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Blast Furnace Capacity

A good deal has been said from time to time of the great increase in iron-making capacity in the last five years, and some rather extravagant estimates of the possible make of pig iron in this country. These may be corrected by the definite figures presented by the American Iron & Steel Association in its final report. According to these there were on the lists of the Association on Nov. 30, blast furnaces having a total rated capacity to make 42,893,000 tons of pig iron yearly; but of these 43 stacks, rated at 1,766,000 tons, have been long idle, and it may be fairly assumed that few, if any, of these will ever go into blast again. Most of them are unable to operate at a profit—some not at all—owing to antiquated construction and equipment, unsuitable location or other causes. Deducting these, we have left furnaces with a total yearly capacity of 41,127,000 tons yearly.

Assuming this figure as our total present limit, it does not follow that we can turn out 41,000,000 tons of pig iron in a year. The rating of a furnace is usually based on its highest possible or actual output in a day or a week. But no furnace can run at this highest rate for a year continuously, and a deduction of somewhere between 5 and 10% must be made from the maximum daily make \times 365 to get at the real capacity. Moreover, a blast furnace cannot run indefinitely, and in practice a certain number must always be out of blast for relining or other repairs. The time for blowing out is usually postponed as long as possible, but it is sure to come. It is probably safe to assume that from 15 to 20% of the stacks must be under repair, even when demand for iron is heavy and there is a motive for making the idle time as short as possible. Putting these two together, it would seem that the actual make of iron at the present time could not exceed 32,000,000 to 33,000,000 tons a year. According to the most reliable

figures, we were running at the rate of 32,000,000 tons of iron yearly on Dec. 1; and our make for 1912 will not be far from 29,600,000 tons. It may be added that the new furnaces now under construction will have, when completed, a capacity of about 1,500,000 tons, so that the capacity next year will be approximately 34,000,000 tons.

A different cause limits at the present time the increase of active furnace capacity, and that is the supply of coke. The quantity of iron made with anthracite and raw bituminous coal is very small; adding that made with charcoal and we find that coke is the fuel used for fully 95% of the iron made. The coke plants at present are being worked very nearly to their full capacity with the labor attainable, and no early increase is in sight. Next year several large byproduct plants will go into operation, but until that time no large increase in ironmaking is possible.

"Blue Sky" Legislation

At a recent meeting of an association of investment bankers in New York, there was considerable discussion of the so called "blue sky" legislation for the protection of investors against wildcat promoters, and the opinion was expressed that laws imitating that of Kansas will probably be passed, sooner or later, in most of the states. While it is recognized that the intention of such legislation is beneficent, there is a feeling that the plan that is now being commonly pursued is not only inadequate, but also may become as great an evil as that which it is sought to correct.

The matter of preventing swindling stock-selling schemes is extraordinarily difficult, as the Government has found out in its actions against the gentry engaged in that business who have been arrested and put on trial. The defense is always, of course, that their promoters "thought" their schemes were good and would turn out to be bonanzas and would

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pay the big dividends promised. In other words, they were not pickpockets, but simply members of the Col. Seilers' family.

The prosecution has to prove a wilful attempt to defraud. In the cases of the gold-brick man who gilds a bar of lead and sells it to the hayseed, or of a Jerne-gan who dons a diver's suit and salts his submarine gold collecting plates, there is, of course, a *prima facie* intention of fraud. But in the ninety and nine cases of wildcat-company promoters, the guilty knowledge is buried in their own brains, many of their figureheads are dupes, and legal proof is often difficult to obtain. The suckers and gudgeons bite, and the lawyers for the defense try to make out with straight faces that they had a run for their money, while everybody of expert knowledge knows that the schemes were fraudulently conceived and never had any legitimate chance. In this connection, let us suggest to judges and lawyers that they exercise a little common sense; so far the juries have displayed that quality in an admirable way. The jurors are not responsible for the long-drawn out trials.

Candle Fires

The fire recently started in the Stewart mine of the Anaconda company, which fortunately is well under control and will not result in any great damage, is supposed to have been caused by a careless miner leaving a burning candle when he went off shift, although there is no positive proof that this was the cause. However, fires frequently are started in this way in the Anaconda mines and the company tries to prevent them by sending inspectors, commonly referred to as "fire bugs," through the stopes after the men have left.

This experience draws renewed attention to the danger in leaving burning candles in a mine, especially one that is timbered and is dry, although there may be the danger of igniting combustible rubbish and creating a suffocating fire in almost any mine. That terrible fire in the Belmont mine, at Tonopah, Nev., on Feb. 23, 1911, which caused the death of 17 men, was undoubtedly started by a lighted candle being left on a pile of mine timber in a winze. Mining rules covering this particular kind of carelessness cannot be made too strict, nor should any inspectorial precautions be neglected.

Reforming the Patent System

In view of the extensive agitation for radical changes in the patent system of the United States, in connection with which several bills affecting and greatly modifying the patent system are now pending in Congress, the board of directors of the American Institute of Electrical Engineers has adopted resolutions urging that Congress provide for a commission, composed of independent, competent men of such national standing as will command the respect of the whole country, to hold public hearings, to make a thorough and careful study of the patent situation, and to report about it to Congress. It is further urged that the present system be let alone until such a commission has been appointed and has reported.

These recommendations, we think, embody common sense. Unfortunately, that is a commodity that Congress does not like. The attitude of Congress toward commissions of experts is very much like that of the devil toward holy water. Congress infinitely prefers committees of its own, headed by a Stanley or a Pujo. Should members of Congress be deprived of the opportunity to sit in the spotlight? Oh, never!

The Geological Survey Wants a Building

Director George Otis Smith recently appeared before the house committee on public buildings and grounds at Washington and made a vigorous argument for a new building to house the Geological Survey and the Bureau of Mines. The work of both of these organizations is seriously handicapped by inadequate quarters, and as we have previously urged, they should be granted a building fitting their needs and commensurate with the importance of the mineral resources of this country. The valuable records of the Survey should not be left in their present unsafe repository, nor the Survey further hampered in its work by inadequate facilities.

We hope that Congress will give earnest consideration to this reasonable request. There is more legitimate need for a proper geological and mining building in Washington than there is for many of the ornate post-office buildings that are erected in the several congressional districts.

The Steel Statistics

The service which the American Iron & Steel Association has for many years rendered to the iron and steel trades ends this week with its transfer to the new Statistical Bureau of the American Iron & Steel Institute. The institute management has wisely decided to retain the experienced statistical staff of the association in the new bureau, and will also take over all the records and documents.

The year that is about to close has been a prosperous one for the mining industry. The shipments of iron ore from the Lake Superior region have been the largest on record. The coal miners have been pressed hard to meet the demand for their product. The prices for copper and zinc have ruled high. Silver has also been high, according to recent standards for that metal. Lead is the only metal for which a high price has failed to rule throughout the year.

New methods of mining, the employment of new mechanical agents, etc., have introduced new hazards to life and limb. For example, there are now numerous fatalities resulting from men coming into contact with electrical wires. The most prolific single cause of mining accidents is still, however, "falls of roof," and this is the hardest thing to guard against by written rules. The only safeguards are good foremen, eternal vigilance and common sense. In the exercise of the last the miner must participate as well as his superiors.

The German government plan for a state controlled company to monopolize the sale of oil in the Empire seems to be meeting with strong opposition in the Reichstag. Recent advices are that it is attacked by some strong interests and may not be adopted at all, unless in a much modified form.

In its next issue, the first of 1913, the JOURNAL will appear in a new dress. The type will be larger and more easy to read and we shall return to the two-column measure, which was the form of our pages previous to 1902.

The annual statistical number of the JOURNAL, reviewing 1912, will be the issue of Jan. 11, 1913.

By the Way

At the last meeting of the stockholders of the Cape Copper Co., it was stated by the chairman that the Tilt Cove mine, Newfoundland, is now practically exhausted. Thus passes a famous old mine, never a large producer but always an interesting one.

Among the witnesses recently called in the case of A. L. Wisner & Co. was "A. T. Van Sickle, a mining expert and stock salesman, formerly in the employ of that firm." At first glance this combination of avocations struck us as peculiar, but after a little reflection we thought that it might exist even in the halls of the mighty.

To the Minesota mine, Ontonagon County, Michigan, belongs the credit for having produced the largest mass of native copper found in the Lake Superior copper country. Its greatest length was 46 ft., the greatest breadth 18½ ft. and its greatest thickness 8½ ft. Its weight was over 500 tons, says A. H. Meuche, in a publication of the Michigan Geological Survey. To cut up this one mass took 20 men over 23 months.

Now we are beginning to hear the reiteration of the old, old remarks of a certain school of economists that a reduction in the price of copper would be of no interest to consumers; that the latter would as lief pay a high price as a lower one, etc. Also there comes the gossip that the Department of Justice is investigating copper conditions, that it plans to ascertain whether there is a conspiracy on the part of producers to hold metal off the market and keep prices at a level which acts virtually as a restraint of trade. Of course, the Attorney-General cannot prove anything of this sort any more than he can about anthracite. Yet in both cases, the unanimity with which it is considered that the price of the commodity ought to be a certain specific thing is interesting. Also interesting are the explanations of the copper producers. A few weeks ago there was no open market, no copper obtainable at anything less than the pegged price except from "second hands," junk dealers and other guerrillas. Now, we are gravely offered the news that "There has been no concerted action on the part of the producers to maintain any price. In fact, sellers of more than 200,000,000 lb. annually have been cutting under the higher price level and securing some small business!"

The "Luminator" process applied to cyanidation appears to be covered by the patent of Gaston Jacquier. As we understand it, aluminum sheets are suspended in a tank at right angles to the magnetic needle, and immediately after a clean-up the precipitated solution is run into the tank. It must be verified each day by compass that the aluminum sheets are

at right angles to the earth's magnetic field, and there must be sunlight present. In 24 hr., "all the gold and silver contained in dissolution are precipitated on the sheets in a pure state." The plates are taken out and cleaned, then put back. In three or four days more the zinc or copper present deposits "on the sheets as a white and chemically pure crystal" (what salt of copper is this?). The aluminum is not corroded. We understand Mme. Curie is unable to explain what part the orientation of the plates plays; Madame Curie is miles ahead of us, as we are in the dark on at least five other points.

During the fire in the Homestake mine, in the Black Hills of South Dakota, all possible data bearing on the subject of fires and gases were collected with the hope of utilizing some of them which would aid in mastering the flames. About the large opencut in Lead, it was noticed that smoke and gases were filtering out of a great number of seams and cracks, and in order to determine the nature of these fumes, two chemists from the Homestake assay office appeared one day on the scene armed with bottles, rubber hose, etc., and a small suction pump. They proceeded to rig up the pump, connecting the suction through a piece of rubber hose into one of the cracks from which fumes were arising, and began to pump the gas into the bottles. Two Cornishmen were standing near, interested spectators of the proceeding. As the operation of pumping commenced, one of them turned to his companion and said, disgustedly: "Eil, I wonder if 'em blewddy fools theenk 'ee can poot out fire with that 'ing."

That a chemical process should undergo five distinct evolutionary steps was claimed by Jasper Whiting, in a paper before the Congress of Applied Chemistry. These steps (which might well apply to any new process or device) are: The beaker or laboratory stage; the small-sized unit; the life-sized unit; the semi-commercial plant; the commercial plant. In the first stage only the technical side of the problem should be attacked, but this should include a study of competing conditions of one's own process, whether the raw materials can be had at a reasonable price in large quantities, and whether there is a permanent market. In the small-sized-model stage, the process should be worked in a variety of ways and an attempt made to learn the best conditions of operation. In the third stage the chemist should call an engineer into consultation, and neglect of this has wrecked many processes. The temptation is to hurry too greatly in this stage, and the first life-sized unit should be worked with for months, until all its troubles, both cumulative and otherwise, are known. When this stage is about 80% complete is the time to apply for a

patent. In the step to the semi-commercial plant will come the change from skilled labor to ordinary, and the fool-proofness of the apparatus will be tested, also the relationship of the separate operating units. Financing must also be considered at this stage. The commercial plant should, as far as possible, be laid out in sectional units, and one built and operated first. If this goes well the rest is easy.

The Temiscaming & Hudson Bay company, at Cobalt, has just paid its 43d dividend. The history of this mining company is little short of romantic. Few companies in fiction or on the stage have been more successful. It has returned to date \$1,684,137 on an investment of \$7761. During the last three or four years, the company has been paying 2400% per year, the returns during the last fiscal year being 2700%. In 1903 the Temiscaming & Hudson Bay Mining Co., Ltd., was formed by a number of New Liskeard townsmen who believed from reports brought down from the north by Indians, fur traders, and lumbermen, that there were valuable mineral deposits in the then unexplored Larder Lake district; a number of claims were staked and some work done. With the advent of the railroad in 1904, came the discovery of silver at Cobalt, and the company's prospectors were immediately sent south to the new field where they staked eleven claims. The first valuable vein was opened on what later became the Cobalt Silver Queen property, and in 1905 the company was able to declare a dividend of 200% from shipments of ore made on this property. This portion of the company's property was sold the next year for \$810,000. Meantime, development work was actively conducted on other claims owned by the company, and in the spring of 1907 a rich shipment of high-grade ore was made from the North claim on the shore of Sasaginaga Lake; from this property the company has been shipping ever since. When the company was first formed it was capitalized at 25,000 shares at \$1 each, of which 7761 shares were issued and paid up. Owing to the richness of the ore found in these properties, no further capital subscriptions were ever required. Thus on less than an initial expenditure of \$8000, nearly \$2,000,000 have been returned to its stockholders, and the company still has important reserves. Originally all this stock was held in New Liskeard, but as its value was recognized, it became scattered and though more than one-half the stock is still held by the original New Liskeard subscribers, shares are now held in all parts of Canada and the United States, and even in England, France and Belgium. The company still holds nine claims at Cobalt and has since acquired five at Gowganda.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Canadian Feldspar Shipments

In the JOURNAL of Dec. 14, 1912, p. 1148, in connection with the announcement of a shipment of ground feldspar from the Parham feldspar mine, in Frontenac County, Ont., occurs the statement that this is said to be the first feldspar mined in Canada. This is, of course, merely a case of Homeric nodding. The error is presumably that of your correspondent, for the fact is quite to the contrary.

Feldspar has not only been mined for many years in Canada, but one of the moving causes of the extended reconnaissance of Maine's feldspar deposits conducted by the Federal Bureau of Mines during the last summer was a desire to extend the domestic production, if possible, so that local producers might supply the demand now filled by comparatively heavy importations from Canada. Bedford, Ont., has been a heavy producer for years, its shipments to Trenton, N. J., consumers as long ago as 1901, running as high as 4000 tons in a single quarter. The Bedford spar is a red orthoclase, containing little or no iron, despite its color, and calcining to perfect whiteness.

C. VEY HOLMAN.

Rockland, Maine, Dec. 16, 1912.

Who Is a Mining Engineer?

Mark R. Lamb's formula for determining the Relative Location of a mining engineer has been tested by application to the life lines of a number of my acquaintances. Some of the cases worked out well, but others were found which could not be made to check with the known conditions, and I have finally discovered the reason. Before going farther I will state that I am prepared to furnish the affidavit required by Mr. Lamb that I have not yet determined my own Relative Location.

A QUICK ACTING TONGUE THE ENGINEERS' FRIEND

The chart still lacks one vital factor: namely, a scale of the Use of Language. It may be called by several different names, as the Scale of Eloquence, the Gift of Gab, or the scale of Verbal Persuasion. A little study will soon convince the observing student that this factor is not covered by either Publicity or Tact or Specialization or by any combination of these scales. Moreover, it is distinguished by being a native endowment;

while, as Mr. Lamb admits, Publicity may be attained by extra work, and Specialization is largely dependent on outside influences. And Tact can only go as far as making a man keep silent and does not alone help him to put up a good talk when that is the particular thing needed. Good talkers, even more than poets and singers, are born, not made. The Social scale suggested by your correspondent from Missouri (ENG. AND MIN. JOURN., Nov. 30, 1912), would come nearer covering this factor than any line on the chart and yet that does not reach this all important factor.

Without a well developed gift of gab what benefits could be derived from a Boston or a London experience? And I never heard of an engineer reaching the "Private Car" without ample endowment in the line of the use of language. Referring to the frequently heard saying that if you have anything to say you can always find words to express it, we should remind ourselves that it is only smooth talkers who make that remark. It is useless to object that the success of a smooth talker is not "as an engineer." It certainly belongs to his rating in a more vital way than does Publicity.

"GOLD BRICKING" A PAYING ART

Actual examples will serve to make the case clear. A mining engineer that I knew was employed to make a survey for an important underground connection. The work did not connect. The mistake cost the mine about \$6000. An ordinary engineer would have been fired instanter or made to pay the loss. Everyone in that community knew of the general carelessness and unreliability of this engineer—everyone excepting the employer. He was a little suspicious at first but our good talker engineer kept close to his ear and not only persuaded him that someone else was to blame but that the distorted work would eventually benefit the mine. Marvelous, but true!

Another case: A well known high-priced engineer made a mine examination. One of the features of the elaborate report was a lengthy assay list accompanied by charts showing the location of the samples; but there was nowhere, either in the text or on the plat, a figure to show the width of the ore taken for a sample. A subsequent examination of the engineer's field notebook showed that he had never measured the widths of his samples. Impossible! you say; how could he have made up his report? But he did;

and afterward he talked with his client so fluently that he forgot all the little details of the written report and believed that he had received one of the most valuable reports ever made.

Another case showing the effect of a lack of conversational power: A competent young mining engineer sampled a mine, taking cuts of the vein at the backs of the drifts and also from the floors. His report was disappointing to the vendor, who was a fluent talker and went to the client and explained that his engineer was incompetent because he had not cut the samples in a complete ring around the drift, including the walls as well as the vein. In vain the engineer tried to explain that samples thus taken would have given even lower values than shown by the returns. He was a slow talker, poor fellow, the vendor won the day. Unheard of you say, that any man with the good judgment to employ an engineer would not take his advice! But truth is stranger than fiction!

We call upon Mr. Lamb to put the new scale on that chart. To illustrate the absolute necessity and unquestionable application of this factor it may be observed that the line, properly placed, will be so adjusted that a high value on this scale when coordinated with even one of the lower numbers on the Specialization scale, "Machinery Salesman," for example, will give a high result on the "Money" scale. And so on. It is evident that this scale must have a below zero graduation to accommodate those who talk too much.

H. W. B.

Denver, Colo., Dec. 14, 1912.

Overload Alarm for Dorr Thickeners

The spring-alarm connection on Dorr thickeners, described in the JOURNAL of Dec. 14, 1912, p. 1123, is furnished by us regularly when desired and was not put on by the Blue Flag company, as might be inferred from the article.

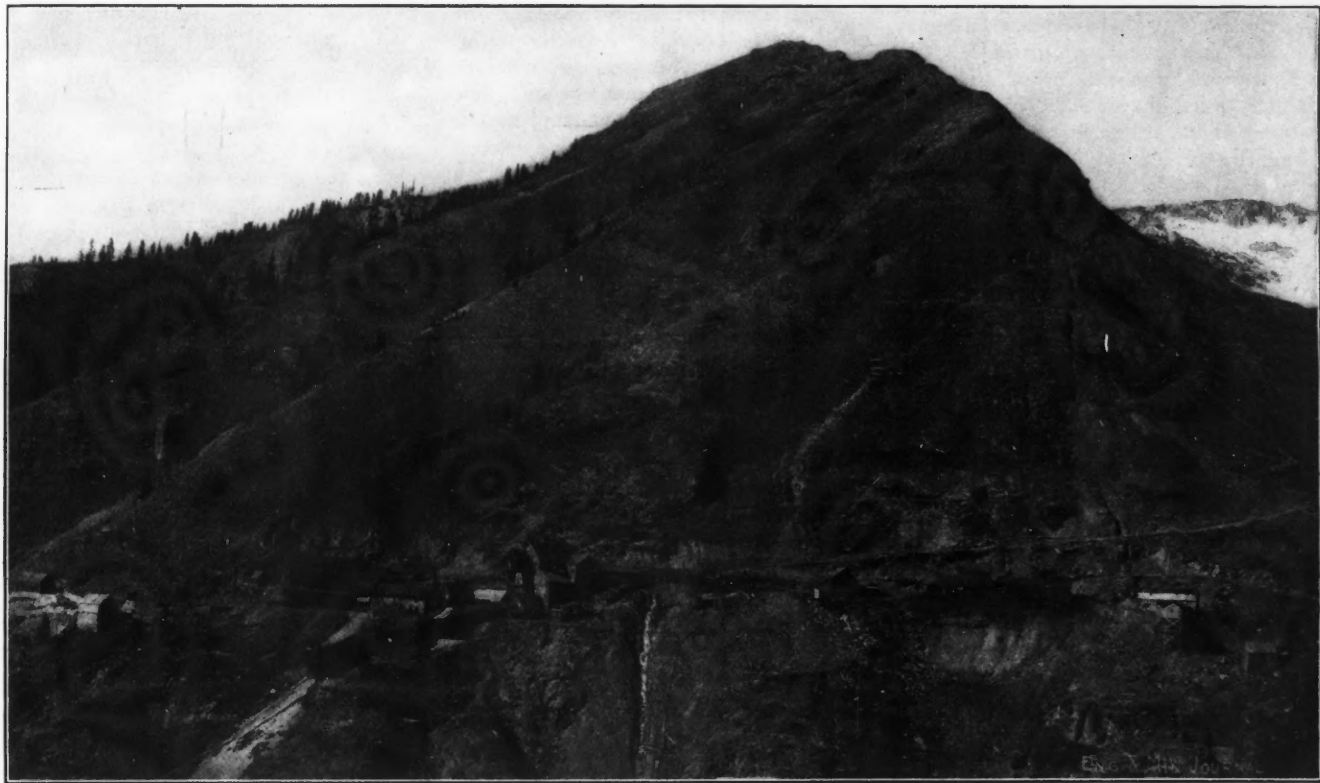
We have now changed our method somewhat and instead of this device are using the pressure of the worm shaft on the button at the end of the shaft to indicate the overload in the same way. This allows the alarm bell to be placed in any part of the mill desired; also a number of thickeners may be connected up with one bell.

THE DORR CYANIDE MACHINERY CO.
Denver, Colo., Dec. 19, 1912.

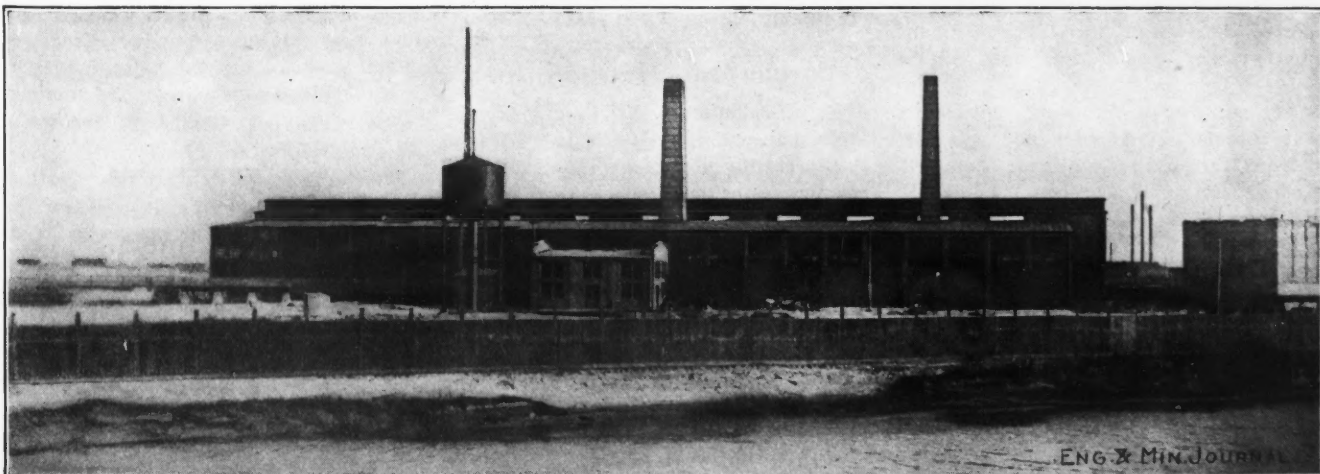
Photographs from the Field



SMUGGLER-UNION STAMP AND CONCENTRATION MILL AND CYANIDE PLANT AT PANDORA, NEAR TELLURIDE, COLO.



SMUGGLER-UNION MINE IN THE SAN JUAN DISTRICT, COLORADO



NEW PLANT OF INTERNATIONAL LEAD REFINING CO., AT EAST CHICAGO, IND.,—THE PARKES' PROCESS IS USED

Concerning the Patenting of Borax Claims

WASHINGTON CORRESPONDENCE

Senator Massey, of the Committee on Mines and Mining, has submitted to the Senate a report in favor of his bill proposing to change the laws regarding patenting claims for borax on public lands. He said that, owing to the nature of the deposits of borax, uncertainty as to titles has resulted because of the doubt as to whether the land should be or should have been acquired as a placer or as a lode. This uncertainty has already led to litigation.

Originally the ruling of the Land Office was that a mineral deposit not metaliferous could only be acquired under the placer laws. This construction has in recent years been reversed by the Land Department, and the weight of the opinion of text writers on mineral law has been given against this ruling and some of the courts have rendered decisions contrary to it. It has not been finally determined, however, by the United States Supreme Court which of these constructions was right. The earlier interpretations may be the final interpretations of the law. In every instance where Congress has specifically determined as to any particular character of mineral deposit it has specified the placer law as applicable to nonmetaliferous minerals.

New York Section, A. I. M. E.

One of the most successful meetings of the New York Section of the American Institute of Mining Engineers was held in the Engineering Societies Building on Dec. 20, when Dr. Alfred E. Barlow, president of the Canadian Mining Institute, presented a paper on "The Silver-Nickel-Cobalt Deposits of Cobalt, Ont." Doctor Barlow's paper was a comprehensive review of the mineralogy and geology of this famous silver district, and the statistics of production and present treatment methods were also reviewed. Numerous maps and lantern slides were offered, illustrating the features of the district; also typical specimens of the ores.

