three months.

There was some activity among dealers in this market during the latter part of last week. How little interest the actual consumer, however, takes in the metal is best illustrated by the fact that last week's London steamer took back 100 tons of tin, for which the owners believe they will be able to find a better market in London than here. At the close, quotations are made at about $34\frac{1}{4}$ cents.

Lead—Demand in this metal remains fairly good at 4.40c., New York, while Missouri lead seems to be offered a little more freely. Prices in St. Louis close at $4.27\frac{1}{2}$ @4.30 cents.

In Europe business continues on a very large scale and heavy sales to consumers are reported. The market closes firm at £12 13s. 9d. for Spanish lead, and £12 16s. 3d. for English.

Spelter—Consumers are not quite so willing of late to follow the advance in this metal. Buying on their part has diminished and business therefore is very quiet. The market closes somewhat easier at $5.37\frac{1}{2}$ @5.40c., St. Louis, and $5.52\frac{1}{2}$ @5.60c., New York.

Very large buying is reported from the other side, and it appears that consumption abroad has overlapped production, and from the present outlook existing stocks will have entirely disappeared by the end of the year. In consequence, the market is extremely strong and closing quotations are cabled for good ordinaries at £23 10s., and for specials at £23 15s. per ton.

Base price of zinc sheets is \$7.50 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount

European Zinc Convention—The convention of the European zinc producers expires by limitation Dec. 31 next, and negotiations are now in progress for its renewal. The results of the agreement are considered to have been satisfactory, and the proposed extension will probably be made. On this point the report of the Vieille Montagne Zinc Company, recently issued, says that that important company will join in the new convention, on condition that any reduction of output from the actual quantity shall be determined, without taking account of fluctuations in quotations, whenever unsold stocks shall begin to exceed an amount to be fixed by the agreement.

Other Metals

Aluminum—The market has been dull, with No. 1 ingot freely offered at 22c. and the chances that business could be consummated for less. The quotation is nominal at $21\frac{1}{2}$ @22c. per lb., New York.

Antimony—The market remains dull, with only a retail business forward. Prices are nominally unchanged at $8\frac{1}{4}$ @

$8\frac{3}{4}$ c. per lb. for Cookson's; $7\frac{7}{8}$ @8c. for U. S., and $7\frac{1}{4}$ @ $7\frac{3}{4}$ c. for outside brands.

Quicksilver—Business remains good and the market is firm, but prices are still unchanged. New York quotations are \$46 per flask of 75 lb. for large lots; \$47@48 for jobbing orders. San Francisco, \$45.50 for domestic orders and \$2 less for export. The London price is £8 12s. 6d. per flask, with £8 6s. 3d. quoted by second hands.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 500-lb. lots, up to 55c. for 200-lb. lots. The price of electrolytic is 5c. higher.

Cadmium—Current quotations are 60@70c. per lb. in 100-lb. lots, f.o.b. New York, according to quality of metal.

Magnesium—The price of pure metal is \$1.50 per lb. for 100-lb. lots, f.o.b. New York.

Zinc and Lead Ore Markets

Platteville, Wis., Sept. 17—The base price paid this week for 60 per cent. zinc ore was \$43@44 per ton; no premium price was paid. The base price paid for 80 per cent. lead ore was \$52@53 per ton.

SHIPMENTS, WEEK ENDED SEPT. 17.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Galena.....	752,875	.....	.....
Mineral Point.....	686,120	.....	.....
Platteville.....	508,800	.....	548,200
Benton.....	372,310	.....	.....
Cuba City.....	338,885	109,385	515,395
Harker.....	227,230	.....	.....
Highland.....	193,700	81,300	.....
Dodgeville.....	125,800	.....	.....
Shullsburg.....	58,700	.....	.....
Montfort.....	.....	66,000	.....
Total.....	3,204,420	256,685	1,063,595
Year to date.....	68,661,765	7,020,904	18,791,825

Shipped during the week to the separating plants, 2,003,660 lb. zinc concentrates.

Joplin, Mo., Sept. 17—The highest price paid for zinc sulphide ore was \$47 on a base price of \$44.50 per ton of 60 per cent. zinc. The highest base price for ores carrying less than 4 per cent. iron was \$45, a few bins selling for that for next week's delivery. Ores carrying from 8 to 10 per cent. iron at Miami sold for \$49 base. Zinc silicate sold on a base of \$21@24 per ton of 40 per cent. zinc. The average price, all grades of zinc, was \$41.10 per ton. Lead ore sold generally at \$56, and the average price, all grades of lead, was \$55.10 per ton.