The discussion following the lecture was especially interesting and was participated in by Prof. William Campbell, George M. Colvocoresses, Louis V. Emanuel, John Wellington Finch and John M. Clark, K. C. Professor Campbell presented a series of slides illustrating the order of mineral formation, which in the ores examined was as follows: smaltite, niccolite, chloanthite, calcite, argentite, native silver and native bismuth. One of the curious facts illustrated in several of these slides was a "rosette" of smaltite surrounding a kernel of native silver. Mr. Colvocoresses

discussed Gowganda, Montreal River and other neighboring districts comprising the same general geological formations as exist at Cobalt; in this area of 2000 square miles, about 500 veins have been discovered, but only six were important producers. The production from Cobalt has been about 150,000,000 oz. of silver, while the remainder of the area has produced only about 5,000,000 oz., he said; most of the productive veins were in the diabase. Mr. Clark wittily discussed legal matters relating to the Cobalt district and pointed out the differences between the Provincial legislative powers and those of the states. He also referred incidentally to the discovery of nickel in the Cobalt district in 1892 and to the investigation made to determine if "another Sudbury" had been discovered.

At the close of the formal part of the meeting, President Kemp moved a vote of thanks be extended to Doctor Barlow for his illuminating discussion of the genesis of the Cobalt ores; he said, however, that a neighbor at dinner the previous evening had commented on the fact that he had heard a great deal about the Genesis of veins, but that his experience had been principally concerned with the Exodus of veins.

Cobalt Steel to be Studied

SPECIAL CORRESPONDENCE

The Mines Branch of the Canadian Department of Mines has undertaken an important investigation with a view of utilizing the cobalt contained in the ores mined for silver in the Cobalt area, much of which now goes to waste on account of the limited market for this metal. Cobalt resembles nickel in many of its properties, and it is thought that it may perhaps be substituted for nickel in steel alloys.

The services of Dr. Herbert T. Kalmus, formerly of the Massachusetts Institute of Technology, have been secured to conduct an exhaustive investigation as to the availability of cobalt as a steel alloy in place of nickel, arrangements having been effected with the Kingston School of Mining.

Pyrene Fire Extinguisher

The installation of 300 Pyrene fire extinguishers at the Anaconda mines in Butte recently, led to the JOURNAL's representatives being present at some demonstrations of the machine. The extinguisher consists of a small brass body holding one quart of the extinguishing fluid, and fitted with a small interior force pump, capable of throwing the contents about 30 ft., but usually most advantageously used at distances of six to 10 ft. The fluid contained boils at about 197° F., forming a blanket of incombustible gas over four times as heavy as air. The liquid and the gas are both nonconductors

of electricity, so that it is possible to strike and break an arc of any magnitude, without danger to the operator.

The tests witnessed were: Gasoline spilled on a floor and ignited; gasoline burning in buckets; burning acetylene generated from carbide and water; acetylene and gasoline; cotton waste saturated with oil; excelsior wet with gasoline; and fires made with excelsior, waste and kindling inside wooden boxes. In every case the fire was extinguished by a portion of the contents of a one-quart extinguisher in a few seconds. The application to carbide, gasoline and electric short-circuit fires, which are either spread or intensified by water, is especially important.

Of course, Pyrene, or any other extinguisher will not replace the fire department. A big fire needs big apparatus. But there are a few critical seconds when every fire is small, and during this period Pyrene will put it out.

Brazilian Iron Negotiation

An international corporation with a capital of \$100,000,000, having for its object the acquisition and exploitation of coal and iron deposits in Brazil is projected, according to London advices. The Rothschilds, the Barings, Sir Ernest Cassel and a group of American bankers are reported interested in the combination.

The Itabira Iron Ore Co., Ltd., which owns mines in the district of Itabira in Minas Geraes, Brazil, is closely connected with the operation. The Itabira company owns the mines while the railroad and port are controlled by other interests. So far mining has not been practicable, owing to the heavy shipment costs, but with the mines, railroad and port all under one management, the outlook would be changed.

Price of Boron Suboxide

It is announced in *The Brass World*, October, 1912, that boron suboxide, to use in making sound copper castings, is obtainable from the General Electric Co. at \$2.50 per lb., and that one pound will deoxidize 100 lb. of metallic copper. As remarked earlier in the JOURNAL, the process seems to be a long way from supplanting the old wood poles in cathode melting, whatever may be its merits in the production of small castings for electrical purposes.

Magnetic Permeability of Iron Minerals

According to a table given in *Echo des Mines*, Nov. 11, 1912, the iron minerals have the following magnetic permeability: Metallic iron, 2.163; magnetite, 1.467; ilmenite, 1.287; pyrrhotite, 1.078; hematite (red), 1.025; spathic iron ore, 1.022; brown hematite, 1.010; iron pyrites, 1.002. Only magnetite and ilmenite of the ores are truly magnetic in the ordinary sense.

Obtaining Efficiency in Mining

By Andre Formis*

It is a noteworthy fact that the manufacturing enterprises of the world at large have assumed enormous proportions in the last decade. Aside from purely economic conditions this state of affairs is mainly due to the elimination of destructive competition, the standardization of output and the use of efficient power and labor-saving devices.

Indeed the latter two factors claimed our greatest interest, because through employment of skilled labor in its broadest sense, from the college-bred manager and his engineering staff to the workman who keeps a special machine tool supplied to its capacity of output, the great savings in cost of production are effected. This fact is so well recognized that today the mining industry, which has been so notoriously marching in the rear, is beginning to appreciate the effect of technical management in decreased costs, increased production and improved labor conditions.

MINING COSTS ARE 70% LABOR

When it is considered that in mining operations proper, the cost of labor is about 70% of the total cost, it is evident that every progressive company must make intelligent efforts to reduce this cost to a minimum. This end may be attained through several methods, some or all of which will lead to better results, according to local conditions.

The simplest unit of cost comparisons may be stated to be the cost per ton of rock hoisted. This factor depends only on two variables: Efficiency of labor, and cost of supplies which includes power. It may be proper to base costs on the refined output which is sold and on which the profit or loss directly depends. This cost includes three variables, the third being the physical condition of the raw material to be extracted and the variations in selling price.

Mine costs in their fundamental form may be classified as follows: Cost equals labor, 70%, plus supplies (power etc.) 30%. Evidently the largest saving can be effected in the largest item of cost, labor. In the majority of mines the labor required underground may be stated to be: Breaking of ore and rock; handling of broken ore and rock; tramming and storing of broken material; loading into pockets and hoisting devices. All other items of labor, such as track extensions, repairs to tracks, pumping, timbering, handling of supplies, underground superintendence, etc., are quite constant and depend on the character of the rocks, position of orebodies and method of mining.

Mining costs are 70% labor and 30% supplies, making necessary close attention to the labor problem. Attention to drilling, shoveling, pumping, etc., will greatly reduce costs.

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As an example the analysis of the labor required to operate a development proposition, employing five drills, the Ojibway Mining Co.'s property may be quoted. Development is being carried on in two shafts, No. 1 shaft is being sunk at a depth of about 2050 ft. from surface on the angle of the lode which is 33° from the horizontal, and in the foot-wall trap. Two machines are employed on two nine-hour shifts per day. In this shaft two drifts are being driven on the lode at the 1600- and 1700-ft. levels respectively, also on two nine-hour shifts. In No. 2 shaft a crosscut is being driven on the 1900-ft. level in the foot-wall trap.

LABOR REQUIRED FOR SMALL MINE

Office	
Superintendent, clerk, stenographer and supply clerk.....	\$ 400
Underground	
1 mining captain.....	135
1 Night boss.....	90
20 Miners (5 machines, two shifts) at say \$70 per mo.....	1400
10 Trammers \$60 per mo.....	600
6 Landers (includes two puffer boys).....	270
1 Pump boy.....	35
2 Timbermen and tracklayers.....	125
1 Changehouse man.....	45
42.....	3100
Surface	
1/2 Foreman and 1/2 master mechanic.....	115
2 Surface labor.....	100
1 Team (hired on contract).....	125
1 Carpenter.....	80
2 Machinists.....	120
1 Blacksmith boss.....	68
1 Blacksmith helper.....	48
2 Hoist engineers.....	112
2 Compressor engineer (electric plant).....	140
3 Firemen (eight-hour shift).....	189
1 Coal passer and ash wheeler.....	50
17.....	1147
Total labor.....	\$4247
Average rate.....	\$2.59

The Ojibway cost sheet for the month of June shows the number of men employed was 61, at an average rate of \$2.51, the total labor cost being \$4185.42 which is sufficiently near the estimated cost of labor required. It further shows that in this case only the actually necessary labor is being employed, that the rates paid are the average prevalent in the district. There is no undue favoritism shown in any department and there are no superfluous positions filled,

as for instance mining engineer, time-keeper, day-shift boss or trammer boss. The amount of labor being a readily determined quantity in every case the next step is the investigation of the methods wherein labor is used. By far the most important is the method of breaking the product in place. In other words the miners are the chief item of expense.

DRILL RECORDS AT OJIBWAY

With the minimum amount of labor given, methods are devised by which the miners' product can be increased. This factor is receiving considerable study at this time; thus far good results have been shown. The miners' machine drills are being improved materially. In medium hard and soft rock a one-man piston drill, made by the Ingersoll-Rand Co., is being considered favorably by some. The piston is 2 3/4 in. in diam. The drill weighs 156 lb. It operates with about 90-lb. air pressure, delivering about 600 blows per min. In certain favorable stopes two or three machines are used with as many miners and one helper between them. He assists in setting up and removing the posts and whatever scaffolding is necessary. In certain localities the hammer stoping drill is used, but its application is confined to upward holes and the twisting of the steel must be done by the miner, sometimes a tedious operation. The Ingersoll-Rand Co. is marketing such a drill which rotates automatically. Water or dry holes are drilled to a depth of six to eight feet by one man with good speed in medium hard rock. The drill steel is the hollow kind with a hexagon rosette bit.

My experience at the Ojibway has shown that in the Kearsarge lode at this point a fair day's drilling with a 3 1/2-in. machine is about 34 ft. per shift. The machine is the well known Ingersoll-Rand R-3 drill, weight about 295 lb. 400 blows per minute. The one-man drill with only one man averages 22 ft. per shift and the same drill with one miner and boy increased the footage to 30 ft. per shift. The small drill needs a pressure of 90 lb. air, the larger drill works well with 75 lb. of air. With the smaller machine a certain increased air loss is experienced due to the heavier pressure carried, also the compressor works at less efficiency. Among the comparative drill records now extending over 16 months a No. 10-A Fort Wayne electric drill has made a good showing. The average drilling speed is about 34 ft. in medium hard ground and with

two men. The power cost is only about 15% of the air cost. In excessively hard ground the drill is not effectively used, but compares well with the one-man drill. These drill tests are not definitely closed. The drill manufacturers appreciate the importance of this matter and they make strong efforts to improve their apparatus embodying the various principles now in use. The progressive policy of the drill manufacturers deserves every aid that a mine management can give.

As a matter of fact the air drill is used so extensively that it seems a waste of time to call attention to one of the main features of the machines. That is the comparatively greater drilling speed in wet or water holes, pointed on a downward angle if the water supply is intermittent and introduced by hand, or at any angle if the water is forced into the hole mechanically. It can be demonstrated, however, that the downward pointed holes do not break the same amount of rock as a dry horizontal hole.

In fact a material difference in the tonnage broken is the direct result of changing the dip of the hole to a horizontal position. This is very apparent in overhang stoping as illustrated in the accompanying diagrams.

The electric drill makes greater speed in horizontal holes, which are self cleaning, dry and practically dustless. In order to take advantage of this characteristic in drifting, instead of the usual downward cutting-in holes, horizontal holes were drilled with one set-up of the post, a three-foot arm being used on the post. The depth of the cut was thereby increased from about 4½ ft. (downward air-drilled holes), to about seven feet (horizontal holes) and the rock broken was blown beyond the face of the drift, allowing the men to set up immediately after the smoke cleared. With downward air-drill holes the tendency is for the broken material to pack down in front of the face and it must be picked and removed by the miners before the post can be set up again. The average drifting per month was thus increased from 53 to 70 ft. The cut is blasted at one firing with electric fuses. The square is then drilled and blasted in two rounds with the du Pont first- and second-delay fuses, breaking the lifters last. The 3-ft. arm was tried with the air drills, but the post cannot be clamped rigidly enough to withstand the great leverage of the heavy moving parts.

HIGHER EFFICIENCY TO BE SOUGHT BY FASTER DRILLING

It is apparent that higher efficiency of the most costly part of underground expense, namely miners' labor, must be

sought through increased product, which is derived from increased drilling speed and the proper placing of holes in the face of stope or drift. It is understood that in order to make any material improvements here the labor element must be handled with justice and fairness. It is only proper that the miners receive a share of the increased profit, be it either as bonus or sliding-scale contract.

This point is well worth the consideration of any engineer or superintendent who actually spends a few hours underground each day in an effort to increase the output per man and to tune up the various operations to their maximum of useful effort, aside from creating a greater spirit of loyalty to the company's interests by being seen actively interested in the welfare of the men.

REQUISITES IN ECONOMICAL TRAMMING

The next item of importance is tramming. Without respect to the method used for tramming, power, animal or man, the prime requisite is a good well graded track, rails of sufficient section to stand the load with but few ties under them. Rails should have smooth joints,



EFFECT OF DIFFERENT DRILLING METHODS

be connected with tieplates and bolted. Cars should never leave the track on account of a poor track. This condition is frequently met with and is quite inexcusable. Cars are often loaded at the heading with the shovel; this is greatly facilitated by laying a steel plate on the floor before blasting.

When any considerable amount of loosening up of the dirt is necessary two men tram about 15 two-ton net loads to the pocket or hoisting skip. Forty tons is considered a fair day's work where not much selection is necessary. Therefore the total cost of tramming by hand should not exceed 15c. per ton. A mule can haul four cars and the cost, including the high depreciation, is about 10 to 12c. per ton. Motive power, air or electric, reduces the cost to about 5c. per ton. The installation of electric haulage depends largely on distance and quantity of material to be hauled per level, in other words, permanence, cost of power and adaptability. Whatever system may be used, loading from pockets or shoveling from the floor, a greater quantity is handled over good tracks.

The cost of timbering is next in importance in many mines. It depends on

the method of mining, the base of supplies and the deterioration.

DETERMINING THE METHOD OF MINING

It is important to determine early in the life of a mine what system of mining will be the most economical, considering a reasonable extraction with low mining costs and safety of openings, necessity of filling mined-out portions or caving, etc. An important consideration is the possibility of mining out the ores from the boundary lines first and then back toward the shafts, thus saving perhaps heavy timbering costs. The caving of worked-out portions relieves the hanging over adjoining stopes, avoids maintenance of heavy ground and adds to the safety of other openings.

There is another method of mining which has been used in one of the mines on the Marquette range. It consists of raising in ore on the foot wall, widening the raise fan-shaped, drilling long holes into the ore in the hanging and thus blasting vast masses of ore with but little drilling. The falling ore breaks itself up on reaching the foot wall and is then handled into cars at the mouth of the raise. Low costs were obtained with satisfactory safety to the men. It may be well to state that intermediate raises were left untouched and thus formed traveling roads for the men to the heads of these stopes. The ore in these pillars was the last to be removed.

PUMPING ECONOMIES

Costs of pumping are large in many mines, owing to depth and heavy flow of water. Steam-driven crank-and-flywheel, compound pumps are used with good economy; the steam pipes in shafts must be well protected from water. I recollect a Western mine where I was told that the pumping costs were high, the steam lines to the pumps in the shaft were unprotected from water as well in the drifts down to a winze. It was difficult to see on account of the steam vapor and in the winze the heat was stifling. In this case a motor-driven unit would have saved nearly one-half of the steam cost and probably increased the efficiency of the men one-third.

For discontinuous pumping of small amounts of water the electric motor is not surpassed. There is no peak load, no freezing air valves or extravagant use of compressed air. At the Ojibway ordinary triplex pumps belted to motors are installed certain distances apart which correspond to about 200 lb. pressure per sq. in. at the pistons. Seventy-five gal. per minute are pumped from sump to sump, the lowest drift having a temporary air pump

which collects the water below the last permanent electric pump. One boy on day shift pumps out sump after sump.

It would take considerable time to follow the lesser steps of operations that make up the total cost of production. In each case the treatment of every item should be thorough. The resulting economies will amply repay any effort made in this direction. Last but not least, a system of cost records should be used on which a clear statement of results can be read. A comparative cost sheet with enough divisions of operations is quite comprehensive. Each class of operations is divided into labor, supplies, total cost, cost per ton, decrease or increase per ton as compared to the previous month. Explanations of one cent difference or over should be made by the engineer in charge. Any undue variation perhaps in methods or tonnage production will be apparent at once.

Under the head of supplies a close check on the materials on hand in the warehouse should be kept in order to eliminate leaks. A classification on loose cards showing each item in stock, with purchase price, freight and cost of handling, can be kept continuously up to date and thus forms an inventory always up to date. This record is valuable in case of fire as on this record, insurance may be adjusted.

The foregoing should be an argument for the employment of technically educated, practical mining men, either in permanent positions or as consulting efficiency engineers. Such men should have had varied actual underground work for a number of years, they should be qualified to direct operations and they should be still in the habit of keeping in actual touch with the miners, the working faces of drifts, stopes and shafts.

Developments at Santa Gertrudis

During the last year The Santa Gertrudis Co. vigorously carried on the work of thoroughly preparing the mine for the economic production of ore. As a result there remain, according to the annual report, only the completion of the new San Francisco shaft No. 2 and the finishing of the new main pump station on the 18th level to place the property in excellent condition for cheap work. The principal problem, thereafter, will be an improvement in labor efficiency. The success of the plan of establishing a well housed laboring community for this purpose was fully proved.

The development of the 18th level from the eastern boundary line westward to the San Francisco shaft was completed during the last fiscal year, exposing a pay shoot for practically the entire length of 1800 ft. In direct contrast to the con-

ditions found on the 17th level, the west face on the 18th level opposite the San Francisco shaft shows good pay ore, indicating strongly a westward extension of the oreshoot with depth. The development of the 19th level is in its initial stage, work being carried on at present by drifts east and west from the San Guillermo or main hoisting shaft and the counter shaft.

To obtain the best economic results, it is the present policy of the management to extract all low-grade ore on any one level with the high-grade, thereby not only making available a large extra tonnage, but also decreasing the cost of maintaining the level open over a longer period of time.

Report on the Sudbury Nickel Field

TORONTO CORRESPONDENCE

The summary report of the Mines Branch of the Canadian Department of Mines for 1911 contains a report by Prof. A. P. Coleman on the Sudbury nickel field, which, owing to the increase in the world's demand for nickel, of which Sudbury furnishes more than 60%, is now receiving an unusual amount of attention. The older companies are extending their operations and increasing their known ore reserves and new operators are entering the field. As all the known deposits are more or less directly connected with the basic edge of a great synclinal sheet of norite, merging into micropegmatite, Prof. Coleman's examination was principally concerned with this basic edge.

VICTORIA MINE THE DEEPEST IN ONTARIO

The work was begun at the Trillabelle mine at the southwest end of the boat-shaped syncline and carried southwest past the Chicago and Sultana mines to the Victoria mines of the Mond Nickel Co. The mine is working upon two orebodies of comparatively small horizontal dimensions, but of astonishing continuity since they have been followed downward for 1600 ft. without a break and promise to go on indefinitely. Victoria mine is by far the deepest mine in Ontario and is overpassed by only one or two in British Columbia.

From this point the basic edge was followed to the Crean Hill mine belonging to the Canadian Copper Co., where interesting relationships are found, since the country rock to the south has been thrust over the norite along a gently inclined fault plane. In this process the greenstone of the country rock was greatly shattered and ores from beneath penetrated all the fissures. It is probably owing to this fact that more copper than nickel is produced by this mine, an unusual feature not observed elsewhere in

the region except at the old Copper Cliff mine. The small, but wonderfully rich Vermilion mine lies a short distance southwest of Crean Hill. Northeast of this point the basic edge has disclosed no large orebodies for six miles, at which point the Gertrude mine, the property of the Lake Superior Corporation, was worked some years ago.

CREIGHTON MINE FURNISHES ABOUT HALF THE WORLD'S NICKEL

A mile and a half further east is the Creighton mine, where a bay of the norite projects southeast into the country rock of granitoid gneiss. The Creighton has the richest ore of any large mine of the region, and now furnishes about half of the nickel of the world. The diamond drill has proved that the orebody continues for a long distance beyond the present workings so that there are large reserves of ore.

The next important group of mines is on the Copper Cliff offset, including the famous Copper Cliff mine. It is more than 1000 ft. deep. No. 2, a larger pipe-like orebody, was being worked a little to the north. Farther to the northeast the Garson mine, 12 miles from Copper Cliff, opened up by the Mond company, was producing more ore than the Victoria, and shafts were being sunk on the Froot, or No. 3 mine, by the Canadian Copper Co., and on the Froot extension by the Mond Co. Diamond drilling has proved that this long outcrop of ore dips toward the basic edge of the norite and that the deposit is much the largest in the district, surpassing the Creighton in quantity, though not equaling it in grade of ore. A great fault has shifted and fractured the norite and greenstone, breaking them into large irregular blocks, between which the ore has been deposited, the fault plane being nearly vertical. Copper ore is unusually abundant, about equaling the nickel in amount. Diamond drilling at the Mount Nickel mine north of the Froot shows the presence of a good orebody.

OLD PROPERTIES MAY BECOME PRODUCTIVE

On what may be called the Eastern Nickel Range, two good finds have been made and diamond drilling has shown that some old properties are worth more than was suspected. The Whistle mine at the north end of the range now being developed, has been proved to contain a good amount of ore. It has been connected by the Nickel Range Ry. with the Canadian Northern system. The Dominion Nickel and Copper Co. has undertaken much diamond drilling and development on its properties on the Northern Nickel Range with encouraging results, to insure a plentiful supply before the erection of a smeltery. Following the basic edge of the norite from Bowell Township to the region of the Trillabelle

mine completes the circuit of the nickel-bearing eruptive. Along the latter portion, ore has been found at four points, but there has been little advance in development. The work of the year has resulted in a number of changes in the map of the nickel ranges, but most of them of small extent.

The results confirm the opinion held by geologists and most mining men, that the ore deposits are the result of magmatic segregation from the norite-micropegmatite sheet with which they are connected. Almost all the development work now being done, especially the diamond drilling, is closely checked in accordance with the geological principles resulting from this theory, illustrating the practical value of the work of the geologists who mapped the region.

SMELTERS INCREASE PROPORTION OF GREEN TO ROASTED ORE

Advances in the metallurgy of the ores are made by the Canadian Copper Co. in increasing the proportion of green to roasted ore smelted, giving an approach to pyritic smelting, in the construction of a reverberatory furnace to treat fines and flue dust, and in the introduction of immense converters with a basic lining to replace the small acid-lined converters.

The Mond company was constructing a new and much enlarged smelter at Coniston, conveniently placed with good railway connections with their mines. The report concludes with the statement that the Sudbury mining district is making rapid yet solid advances and bids fair to be the most steadily prosperous metal-mining region of Canada. The peculiar character of the orebodies, which follow the margin of a great mass of eruptive rock, dipping away to unknown depths, suggests that mining may follow them also to great depths, giving a permanency to the camp which cannot be hoped for in most other mining regions.

Detection of Nitric Acid in Sulphuric Acid

The use of diphenylamine in testing sulphuric anhydride and fuming sulphuric acid for nitric acid is unreliable under ordinary conditions, according to W. N. Iwanow (*Chem.-Zeit.*, p. 1170, 1912; *Journ. Soc. Chem. Ind.*, Nov. 15, 1912), since an acid containing over 20% of free anhydride gives a pink to blue coloration with this reagent. To test an acid containing, say, 30% of free anhydride, it should be first diluted with about twice its volume of pure sulphuric acid of sp.gr. 1.84, so as to produce approximately the monohydrate, which gives no coloration in the absence of nitric acid. The diphenylamine test may be used in the absence of nitric acid to give a rough estimate of the percentage of anhydride in fuming sulphuric acid.

Rand Mining Notes

JOHANNESBURG CORRESPONDENCE

The new 100-stamp mill of the Consolidated Langlaagte mine was started on Oct. 1. It has a capacity of 45,000 tons per month. The ore reserves in the new mine are over 1,500,000 milling tons, assaying 8.4 dwt., and in the old mine about 400,000 tons, assaying 6 dwt. The share market is depressed, owing to the Balkan war, and the stocks in several mines now stand at a figure offering attraction to the investor. The general public, however, appears to have a vague idea of the short life remaining to several of the largest producers and the local mining journal has recently published some optimistic estimates on the subject.

The Simmer & Jack East mine is one of the group of unfortunate deep-level mines near Germiston, where the falling-off of the grade of ore in depth has been so pronounced. It was taken over by the holders of about £800,000 first-mortgage debentures, and the original shareholders and the second-mortgage debenture holders have lost all. The mine has been sold to the Knights Deep Gold Mining Co., which adjoins it and which has a joint milling plant of 400 stamps. The Simmer East has about a million tons developed, worth about £1 per ton. The unworked ore in the mine, if it can be made to yield a fair profit by working the two companies together, will be useful in prolonging the life of the Knights Deep, which by itself has a life much under the 15 years stated by the *Rand Mining Journal*.

The Consolidated Langlaagte mill has to work under the Sunday observance law, which prohibits any new mills from working for 24 hours on Sunday. It has been found that great trouble and loss of time are experienced, as the classifiers have to be run down clear of sand and then filled up again after starting before the tube mills get a proper supply of sands, making the stoppage a much longer one than was anticipated.

Despite the Balkan war, the government is calling for tenders for working an area of 2235 claims, or over 1900 acres lying on the dip of the Brakpan mines. The government insists that the capital shall consist of £1,200,000 in £1 shares, of which £650,000 is estimated as required for shaft sinking and development, and £550,000 for equipment.

The royalty required varies as the ratio working profit bears to the amount recovered per ton. If profit is 10% of recovery, the royalty is 10%; if 15%, royalty 15%; 25%, royalty 25%; 30%, royalty 30%; 40%, royalty 37.5%; 50%, royalty, 42%. The area lies deeper than the Brakpan mines and sinking will be more troublesome and costly, owing to the presence of interbedded diabase sheets coming eastward from the Rand

Collieries, Ltd., where they caused expense and trouble in sinking.

For the year ended June 30, 1912, the Nourse mines crushed 609,250 tons, valued at 30s. 6d. with a working cost of 22s. 6d. and a total working profit of £253,233. Ore reserves are 1,969,000 tons of 6.6 dwt. The total working profits of the Witwatersrand mines were £11,415,000 in 1911, and for the first nine months of 1912, £9,409,825, so that the probable profits for 1912 will reach £13,000,000.

The only sign of progress on the West Rand is shown at the West Rand Consolidated, where richer ore has been developed on the Kimberley or Battery line of reef, and profits have been raised from £3000 to £8000 per month. The milling plant is to be increased from a capacity of 30,000 to 60,000 tons per month.

The Johannesburg Consolidated Investment Co. now has £400,000 invested in De Beers Consolidated, Jagersfontein and the Premier mine, and holds two seats on the Premier board. It is undoubtedly using its influence with success to create an agreement between all these producers to control the production and sale of diamonds. It is reported that a valuable diamond pipe has been discovered near Klerksdorp, on the line from Kimberley to Johannesburg, and several other promising discoveries are reported, including large areas of volcanic breccia near the Premier mine, which carry diamonds and which may prove payable.

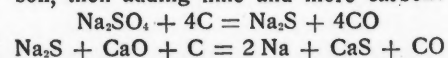
At the recent annual meeting of the Johannesburg Consolidated Investment Co., it was stated that as during the next three years there would be no greatly enhanced demand from new mines for native labor, the present supply, owing to increased efficiency and the greater use of rock drills, should prove sufficient with the natural increase.

Carbonate of Soda in South Africa

A discovery of carbonate of soda is reported at the Salt Pan, near Hamans Kraal, about 20 miles from Pretoria (*Chem. Tr. Journ.*, Dec. 7, 1912). A Johannesburg syndicate has leased the farm from the government and is putting down bore holes, which so far have proved the deposit to extend to millions of tons and with increased value in depth.

Reduction of Sodium from Sulphate

According to P. A. Emanuel (Brit. pat. 20,046, of Aug. 27, 1910), sodium can be reduced from the sulphate by heating it in a carbon-lined retort, with free carbon, then adding lime and more carbon:



The temperature is then raised until the metal distills over at 250° Centigrade.

Details of Practical Mining

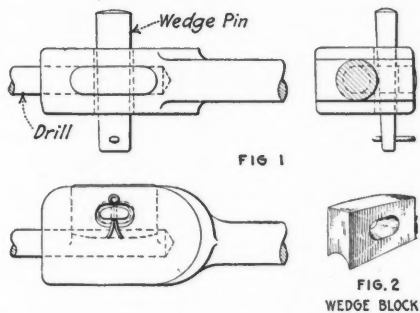
Accounts of Useful Ways of Doing Many Things in the Day's Work

Taylor and Rule Drill Chuck

By R. A. RULE*

The Taylor and Rule chuck for rock drills holds the drill steel by a system of wedges. It is quickly adjusted and released by one blow of the hammer for each operation. As the wedge pin itself does not come in contact with the drill it does not jar loose and the drill steel is held tightly all the time the machine is in operation. This chuck permits about one-third faster work than the usual U-bolt type, as there are no bolts to tighten or loosen. Furthermore the maintenance charges are lighter, there being no threads to strip or wear out, and U-bolts and nuts to replace.

The drill steel is placed in the hole in the end of the chuck, as shown in Fig. 1 of the accompanying drawing. The wedge



TAYLOR AND RULE DRILL CHUCK

block, Fig. 2, is inserted in the slot in the top of the chuck and the wedge pin is passed through the hole shown in the side of the chuck and through the hole in the wedge block. A stroke from a hammer on the end of the wedge pin, which bears on top of the hole in the chuck and on the bottom of the hole in the wedge block, presses the wedge block down tight on the drill and holds it securely all the time the machine is in operation.

It is not necessary to remove the wedge pin every time a drill is changed as a spring cotter pin at the end of the wedge pin holds it loosely and prevents it from falling out, after it has been driven back by a blow from the hammer, and the drill released.

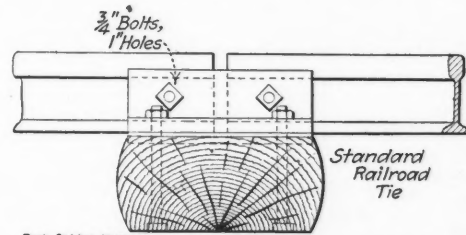
It is also unnecessary to shank the drill steel when this design of chuck is used, as the hole in the chuck may be drilled the correct size so as to take the steel in use.

*Osceola, Mich.

Steam Shovel Track Connections

Much time is lost in steam-shovel work in "moving up." This loss is usually due either to derailment on account of poor track laying or to the slowness with which the crew makes the connections. In order to save time the following method of connecting track sections has been devised and used in many pits on the Mesabi iron range. Not only does it save time in laying the track, but insures a connection that the wheels will pass over without danger of derailment.

It consists of two 4x6-in. angles, shop riveted to a 3/4-in. plate, which is as wide as the tie used and long enough to accommodate the size rail used in the sections. The angles are spaced 1/4 in. wider than the width of the base of the rail. The holes for connecting the rails are spaced and bored as in ordinary angle bars, except that there is but one hole for



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ANGLE-BAR, STEAM-SHOVEL TRACK CONNECTIONS

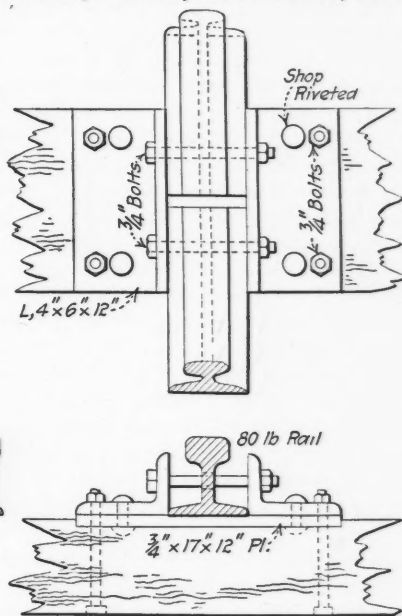
each rail, which is 1/4 in. larger in diameter than the bolts in order to lessen the difficulty in making the joint. Two plates, with their upright angles, are bolted to a good tie, as shown in the accompanying drawing.

It is customary to bolt the connecting tie to the front section, while the steam shovel is at work. As soon as the whistle blows to move up, the rear section is carried forward; and it is only necessary to pass a bolt through each plate to make the connection instead of having trouble with two pairs of angle bars.

If diamond-drill rods are greased with melted tallow or other suitable lubricant and then coated with Stockholm tar, it will be found that the tar will make a smooth lining in the hole which tends to prevent caving, says W. H. Trewartha-James (*Bull. No. 95, I. M. M.*). In some cases, particularly where there is sulphur in the strata, the casing thus formed is almost as hard as cement.

Sand Filling at Cinderella Consolidated

The system of sand filling, devised by Mr. Girdler-Brown, of the Cinderella Consolidated mine, in the Transvaal, was described by R. E. Sawyer before the Institution of Mining and Metallurgy, Oct. 17, 1912. In first cost it compares favorably with any other method, no de-



ENG. & MIN. JOURNAL

watering cones or neutralization process being necessary, and it shows to greatest advantage when employed in shafts of great depth and under circumstances such that continuous filling is not necessary, as interruptions are almost certain to occur from time to time in wet weather, due to an excess of moisture in the sand.

AIR AND SUN BEST CYANIDES

The sand used should not contain over 5 to 6% of moisture, and should have been exposed to the sun and air for at least two days before being used. It will then be practically free from cyanide and neutral in character. Sand taken directly from the cyanide tanks was tried for this process, but even after it had been treated with potassium permanganate, considerable quantities of cyanogen were evolved when the sands became mixed with acid mine water. This action was, however, entirely obviated by ex-

Note—Abstract of a paper "A System of Sand Filling on the Rand." *Bull. No. 97, I. M. M.*

posing the sand to the sun and air, as already mentioned. Plans were originally laid out to follow the usual practice in sand filling of running the sand down the shaft mixed with water, but this idea was found to be impracticable, owing chiefly to the excessive wear of the pipe caused by the great depth to which the mixed sand fell and the cost of pumping entailed. When the column first installed was worn out, it was replaced by a square wooden-box launder, down which the sand fell unmixed with water. The launder measured 11x12 in. in cross-section, and its cost was approximately 61c. per running foot. Observation doors were cut at distances of about 100 feet.

SAND WITH UNDER 4% MOISTURE RUNS FREELY

The piping and launder from the surface bins were replaced by a belt which conveyed the sand to the top of the box launder. It was found that sand containing not over 4% of moisture would run freely from the bins to the belt without handling. On arriving at the head of the launder, the sand falls down the box to a steeply inclined iron plate, over which a stream of water is made to play.

The plate should be provided with a liner of the hardest white cast iron to counteract the excessive wear at the point. After being mixed the sand and water flow into a steeply inclined launder, where they undergo further mixture before being conveyed by pipes or launders to the part of the mine requiring filling. The effective capacity of the plant is controlled by the quantity of water available, as it is found that the delivery of the sand to the vertical box is practically without limit. In the Cinderella plant, experience shows that the box launder has not appreciably worn, the reason for this being the conduct of the sand, which travels normally down the center of the box with little or no impingement on the side.

This was proved by examination through the observation doors alluded to. The sand could be seen falling in a steady stream, the bare hand could be held in the corner of the box, but it was difficult to hold an iron bar across the falling sand at the middle of the launder and the metal was quickly polished by the rapidly moving particles. It was noticed that the falling stream of sand created a suction down the launder, thus, on opening an observation door, no sand escaped, but air was drawn in.

EFFECT OF TOO MUCH WATER

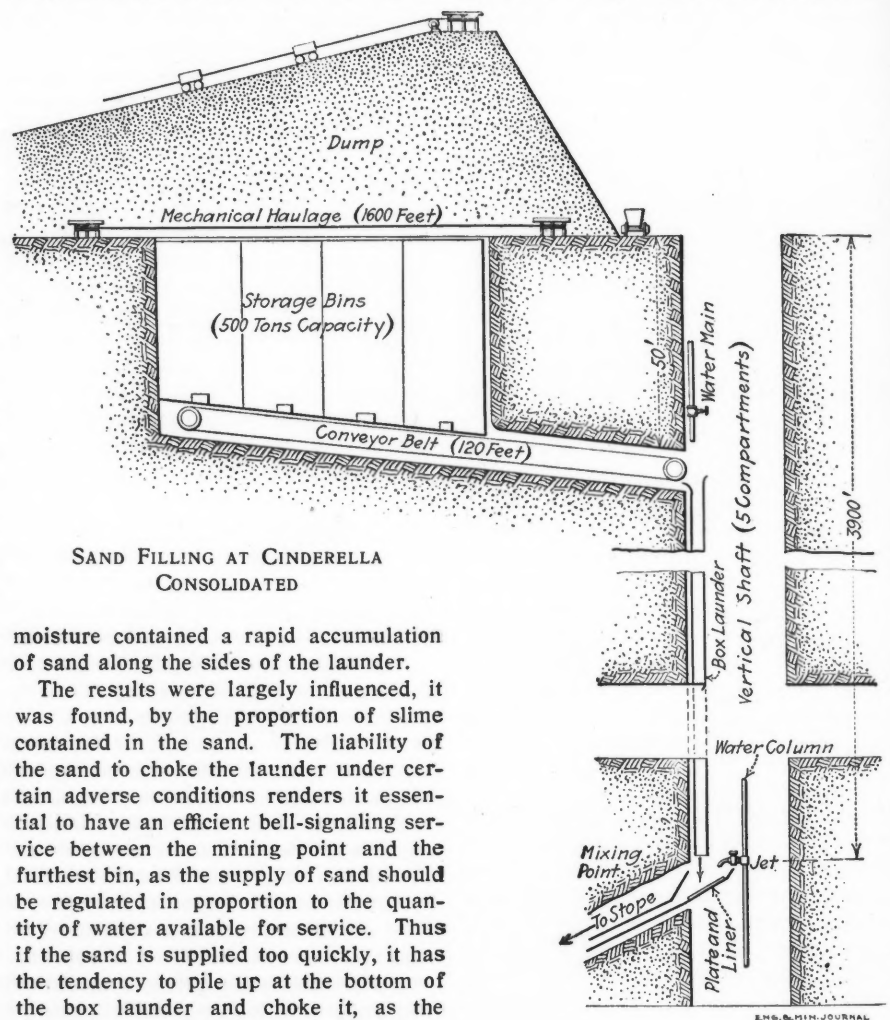
From time to time trouble was caused by the sand containing too great a percentage of moisture. This caused it to adhere to the sides of the launder in gradually increasing quantities, until at last the flow was seriously impeded. Under such circumstances the remedy

was to flush out the box with water from the surface until the adhering sand was washed away. In this connection, experiments were conducted with a view to determining the maximum percentage of moisture which would allow the sand to run down "dry." The following were the results:

Up to 5% moisture the sand fell freely, leaving the sides of the box clear and dry. From 5% to 7%, the moisture did not affect the fall, provided that the sides of the box were themselves dry. From 7% to 9% the sand gradually became adhering to the sides of the launder where it accumulated slowly. From 9% up of

stant trouble by adhering to the sides of the launder, forming an accumulation. These accumulations happened at various points down the launder, but principally at one point about 600 ft. down.

Jets of compressed air were introduced with a view of increasing the velocity of the falling stream, and thus preventing the adhesion of the sand. The box launder was, furthermore, connected with the intake of the ventilating fan near the bottom, and to a Roots blower at the top, the idea being to dry the sides of the box and thus prevent the sand from sticking. These devices undoubtedly permitted the use of damper sand than could other-



moisture contained a rapid accumulation of sand along the sides of the launder.

The results were largely influenced, it was found, by the proportion of slime contained in the sand. The liability of the sand to choke the launder under certain adverse conditions renders it essential to have an efficient bell-signaling service between the mining point and the furthest bin, as the supply of sand should be regulated in proportion to the quantity of water available for service. Thus if the sand is supplied too quickly, it has the tendency to pile up at the bottom of the box launder and choke it, as the water is not in that case sufficient to flush it away. On the other hand, if the sand appears to be coming down slowly, it may be that a certain proportion is sticking to the sides of the launder on account of there being too great a percentage of moisture. When this is found to be the case, flushing must be resorted to, as mentioned previously, and must be repeated from time to time as the occasion warrants.

Numerous efforts were made to use the current sand production direct from the cyanide tank with a view of saving transportation from the dumps. It was found, however, that this sand, which contains from 12 to 15% of moisture, gave con-

wise have been employed, but they were practically of no avail when the sand carried over 10% of moisture, and were consequently abandoned after prolonged trial.

LAUNDERS SHOULD BE IN DOWNCAST COMPARTMENTS

It was found necessary to place the box launder in the upcast side of the shaft and in the same compartment with the pump column, consequently the box was always wet on the outside and water constantly reached the interior. The sand containing not over 4% moisture does not give rise to any considerable trouble, especially if the launder has its interior sur-

face plain and smooth and the outside tarred. With sand containing up to a maximum of 8% of moisture, the launder should be placed in the driest compartment available on the downcast side.

There is actually a saving in the quantity of water required to be pumped out of the mine when the sand-filling plan is in operation. The sand in the stope probably retains at least 10% of water, the sand as sent down contains on an average 3%, and it is calculated that in the course of a good day's run the water saved from being pumped 4000 ft. to the surface will amount to about 8000 gallons.

The labor required to operate the plant is small, a subforeman in charge of three

In discussing Mr. Sawyer's paper, H. F. Marriott said that probably Mr. Sawyer's method was limited in its usefulness to the Rand, and then only to certain of the smaller mines. First, because it is necessary for the success of the operations that they should be conducted in an atmosphere capable of drying the daily supply of tailings with extreme rapidity, and, secondly, because of the necessarily limited tonnage available for delivery into the mine, even under favorable atmospheric conditions.

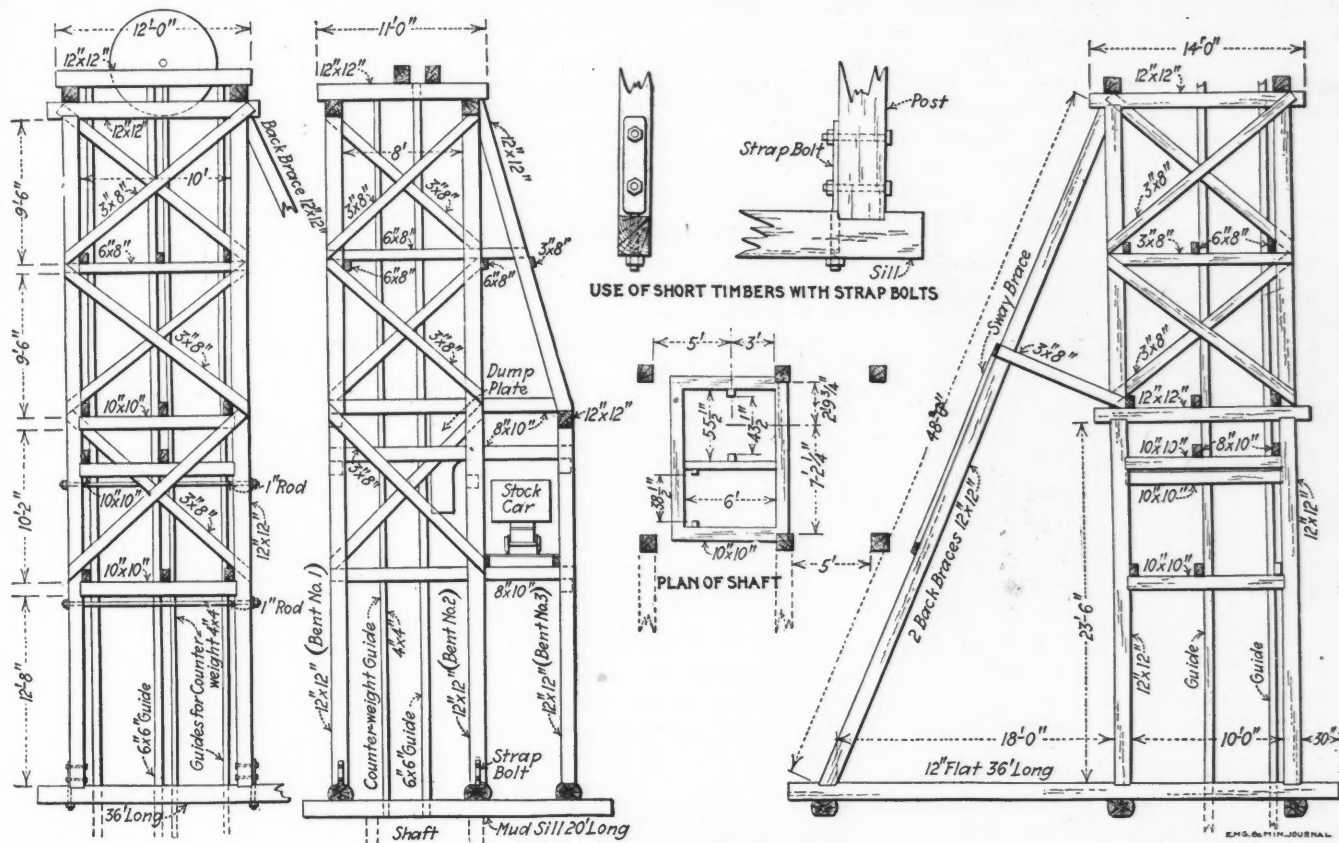
As against the intermittent working of the dry delivery and the insecurity of the dry sand supply, there must be reckoned the saving of cost of pumping water

the depths from which they originally came. Either of these courses necessitates wet treatment, and other requirements have to be considered before one's faith can be definitely pinned either to the wet or dry process.

Small Timber Headframe

By H. L. Botsford*

The accompanying drawings illustrate a small timber headframe. It was designed for use at an exploratory shaft, from which it was desired to ship ore from time to time as the work of development progressed.



A SMALL TIMBER HEADFRAME

boys will look after the belt and surface bins, and the underground part, including the mixing point and the stope to be filled, is in charge of the timberman. The sand

COST OF SAND FILLING

	Per Shift	Per Ton
Surface: 25 unskilled laborers.....	\$9.11	\$0.0228
One white laborer.....	1.22	0.0031
Three natives.....	1.09	0.0027
Underground, 1 timber man.....	4.86	0.0122
Three boys.....	1.46	0.0036
Total labor.....	\$17.74	0.0444
Power for haulage, belt, pumps; 23 kw. per hr @ 1.13c.....	3.16	0.0079
Total labor and power.....	\$20.90	\$0.0523

is brought from the dump to the surface bin by means of mechanical haulage, the actual shoveling and tipping necessary being done by unskilled labor. On an average of 400 tons per shift, the cost was 5.23c. per ton.

from the bottom of the shaft to the surface; but on the other hand, one of the reasons for adopting the wet process of sand transportation was that there was known to be a large amount of gold contained in the dumps, from which the stock of filling material was to be taken, and it was considered that by washing this down with water and keeping the water separate from the rest of the pumping operations on the mine, it might be found possible to recover a profitable portion of this gold on the return of the water to the surface, or alternatively that the material extracted from the dumps for sending below might be treated *en route* by cyanide, and that the portion of the contained gold still amenable to further treatment might be extracted, before the sands were finally carried to

Where long timbers are not obtainable, or are too expensive, the headframe may be built in sections, with intermediate caps, and holding-down bolts between the sections. Strap-bolts answer this purpose and cost less than long rods running the full length of the section, from cap to sill.

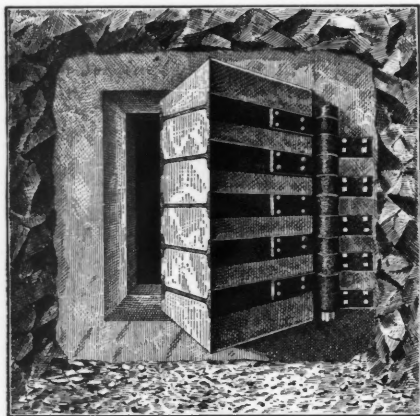
According to the report of the Burma Mines, Ltd., which operates lead mines in Burma, India, the following percentages of fluxes were used during 1911 in smelting the total charge: Coke, 13.108%; iron ore, 26.198; limestone, 13.435; scrap iron, 0.99; a total of about 54% of the entire charge at the works of this company.

*Creighton mine, Ontario.

Reinforced Concrete Door for Powder Chamber

For storing the dynamite used for blasting in the Catskill Aqueduct Tunnel, a dynamite room has been cut in the rock, 250 ft. underground, and connected to the tunnel by a low, narrow drift about 20 ft. long. At the end of this drift nearest the storeroom there is keyed into the rock walls a massive concrete frame, beveled at an angle of about 20°, to receive a heavy, reinforced-concrete door, similarly beveled, as shown in the accompanying drawing. This door is built up around five 15-in. I-beams, with reinforcing rods passing through and between them; it swings on a 3-in. steel pin and weighs two tons.

The door swings inward toward the dynamite chamber and is arranged so that it can only open about two-thirds of the full way, or to an angle of about 60° or 70° with the plane of the frame (*Eng. News*, Nov. 21, 1912). Its objects are to reduce the force of the shock in the



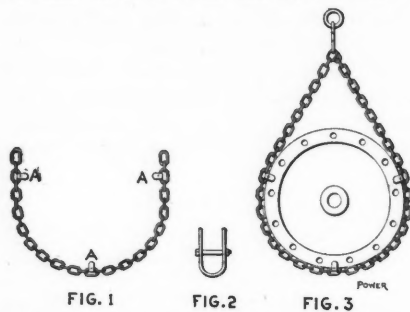
REINFORCED CONCRETE DOOR FOR CATSKILL AQUEDUCT POWDER CHAMBER

tunnel in case there should be an explosion of the stored dynamite, and to protect the dynamite chamber from excessive shocks from blasts in the tunnel, as it is claimed that in either case the door would be closed by the difference between the air pressures on the two sides. An explosion of dynamite in the chamber would, of course, force the door shut by direct pressure. Should an especially heavy charge be fired in the tunnel, the blast of air rushing past the entrance to the drift, connecting with the powder chamber, produces a partial vacuum in the drift and thereby causes the concrete door to swing shut. This frequently happens and it has been necessary to open the door with crowbars in order to release workmen who were imprisoned in the chamber because of the great weight of the door.

It is interesting to note in this connection that concrete construction is being used for fire doors at the Anaconda copper mines.

Chain Sling for Removing Cylinder Heads

The illustrations show a chain sling described by James McClure (*Power*, Nov. 26, 1912) which have been used with success for removing cylinder heads. Fig. 1 shows the sling when ready to put around the edge of the cylinder head. Fig. 2 is a piece of flat iron bent into a U-shape and fastened to a link of the chain with a



CHAIN SLING AND CLIPS FOR REMOVING CYLINDER HEADS

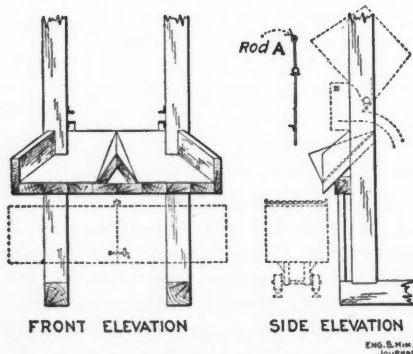
bolt. Three such pieces are used as shown at AAA, Fig. 1.