The zinc market opened strong Thursday on a \$44 base and by Friday night had reached \$45 and very few car loads sold under a \$44 base. Producers were slow to let go of their ore as the spelter market was showing an upward tendency and many of them are holding for a \$45 base or better.

SHIPMENTS, WEEK ENDED SEPT. 17.

	Zinc, lb.	Lead lb.	Value.
Webb City-Carterville	4,658,870	1,026,860	\$128,402
Joplin	2,339,600	208,540	57,310
Alba-Neck	981,950		22,584
Galena	779,210	82,710	18,637
Duenweg	472,420	121,380	11,853
Granby	712,230	4,830	9,915
Miami	568,980		8,634
Sarcoxis	461,870		8,596
Badger	414,980		8,507
Aurora	429,980		7,978
Spurgeon	132,750	173,830	7,008
Carthage	298,950		6,576
Jackson	244,600		5,124
Carl Junction	178,830		4,023
Oronogo	60,710	29,500	2,080
Quapaw	60,010		1,140
Totals	12,795,940	1,647,650	\$308,367

38 weeks.....422,518,840 61,314,220 \$9,874,107
 Zinc value, the week, \$262,958; 38 weeks, \$8,296,276
 Lead value, the week, 45,400; 38 weeks, 1,577,831

MONTHLY AVERAGE PRICES.

Month.	ZINC ORE.				LEAD ORE.	
	Base Price.		All Ores.		All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	\$41.25	\$47.31	\$38.46	\$45.16	\$52.17	\$56.99
February	36.94	40.69	34.37	39.47	50.50	53.64
March	37.40	43.60	34.71	39.71	50.82	51.26
April	38.63	41.00	37.01	39.33	55.63	49.72
May	40.06	40.19	37.42	37.51	56.59	48.16
June	44.15	40.20	40.35	37.83	57.52	48.80
July	43.06	39.63	41.11	36.80	53.74	48.59
August	48.25	40.13	44.54	37.32	57.60	49.75
September	47.70		44.87		56.11	
October	49.50		45.75		55.02	
November	51.31		48.29		53.94	
December	49.45		47.57		55.26	
Year	\$43.98		\$41.20		\$54.60	

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

Other Ore Markets

Iron Ore—Current quotations for Lake Superior ores, on dock at Lake Erie ports, are: Bessemer ore—base 55 per cent. iron and under 0.45 phosphorus—\$5 per ton for Old Range and \$4.75 for Mesabi; nonbessemer—base 51.5 per cent. iron—\$4.20 for Old Range and \$4 for Mesabi.

In the East there is no organization of sellers, and a wide range of prices exists, according to quantity and location of mines. A good nonbessemer ore, around 50 to 55 per cent. iron, can be had at \$3@3.50 per ton, f.o.b. mines; but no general quotations can be given.

Manganese Ore—The base price, as fixed by large buyers, is 25c. per unit for manganese and 5c. per unit for iron content, for a base ore containing 49 per cent. or over in manganese, not over 0.20 phosphorus and 8 per cent. silica. Prices range down to 23c. per unit for 40 per cent. manganese; with deductions for excess of phosphorus and silica.

Tungsten Ore—Ferberite, wolframite and huebnerite ores, \$6.50@7 per unit per ton of 2000 lb. of ore containing 60 per cent. of tungsten trioxide. For scheel-ite ores, 50c.@1.50 per unit less.

Zinc Ores—For Rocky Mountain blende, of good quality, especially as to iron and lead content, delivered at Kansas smelting points, the current price is for

the zinc content, less eight units, at the St. Louis price of spelter, less \$14@15 per 2000 lb. of ore. See also Joplin and Wisconsin ore markets.

Pyrites—Domestic furnace sizes fetch 11@11½c. per unit at mines; fines, 10¾@11c. Pyrites containing arsenic realize from ½@1½c. per unit less. Delivery to Eastern acid works costs from 2 to 3c. per unit more. Most contracts are made f.o.b. mines.

CHEMICALS

New York, Sept. 21—Business generally is quiet, with few signs of early improvement on any considerable scale.

Copper Sulphate—The market is easy and prices unchanged. Quotations are \$4 per 100 lb. for carloads or over, and \$4.25 per 100 lb. for smaller orders.

Arsenic—The market has again lapsed into dullness. Prices are lower, \$2.25 per 100 lb. being quoted for white arsenic.