To use this sling, the nuts are taken off the studs and then the head is pried forward sufficiently to allow the three U-shaped pieces to slip over the edge of the cylinder head. Then by proper tension on the sling, the head can be taken off easily without injury to the threads of the stud bolts. Fig. 3 shows the application of the sling.

Dump Arrangement for Underground Hoisting

BY W. W. SHELBY*

When conditions are such that it is desirable to have a skip dump directly into cars the accompanying sketch shows a satisfactory arrangement for an un-



DUMP ARRANGEMENT FOR UNDERGROUND HOIST

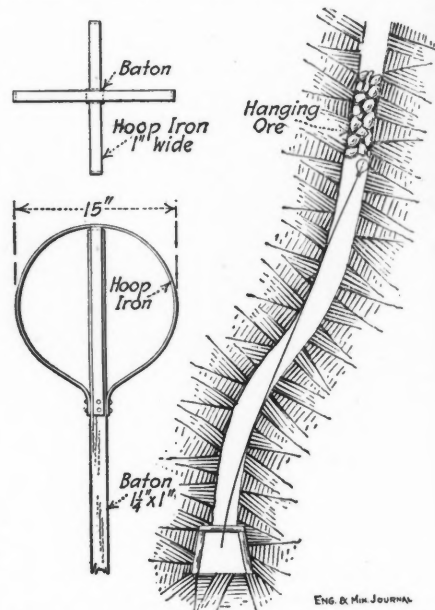
derground dump. The width of chute is one foot less than the length of car. The middle partition serves two purposes: to distribute the ore so as to utilize as much car capacity as possible, and to protect the chain across the top of the "middle dump" cars. A 3/8-in. iron plate, stiffened

*Smuggler, Colo.

by a 1x1/4-in. angle iron is suspended in front of the chute. This plate, the dimensions and position of which depend upon local conditions, swings freely about the rod A, and deflects the few stray pieces of rock which might otherwise go over the car in too rapid dumping.

Opening Ore Passes

One of the common and most dangerous methods of opening "hung-up" ore passes is to go up the pass under the hanging ore, fix and light a charge of explosives and get down before anything happens. To avoid all danger the appliance shown in the accompanying drawing has been in use at the Lord Nelson mine for about four years, says W. J. Nicol in *Min. and Eng. Review*, Oct. 5, 1912. The apparatus consists of a flexible baton of any convenient section (1x1/4-



DEVICE FOR STARTING "HUNG UP" ORE PASSES

in. hardwood is suitable) with two pieces of stout hoop iron bent to form a curve and nailed over the end of the baton. The curved pieces of hoop iron keep the end of the baton from coming in contact with, and being held up by, the timbering of the pass. The device can easily be pushed up an irregular pass, and by lashing on other batons with beveled ends as required, any height may be reached. When the top end, with the hoops attached, reaches the hanging ore the batons are used to poke the ore and it is generally possible to start it running again without the use of explosives. Mr. Nicol says that it has been possible to start a pass which had been hung up 100 ft. above the level and in no case has it been impossible to start the ore by simply poking it. This device could also be used in conjunction with electric detonators to fire a charge of explosives under the hanging ore.

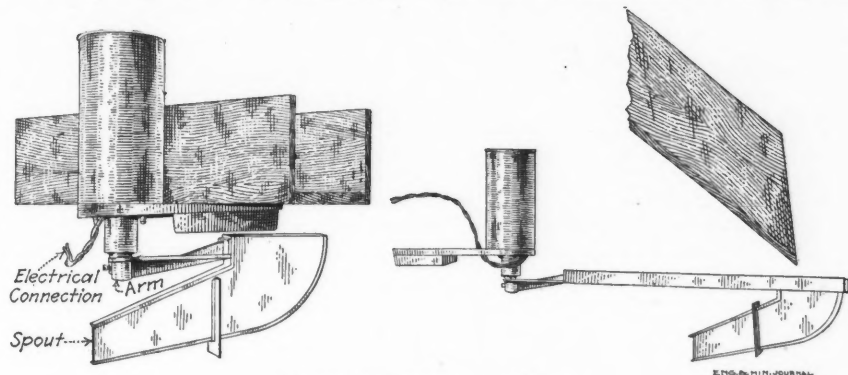
Details of Metallurgical Practice

Records of Experience in Ore Dressing, Cyaniding and Smelting

Flood Automatic Sampler

The Flood automatic sampler is being much used in Colorado mills at the present time and, as the device is simple and easily placed and cared for, its use seems to be on the increase.

It consists of a sheet-metal spout by means of which the sample is cut from the stream of pulp or ore and directed into a proper receptacle. This spout is sustained and moved by an arm which is actuated by a solenoid. An eight-day clock controls the movement of the sampler by closing a knife switch at desired intervals, the switch remaining closed for from one to five seconds as required. When the switch is closed the current reaching the solenoid moves the arm and sample spout into position under the stream to be sampled and keeps it there for the required time. When the switch



FLOOD AUTOMATIC SAMPLER

is opened the spout returns immediately to its normal position.

The cut showing the device is explanatory. In Fig. 1 the hole in the bottom of the launder is encircled by the casting which is part of the sampler, the whole being self contained and needing no adjustment. The stream passes through this hole at all times and is sampled at the desired intervals as explained. One clock will control any number of machines and can be installed in the office or any other place where it can be under guard. The machine can be made in the long-arm style, and is appropriate for sampling dry-crushed ore or pulp.

A defect in the machine, which may, however, be easily remedied, is that the receiving part of the spout is generally made too narrow. When the spout is in the stream of material it can receive only a portion of the fall, whereas to be most satisfactory the whole stream should be taken for the given space of time.

Due to the fact that the machine is governed by clockwork and electric current, assuring that a sample be taken at stated intervals, and that the time during which the sample is taken is always the same, a correct sample should result. It may be so accurate that the total tonnage of ore or pulp passing per day could, with suitable checking, be calculated from the weight of the sample, the intervals and time of taking sample being known. The machine is patented and is made by Hendrie & Bolthoff Mfg. & Supply Co., of Denver.

How to Cover a Pulley

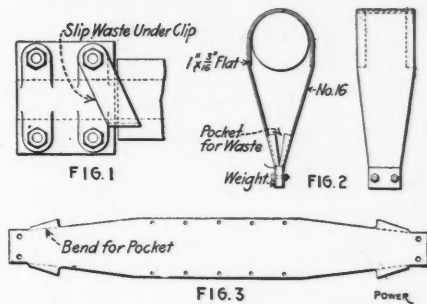
It is an easy matter to cover a pulley, if the covering is prepared in the proper manner. The first thing to do is to remove all the old covering and pull out the nails and, if necessary, re-

Keeping Stray Oil Off Belts

Considerable trouble has been experienced in power transmission from the oil which would work out of the bearings and follow the shaft to a pulley hub, to be thrown off by centrifugal force and land on the inside of the wheel rim. From there it would creep to the outside and get on the belts, says James Clark (*Power*, Dec. 3, 1912). Oil would also work out between the tight and loose pulleys and get on the belts in the same manner.

To overcome the trouble caused by the oil from the bearings, some clips of No. 16 sheet steel were made and fastened between the two nuts which held the bearing cap, as in Fig. 1. The end of the clip was bent for holding a small bunch of waste against the end of the hub to wipe off the oil continually.

To take care of the oil from the loose



DEVICES FOR KEEPING STRAY OIL OFF BELTS

move the wedges and replace them with new ones, says the November *Pemberthy Engineer and Fireman*. The leather to be used for the covering should be wider than the pulley to be covered and about three or four inches longer than is necessary to reach around the pulley. Soak the leather in a pan of warm water for almost one hour. Square one end of the leather and nail it to the wedge, using nails that will just reach through and clinch on the side next to the pulley.

Stretch the leather as tight as possible and nail to the next wedge and continue until the last wedge is reached. Nail the leather to the last wedge before cutting it off. Trim the leather down to the rim of the pulley.

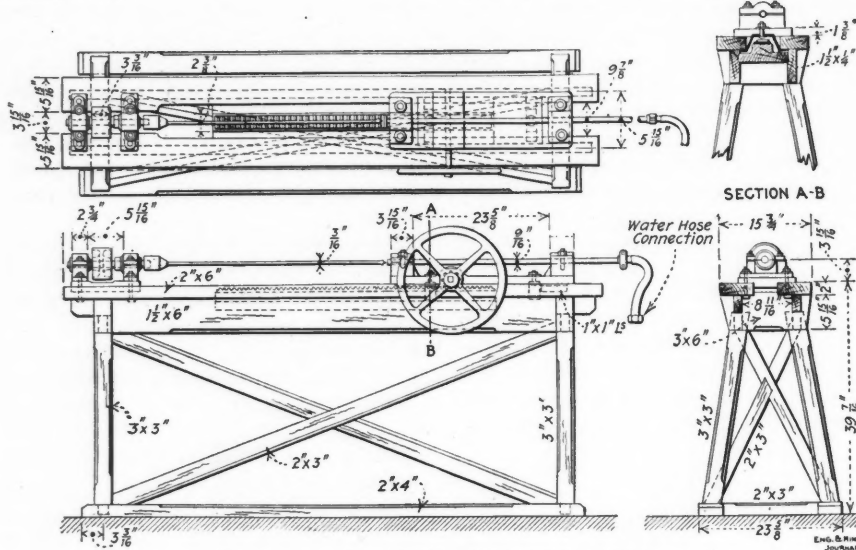
Allow the pulley to dry a short time, say 15 min., before putting it in service. If the leather is riveted to the pulley instead of being fast to the wedges, proceed in the same manner, punching the holes after the leather has been stretched.

pulley, oil catches were made as shown in Fig. 2; Fig. 3 is a development in the flat. These were made of No. 16 sheet steel. The curved end which fits the hub was bent to a radius about $\frac{1}{2}$ in. larger than the hub and fitted with a strip of $1 \times \frac{3}{16}$ -in. flat on each side. These strips are to prevent the catcher from coming in contact with the hub at the point where the oil works out; otherwise the oil would creep between the catcher and the hub to the spokes and down to the belts. The width of the curved end should be about $\frac{1}{2}$ in. less than the distance between the spokes of the tight and loose pulleys. and the length from the center of the shaft to the end about 12 to 18 in., depending on the size of the pulleys. The other end of the catcher is fitted with a weight to prevent it from turning with the wheels; it also has a pocket to hold the waste. These devices are simple to make and completely cured the oil trouble.

Lathe for Cleaning Condenser Tubes

BY MARK R. LAMB*

It frequently occurs that the condenser tubes become clogged with lime and much trouble is experienced in cleaning them and in keeping them clean. The accompanying engraving shows a working drawing for the construction of a lathe. This device has been satisfactory in cleaning condenser tubes which are used with a heavily lime-charged cooling water.



LATHE FOR CLEANING CONDENSER TUBES

A point to be particularly noted is that the water hose is attached to one end of the tube and water turned on before the drill is started. The drill is made somewhat longer than half the length of the tube and the latter is reversed after half of it has been drilled clean. The drill is made by welding to a short piece of ordinary drill a sufficient length of shank of less diameter.

The wooden blocks for clamping the tube in position must be carefully tightened so as to avoid distorting the tube.

A Centrifugal Pump of Large Capacity

A steam-turbine-driven centrifugal pump of 100,000,000-gal. per day capacity, driven by a steam turbine, is to be installed in the Ross pumping station of the Pittsburgh water-works by the DeLaval Steam Turbine Co., of Trenton, N. J., which reports that this will be the largest steam-turbine-driven centrifugal pump ever built in this country; the rated capacity is 100,000,000 gal. per day against a total head of 56 ft. The pump is guaranteed to show a duty of 115,000,000 ft.-lb. per 1000 lb. of dry steam, all steam used by the condensing equipment being charged to the main unit.

*Manager in South America for Allis-Chalmers Co., Santiago, Chile.

The methods of dividing and distributing pulp at the Homestake mills are described by A. J. Clark and W. J. Sharwood in *Bull. 98, I. M. M.* Wherever a large stream of pulp has to be divided into equal parts for distribution to a number of parallel units, the principle adopted is to make the divisions at a single point in the wide launder and carry the fractions together in parallel streams, rather than to split off a num-

a "tipple" is used, made of sheet or cast iron. With the tipple in its normal flat position, the stream passes over it nearly horizontally, but when the tipple is thrown up the stream drops abruptly to a lower level.

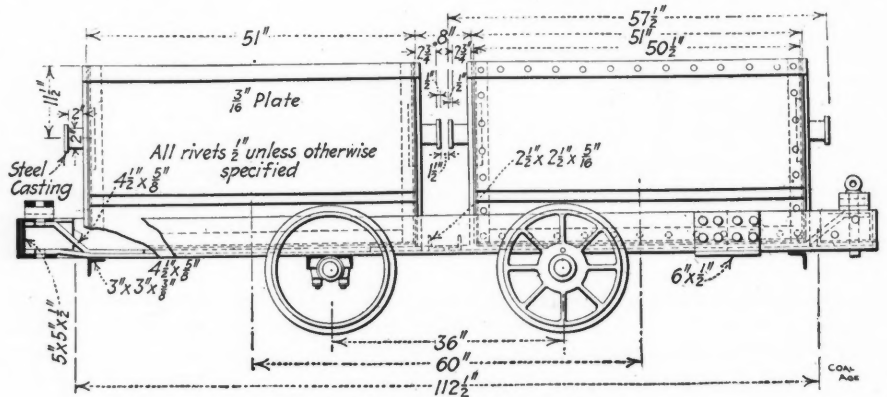
The amalgamation tailings are carried in launders variously constructed, the most satisfactory being of wood, lined with hard paving brick set closely, but without mortar or cement; the grade is 1.5 per cent.

After passing the first set of cones, tailings are conveyed for the most part in cast-iron pipes. The present construction is to cast the pipe in a simple cylindrical form, 1 in. thick and 12 ft. long, making a butt joint covered by a loose-fitting sleeve, the space being packed with jute.

With sandy tailing there is appreciable wear on the bottom, the pipe running partially full; it is customary to turn the pipe through an arc of 120° when wear has progressed to a certain extent, and a pipe will thus be turned twice before being rejected as worn out. The turning of a pipe may be accomplished rapidly and without shutting off the flow of pulp. In general it may be stated that pipe will last longest on the flattest grades.

Combined Car and Bucket

The Spring Cañon Coal Co., which is developing near Helper, Utah, is introducing a novelty hitherto untried in the West-



SIDE VIEW OF COMBINATION CAR

ber of successive laterals at various points from the main stream. In many cases the finer adjustment is made by tongues of cast iron. These have sharp sloping edges to meet the currents, the other ends being pivoted and the tops provided with means for clamping them in any position; the parallel divisions are of wood.

Where streams unite or branch, or make sudden turns, a sump of wood or concrete (or for extremely small streams of cast iron) is placed at the angle, sufficiently deep to accumulate a thick bed at the bottom, which prevents wear of the material. At points where it is occasionally necessary to divert or bypass a stream from one launder to a lower one,

ern field. After careful consideration, in place of constructing a long and crooked surface haulage road, the coal will be taken from the mine opening to the tipple by an aërial tramway (*Coal Age, Nov. 30, 1912*).

The mine cars, as shown in the accompanying illustration, consist of a steel truck designed like that of the usual mine car, but the body will be made up of two steel buckets, each holding 3000 lb. of coal, and having trunnions on the ends to receive the yoke of an aërial tram.

The results of this experiment are being watched closely, as its success will permit the opening of large bodies of coal which would otherwise be practically inaccessible.

Notes from Current Literature

Concerning Mining, Metallurgy and Industrial Chemistry

Needed Changes in Rand Mining Methods

Notwithstanding the fact that some Rand mines have attained a vertical depth of over 5000 ft., the modifications made in the system of mining have been few and on the whole inadequate to meet the altered conditions, says the *South African Mining Journal*, Nov. 16, 1912. Depths are now being reached on the Rand in stoping operations when not only the size, but also the shape and proportions of the pillars, must be taken into more consideration.

If mining operations on the Rand are to be conducted with an ample margin of safety from air blasts, even under ordinary circumstances, it is necessary that a third of the area should be occupied by pillars in the first working even at such a shallow depth as 2000 ft. from the surface. At a depth of 3000 ft. it might be advisable to leave one-half in pillars, and, if the same reasoning be continued, it will be urged that at a vertical depth of 6000 ft. the leaving of pillars would be useless, and if mining is to be carried on at that depth with safety a different method of mining will become necessary from any yet practiced on the Rand, that is if air blasts, with all their attendant evils, are to be avoided.

Reactions with Fused Potassium Hydroxide

Tests were made on various elements when fused with potassium hydroxide (*Ber.*, p. 2300, 1912; abstr. *Journ. Soc. Chem. Ind.*, Nov. 15, 1912). The various substances were heated in crucibles of nickel or gold in a vertical tube in an electric furnace. A slow stream of nitrogen could be passed through the tube, and the issuing gas passed a calcium-chloride tube to absorb any water, then a tube of red-hot copper oxide, finally a calcium-chloride tube to absorb water formed by the combustion of any hydrogen evolved. It was found that a temperature of 400° C. was sufficient to drive off all extraneous water from the hydroxide, which then corresponded in composition with the formula, KOH, and that up to 660° C. no dissociation into oxide and water occurred, though the hydroxide very sensibly volatilized. At temperatures between 550° and 660° C., gold, aluminum, manganese, and potassium showed no sensible action on the hydroxide. Iron, cobalt, and nickel were

sensibly attacked, though no evolution of water, hydrogen, or potassium could be detected. Chromium, molybdenum, and tungsten were also very slightly attacked, but free potassium and hydrogen were in these cases evolved. The reaction with carbon or magnesium was similar but much more marked, and silicon reacted violently even at 400° C., evolving hydrogen. The reaction of sodium was remarkable: in all probability the first stage was a condition of equilibrium of the reversible reaction $\text{Na} + \text{KOH} = \text{K} + \text{NaOH}$; and the sodium then reacted with the sodium hydroxide, forming sodium oxide and hydrogen, while the potassium volatilized.

Morse-Sargent Feldspar-Potash Process

Harry W. Morse and Ledyard W. Sargent, of Cambridge, Mass., have patented (U. S. pat. 1,041,327) a process for the production of potash from feldspar. The process consists in subjecting orthoclase feldspar at a high temperature, first to the action of calcium sulphate (gypsum), and then to the action of a chloride of an alkali, or alkaline earth. The products are sulphuric and sulphurous oxides, which are to be used in acid manufacture, potassium salts, and a residue suitable for making portland cement.

In the first stage a temperature of about 1000° C. is recommended, i.e., low enough to avoid fusion, and heating is continued until the oxides of sulphur cease to come off. In the second stage a temperature of about 600° C. is recommended, i.e., below the point at which quick volatilization of potassium chloride takes place. The two stages may be combined, but the results are not so good. The potash salts are extracted from the product of the second stage, and the leached mass burned for cement.

Pure Titanium

The attention of scientists has been engaged for a long time upon the problem of obtaining the metal titanium in a pure state, says the *Chemical Trade Journal*, Dec. 7, 1912. Experiments have been carried out in the Rensselaer Polytechnic Institute, Troy, N. Y., by Matthew A. Hunter. Titanium chloride, TiCl_4 , was inclosed with pure sodium in a metallic bomb. The capacity of the bomb was about 1000 c.c., and was built up out of machined steel parts. It is said that the

reaction inside the bomb takes place so rapidly as to be practically instantaneous, and it should be noted that chemical action only takes place after the steel inclosure has been heated to a certain temperature. Tests made on the metal after it has been obtained in a pure form by this method show that it is hard and extremely brittle in the cold, but when heated to a dull-red heat, it is almost as easily forged as ordinary cast iron. It resembles polished steel in appearance, but does not break with the crystalline structure which is characteristic of the latter metal. All attempts made to draw it into wire have so far failed. The melting point of titanium is approximately 1800° C., while the specific gravity is about 4.5 and the specific heat 0.1462.

Air Blasts in Rand Mines

In discussing a paper by Tom Johnson on the subject of air blasts, J. Chilton stated (*Journ. Chem., Met. and Min. Soc. of So. Africa*, October, 1911), that but few mining districts are entirely free from this puzzling phenomenon.

That roof pressure is primarily the cause of air blasts, few will deny, but that they are only produced by pressure, demands further proof. In mining operations, with some area excavated, the pillars when first cut carry little weight. As the worked-out area increases, the hanging walls slowly bend until their weight is supported on the edge of the pillars and face; these after a time become overloaded, and like any hard rock under pressure, the walls suddenly fail and large masses of rock often fly from the face with a velocity almost approaching that of a projectile from a gun. When this outburst occurs near a large worked-out area, the result may be put down to pressure, but as these often occur in tunnels and drives in virgin ground, it will be apparent that the pressure theory does not quite meet the case.

Many mining engineers consider that these outbursts are the result of stresses and strains set up by rock movement in the upper strata of the earth's crust. Such phenomena as the earth-tide at Kimberley, South Africa, where the surface of the ground rises and falls as much as three inches in a single day, and the great earth movement of the Witwatersrand which is causing the strata south of the reef outcrops slowly to move northward, afford some evidence of the stress and tension, the contraction, and the ex-

pansion that the upper beds are undergoing, and it seems not unlikely that these forces may produce marked effects upon mining at great depths.

Probably this air-blast action is sometimes set up by molecular tension, due to the cooling of the outer rocks when exposed to the chilling effects of the mine atmosphere, and the compressed air from rock drills. When radiation begins the outer layers of rock cool rapidly and attempt to contract on the still heated and therefore expanded interior. Thus stresses are set up that the rock cannot resist and large slabs are often detached with great violence often accompanied by a sharp report like a gunshot.

Many competent observers seem inclined to the opinion that these disruptions are entirely due to earth movements and that roof pressure plays only a secondary part in their production. A well known German mining engineer contends that these outbursts are due to sudden release of tension in a rock mass.

In a Central Rand mine many accidents from flying fragments of rock occurred in a particular working place. The zone of danger existed at a depth of 2000 ft. and in the neighborhood of a large fault with a throw of over 100 ft. The strata in the locality were much folded, and numerous sympathetic faults ran parallel to the main one. It was noticed that the disruptions took place near a large symmetrical fold, and it seemed evident from their long continuance that the force that produced the fold was still in operation, for these outbursts continued for a period of over two years.

The idea that occluded gases may produce some of these outbursts should by no means be overlooked. When it is remembered that gas at a pressure of 900 lb. per sq.in. has been known to exist in many coal mines, it is not astonishing if this enormous pressure sometimes forces out large masses of coal and exhibits effects very similar to those shown by so called "air blasts." May not some of the air blasts in metal mines be produced by occluded gas? That gas does exist in the pores or fissures of rocks in metal mines, even at great depths, has been proved by outbursts of methane at some of the Rand mines.

Mr. Chilton states that the system of working two reefs outlined by Mr. Johnson is probably the one that will be found to show the greatest efficiency. Working out the top reef first causes the hanging of the lower stopes to break up. In one of the mines where this system was worked the machine men constantly experienced difficulty in rigging up as the tightening up of the machine bars often forced up the foot wall of the upper stope even when this was six feet thick.

If the drives in a mine are situated in the foot wall there should be little difficulty in working without leaving pillars,

provided some sorting and packing is done underground, any roof pressure would be supported on packs, and even if the roof collapsed little damage would be done, as the drives would remain open. One of the mines on the Central Rand tried the system of working without leaving pillars some years ago, but the results were not such as to encourage imitators. The faster moving of faces would probably do something to prevent collapse from roof pressure, but would cause great loss in efficiency, and one could anticipate some grade trouble if a large advancing face struck a poor zone or shoot.

The assertion that too much timber is used in our mines is somewhat astounding; when it is remembered that in 1911, 835 casualties from falls of ground occurred in the Transvaal mines, 95% of which could probably have been prevented by a more generous use of timber.

Utilization of Peat Fuel

A recent report of the Canadian Department of Mines on the "Utilization of Peat Fuel for the Production of Power," covers the work during 1910 and 1911 at the peat gas-producer plant at Ottawa, the only plant of its kind in America. The experiments showed that with the plant supplied by the manufacturers it was impossible to obtain a gas sufficiently free from tar to permit the engine to operate many hours without cleaning the cylinder and valves. Efforts were made to correct this defect and after many trials by the technical staff of the fuel-testing station, some changes in the construction of the producer were made, full details of which are given in the report. With the plant as remodeled, running may be continuous for a week or more without having to shut down for the purpose of cleaning the valves of the engine.

The operation of the producer is uniform and the gas delivered to the engine varies only slightly during a 10-hour run. The services of only one man are required to run this plant when operated on day-shift work only. The consumption of fuel per brake-horsepower-hour—including standby losses—is for full load, 1.7 lb. of dry peat, or 2.3 lb. of peat containing 25% moisture. In estimating fuel costs the assumption is made that peat with moisture content of 25% can be delivered to the producer at \$2 per ton, but to take advantage of this low cost of fuel, the power plant will have to be located near the bog where the peat fuel is manufactured. On this basis the fuel costs of a plant run with a power factor of 75% for 3000 hr. would be \$8.40 per brake-horsepower-year, including standby losses. The saving will be most apparent in those places removed some distance from coal mines but situated near large areas of bog which can be rendered avail-

able for the production of a supply of peat fuel.

New Thermit Treatment of Steel Ingots

The troubles arising in the cooling of steel ingots are mainly as follows: A segregation of phosphorus and sulphur to the top of the ingot, giving that portion undesirable mechanical properties. The sides and bottom of the ingot set first, the molten portions as they solidify attach themselves to the part already set with diminution of volume, eventually leaving a hollow at the center (piping). The gases (H, CO, N) given out during solidification are unable, toward the last, to escape, but are retained in the metal, forming blow-holes.

The first method of thermit treatment to avoid piping was to plunge a thermit cartridge into the pipe, in order to remelt the surrounding parts. As soon as this remelting was effected, the hole was filled by pouring in fresh liquid steel from the ladle. Success was attained, however, only in exceptional cases, and the method was soon discredited.

At the September, 1912, meeting of the Iron & Steel Institute, Dr. Hans Goldschmidt described a new process, which has proved very effective, particularly in nonsiliconized steel. In this new method the thermit cartridge is plunged to the bottom of the ingot, before any solidification has begun to set in. The reaction causes an energetic ebullition of the liquid contents of the ingot mold, and gases which have just begun to separate are violently expelled, or if the charge has not been siliconized, the bubbling of the metal due to the disengagement of gas is incidentally checked.

The most noticeable feature, however, is the sinking down of liquid metal in the mold of three or four inches, the density of the metal being increased by an amount corresponding to this reduction in volume. Further metal is then poured from the ladle, until the level of the ingot is restored, and the ingot is then, if nonsiliconized, covered with an iron plate in the usual way.

The violent frothing up, due to the action of the thermit, has another good effect, for the impurities which have already begun to accumulate in the center are driven upward and their further accumulation prevented.

At the Shulz-Knaudt A. G. where 17,891 ingots had been treated in this matter, the percentage of rejected plates, due to imperfections in the ingot, was reduced to 0.3%, and the weight of the ingots to produce the same weight of plates was reduced by 5%. The net saving is computed at \$0.27 per ton of plates rolled, assuming scrap costs \$14.50 per ton, and rough finished plates are worth \$29 per ton.

Cyanide Practice in the Black Hills

By Herbert A. Megraw

The mineral district of the Black Hills, in South Dakota, has long occupied a prominent position in the mining world, due to the extent of its deposits and their original richness. In the early days ores of high grade were obtained and as these gradually disappeared, ores of lower grade had to be depended upon to keep up production. The ingenuity of the metallurgical world was taxed to the utmost in devising methods by means of which profits might be obtained from rebellious ores containing only small quantities of gold and silver. The whole gamut of metallurgical methods has been played upon in the effort to treat the ores economically.

CYANIDATION VICTORIOUS OVER OTHER PROCESSES

Such processes as smelting, pan amalgamation, bromination, chlorination, plate amalgamation, all had their day and were thoroughly tried, but nothing made any, noteworthy success until cyanidation was tried, proved available, and applied on a large scale to the treatment of the ores. Cyanidation has been the means by which enormous quantities of low-grade ores have been made economically available and millions of dollars have been taken from ores which by no other means could be beneficiated at a profit. It is probable that in no other mining district has cyanidation had a greater beneficial effect.

The first application of cyanide in the Black Hills was at the Rossiter plant in 1892, but great and decided success was not demonstrated until 1900, since which time the applications of the process have increased, until at present there is no successful installation which does not make use of the process in some form.

The ores are in the main siliceous, containing silica in the form of quartz and in proportions varying between 75 and 90%. The unaltered blue ores contain less than the red oxidized mineral. The blue ores contain also an average of from 6 to 8% of pyrites, fine and evenly distributed, though some of them contain as high as 20%. In the red ores the pyrite has been oxidized to form the iron oxides which give the ore its color. Tellurium has been found in some minerals and the existence of tellurides of gold and silver is maintained by some authorities. Copper occurs in minute proportions in many of the minerals. At some of the larger mills, notably the Homestake, copper is always present in the precipitate, but this is believed to be due principally to the caps used in detonating the charges of explosives and from other similar sources, although

A resumé of cyanidation as practiced in an old and famous mining district. The prominent features are roll crushing, either wet or dry, milling in cyanide solution, separate treatment of sand and slime with filtration of the latter by many of the principal systems. Unusual plants use a system including coarse, dry crushing and leaching of the entire product. Acid treatment of precipitate is general and sometimes roasting in addition. The district is especially interesting as being the first important district in America to make use of cyanidation to solve the problem of treating extremely low-grade ores.

Note—This is the fifth of a series of articles on American cyanide practice by Mr. Megraw. Previous articles appeared in the issues of Nov. 2, Nov. 23, Dec. 4 and Dec. 21, 1912.

copper does exist in the ore. The gold is in an extremely fine state and is rarely found free. The ores are fairly hard, in some instances extremely so, but there is also much clayey material which produces a large amount of colloid slime. All grades of hardness are found between the extremes of clay and extremely hard and close-grained rock. In most cases the mineral is heavy, the specific gravity of the solids in mill pulp often running as high as 3, while there are many graduations under that figure, all however, being comparatively heavy.

DRY CRUSHING AT WASP NO. 2

One of the most interesting installations in the Black Hills is that of the Wasp No. 2 Mining Co., where a flat quartzite deposit carrying extremely small quantities of gold is being milled at a substantial profit. The ore, after passing the usual crusher system, is broken through four sets of rolls, two of which are used for roughing and two for finishing. This crushing is all performed on the dry ore. After passing the finishing roll the material will all pass a screen having $\frac{1}{4}$ -in. openings. A large proportion of the material is, of course, much finer, varying between fine sand, there being little slime, and the maximum size of $\frac{1}{4}$ in. The crushing is carried no farther, the ore being treated in this condition. This finished product is stored in bins and is drawn out as required to charge the treatment tanks. The tanks are charged from these bins by means of a system of belt conveyors

which receive the material at the bins and deliver it at about the center of the treatment tanks, where it is distributed by hand. The leaching tanks are six in number, each 32x12 ft., and hold a little over 400 tons of ore.

TREATMENT BY LEACHING

The cyanide treatment of this ore is entirely by leaching. The practice is to add first a bath of solution carrying five pounds KCN per ton in sufficient quantity to impregnate the charge thoroughly and leave a solution covering of about an inch over it. This bath remains in contact with the charge for 12 hours, when it is drained off. The mixture of fine and coarse material offers little resistance to the passage of solutions and the leaching rate is exceptionally high, which facilitates the treatment to no small degree. It will be seen that this condition of porosity of the charge also facilitates treatment, for the reason that air for aeration of the charge readily penetrates the entire charge, following the solution through the mass.

After the strong solution has been drained off, a weaker solution is added, the strength being $2\frac{1}{2}$ lb. KCN per ton, and this treatment is continued for 48 hours, there being seven separate additions of the solution during this time. A subsequent water wash is given in quantity only sufficient to displace the solution held by the ore. The gold-bearing solutions from this treatment are passed over zinc shavings, the resulting precipitate being dried and melted in a crucible furnace using oil fuel in the usual way.

TONNAGE ESTIMATIONS MADE IN TANKS

No attempt is made to sample or estimate the quantity of ore handled before it enters treatment, all calculations being made on the filled tanks before the cyanide solutions are added. In the general run of mills this would be considered faulty practice, but in this case where the ore is crushed dry and loaded into treatment tanks without any preliminary treatment or separation of any kind, it is probably as accurate as any way could be and is extremely simple. The tanks can be sampled satisfactorily by means of the pipe sampler, taking a large number of tests in different portions of the tank, and a good estimate of the weight can be made from it as well as a satisfactory sample for determining the content of the charge in gold and silver.

The cost of discharging the tanks is low, approximating only about five cents per ton. The work is accomplished by

seven men, four of whom are employed inside the tank shoveling out the charge through bottom doors, and three employed in tramming out the cars, which are loaded directly under the discharge gates. The men inside the tank do not have to lift the charge at all, the process being simply to scrape the material to the discharge gates. The proportion of moisture is small and the material runs readily enough and gives no trouble. Due to this facility the tanks may be emptied in about seven hours. The tanks are charged at a rate which gives the mill a daily capacity of 500 tons.

LIME ADDED AT THE CRUSHERS

Lime at the rate of six pounds per ton of dry ore is added at the crushers, and is carried through the crushing system with the ore, being thus thoroughly mixed with it. The treatment solutions carry about one pound dissolved CaO, which is sufficient to protect them against any small amount of acid which the ore might develop.

The method of adding lime seems to me to be somewhat wasteful in this instance, as the ore is not entirely reduced to a fine state and it is reasonable to suppose that the lime, at least in part, will be in coarse particles. The time of treatment is not sufficient to dissolve the coarser pieces of lime entirely and it is likely that an appreciable percentage of it is discharged undissolved, occasioning a slight loss. I am of the opinion that some method of adding the lime in emulsion in the quantity actually required for protection might result in a slight reduction of the cost of lime used. A hint would be to consider the method used at the Homestake mills for adding lime to the leaching tanks. While this method might not be applicable in exactly the same form, some simple variation of it might be productive of good results.

GOOD EXTRACTION AT LOW COST

The extraction averages about 70% of the precious metals contained, sometimes a little more and occasionally a little less, depending on the grade of the ore handled. The cost of the treatment is exceptionally low. The entire costs of the operations are: Mining, 53.48c. per ton; milling, 66.82c.; general expense, 4.35c. The principal items in the milling cost are: Labor, 21.3c. per ton; cyanide, 6.3c.; zinc, 3.3c.; lime, 1.2c.; power, 8.4c., and supplies and repairs, 12.6c. per ton milled.

UNUSUALLY SIMPLE TREATMENT AT WASP MILL

It will be seen that the metallurgy of the Wasp ore is extremely simple. The simplicity is probably due, in a great measure, to the fact that the gold is

contained in cleavage planes which are fractured and opened by the coarse crushing, thus exposing a maximum quantity to the action of cyanide solutions. Besides, the rock itself is porous and the solutions can readily enter and act upon a large portion of the gold, bringing it out without entailing the expense of fine crushing.

A large number of experiments have been made on this ore by competent metallurgists in order to determine whether an economical higher extraction could be obtained by grinding finer, but the conclusion has been that the maximum profit is being obtained by the system now followed. The ore carries only about \$2 per ton and will not stand a higher operation expense. It is likely that there are few examples of a similar nature in existence where a profit ranging from 50 to 75c. per ton can be obtained on ore of this low gold content. I have seen one other example, a Mexican mine which contained an ore having a good gold content. The ore was so porous that pieces $\frac{1}{2}$ in. in size would readily surrender their content to weak cyanide solutions, but this ore was in the surface zone of a vein and was soon exhausted.

WET CRUSHING IN CHILEAN MILLS AT GOLDEN REWARD

An example of conditions differing from those obtaining at the Wasp is found at the mill of the Golden Reward Mining Co. at Deadwood. This company owns mines in different districts and the ores delivered at the mill for treatment differ widely in character. Some of them are hard, while others are at the other extreme of the scale, being soft and clayey, many variations between the two being submitted for treatment. The ore is delivered to the mill in railway ore cars and is always carefully weighed before being put into the mill bins. The ore is crushed dry through a series of crushers and rolls, an automatic sample being taken during the process which is reduced in a small crushing roll, put through several quartering samplers, and finally divided in a small hand sampling machine, which delivers a sample appropriate for assaying purposes. The reject from the sampling all goes into the mill bins with the milling ore.

From the mill bins the ore is taken to Chilean mills of the modern, high-speed type, making 30 r.p.m., and is milled in cyanide solution. The feeders for these mills are similar to the Challenge feeders used for feeding stamps, but are continuously moved by power, belt and pulley, and the feed is arranged so that a practically continuous stream of ore is fed into the mills. The ore is milled to pass a 16-mesh screen.

DRAG CLASSIFIERS USED

From the Chilean mills the pulp goes to drag classifiers of the so called Esperanza type, which differ from the Dorr machines in that the series of scrapers is connected to a link belt, which moves continuously over sprockets, large at the slime-discharge end of the machine and smaller at the sand end. These machines are more or less efficient, but the general consensus of opinion among those who use them is that the absence of the reciprocal motion, which is obtained in the Dorr machine, allows more slime to be carried over with sand product. The reciprocal motion of the latter seems to turn over the sand, loosen it and offer facilities for washing out the greater portion of the slime mixed with it.

The separation of slime and sand is about half and half, the sand being delivered into leaching tanks, each 20x10 ft., where it is treated in the usual way by successive solution washes, followed by a final water wash. The slime is passed through Dorr thickeners and pumped into slime-storage tanks, the simple passage through the thickeners being sufficient to dissolve the economical maximum of the contained gold.

MOORE VACUUM FILTER USED

From the slime-storage tanks the pulp is drawn by gravity into the Moore filter at an average dilution of about one of solid to $1\frac{1}{2}$ of solution, this rate varying with the exigencies of the occasion. The Moore plant contains two 40-leaf baskets, each leaf measuring 6x8 ft. A 1-in. cake is formed on the leaf in from 40 to 60 minutes, depending on the condition of the leaves. The cake is washed with solution and water and discharged following the usual practice, the application presenting no novelties.

The proportion of colloid slime existing in the pulp makes it particularly applicable to filtration by this system and efficient results are procured with comparative ease. The problem of filtration is not a simple one in any case and it cannot be said that any of the processes in use at the present time approximate perfection to any great extent, but by applying the machine and method best adapted to any particular ore fairly satisfactory results may be obtained.

The ores treated at this mill vary widely in grade, running from a minimum of about \$5 per ton to a maximum of about \$12. An average extraction of slightly under 80% is obtained at a cost of less than \$1.50 per ton milled. The lime used in treatment, the quantity varying with the ore at hand, is added at the crushers and amounts usual-

ly to four to six pounds per ton milled. The milling capacity is about 275 tons per day.

The practice at the Golden Reward mill is typical of the modern tendency to mill in cyanide solutions, in this case the strength being about $1\frac{1}{2}$ lb. KCN per ton, and although the mill is old and not particularly well adapted for securing low operation costs, the work is nevertheless efficiently done and the costs, under the circumstances, do not seem to be exorbitant.

EXPERIMENTING WITH ROASTING PROCESS

The Golden Reward company possesses a large quantity of ore which has resisted the efforts of metallurgists to treat it by any of the straight milling

WET CRUSHING THROUGH ROLLS AT TROJAN MILL

Another mill employing a wet crushing process and using cyanide solutions throughout is that of the Trojan Mining Company at Portland, probably one of the most modern installations in the Black Hills. This mill formerly was the property of the American Eagle company, but was acquired by the Trojan company and remodeled to suit modern practice. The ore from the mines is dumped into bins at the crusher house and from these bins is drawn over grizzlies, the undersize going to a belt conveyor, the oversize passing through gyratory crushers and then joining the undersize on the belt conveyor. This con-

a launder to two Monadnock Chilean mills, each seven feet in diameter. These mills gave some trouble due to slight mechanical imperfections, but these have been remedied so that the mills now give good results. The product of the mills is elevated to Dorr classifiers where the sand and slime are separated. The sand is delivered to 200-ton leaching tanks, 28x8 ft., through automatic revolving-arm distributors. The sand treatment presents no novelties, being the same as that usually followed in the district.

AIR AGITATION OF SLIME

The slime from the classifiers is taken to three tanks for air agitation, these tanks being said to be of the Pachuca



DEADWOOD, S. D., SHOWING HOMESTAKE SLIME PLANT IN CENTER BACKGROUND

processes and an effort is now being made to render it amenable to cyanidation by giving it a preliminary roast. Experiments have shown that after being roasted the ore is amenable to cyanidation and high extractions can be obtained without excessive consumption of cyanide or other chemicals. The cost of roasting will not be excessive as it is proposed to utilize the sulphur content as fuel as far as possible, thus reducing the consumption of extraneous fuel.

A roasting furnace is now in course of erection and will be in operation in the near future. The results obtained by this departure in metallurgical practice will be awaited with interest.

veyor has a slope of about 16° and delivers ore into mill bins having a capacity of about 450 tons. An automatic sampling arrangement was at first installed to cut a sample from the ore stream falling into the bins, but the arrangement did not give a representative sample and was dismantled.

The ore is drawn from the mill bins and fed by disk feeders into two sets of crushing rolls, strong cyanide solution being added at this point. These rolls were probably not intended for wet crushing, for the housing leaks a good deal and the almost constant attention of an attendant is necessary to keep the leaks stopped up.

The product of the rolls flows through

type. They measure 17 ft. 6 in. in diameter and 16 ft. in height, and it will be readily seen that they differ a great deal from the Pachuca idea in their proportions. A true Pachuca tank should have about 40 ft. of height for a diameter of 15 ft. and the Trojan tanks have a greater diameter with much less height. They are, however, doing excellent work. The dilution of the slime under treatment is about 1 or $1\frac{1}{2}$: 1, the object being to maintain a fairly thick pulp suitable for subsequent filtering.

A detail of these tanks which is of interest is the central air-agitation tube, which is not a tube at all, but a succession of cone sections set one above

another through the entire height of the tank. The idea is that, whatever the height of the pulp in the tank, it can be successfully agitated because the central tube will discharge itself at almost any point.

The slime treatment is continuous through two of the agitation tanks, the slime from the first one being transferred either to the second or third tank, as desired, by air lifts, and from these secondary plants it is drawn off into the filter plant. The average agitation time of the slime is five to six hours, no solution being decanted but the entire pulp going to the filter.

The solution fed into the primary crushing rolls with the ore averages three pounds of KCN per ton and is added in the proportion of four to six tons of solution to one of ore. The sand in the leaching tanks is treated with this same solution for about three days, and this treatment is followed by treating two days with weak solution, which has been precipitated, containing about one pound of KCN per ton. A light water wash is given before discharging the sand, the treatment usually extending over about five days.

The filter is the ordinary Butters stationary, semi-gravity type which, while more or less satisfactory, entails a high cost for pumping pulp and solutions. From the filter the solution effluent from making cake is sent to the precipitation department, the weak barren-solution wash and the water wash not being precipitated.

Precipitation is accomplished in the usual way, using zinc shavings and the ordinary form of steel box. The boxes have a total capacity of 384 cu.ft. of zinc. At the cleanup the precipitate is run into an acid-treatment tank where the sulphuric-acid process, customary in the Black Hills plants, is carried out. The precipitate is collected, dried, partly roasted, fluxed and melted in crucibles in a coke furnace.

The capacity of the Trojan mill is about 175 to 180 tons per day, but steps are being taken to increase this tonnage materially. The extraction secured by the combined slime and sand treatment is in the neighborhood of 75%, somewhat more on the slime than on the sand product.

CRUSHING PRACTICE IS UNUSUAL

The practice of crushing with cyanide solution through rolls is not usual, although it is practiced in a few cases and in one other instance in this district, as will be noted. It has been productive of good results, probably due to the increased time of contact between the ore and cyanide solutions, and the agitation secured in the rolls and chilean mills.

The chilean mills are efficient crush-

ing machines and are capable of handling large quantities of ore, but being high-speed machines they naturally incur a maintenance cost which is high compared to the results obtained with slow-speed mills. In this connection it might be mentioned that the Minnesota mill, at Maitland, is equipped with slow-speed mills of the Lane type, and it is claimed that these mills have demonstrated their ability to crush an equal or greater quantity of ore with less expense both for operation and maintenance.

The chilean mill is said to have been introduced into Elack Hills practice by J. V. N. Dorr, who first installed them at the Lundberg, Dorr & Wilson mill and afterward included them in the design of the Mogul mill, where they gave good results. The Mogul mill was recently destroyed by fire and rebuilding is now under consideration, but the new plant will probably be built on a site more convenient to the mining properties owned by the company.

DRY CRUSHING OF HARD ORES AT VICTORIA MILL

As an example of extremely hard ores found in the Black Hills district, the material handled by the Victoria mill in the Spearfish Cañon region may be mentioned. The ore here is extremely hard and the mill equipment has been designed with this characteristic in view. The ore is delivered into the mill bins by a tramway and from these bins is passed through a gyratory crusher which delivers a product that will pass a 1¼-in. ring. This crusher product is passed through a set of rolls which delivers a product having a maximum size of ¾ in.; the crushed ore drops into a 100-ton bin.

From this bin the ore passes a set of fine-crushing rolls and through a trommel, carrying 6-mesh, No. 14-wire screen. The oversize from the trommel passes to a second set of fine-crushing rolls, and through another trommel like that already mentioned. The oversize from this trommel goes back to the same rolls and the screened product from both trommels drops into a finished-product bin having a capacity of 200 tons.

The ore is so hard that its passage through the rolls is accompanied by a great deal of noise which sounds much like cannon shots, but the rolls handle the material in a satisfactory manner without undue wear.

The finished product is drawn from the bin and taken to leaching tanks by means of a belt-conveyor system. The conveyor deposits the ore into the center of the leaching tanks, each 27½ ft. in diameter by eight feet deep, with a capacity of about 200 tons, and the distribution is by hand.

Leaching is practiced in the ordinary way by first treating with a 3-lb. cyanide solution, for 72 hr. During this treatment about 70% of the gold content is dissolved. An additional 10 or 12% is obtained by leaching for a further period of 48 hr. with cyanide solution containing 1½ lb. KCN per ton, the latter being finally displaced with a minimum water wash.

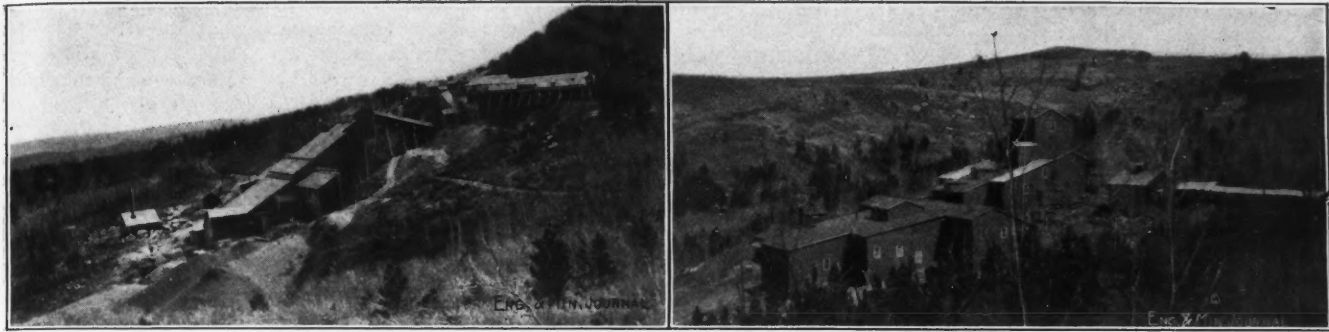
PRECIPITATION ON ZINC SHAVINGS

Precipitation is accomplished in the usual way, using zinc boxes of the ordinary type made of sheet steel. There are two six-compartment boxes, each compartment measuring two by three feet. Each compartment is connected by a pipe to a main which leads into the acid-treatment tank. At the cleanup the zinc is thoroughly washed and the precipitate, after settlement, is drawn through the pipes directly to the acid tank without further handling. The acid tank is lead lined and furnished with a hood by means of which the gases generated are carried off. The acid-treated product is pumped through a filter press and washed. This precipitate, after being partially dried and mixed with the usual borax-soda flux, is melted in graphite crucibles. The resulting bullion is a little more than 900 fine, of which 50 is silver.

The ore treated at this mill varies in value from \$4 to \$7 per ton. The mill has not been in operation for a sufficient time to standardize the costs, but it is expected that these will not average higher than those obtained at other similar mills in the district. The mill is at present treating about 200 tons per day, perhaps the average being a little under that figure.

A MILL OF HISTORICAL INTEREST

At Terry is situated the Lundberg, Dorr & Wilson wet-crushing cyanide mill, owned by a partnership composed of John Lundberg, J. V. N. Dorr and A. D. Wilson. For several reasons this plant is unique. It was started in January, 1904, and was the first mill in the world to operate continuously and successfully a leaf-filter plant. It was in this plant that the first filter plant designed by George Moore was installed, its difficulties encountered and overcome; the original plant is today operating and doing good work. In this plant also the well known Dorr classifier and the equally well known Dorr thickener were developed. In addition this was the first plant in the Black Hills to use the improved chilean mill for crushing in cyanide solution. The plant has operated steadily since January, 1904, except during the labor troubles of 1907 and 1910, and it has the best record for continuous operation of all the Black Hills cyan-



TROJAN AND RELIANCE MILLS IN BLACK HILLS DISTRICT, SOUTH DAKOTA



BISMARK MILL, WITH WASP NO. 2 IN BACKGROUND



LUNDBERG, DORR & WILSON MILL, TERRAVILLE, S. D.

GOLDEN REWARD MILL, DEADWOOD, S. D.

ide plants. The mill has a capacity of 110 tons per day and, due to the fact that it is treating custom ores as well as ores belonging to the partnership, few details of the practice have been made public and no information as to costs has been given out.

The ore from the mines belonging to the company is held in three bins having a capacity of 135 tons and the custom ore is dumped from mining cars on the Chicago & Northwestern railroad tracks in the rear of the mill into bins holding 80 tons, from which point it is trammed to the crushers. After passing over grizzlies with openings of 1½ in. the ore passes through a Gates gyratory crusher and thence to a 12-in. vertical belt elevator which delivers it into a 75-ton crushed-ore bin. As the ore drops into this bin an automatic sample is cut from the stream.

WET CRUSHING ROLLS USED

From the crushed-ore bin the material is fed by a cam feeder into a Carterville geared roll together with solution carrying 1½ lb. KCN per ton. The solution is run in sufficient quantity to sluice the product satisfactorily through a launder into the Chilean mill. This product, which will average about ¾ in. in size, passes to a 6-ft. Monadnock Chilean mill, and is reduced so that practically all of it passes a 30-mesh screen. At this point sufficient clear overflow from the thickeners and cones is added to bring the quantity up to three or 3½ tons of solution to one of ore.

The ground product from this mill is taken to a standard Dorr classifier, the sand product of which passes to one of four leaching tanks, each 18 ft. in diameter by 11 ft. deep, holding 105 tons of sand. In addition to the 32 hours required to fill each tank, the charge is given a further 12-hr. treatment with mill solution. The balance of the five-day treatment is with barren solution carrying 1½ lb. cyanide per ton, followed by a weak-solution treatment and finally a minimum water wash. The leaching rate starts at five tons per hour and gradually diminishes toward the end of treatment at which time it is one to 1½ tons per hour.