Nitrate of Soda—Business is more quiet than it has been. Sellers still ask 2.10c. per lb. for spot, but are a little easier on futures, for which 2.12½c. per lb. can be done.

Potash Salts—A conference is to be held shortly in Berlin for the purpose of settling, if possible, questions concerning the prices and exports of potash salts. The German Government represents the potash producers; the other parties will be representatives of American companies owning mines or having long contracts with mine owners. They will be accompanied by M. H. Davis as commercial representative of the State Department of the United States.

Petroleum

Exports of petroleum and products from the United States, eight months ended Aug. 31, in gallons:

	1909.	1910.
Crude petroleum	81,144,885	73,519,692
Naphthas	44,879,303	56,986,858
Illuminating oil	679,860,120	623,462,533
Lubricating and paraffin	93,977,393	106,360,902
Residuum	69,967,559	70,553,269
Total	969,829,260	930,883,254

The total decrease this year was 38,946,006 gal., or 4 per cent.

Scotch Oil—After prolonged negotiations, the directors of the Scottish mineral-oil companies have fixed the prices of burning oils for the new selling season now being entered on at 5½d. per gal. for No. 1, which represents a drop on last year's rate of about ¼d. per gallon.

MINING STOCKS

New York, Sept. 21—The general stock market has been dull throughout the week, with price movements irregular on light trading. There has been no general tendency apparent and fluctuations were not large.

The Curb market was also dull, with only moderate trading in copper stocks and changes in those stocks were unimportant. Nevada gold shares were quiet and with no special interest shown. The most active business was in the Cobalt stocks, especially Nipissing, which showed some strength.

Boston, Sept. 20—Copper shares continue to display a lack of animation and price changes are trivial from day to day. The market is a waiting one, but with its thoroughly liquidated condition offers the prospective buyer a favorable opportunity.

COPPER PRODUCTION REPORTS.

Copper contents of blister copper, in pounds.

Company.	June.	July.	August.
Arizona, Ltd.	2,902,000	2,910,000	2,620,000
Balaskala	1,226,000	1,100,000	
Boleo (Mexico)	2,115,314	2,272,600	2,039,320
Copper Queen	10,219,687	10,730,372	9,426,763
Calumet & Ariz.	2,490,000	2,705,000	2,560,000
Cananea (Mexico)	4,280,000	4,500,000	3,526,000
Detroit	2,017,000	1,800,000	2,100,000
Imperial	800,000	800,000	400,000
Nevada Con.	6,186,832	6,896,429	5,800,000
Old Dominion	2,092,000	2,000,000	2,693,000
Shannon	1,528,000	2,207,000	1,546,000
Superior & Pitts.	2,245,000	2,324,000	2,520,000
Utah Copper Co.	8,358,496	8,677,000	7,443,000
Butte District	23,750,000	23,750,000	23,750,000
Lake Superior	18,000,000	19,000,000	18,800,000
Total production	88,130,329	90,804,411	85,224,283
Imports, bars, etc.	20,817,978	17,714,034	
Imp. in ore & matte	5,579,618	6,637,836	
Total	114,527,915	115,156,281	

Butte district and Lake Superior figures are estimated; others are reports received from companies. Imports duplicate production of Cananea, and that part of Copper Queen production which comes from Nacozari. Boleo copper does not come to American refiners. Utah Copper report includes the output of the Boston mill.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries Domestic.	Deliveries for Export.
IX, 1909	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,596
XII	117,828,655	69,519,501	59,546,670
Year	1,405,403,056	705,051,591	680,942,620
I, 1910	116,547,287	78,158,387	81,691,672
II	112,712,493	66,618,322	37,469,518
III	120,067,467	62,344,818	40,585,767
IV	117,477,639	67,985,951	31,332,434
V	123,242,476	59,305,222	45,995,400
VI	127,219,113	53,363,196	65,896,948
VII	118,370,003	56,708,175	59,407,167
VIII	127,803,618	67,731,271	61,831,780

VISIBLE STOCKS.

	United States.	Europe.	Total.
IX, 1909	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I, 1910	141,766,111	244,204,800	385,970,911
II	98,463,339	248,236,800	346,700,139
III	107,187,992	254,150,400	361,338,392
IV	123,824,874	249,625,600	373,450,474
V	141,984,159	246,870,400	388,854,559
VI	160,425,973	239,142,400	399,568,373
VII	168,386,017	232,892,800	401,278,817
VIII	170,640,678	222,320,000	392,960,678
IX	168,881,245	218,444,800	387,326,045

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