SLIME TREATMENT SIMPLE

Slime from the classifier, which amounts to 50 to 55% of the dry weight of the ore, is divided between two cones, one 18 ft. in diameter and the other 22 ft., and one standard 18-ft. continuous Dorr thickener. The two cones are so placed as to give a gravity flow of clear solution to the roll supply tank while the overflow of the thickener goes to the Chilean mill. The thickened slime containing about 55% moisture is transferred by air lifts from the thickener and

the 18-ft. cone to the 22-ft. cone. From the latter it goes to a small cone agitator and into the loading vat of the Moore filter, usually carrying about 55% moisture and containing from five to 10% of —200-mesh material.

FIRST MOORE FILTER

This original Moore filter plant was designed in the beginning to handle 30 tons of slime per day, but it has been crowded until it now handles 60 tons daily, using two baskets. With minor changes in the construction of the plant and a change in the bottom of one tank the installation is practically the same today as when it was designed in 1903.

The crane for the transfer of the basket is operated by water at 105-lb. pressure, the water being pumped into an accumulator. It gives little trouble and costs almost nothing for maintenance. The mill solution and most of the barren-solution wash from the filter process and sand leaching go to the gold tanks and are precipitated. Solutions assaying less than \$1 per ton are not precipitated unless the treatment happens to demand additional barren-solution, or the supply of high-grade solution is insufficient to keep the precipitation department busy.

USUAL PRECIPITATION BY ZINC SHAVINGS

The solutions are precipitated by means of zinc shavings. In this plant barrels have always been used instead of zinc boxes, the plant having a total of 30 barrels in 10 rows of three each. They are cleaned up twice a month, the rule being to take all the contents of the head barrel, part from the second barrel and still less from the third barrel, sorting all the coarse zinc and returning it to the second barrel. The fine zinc and precipitate thus sorted out are placed directly in the acid tank. The barrels are all moved up one step, the second barrel before cleaning up becoming the first and the first barrel moved down to the foot. The second barrel, now the head of the series, is repacked, the next partially repacked; all of the fine material taken out is put in the acid tank. As the cleanup usually consists of about 100 lb. of dry product, all the figures which follow apply to a cleanup of that size.

To the product in the acid tank 415 lb. of commercial sulphuric acid are added and allowed to remain in contact for six to seven hours, or until chemical action has nearly ceased. Water in equal volume is then added and the contents are heated with live steam and allowed to stand 10 or 12 hr., usually over night. The following morning the solution is siphoned into a settling tank where any flocculent matter is settled. Another water wash is added and live steam again

introduced to heat the charge thoroughly. The charge is then allowed to stand about an hour. The clear solution is drawn off into a vacuum tank and filtered. When the acid tank is nearly empty the contents are energetically stirred to bring all of the product into suspension and the charge is transferred to a vacuum tank and filtered.

When the moisture contained is brought down to 4 or 5% the product is taken from the tank, broken so that no piece is larger than a 1-in. cube and placed in flat, iron roasting pans. These pans are placed in a soft-coal furnace and the fire is started. The furnace has a total capacity of four 18x3-in. pans in two layers; 1½ to two hours' time is sufficient to drive off nearly all the zinc, and the resulting bullion is comparatively clean. The product in the pans is not touched or stirred during the roasting and experiments have proved that mechanical losses are thereby eliminated. The size to which the product is broken is small enough to insure a good clean roast.

The roasted precipitate is placed in a No. 100 graphite crucible in a coke furnace together with five to seven pounds of flux composed of ⅔ borax glass and ⅓ sodium carbonate. Melting is usually completed in about 1½ hr., using 80 to 100 lb. of coke. The bar is poured into a bullion mold as it is not necessary to remelt. The resulting bullion is 950 to 970 fine. Bars have been made as high as 984 fine, but the average is as stated above.

Although the mill was built seven years ago it is kept in the best repair and is still up to date in most of its features. The machinery is driven by electricity throughout, using alternating current at 440 volts; a total of 104 hp. is used.

OTHER MILLS IN THE DISTRICT

Among the mills now operating in the Black Hills district may be mentioned the new Reliance, which has just been remodeled and has started operation along lines unusual in the camp, treating slime by a continuous decantation process and making use of Dorr thickeners for the purpose. This mill has also installed a Portland continuous filter for filtering the slime tailing. The mill has been in operation only a short time, remodeling is not yet complete and no information is available for publication.

The Bismark Mining Co. is building a mill near the Wasp No. 2 in which the system of treatment will be identical with that of the latter. The mill is approaching completion and should be in operation in the near future.

In this paper no mention has been made of the metallurgy of the Homestake installations. This is a matter

which is so extensive that it should be treated alone and I hope, in a later paper to discuss that practice. The Homestake is treating ores on a scale which is not equaled at the present time and has attained an astonishingly low cost for mining and milling. An ore of low grade is being treated and the methods, original in many instances as they are efficient, are a lasting credit to the energy of the technical men who are responsible for their devising.

There are many mills in the Black Hills which are not now operating, but it would serve no useful purpose to speak of these at the present time in spite of the fact that some of them may resume operations in the near future.

CONCLUSIONS

It is with no little hesitation that one ventures to call attention to details in the practice of this district which seem capable of improvement, in view of the fact that capable operators have studied the problems and undoubtedly are aware of the solutions of them even if they are not put into practice at the present time. A little criticism, however, may be helpful from a constructive point of view and the few suggestions that I venture to make are offered in a friendly spirit, with a desire only to add a little to the present practice. It is possible that a perspective view may be appreciated by those whose vision has been limited by long contact and short focus.

The first impression is that in few of the operating plants is there any efficient means of estimating with accuracy the tonnage treated. The importance of the point will be readily appreciated by those familiar with the problem, so that it needs no discussion. It will be sufficient to say that mill estimations are not sufficiently accurate upon which to base comparative calculations except in such extraordinary cases as has already been mentioned in the Wasp No. 2 mill. A system of weighing the mill ore, while expensive to install, will repay, in information acquired and in satisfaction, any financial outlay which may be necessary.

The same is true of sampling. Sampling plants are expensive to install but are productive of much good. In some mills in the district samples of mill run are taken by means of a large elevator bucket fixed to a chain belt which periodically crosses the stream of ore falling into the mill bins. This device is more than likely to give erratic results. The area of the bucket opening is too small, and large pieces of ore strike the edges of the bucket and bounce off, leaving a sample which is not representative. Often the capacity of the bucket is not sufficient to hold the entire quantity of ore which belongs to it and it piles up and overflows, again resulting in an erratic sample. I

believe it is recognized that to secure a proper sample it is necessary to take the whole stream of ore at regular intervals, the oftener the better, and to reduce the size of the sample by successive operations of the same kind. A part of the stream for all or part of the time is not sufficient and leads to a sample which is not accurate, and this, in the opinion of those who have most carefully studied the subject, is worse than no sample at all.

CRUSHING HARD ORE WITH ROLLS

The practice of crushing through rolls in this district should be an object lesson to some metallurgists who have maintained that rolls are not adaptable to hard ores. Some of the roll installations here are crushing extremely hard, close-grained ores and doing it efficiently and at low cost. The controversy as to the supremacy of rolls or stamps might receive considerable light if a thorough comparison of the different practices in the camp were made. The greatest difficulty is that only one company, the Homestake, is using stamps, and this is on such an enormous scale that the extremely low costs obtained there cannot be compared with those obtained by rolls on a much smaller scale. The Homestake mills are treating more than 4000 tons daily and by reason of the extent of the operation are able to institute economies which would be impossible in smaller plants, the largest of which treats but 500 tons daily. Comparison of results without a long period of study and analysis is obviously out of the question.

High-speed Chilean mills are operated in a number of plants and are giving good results. I have for some time believed that the slow-speed mill is capable of giving more economical results and a comparison of the cost of these and the cost obtained by the slow-speed mills at the Minnesota mill would be of greatest interest. In view of the fact that the latter will probably begin operations soon I hope to see this comparison made.

The use of lime is accompanied by some losses which might possibly be avoided by some slight change of method. This is typified in the case of the Wasp No. 2 which has already been mentioned and a similar procedure is followed at some of the other mills. The use of lime should be carefully watched, as it has been clearly proved at the Homestake that excessive lime has a retarding effect on the solution of gold in the ores of the Black Hills.

On the ores in general it is said to be true that fine grinding increases extraction, and where the ores have sufficient value to justify additional expense it would seem to be good business to determine accurately at just what point grinding can be carried to return the maximum economical extraction.

I wish to express my appreciation of the opportunities which have been unaniously extended to me during my visit to the Black Hills. A personal mention of all those who have facilitated my investigations would look too much like a census of the district. The mills have been freely open to me and information given without reserve. Much of this information has been given in confidence and with the request to avoid publication and all of these requests have been respected.

The World's Iron Ore Reserves

The provisional closing of the Salangen iron mine, following the inactivity in Dunderland, has directed attention to the problem of Norwegian concentrating ores, says the *Mining Journal*, Nov. 9, 1912. Of the large deposits, Sydvaranger ranks first, with about 37% of iron in the ore, Dunderland 36%, and Bogen and Salangen 31 per cent.

DUNDERLAND ORES CARRIED TOO MUCH GLANCE

Magnetic separation is, therefore, necessary in order to get rid of impurities, chiefly quartz, before the ore is available for the smelter, and as magnetite has a greatly higher magnetizing intensity than iron glance (180:1), the separating process to be adopted must depend on the nature of the ore. The trouble at Dunderland arose from the fact that iron glance predominated, about 2½ to 3 times as much glance as magnetite, and to meet the difficulty the Edison magnetic-separation method on the dry principle was adopted; but owing to the dust created was found (so far as the operatives were concerned) to be unsuitable. This trouble is not present with the Sydvaranger, Salangen and Bogen ores, which are pure magnetite, nor with some smaller deposits.

According to Prof. J. H. L. Vogt, the iron ore available by opencast working, from the chief Norwegian iron deposits, is as follows: Sydvaranger, 100,000,000 tons; Dunderland, 110,000,000 to 120,000,000 tons; Salangen, 30,000,000 tons; Bogen, 15,000,000 tons, and all others, from 75,000,000 to 100,000,000 tons; in round figures 350,000,000 tons of ore, of which 200,000,000 tons are magnetite. In depth up to about 100 m. a reserve of 750,000,000 tons can be reckoned with, and up to 200 m. about 1,500,000,000 tons of 30 to 36% iron ore.

Apart from concentrating ores there is in the north of Norway a number of occurrences of sorting ore, Sydvaranger alone presenting a reserve of at least 4,000,000 tons, possibly 8,000,000 tons, of 52 to 53% ore; while in the south an effective ore supply of 5,000,000 tons may be reckoned. The successful handling of the titaniferous ore at Rødsand, by the

Gröndal process, has drawn attention to similar deposits in the western district. There is an ilmenite deposit at Ekersund, Soggendal, carrying about 39% TiO_2 , and 38% FeO, which places this deposit in a unique position for the production of ferrotitanium, ferrosilicon, titanitic acid, etc. Numerous other deposits carry smaller percentages of TiO_2 . Some of these ores could be hand-sorted to 52% iron, and most could be magnetically concentrated to 64 to 67% of TiO_2 . The potential reserves of the titaniferous ores of Norway are placed by Professor Vogt at about 15,000,000 tons, with a metallic content of about 9,000,000 tons, by which is understood ores with 40% Fe, and below 8 to 10% TiO_2 , calculated as a concentrate of 65 to 68% Fe.

THE OLDER IRON MINES FAILING

In regard to the world's supply of iron ore, the production of Belgium has fallen from three-quarters of a million tons in the period 1850 to 1870, to 200,000 tons in the last 10 years, and in Scotland from 2,000,000 tons in the period 1855 to 1880, to less than a million tons in recent years.

The Bilbao mines, in Spain, up to the present have produced about 180,000,000 tons of ore; while it is calculated that the present reserve amounts to only about 70,000,000 tons. Even if this estimate is a low one, it is obvious that the Bilbao exports must within a generation, or even 20 years, exhibit a great decline. The same condition of affairs is to a certain extent apparent in connection with the Krivoi-Rog mines, in South Russia, the most important source of supply in that country.

Against these declines must be considered the unworked deposits which, at present, lack transportation. In this connection, Kirunavaara and Gellivaara may be mentioned, as their annual output in a few years should be 4,000,000 tons, and also Sydvaranger, in Norway.

Four-fifths of America's iron production comes from the Lake Superior deposits, with an annual output of a little over 40,000,000 tons, and although the richest and best ore beds will be depleted in a calculable future, there will remain a quantity of somewhat poorer ores sufficient to last for centuries. The world's three largest iron-ore deposits at present being mined are the Lake Superior field, with Mesabi as the most important mining district; Kiruna, with other deposits in Norrbotten, Sweden; the so called minette deposit in Germany and Luxemburg, with adjoining parts of France. From Minas Geraes, Brazil, a number of large iron-ore deposits are reported as available, and it is even mentioned that from these alone, by open-cast work, it is possible to take out about 2,000,000,000 tons of ore. From other foreign countries have also come late tidings of gigantic ore deposits, so that Professor Vogt concludes that for

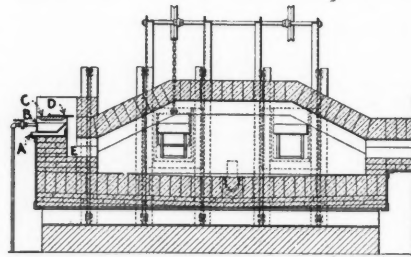
generations to come the world will have all that it will require of iron ore, and that the lament about iron-ore hunger should cease.

The Gamm Oil Furnace

The Gamm oil-burner, shown in the accompanying illustration in connection with a reverberatory furnace, is a device for burning oil without forced draft, steam atomizing, or any other aid to combustion, except a stack. The burner consists of four castings, a lower air passage *A*, an oil pan *B*, an upper air passage *C* and a damper plate *D*. They are all of the simplest forms.

A furnace operating on this system was shown recently in Weehawken, N. J. In starting the furnace the oil pan was filled, and a small piece of burlap was lighted and thrown on the surface. The oil began to burn and the flames were carried down passage *E* into the furnace, the air for combustion being furnished by the inlets between the lower and upper castings and the pan, and by the opening left by the damper. The furnace was a $2\frac{1}{2} \times 5$ -ft. reverberatory, and was soon full of flame.

Regulation of the flame was furnished by *D*. When *D* is shoved forward, shut-



GAMM OIL FURNACE

ting off the air supply, the flame is long, filling the entire furnace (reducing atmosphere), when *D* is back, the flame is short, and the furnace atmosphere oxidizing. The change from one to the other takes place in about three or four seconds. The oil runs into the pans in a small stream, but through large pipes, so there is little danger of stoppage of the oil by grit, etc. If it does stop, the fire burns for some time on the supply in the pans, then goes out. There is no air, steam, etc., escaping, and if the oil starts again there is no "flare back."

The experiment was shown of intentionally opening the cocks and overflowing the pans. The oil flowed down *E* toward the furnace, and into the lower air passage, and burned, generated a great volume of flame, but doing no damage. There was no smoke to be seen issuing from the stack at any time.

A bar of steel $1\frac{3}{4}$ in. in diameter was placed in the furnace and taken out in two minutes, by which time it was at a bright red heat. The furnace quickly melted glass and copper.

The furnaces have already been put into commercial use for melting copper, german silver and nickel, the largest furnace so far built being said to have an 11×25 -ft. hearth and to melt a charge of 35 tons of metallic nickel.

A 62-ft. flame is said to have been produced with these burners, but the Weehawken furnace and flue were too small for such a demonstration. The absence of noise was an agreeable feature to one accustomed to the ordinary atomizing or spray burners, and the absence of flames shooting from every opening, as is the case with forced-draft furnaces, makes it agreeable to work with.

Theoretically the advantages over atomizing burners are considerable. No power is required for blowers or boilers, and, as is the case with steam, no heat is lost in warming the atomizing agent. So far as could be seen in one afternoon, the results bear out these considerations.

The furnaces are marketed by the Oil Furnace & Engineering Co., of 60 Liberty St., New York. H. F. E. Gamm, inventor of the furnace, is chief engineer.

Austrian 1911 Mineral Production

According to official reports the mineral production of Austria for 1911 was as follows, the items being arranged in order of descending value: Bituminous coal, 14,379,817 metric tons; lignite, 25,265,334; iron ore, 2,765,815; lead ore, 23,845; silver ore, 24,143; quicksilver ore, 111,016; zinc ore, 32,166; graphite, 41,559; copper ore, 10,974; gold ore, 29,647; pyrites, 15,805; manganese ore, 15,954; mineral paints, 2902; tin ore, 9435; tungsten ore, 45; asphalt, 1740 metric tons.

Metal production was as follows, the items again standing in descending order of value: Pig iron, 1,596,148 metric tons; zinc, 15,766; lead, 18,097 metric tons; silver, 48,036 kg.; quicksilver, 704 metric tons; copper, 1760 metric tons; radium preparations, 14.146 grams (containing 2.647 grams pure $RaCl_2$, valued at \$214,928); gold, 205.342 kg.; copper sulphate, 767 metric tons; uranium preparations, 5785 kg.; tin, 15 metric tons.

Bituminous-coal mines employ 63,567 men, 2141 women and 4119 children; lignite, 52,048 men, 2150 women, 704 children; iron mines, 6134 men, 110 women, 65 children; iron works, 5566 men, 86 women, 134 children; lead mining, 2825 men, 533 women, 218 children; silver mining, 2275 men, 7 women, 18 children. In general, women and children each form about 3.3% of the total Austrian mine workers.

Fuller's earth is now chiefly used as an oil clarifier. The United States production equals only about three-quarters of the consumption. About one-half the domestic production comes from Florida.

Labor Conditions at Copper Range

By Claude T. Rice

The question of housing employees is a matter much neglected at Western mines, where the superiority of the married miner in work and faithfulness is not appreciated as much as it should be. Lake Superior mining companies always provide houses for their best employees. The houses are rented at a price so low that it does little more than take care of the repairing and other fixed charges, such as taxes and insurance. Western mining companies are prone to attribute this practice to the settled conditions in the Lake Superior district, but even at the new prospect camps, houses for married employees have to be provided before the company can attract the better class of men.

PATERNAL POLICY RESULTS IN STABLE CONDITIONS

As will be shown by plans and approximate costs of erecting the houses furnished the men by the Copper Range Consolidated Co., these houses do not have to be expensive to be comfortable. Any company that has arrived at the stage of employing a considerable force of miners ought to be able to afford the expense of housing the married miners in its service. If this policy were carried out there would be more married miners in the Western camps, and there would be less discontent and senseless agitation, and in time we would see the son following the father in American mines. Mine accidents would become less frequent, labor troubles and discontent would be less rampant, and efficiency in mining operations would show marked improvements, with wages going to the merchant and the butcher instead of to the saloonkeeper and the gambler, as is so characteristic of Western camps. Provision for families brings families, and families alone beget stable conditions as far as labor is concerned.

BOWLING ALLEYS PROVIDED

The companies in the Lake Superior district generally show some interest in the entertainment of their employees. They help the different baseball clubs and encourage the men to organize bands and other such organizations as will help to make the community self-contained to the greatest degree. If the men are not furnished some legitimate amusement they are either going to spend their leisure hours drinking and gambling or else become discontented. The Lake companies realize this clearly and at each of its different properties the Copper Range Consolidated Co. has erected a bowling alley where the charge for setting up the pins and other such things is just enough to cover the expenses. The men come

The paternal policy of the Copper Range Consolidated Co. is characteristic of the Lake Superior copper country and is responsible for stable labor conditions. Cheap rents are possible through company houses; libraries have been established; social organizations are encouraged; injured men are assisted and adequate medical attention provided for employees and their families.

with their families and rooms are provided for the wives and daughters as well as for the men themselves.

PUBLIC SCHOOL SYSTEM

In the Lake Superior district most of the taxes are paid by the mining companies. The companies therefore see that the money of the township is properly spent. For this reason the Lake Superior camps have excellent school houses, such as the high school at Painesdale which is capable of accommodating 400 pupils and cost \$125,000. This is a building of which any community, no matter what its size, might well be proud. The school is fitted with chemical and physical laboratories; a room is provided for teaching the boys manual training in the form of carpenter work, while instruction in domestic science with a laboratory for cooking practice is arranged for the girls. A gymnasium is provided with baths for boys and girls. In fact, bathing is a special feature of the community, for in the basement of the library near-by are free baths, and in the dry-houses the men and boys of the community can get baths at any time and tubs, as well as showers, are provided.

PAINE MEMORIAL LIBRARY

The Lake Superior companies usually take a considerable interest in seeing that the employees and their families are able to obtain good reading matter. In this case William A. Paine, one of the largest shareholders in the Copper Range companies, gave the Sarah Sargent Paine library building, costing about \$40,000, as a memorial to his mother. The company supports this library as well as the three branches which are maintained at Trimountain, Baltic and Atlantic. In this library and its branches there are about 6000 volumes, some being in Finnish and Croatian, as the people of those nationalities showed especial interest, raising money to aid in providing books. Each year the company adds some new books,

while the supply also grows by contribution from friends.

This library is open every day. One room is provided for card playing and other games, where the men can smoke if they desire. In the basement are the baths, while on the top floor is an auditorium that will seat 400 people. This is used for general gatherings, lectures, dances, etc. The library is in charge of a trained librarian, and a certain amount of children's work is done. The library is made to fit in with the work at the schools as much as possible.

Such enterprises are not costly. The company maintains the library and pays the salaries of attendants at a cost of about \$2500 per year besides heating and lighting the building. Much interest in the library is shown by all the employees. Indeed, it is the center of the community's life. It seems that if Western mining companies would operate libraries to compete with the saloons it would be good business and in time would have an indirect effect upon the price of the company's shares on the stock exchange, through efficiency among the employees.

AID FUND ORGANIZATIONS

A characteristic of the Lake Superior district is the interest that the miners show in their "clubs" as they call the aid-fund organizations. Almost as soon as a property begins to produce, the miners come to the manager and ask for the starting of such an organization. These organizations at the Copper Range properties are administered by the mining company, and the surplus funds invested for the men. The officers are the mine captain, the head physician, the company clerk, one surface and one underground employee selected by the company as popular and acceptable among the men. These officers serve without pay. The dues are 50c. per month, and the benefits are paid only in the case of accident, not in the case of sickness, as in the Calumet & Hecla club. Benefits in the case of partial disability are payable beginning six days after the accident, and amount to \$1 per day, being payable for a period not exceeding six months. It is because the benefits only apply to accident cases that these organizations prosper without outside aid. The different funds have grown so that they are able to pay \$600 in case of death or total disability. Cases of serious partial disability, such as the loss of an eye, a leg or a hand, are settled by the committee according to the individual case, the advice of the company physician being depended upon mainly in determining the degree of disability. These clubs are in operation only at the mines, not at the mills.

The aid given by the club does not affect the company's solicitude for the man and his family. If he is able to go back to work again, he is placed at his old job. If he is disabled so that this is impossible, new work is provided for him, and in the case of accidental death the family is helped according to the circumstances of the case. One young man's arm was cut off while working for the company. When he was discharged from the hospital and was able to return to work, he was given a landing job, at the same time being told to brush up on his education as much as possible. He took a course in book-keeping in a correspondence school, and is now a supply clerk at one of the company's properties. With young men such solutions of the problem of the injured employee are available, and in some instances it is possible even to better their lot financially. With the disabled employee past middle age it is a case of hunting up some make-shift job to help him keep going. Some surface work or tending the change house are the positions most applicable. In many instances, the employee can be transferred from the mine to the mill, where the work is mainly watching and little physical effort is entailed.

The company feels reluctant to send a disabled miner underground again if the injury be at all serious. Still, in one of the stopes of the Baltic mine there was, for a long time, a man with one hand who worked on a two-man machine. He had an artificial hand and by means of the hook he was able to do his share of the lifting, and even barring down the back. In fact the mine captain says that he was as good a worker as an able-bodied man.

FEE OF \$1 PER MONTH COVERS ALL MEDICAL ATTENTION

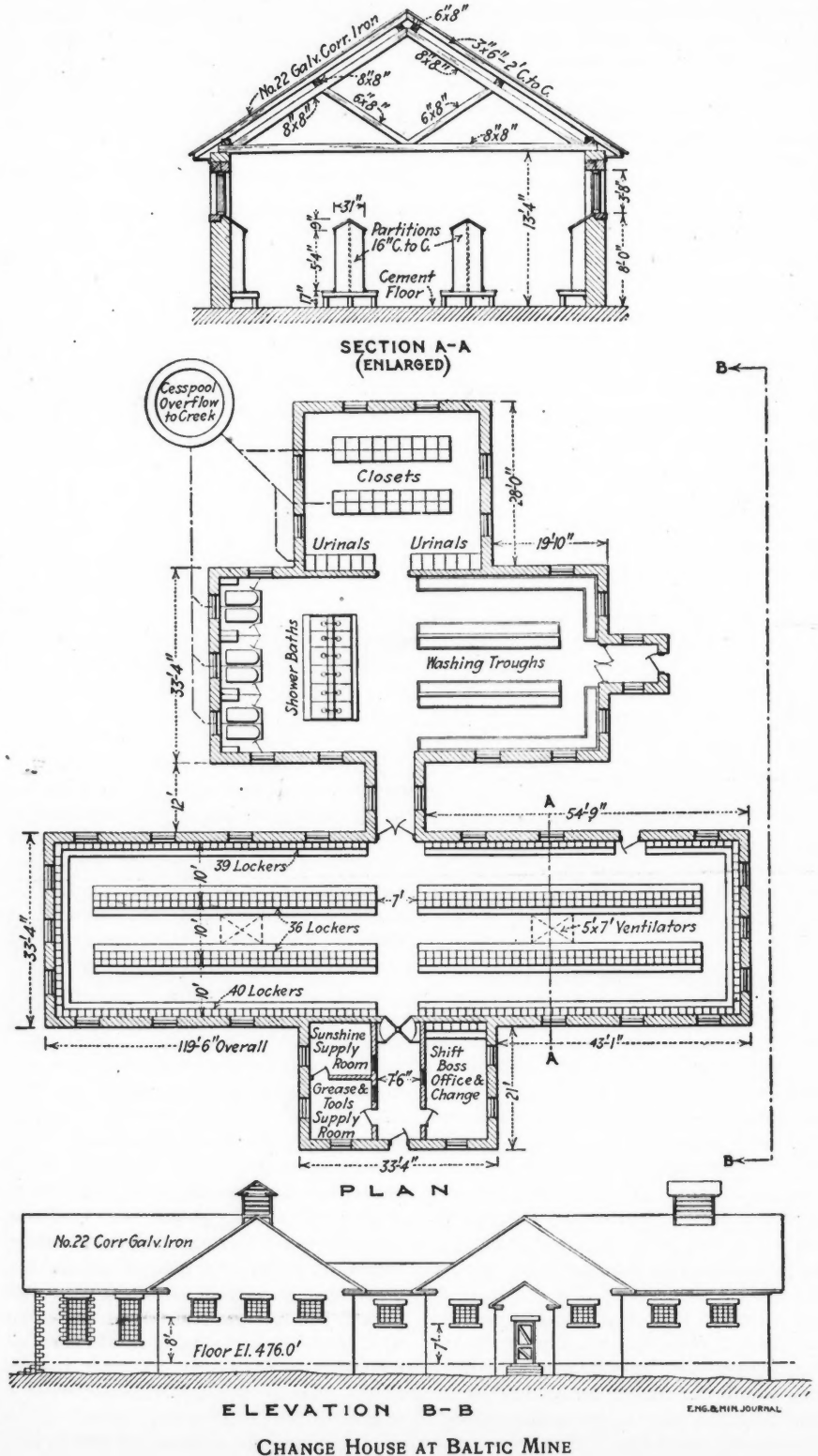
At the Copper Range company the hospital fund is operated on a somewhat different basis from those in other parts of the copper country, in that the men all pay \$1 per month. This is done so that the company can provide a service somewhat broader in its scope. No charge is made to any employee of the company for medical or hospital service in cases of either accident or sickness. The members of an employee's family are given free medical attention outside of the hospital and when necessary to treat the patient in the hospital a fee of \$1 per day is charged. There is one central hospital at Trimountain, with dispensaries and an ambulance maintained at the different mines. There is one doctor at the mills, which are all near together, and one at each of the mines. The medical corps consists of a head physician and six assistants.

COMPANY HOUSES POPULAR

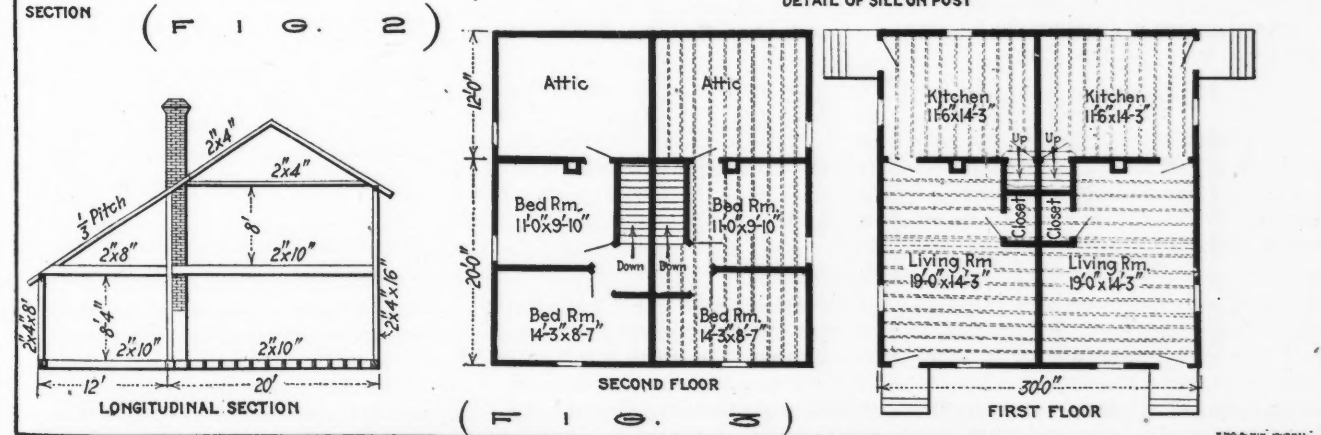
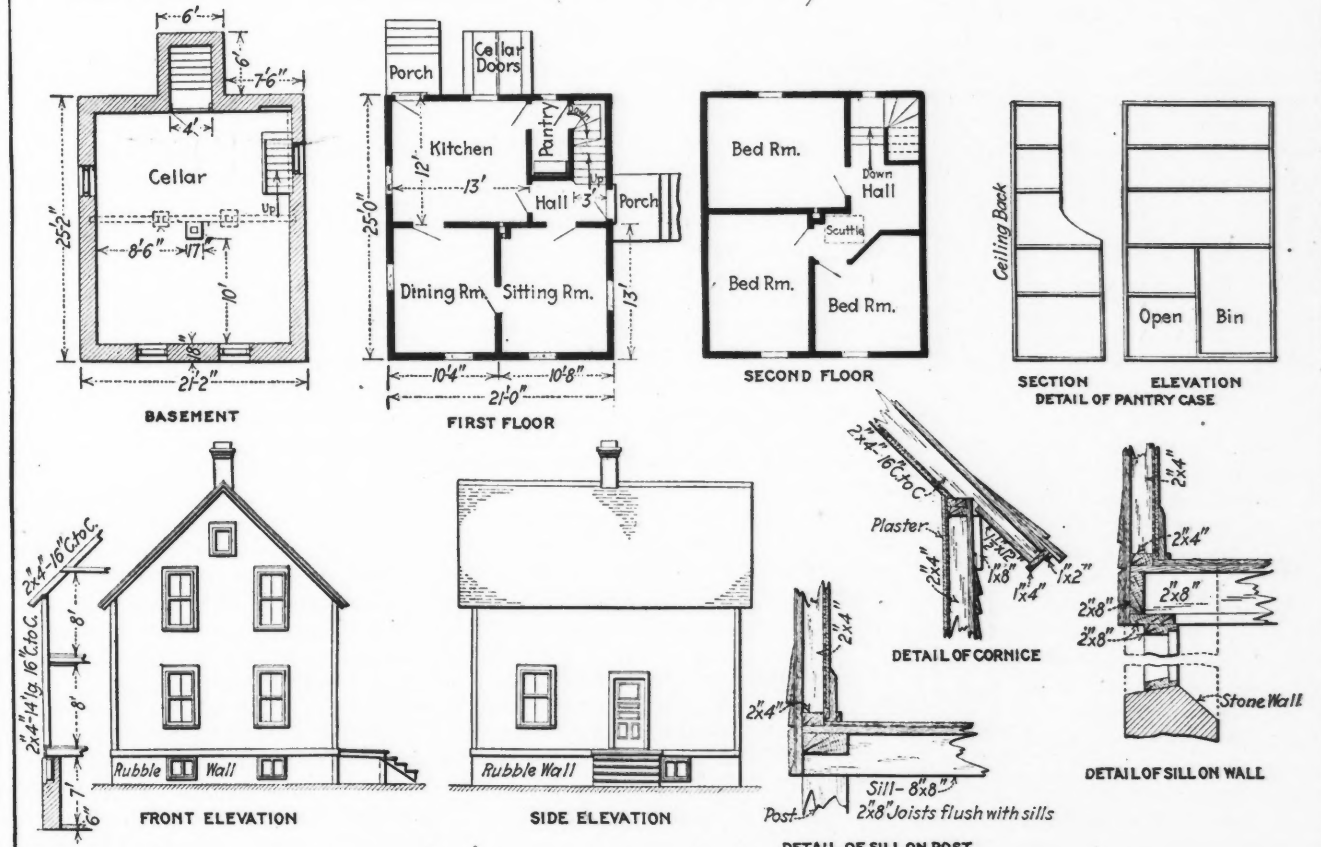
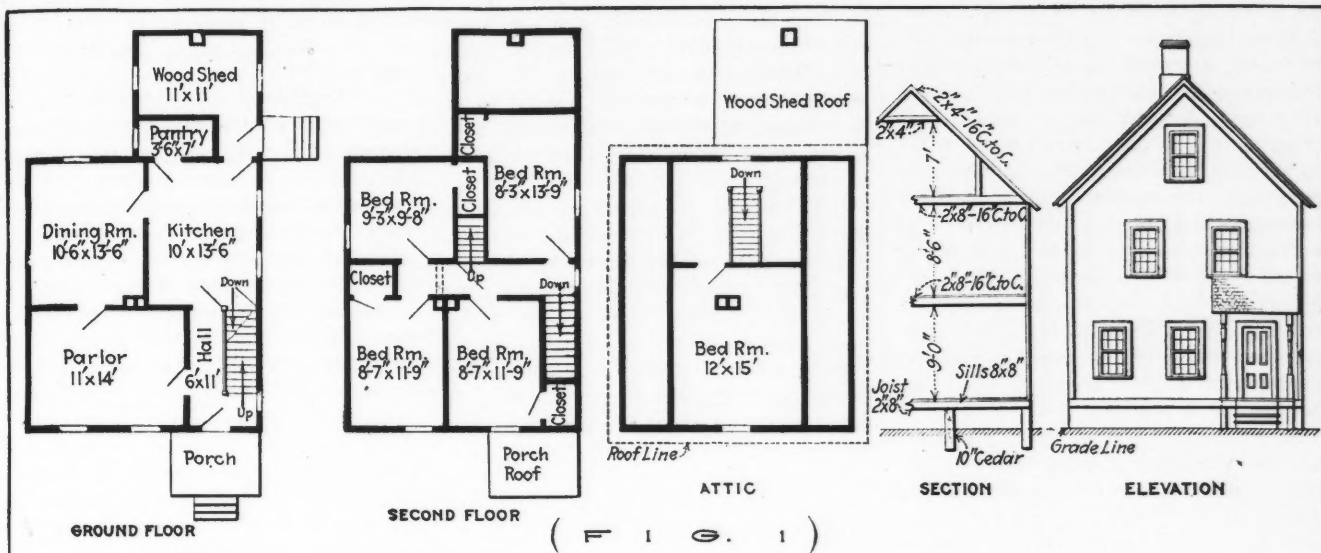
The whole attitude of the company is favorable to the married miners who have

the heaviest expenses. Coal is sold to employees practically at cost. Wood from the locations is also sold to the employees at reasonable rates. The greatest aid, however, comes to the married man through the company houses, which are rented at about 75c. per month per room. This includes water, scavenger service and removal of garbage. Only for malicious and unexcusable damage to a house is the man charged anything extra. Wear and tear due to children is, of course, not

considered. The trouble is that the company does not have enough houses to go around, and it cannot house all the married employees. As a result there is a scramble to get a company house whenever one is vacated, and when a family does get one, it generally sticks with the company. The 75c. per month just about covers the expenses attached to the maintenance of the houses and the cost of the service, so that the company gets no real income from the houses.



CHANGE HOUSE AT BALTIC MINE



TYPES OF HOUSES PROVIDED FOR EMPLOYEES BY THE COPPER RANGE CONSOLIDATED CO.

SINGLE HOUSES MOST DESIRABLE

Plans for some of the houses constructed by the Copper Range company for its employees are given in the accompanying drawings. A good deal of thought has been devoted to their design so as to get as serviceable a house for the money as possible. The houses, almost all have basements and are all finished inside with plaster; they have to be well built owing to the rigor of the winters. The costs given are based on a cost of lumber varying from \$16 per M for rough hemlock to \$30 per M for finishing lumber. Carpenters' wages vary from \$3 to \$4 per day of 10 hours.

Single houses are the most desirable, and if properly designed do not cost much more, proportionately, than a double house. Fig. 2 shows the house that has been found by the company to be the most satisfactory of its single houses. This originated at Trimountain but is now used elsewhere by the company as its standard single house. It has six rooms; the stairs to the second floor are arranged so that, with a minimum of space, separate entrances are provided for all bedrooms. The only drawback is that the entrance is on the side of the house, as the elevation shows. The house alone costs approximately \$1000 erected; the basement costs about \$200 extra. In Fig. 1 is shown another arrangement of a seven-room house. This house has the entrance on the front, but the position of the hall is poor as regards space economy. Several of these have been erected and are popular with the tenants; the attic can be finished off for a children's room if desired. The cost of this house is about \$1300, with basement.

The double house shown in Fig. 3 is the cheapest for a given capacity and is the type best adapted to young properties, as the families of the men who go to work at prospects are generally small. The attic on the second floor also can be finished if desired. This is the type of house that was first used at the Baltic mine. The double house with basement costs \$1200 erected, so that it makes the cost of housing the families much less than with the others.

THE BALTIC CHANGE HOUSE

The change house at the Baltic mine is shown in the accompanying drawing. This cost complete \$20,000. It has a concrete floor. In it there are 462 lockers of expanded metal and without doors, a watchman being kept on duty all the time. The lockers are 15 in. square inside and five feet high, with a shelf nine inches from the top on which to put wash basin and shoes. There are 12 showers and six tubs. Iron washing troughs 16 in. wide and nine inches deep are also provided. The water closets

empty into a large cesspool. The building has a corrugated-iron roof over a covering of wood. The walls are made of sandstone obtained near-by. The men of the community can get free baths at the change house any time of the day, as the use of the building is not restricted to company employees.

It is because of such treatment as this that the miners stay contentedly in these Lake Superior mining camps and let the high-priced camps of the West alone after trying them once. They would rather have families and decent homes than to submit to the living conditions that characterize Western mining camps. A miner gets only about \$70 per month but he can live cheaply. The butcher and grocery bill for the miner's family having three children and living well will not come to over \$30 per month and plenty of vegetables are available in season. The regular board charged in these camps is \$20 per month, including washing. At that price, however, two or three men sleep in a room. One of the reasons for such cheap board is that the company gives the boarding-house keepers cheap rents. Western companies, if they ever wish to get rid of the high wages that they are paying, should study the matter of providing houses for their employees at a reasonable price. They should see to it that early in the life of the company, ground for the future needs is obtained and held so as always to insure cheap living for the mine employees. A little foresight like that which is so commonly displayed by the Lake Superior companies goes a long way toward getting the better of discontent among employees. It is one of the main reasons that wages are lower in the copper country than they are in Western districts.

Doctor Jack Pot Wins Apex Suit

An unusually important apex suit has just been decided by the United States Supreme Court in the case of the Doctor Jack Pot Mining Co. and the Work Mining & Milling Co., of the Cripple Creek district, the course of which has been chronicled from time to time in the columns of the JOURNAL. By this decision the earlier ones of Judge Lewis and the court of appeals have been sustained and it is held that the \$2,400,000 worth of ore in dispute belonged to the Doctor Jack Pot company and must be paid for by the Work company. It was held by Judge Lewis and the court of appeals that the ore was under the Work properties, but that the vein from which it was extracted had its apex on the Doctor Jack Pot ground, and that the Doctor Jack Pot could follow a secondary vein extralaterally notwithstanding the absence

of a discovery vein or discovery cut, the claim being patented.

Tantalum Electrodes

The price of platinum has steadily advanced during the last 10 years, being now far above that of gold, and has reached a height that makes it burdensome to the chemist to buy apparatus made of this metal, so valuable and in many cases indispensable to him. It is not only the decline in production, but the enhanced consumption of this metal by the jewelry trade that has forced the market upward. Regarded from an esthetic point of view platinum ranks far behind silver and gold, hence there is no reason why it should be sought so much as an ornamental object in jewelry, but the fancy of the public has made it fashionable just on account of its high price.

SUBSTITUTES FOR PLATINUM

Since there is no prospect that the price of platinum will ever decline in any considerable measure, science and industry have tried hard to procure a substitute for this precious metal. While it does not seem probable that a substance will be found capable of replacing it in every instance, yet it will be of great moment if substitutes can be found for at least part of its applications whereby a portion of the metal would be made available for purposes for which it is indispensable.

Thus, quartz glass at a moderate price offers, for some purposes, a substitute for platinum, although not quite its equivalent. It is perfectly resistant to acids, with the exception of hydrofluoric, and insensible to sudden changes of temperature, but it is breakable and is a poor conductor of heat. Furthermore, chemical utensils have been made of an alloy of 90% gold and 10% platinum. This alloy is harder and tougher than gold, but more difficult to work than either one of the component metals. It might replace platinum entirely if its point of fusion were higher. As this is only little above that of gold crucibles the dishes made of the alloy are apt to fuse over an ordinary bunsen burner. Its scope of application is large enough, but the economy attained is small. The price of utensils made of it, amounts to about two-thirds of that of platinum in consequence of its higher cost of molding.

TANTALUM APPARATUS RECENTLY TRIED

Quite recently the firm of Siemens & Halske has proposed tantalum, which was originally intended only for metal filaments of electric lamps, as a partial substitute for platinum, and has introduced

Note—Translation by O. H. Hahn, from an article by O. Brunck, in "Chemiker Zeitung," Oct. 19, 1912.

sundry utensils and instruments made out of that metal at a price of 62½c. per gram, including cost of molding.

At temperatures below 200° C., tantalum behaves like a precious metal. It is not attacked by the oxygen of the air nor by acids, with the exception of hydrofluoric acid, but not excepting *aqua regia*. While it is perfectly resistant to aqueous solutions of alkalis, the compact metal is destroyed by fused alkalis. Heated in the air, tantalum begins to oxidize considerably below a red heat and burns, at a higher temperature, to white tantalic oxide, although in a vacuum it will stand the highest white heat. As a material for surgical and particularly dental instruments tantalum has found favor rapidly with practitioners. In chemical laboratories, tantalum dishes are, thus far, the only form in which the metal is used. Its sensibility to oxygen at the higher temperatures and to hydrofluoric acid prohibits a more general use as a substitute for platinum.

EXPERIMENTS ON TANTALUM ELECTRODES

The properties of tantalum described above made it apparent to me, however, that it might be tried appropriately as an electrode material in the electrolysis of metallic salts, especially in electroanalysis, a presumption which experiments have proved to be correct. The electrodes made for me by Siemens & Halske for experimental purposes had the shape and size of the Winkler wire-net electrodes and spirals in general use. However, the cathode was made of a perforated tantalum sheet to suit the convenience of the maker; this practice was, however, discontinued in favor of the wire-net construction.

The experiments reveal that tantalum can be substituted for platinum as cathode material without reserve, while this is not the case with regard to anodes. In the electrolysis of metallic-salt solutions the anode is covered in a short time with dark-blue oxide of tantalum of metallic luster in a tenaciously adhering layer which conducts so poorly that no measurable current will pass through the electrolyte, long before noteworthy amounts of metal have been deposited on the cathode. The increase in weight of the anode amounts to fractions of a milligram; hence the quantity of the tantalum oxide formed only a few milligrams. The blue oxide is insoluble in all acids, including *aqua regia*; hence probably is Ta₂O₅. By rubbing the anode with emery paper the layer of oxide can be removed. If it is desired to use tantalum as anode material and to work with a tantalum cathode and a platinum anode, the tantalum anode may be plated with a thin layer of platinum which can be easily accomplished electrolytically. A coating of a few centigrams of platinum will do. It is even better to use an anode of tantalum wire which is plated

with platinum by a process patented by Siemens & Halske.

Silver, copper, platinum and cadmium can be precipitated quantitatively from the usual acid-sulphate solution, zinc from alkaline-zincate solution, nickel and cobalt from ammoniacal-sulphate solution, tin and antimony from their sulpho-salt solution, on the tantalum cathode without trouble. The metal precipitates are easily dissolved from the cathode by acid, leaving the tantalum sheet unaltered in luster and weight.

NO ELECTROLYTIC ALLOYING WITH ZINC

Tantalum has even some advantages over platinum as cathode material. For example, zinc and cadmium show no disposition to enter into an alloy with tantalum on its surface, hence, there is no need of the cathode being plated with copper or silver as in the case of a platinum cathode. The insensibility of tantalum to *aqua regia* permits the removal of platinum and gold precipitate by that acid. But even in other cases it is convenient to be able to bring the metals in solution by *aqua regia*, or better, by hydrochloric acid with an addition of a little nitric acid if (for example, for the purpose of separating the electrolytically deposited mixture of nickel and cobalt) it is desired that the metals be present as chlorides.

A further advantage of tantalum over platinum is its greater strength and rigidity which prevents the electrodes from getting out of shape by bending. The difference in price is considerable, that of tantalum being 40% less than that of platinum. Further, the specific gravity of tantalum is 16.6 as against 21.48 of platinum, and the tantalum electrodes may be made much lighter on account of the greater strength of the metal. Hence, there is also a saving in weight of about 30 per cent.

The difference in price between tantalum and platinum electrodes is of importance where, as in metallurgical laboratories, a great number of electrolyses have to be made, side by side, and where a large sum is invested in platinum electrodes. Even in alkali-electrolysis tantalum is not attacked in the least as electrode material; hence it may serve as substitute of platinum in the different types of bleaching electrolyses.

Contractors' Bids

Six bids for improving the Neponsit River in Massachusetts, as stated in the *Excavating Engineer*, were as follows: 32c., 42c., 42.5c., 48c., 48.7c. and 58c. per cu.yd. for moving 130,000 cu.yd. of soft material. For removing 130,000 cu.yd. of hard material, the bids were: 42c. 42.5c., 48.7c., 54c., 55c. and 72c. per cu.yd. There were 100 cu.yd. of boulders to be removed; the successful bidder agreed to do the work for \$7.50 per cu.yd., while

the other bids were: \$6, \$8, \$10, \$13 and \$14. The same company agreed to move 800 cu.yd. of "ledge" for \$7.50 per cu.yd., as compared with other offers of \$8.90, \$10, \$12, \$13 and \$14 per cu.yd. of rock.

Colorado Mining Men Make Recommendations

DENVER CORRESPONDENCE

A committee of prominent mining men of Colorado, selected by Governor-elect Ammons, at a meeting of the Chamber of Commerce, reported on Dec. 7, 1912. The report recommends that the governor appoint a state board of mining, consisting of one member from each of the metalliferous mine-inspection districts as now established by law, with the state commissioner of mining as president. This board, if appointed, will have full power to inquire into details of every branch of the industry, and will be required to make an annual report to the governor. An appropriation will be made adequate for the needs of the board.

The committee thinks the Colorado legislature should act in harmony with the legislatures of other states to make a protest against the forest service interfering in mining matters. The assistance of the American Mining Congress is promised in this line.

A "blue-sky" law is favored to prevent unscrupulous promoters from discrediting the mining industry.

A law is favored making it a misdemeanor for any mill operator or smelter to mix, discolor or in any way disguise ore before its value has been agreed upon by buyer and seller.

The present mechanics' lien law was condemned, inasmuch as it makes the owner of a property responsible for all debts contracted by persons working leases on his property. Amendments were recommended doing away with this condition.

Uniform mine taxation throughout Colorado was recommended.

A "drainage district law" was recommended, requiring all parties who profit by new drainage tunnels to pay their share of the cost of the improvement.

A law was also favored extending the principle of eminent domain to aerial trams, electric lines and pipe lines.

Provision was asked for continuing the work of the state geological society.

The committee asked that there be added to the School of Mines a plant for experimental ore dressing, with particular facilities for experimenting upon the treatment of low-grade ores. This school should then be required to make a free analysis of all ores sent in by Colorado miners or prospectors.

The committee favored the bill introduced in Congress by Representative Taylor, seeking the establishment of a plant in the San Juan district for experi-

menting with low-grade ores. The report was signed by the following: Victor C. Alderson, Philip Argall, John T. Joyce, Arthur H. Roller, S. D. Nicholson, W. G. Swart, Bulkley Wells, T. R. Hendhen, D. W. Brunton, A. P. Aidowel, James T. Smith.

Revision of the Mineral Laws

The American Mining Congress has been attempting for some time to secure a complete revision of the mining laws, and has had a committee in Washington three times during the last year to confer with Senator Smoot, chairman of the Senate Committee on Public Lands.

It appears from the report made by this committee at the Seattle meeting that while Senator Smoot is in favor of revision, unexpected opposition developed in the Senate, and that he felt without the administration's support behind him, he could not push the measure. Attempts to interest Secretary Fisher proved fruitless, except that he recommended the abolition of the apex law in Alaska.

The chief problems to be taken up are: The uncertainties of title and litigation caused by it. The latter includes not only the conflicts caused by the extralateral right, but also those occasioned by the consequent shapes of claims and the overlapping of lines; the creation of a definite procedure for acquiring rights to those claims in which the mineral is not near the surface and where discovery must in consequence be long deferred; tunnel locations and the uncertainties of title caused by them in neighboring claims; the present nonobservance of the law of discovery; the partial or complete nonobservance, through various expedients, of the law of assessment; the location of an unlimited number of claims by one individual; locations by proxy.

A general revision now will be particularly timely because of the public interest in conservation and the new legislation now under consideration, for timber, oil, phosphate and coal lands, and also power sites. To omit the mining code from any program for the betterment of laws relating to natural resources, would be to pass by the field where relief is most urgently needed.

The hope of the Committee of the American Mining Congress is to induce Congress to appoint a committee to investigate the present state of the mining laws. The committee reported on the proposed procedure as follows:

After Congress has empowered a committee to act, the committee of the American Mining Congress hopes to have the opportunity of presenting to the committee at Washington, such detailed information and suggestions as may aid in preparing a plan whether for a commission or otherwise, which will be satisfactory to Congress and accomplish the ends desired. It is believed that this may be secured through a wisely selected commission, authorized to draft a re-

vised code for the use of Congress. This commission should hold public hearings in the principal mining centers of the West and Alaska. It should call before it men prominent for their knowledge of prospecting, of claim locations, of mine operating, mine litigation and the history of mining laws and should invite opinions from the public bearing upon the specific points at issue. The authorities and experience of other mining countries should also be consulted and made public and the final recommendations of the commission should be presented to Congress in the form of a fully drafted code.

It is clear that there is a best practical solution for each one of the difficult problems involved in a general revision of the mineral land laws, but in order to determine these best solutions, all opinions must be brought to a focus before some authoritative body which has the power of decision. Moreover, in order to assure the general approval and acceptance of reforms affecting so many varied interests, the personnel of this body should be such as to command confidence and the mining communities should have full opportunities to present their views before it. There is a wealth of learning and practical experience in the country, which is available for the work of framing a revised code, but it is distributed among many men and must be focused by the plan indicated.

Platinum Analysis

The following method is recommended by E. V. Koukline (Rev. Mét., p. 815, 1912; abstr. *Journ. Soc. Chem. Ind.*, p. 1036, 1912), who states that none of the methods ordinarily employed will give a complete separation of the platinum from the base metals. Two grams of the ore, contained in a small crucible previously glazed with borax, are heated with a known weight (seven to 10 grams) of pure granulated silver and 10 grams of fused borax; a small piece of charcoal is placed upon the charge which is then maintained at a temperature just above the melting point of silver, until the gangue of the ore is dissolved by the borax, and the metallic particles are inclosed by the molten silver.

When cold, the metal is separated from the borax, heated with dilute hydrofluoric acid to detach the last particles of the latter, washed with water, calcined at a low temperature, and weighed, the difference between this weight and that of the ore plus silver representing the gangue originally present. The silver having been removed from the metallic "button" by treatment with nitric acid, the insoluble residue is treated with *aqua regia*, at 70° C., in a tubulated retort until no further action occurs, the solution is then evaporated practically to dryness, the distillate—which may contain osmium—being collected in a well cooled receiver.

The dry residue having been extracted with hydrochloric acid (sp. gr. 1.12), the insoluble portion is re-treated with *aqua regia*, etc., as described, the process being repeated until the hydrochloric-acid ex-

tract of the residue in the retort is no longer colored. The combined hydrochloric acid solutions plus the final insoluble residue are several times evaporated nearly to dryness with strong hydrochloric acid to expel the last traces of nitric acid, the concentrated solution being finally diluted with hydrochloric acid (sp. gr., 1.12) and filtered through a weighed filter; the insoluble residue—consisting of osmiridium and a portion of the iridium originally alloyed with the platinum—is washed with hydrochloric acid and then with alcohol, after which it is dried and weighed.

Through the filtrate, heated nearly to boiling, a current of pure acetylene is passed for 45 min. to effect a preliminary separation of palladium; the precipitate is filtered off, washed and (the filter having been moistened with ammonium-nitrate solution) ignited; the precipitate is dissolved in *aqua regia*, the solution evaporated just to dryness, the residue taken up with a little water containing one drop of hydrochloric acid, and the palladium re-precipitated from the solution by the addition of mercuric cyanide; the resulting precipitate is successively washed, dried, strongly ignited in air, heated to redness in hydrogen, cooled in carbon dioxide and weighed as palladium. The filtrate from the mercuric-cyanide precipitation having been evaporated to dryness, ignited, re-dissolved in *aqua regia*, evaporated with hydrochloric acid and added to the filtrate from the acetylene treatment, the latter is evaporated nearly to dryness, diluted with water and heated to about 70° C.

A concentrated solution of sodium nitrite (sufficient to form double nitrites with the metals of the platinum group present) is then added, followed by a solution of sodium carbonate, and the liquid boiled for 45 min.; the gold is thus precipitated as metal together with the carbonates or oxides of copper, iron and other common metals present. After filtration the precipitate is treated upon the filter with cold hydrochloric acid, the residue of metallic gold being subsequently ignited and weighed. To the filtrate from the sodium nitrite and carbonate treatment (now containing only the metals of the platinum group) sodium hydroxide is added, the solution is placed in a retort and heated to 70 to 80° C., while a current of chlorine is passed through it to expel the ruthenium (as anhydride) which is collected in hydrochloric acid contained in the receiver.

The ruthenium is determined by evaporating the latter solution to a syrup, diluting with water and precipitating with metallic magnesium which is added a little at a time; the resulting precipitate is washed first with water, then with 5% sulphuric acid and again with water, the filter and contents being finally dried and burned in air at the lowest possible

temperature. The residue is subsequently heated to redness in hydrogen, cooled in carbon dioxide and weighed.

The solution from which the ruthenium has been distilled is neutralized with hydrochloric acid and evaporated somewhat, when sufficient sodium nitrite is added to reconvert the double chlorides into nitrites; rhodium and iridium are then precipitated by the addition of nitrite and chloride of potassium, and the precipitate filtered off and washed with a 5% solution of potassium nitrite. The solution obtained by dissolving this precipitate in *aqua regia* is evaporated several times with hydrochloric acid to eliminate nitric acid, and a slight excess of magnesium is added; the precipitated metals (mixed with the excess of magnesium) are washed with water containing hydrochloric acid and subsequently calcined in hydrogen; the magnesium is then removed by treatment with dilute sulphuric acid, the residue is washed with water, and the filter and contents incinerated; the residue is finally heated to incipient redness in hydrogen, cooled in carbon dioxide and weighed as rhodium plus iridium.

The latter are separated by fusing the residue with 50 times its weight of pure lead in a porcelain crucible; the fusion is continued for two hours, the charge being covered with potassium cyanide and stirred occasionally with a glass rod. After removal of the cyanide by solution in water, the lead is dissolved in nitric acid and the insoluble residue treated with boiling *aqua regia* which dissolves the rhodium. The insoluble iridium is filtered off, and after incineration of the filter paper, is ignited in hydrogen, cooled in carbon dioxide and weighed; the rhodium is obtained by difference. The filtrate from the precipitation by potassium nitrite, containing only platinum, is evaporated to dryness with hydrochloric acid, the residue taken up with boiling water, the solution rendered slightly alkaline with sodium hydroxide and then boiled with formaldehyde to precipitate the platinum (as metal) which is finally ignited and weighed.

Ignition of Gas by Incandescent Lights

The Bureau of Mines has been investigating the ignition of gas by standard incandescent lamps (*Tech. Paper 28*). The general method of testing was to bring a mixture of natural gas and air in contact with a hot incandescent filament by smashing the electric bulb by a sudden shock; by snipping off the tip; or by puncturing a hole in the neck. A few tests were made by removing the glass, surrounding the filament with gas, and then impressing the rated potential upon the filament. The tests were made

on from 8-cp., 50-volt carbon lamps to 190-watt, 220-volt carbon lamps; and 20-watt, 110- and 220-volt tungsten lamps. The general deduction to be drawn is that while an accident to an incandescent-light bulb may not ignite explosive mine gases, there is great danger that it will, and this likelihood must be recognized in mine legislation.

Dead End Support for Trolley Wires

At dead ends of trolley wires it is customary to connect with the wire, a turnbuckle for pulling out the slack. A wooden or composition strain insulator separates the trolley wire, electrically, from the turnbuckle and hook bolt. The accompanying illustrations show methods of support, described in *Coal Age*, Nov.

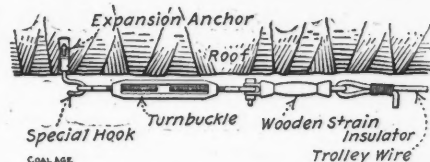


FIG. 1. A DEAD-END WHICH DOES NOT PULL OUT UNDER THE STRAIN

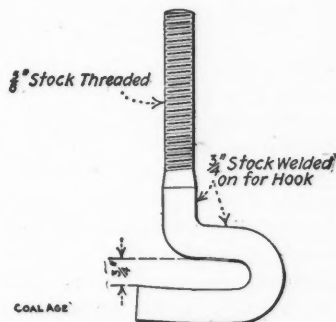


FIG. 2. A HOOK BOLT USED IN SECURING THE ENDS OF TROLLEY WIRES

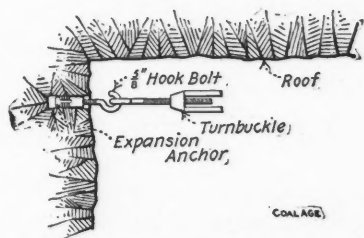


FIG. 3. AN UNRELIABLE DEAD END; PULL ON BOLT DIRECT

16, 1912, which are in use at the Penn Mary coal mines. Fig. 1 shows a 5/8-in. hook bolt, screwed into an expansion anchor in the roof. The hook bolt is made by welding a piece of 5/8-in. diameter stock to a 3/4-in. rod. The end of larger diameter is then bent into a hook, the other end being threaded. Because the pull on the expansion anchor is a side strain, the anchor does not tend to pull out. Hence the attachment is reliable and permanent. Another method of

dead-ending is shown in Fig. 3, where the pull on the expansion bolt is direct. This is rarely used and is not a desirable form of construction.

Rand's Historic Mines

By A. COOPER KEY*

The government mining engineer for the Union of South Africa has recently prepared a table, showing the record of such Rand mines as have been exhausted or which have, when approaching exhaustion, been absorbed by other companies. The table has no pretensions at being complete, for it takes no account of such historic mines as the Crown Reef and the Henry Nourse, which were absorbed in amalgamations that have constituted so important a phase of recent policy. The difficulty of getting figures in such cases must be recognized.

Ten mines are, however, included in the list of defunct mines, the principal among them being the Ferreira; the Bonanza, well named, as in its palmy days it was the richest mine of the Rand; the Jubilee, named in celebration of Queen Victoria's Jubilee, having been incorporated in 1887; the Salisbury, after Great Britain's prime minister; the Champ D'Or, a somewhat extravagantly named venture, the record of which has scarcely borne out its eloquent title.

CENTRAL RAND RESULTS

What have these mines done? The record for tonnage of ore yielded per claim is held with a large margin by the Jubilee, which extracted nearly a million tons from its 9 3/4 claims, equal to 102,500 tons per claim, thanks largely to the great work of the Main Reef. Second comes the Bonanza, which secured 773,000 tons from 11 claims, or at the rate of 70,137 tons per claim. Consequent upon its greater richness, however, the Bonanza is easily first in the direction of gold recovery and dividends per claim exhausted. The figures for these two mines, as well as for the Pioneer and Ferreira mines, practically adjoining and situated in the heart of the central section of the Rand, are given in the accompanying table.

RECORD OF FOUR DEFUNCT RAND MINES

	Gold per claim	Dividends per claim
Bonanza.....	£257,656	£126,890
Jubilee.....	167,318	50,975
Pioneer.....	202,064	101,508
Ferreira.....	178,486	71,926

The Pioneer did best in respect of dividends per ton milled, paying to its fortunate shareholders 35s. 9d., as compared with 34s. 3d. distributed by the Bonanza. It should be explained, however, that the Pioneer was an outcrop concern while the Bonanza was a shallow deep-level, its

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¹A Transvaal mining claim is 400x150 ft., and holders are not entitled to follow the reef beyond these limits.

vertical shaft cutting the reef at 770 ft. Neither the Pioneer nor Bonanza figures include the whole of the ore won from the ground. As far back as 1903 the former was sold to the Crown Reef, while the Bonanza was acquired by the Robinson Central Deep; the assets of the purchasing companies have since passed to the Crown Mines. When transactions of this nature have taken place it is difficult to obtain absolute figures. Similarly the Ferreira, after acquiring the Worcester company, was in March last purchased by the Ferreira Deep. The Jubilee and Salisbury have retained their identity up to the time of exhaustion.

So much for Central Rand data. To the east the Geldenhuis Main Reef produced 38,000 tons, equal to £62,349, and the Stanhope, 40,000 tons, representing £78,374 per claim exhausted. Since 1903 the Stanhope has been worked under the names of the Burham, the Cottswold and the Celine. A Rand mine may be said to die hard; this one was finally closed down in January last, and the figures given apply to that date.

MARKET AND INTRINSIC VALUATIONS

The inquiry is pursued into a comparison of the market values of shares at each year end, with intrinsic values calculated by capitalizing on a 6% remunerative and a 3% accumulation rate, all dividends paid on or subsequent to such dates. Such is, of course, an exact determination after the facts are known, obviously a different matter to the calculation of present value at a date years anterior to the exhaustion of the area.

The glamor of initial returns caused the public to overvalue Bonanza shares. It made its first distribution in 1897, and in 1902 paid no less than 115%, but its last dividend was in 1906. On the strength of satisfactory distributions, the shares were in 1901 and 1902 valued at £6, whereas the intrinsic values were just under 4 and about 3½, respectively.

FLUCTUATIONS FOLLOWING THE ANGLO-BOER WAR

One must not forget that the conclusion of the Anglo-Boer War hoisted the price of shares for reasons which were largely sentimental in character. From a market value double the intrinsic in 1903, there came a sharp appreciation of the mines' more reasonable possibilities, a realization that this state of splendor could not last indefinitely. For four years there was a remarkable approximation in the two sets of figures. The margin was only one of pence, until the price fell to 30s. In 1907 the quotation was 40% below the intrinsic value.

In 1902 the shares of the Jubilee mine were changing hands at 6¼, which meant that the 50% dividend was being purchased on an 8% basis, life considerations being overlooked, although the com-

pany had less than 10 claims to start with, and had been working and paying good dividends for a dozen years. For seven afterward, it paid 50% per year. When people were giving the price quoted, the intrinsic value was but 52s. 6d. Even with the quotation dropping, a sovereign or more a year after a distribution of 10s., the price in 1905 was half as much again as the intrinsic value; in 1908 it was more than twice as great, though there had been a fairly close approximation a year previous. In 1909, the price was no less than 36s. 3d., whereas the intrinsic value was a paltry five shillings.

In 1903, 1904 and 1905, the market price of Salisbury shares was substantially above that justified on intrinsic merits. Later a reversal took place. But another swing of the pendulum occurred in 1908. There were hopes of making good profits out of low-grade ore left in earlier working and the quotation advanced to 26s., or double the intrinsic value of eventual dividends. Later on the price was four times the intrinsic appraisalment. It is true that both the Jubilee and Salisbury have outside assets, which represent about 13s. 6d., and 6s. per share on cost, but this fact does not account for the disparity.

THE HISTORIC FERREIRA MINE

Comparison of prices of the historic Ferreira mine is of particular interest. It must be explained that the intrinsic value is based on dividends, and thus ignores the interest of 95,000 shares in the Ferreira Deep constituting the purchase price. This represented about £4 per share, and would go far to justify the difference in the two sets of figures last year. A full comparison is given in the accompanying table.

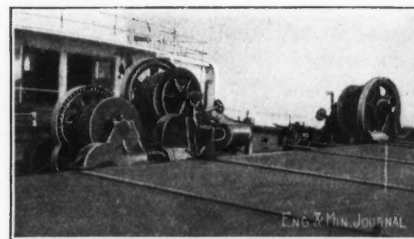
COMPARATIVE DATA OF FERREIRA MINE

	Market Value		Intrinsic Value	
	£	s	£	s
1902.....	24	5	19	9
1903.....	19	15	19	3
1904.....	24	0	18	6
1905.....	19	5	17	0
1906.....	19	15	15	7
1907.....	16	15	13	19
1908.....	16	0	11	8
1909.....	19	10	7	1
1910.....	10	5	3	8
1911.....	4	15	1	0

It will be observed that the price of Ferreira was higher in 1909 (when there was great share-market activity) than in 1905, and virtually the same as in 1903. But in the four years, to take the shorter period, the intrinsic value had dropped no less than £10, upward of £14 having been paid in dividends. In 1909 came the sharp awakening. The lesson of all these figures is that in times of market excitement, intrinsic values go "by the board," and that shareholders in comparatively short-lived mines do not start early enough to write down their capital. It is a great lesson in mining finance and should be thoroughly learned by purchasers of shares.

Safeguarding Machinery

Although a good deal has been said recently about the general movement underway to safeguard employees around mine plants and mills, perhaps a general impression exists that such precautions only are taken around mining machinery proper. It will be remembered that within the last few months the United States Steel Corporation has been making special efforts in this direction at its various works. The accompanying illustration shows to what extent the idea has been carried out. The battery of steam winches shown are on the deck of one of the Corporation's largest lake ore carriers. Most parts are in some way covered. A wide band of stiff steel covers the geared wheel, and metal hous-



GUARDS AROUND MOVING PARTS TO PROTECT WORKMEN

ings cover such parts as cranks, piston rods, etc. Such protection as these afford, could easily be applied to many small pieces of mine machinery, without appreciably adding to the cost.

Prospecting Waning in Transvaal

Statistics issued by the Union Department of Mines and published in the *South African Mining Journal*, Nov. 16, 1912, seem to indicate that prospecting activity is on the wane in the Transvaal. At the end of 1911 there were 925 prospecting permits in force in the province. At the end of June, 1912, this number had declined to 814, and during the succeeding three months was further reduced to 690. Similarly the number of claims held under prospecting title exhibits a decline from 89,577 at Dec. 31, 1911, to 79,796 at June 30, 1912, and 77,754 at Sept. 30, 1912. This decline may be only temporary, but the mineral discoveries of recent years have been most disappointing.

Nodulizing Iron Ores

According to experiments tried by the late Tom Cobb King (U. S. pat. 995,542), a temperature of about 1500° F. is required for the complete desulphurization of pyrite cinder, while a temperature of over 2000° F. is required for the nodulizing sintering. Moisture is said to assist in the process, and he advised moistening all fines before nodulizing.

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.

COPPER

CONVERTERS—Repairing Converters. E. A. C. Smith, Baltimore, Md. (U. S. No. 1,044,587; Nov. 19, 1912.)

REFINING—Improvements in Manufacturing and Refining Copper Alloys. W. S. Rockey and H. Eldridge, New York. (Brit. No. 4409 of 1912.)

REFINING—Improvements in the Process of Fusing and Purifying Copper. W. S. Rockey and H. Eldridge, New York. (Brit. No. 4410 of 1912.)

GOLD AND SILVER

CLASSIFIER. Philip Argall, Denver, Colo. (U. S. Nos. 1,044,844, and 1,044,845; Nov. 19, 1912.)

CYANIDING—Filtering Apparatus. James Millar Neil, Toronto, Ont. (U. S. 1,045,095; Nov. 19, 1912.)

CRUSHING—Quartz Mill. Hiram S. Rankin, Cripple Creek, Colo., assignor to Rankin Quartz Mill Co., Indianola, Neb. (U. S. No. 1,044,571; Nov. 19, 1912.)

DRY CONCENTRATOR. Jacob Wagner, Los Angeles, Calif., assignor of one-half to Max Factor, Los Angeles, Calif. (U. S. No. 1,045,478; Nov. 26, 1912.)

IRON AND STEEL

ALLOY of Iron, Copper, Nickel and Aluminum. John Frederick Duke, Manchester, England. (U. S. No. 1,044,761; Nov. 19, 1912.)

CRUCIBLE FURNACE. Wilhelm Buess, Hanover, Germany. (U. S. No. 1,044,012; Nov. 12, 1912.)

FURNACE—Metallurgical Furnace. Horace E. Smythe, Pittsburgh, Penn., assignor to S. R. Smythe Co., Pittsburgh, Penn. (U. S. No. 1,042,047; Oct. 22, 1912.)

FURNACE-CHARGING BOX. John Allison, Dravosburg, and Gustav A. Hassel, McKeesport, Penn., assignors to Pittsburgh Steel Foundry, Pittsburgh, Penn. (U. S. No. 1,044,842; Nov. 19, 1912.)

FURNACES—Improvements in Reversible Regenerative Gas Furnaces. A. Reynolds, London, Eng. (Brit. No. 16,041 of 1911.)

GAS PURIFICATION—Method of and Apparatus for Treating Gases. Ambrose N. Diehl, Duquesne, Penn. (U. S. No. 1,045,003; Nov. 19, 1912.)

OPEN-HEARTH FURNACE—Air-Cooled Open-Hearth Furnace. Henry Knoth, Monterey, Mexico. (U. S. No. 1,044,788; Nov. 19, 1912.)

REGENERATIVE FURNACE. Moritz Weiss, Resica, Austria-Hungary. (U. S. No. 1,045,650; Nov. 26, 1912.)

TUYERES—Eyesight-Plate for Tuyeres. James B. Rogers, Ashland, Ky., assignor of one-half to Patrick Meehan, Lowellville, Ohio. (U. S. No. 1,045,189; Nov. 26, 1912.)

VANADIUM CASTINGS—Manufacture of Vanadium Cast Iron. Frederick W. Stickle, Newington, Conn. (U. S. No. 1,046,232; Dec. 3, 1912.)

LEAD, ZINC AND OTHER METALS

ALUMINUM—Treatment of Surfaces of Aluminum or Its Alloys for the Deposition of Metals Thereon. Quintin Marino, Golders Green, London, England. (U. S. No. 1,045,718; Nov. 26, 1912.)

MANGANESE—Improvements in the Treatment of Manganese Ores with a View to the Metal Therein Contained. Isabellen-Hutte, G. m. b. H., Dillenburg, Germany. (Brit. No. 8400 of 1912.)

ZINC—Filtering Apparatus. Percy Claude Cameron Isherwood, Leytonstone, Eng., assignor to Refractory Zinc-Ore Treatment Co. (U. S. No. 1,043,939; Nov. 12, 1912.)

NONMETALLIC MINERALS

ABRASIVE—Composition for Making Grindstones, Consisting of Cement, Ground Quartz and Washed Sand. Robert Irving Dowd, Beloit, Wis. (U. S. No. 1,045,531; Nov. 26, 1912.)

CRYOLITE-RUTILE Composition. Ernest Kraus, Lynn, Mass., assignor to General Electric Co. (U. S. No. 1,045,985; Dec. 3, 1912.)

PHOSPHATE—Electric Furnace for Producing Oxides of Phosphorus from Natural Phosphates. Frank S. Washburn, Nashville, Tenn. (U. S. No. 1,044,957; Nov. 19, 1912.)

MINING—GENERAL

CONVEYOR. Thomas A. Edison, Llewellyn Park, Orange, N. J. (U. S. No. 1,041,756; Oct. 22, 1912.)

DRILL-CHUCK. Robert M. Reay, Massillon, Ohio. (U. S. No. 1,045,886; Dec. 3, 1912.)

DRILLING—Rock-Drilling Machine. Paul Lange, Brieg, near Breslau, Germany. (U. S. No. 1,044,790; Nov. 19, 1912.)

DUMP CAR. Frank S. Ingoldsby, St. Louis, Mo., assignor to The Ingoldsby Automatic Car Co., Cleveland, Ohio. (U. S. No. 1,046,191; Dec. 3, 1912.)

DUMPING CAR. John Karhu, Calumet, Mich., assignor of one-half to Richard T. Looney, Hancock, Mich. (U. S. No. 1,046,602; Dec. 10, 1912.)

EXCAVATING DIPPER. Albert E. Park, Minneapolis, Minn. (U. S. No. 1,047,135; Dec. 10, 1912.)

EXCAVATING MACHINE. Le Roy K. Sherman, Chicago, Ill. (U. S. No. 1,044,090; Nov. 12, 1912.)

EXCAVATION—Clam-Shell Bucket. Lewis J. Robb, Pittsburgh, Penn., assignor to Heyl & Patterson, Inc., Pittsburgh, Penn. (U. S. No. 1,046,334; Dec. 3, 1912.)

EXCAVATOR—Slack-Cable Excavator. Alvah D. Hadsel, Philadelphia, Penn., assignor to Cable Excavator Co., Philadelphia, Penn. (U. S. No. 1,045,973; Dec. 3, 1912.)

GRAB BUCKET. Albert J. Albrecht and Samuel H. Conklin, Florence, N. J. (U. S. No. 1,043,749; Nov. 5, 1912.)

HOISTING—Safety Appliance for Pit Cages, Lifts, and the Like. George William Lester, Bangor, England. (U. S. No. 1,043,323; Nov. 5, 1912.)

LAMPS—Improvements Relating to Miners' Lamps. T. Heaton, Wigan, Eng. (Brit. No. 239 of 1912.)

MINE POST. Reinhold H. Weber, Athens, Ohio, assignor to Jeffrey Manufacturing Co. (U. S. No. 1,046,517; Dec. 10, 1912.)

PROPS—Improvements in Props or Stemples for Mines. W. Reinhard, Crefeld, Germany. (Brit. No. 27,415 of 1912.)

PROSPECTING BY WIRELESS WAVES—Method of Locating Subterranean Strata. Heinrich Löwy, Göttingen, Germany. (U. S. No. 1,045,575; Nov. 26, 1912.)

SAND SEPARATOR for Pumps. Arthur P. Silliman and John F. Lindberg. (U. S. No. 1,044,091; Nov. 12, 1912.)

SHAFT-BORING OR TUNNELING MACHINE. William F. Wittich, Erie, Penn. (U. S. No. 1,046,927; Dec. 10, 1912.)

ORE DRESSING—GENERAL

CLASSIFIER. Harry L. Neall, Medford, Ore. (U. S. No. 1,047,106; Dec. 10, 1912.)

CONCENTRATOR—Pan-Motion Belt-Concentrator. Karl Senn, Alameda, Calif. (U. S. No. 1,044,697; Nov. 19, 1912.)

CRUSHER. Oscar Clarence Beach, Los Angeles, Calif., assignor to F. W. Braun, Los Angeles, Calif. (U. S. No. 1,045,499; Nov. 26, 1912.)

CRUSHER. Thomas Joseph Sturtevant, Wellesley, Mass., assignor to Sturtevant Mill Co. (U. S. No. 1,044,596; Nov. 19, 1912.)

CRUSHING—Improvements in Crushing Machines. E. B. Symons, Milwaukee, Wis. (Brit. No. 25,137 of 1911.)

CRUSHING—Ore Crusher. Enos A. Wall, Salt Lake City, Utah. (U. S. Nos. 1,044,832 and 1,044,833; Nov. 19, 1912.)

CRUSHING—Roll Crushing Machine. Thomas Leggett Sturtevant, Quincy, and Thomas J. Sturtevant, Wellesley, Mass., assignors to Sturtevant Mill Co. (U. S. No. 1,045,454; Nov. 26, 1912.)

FLOTATION PROCESS—Separation of Metallic Sulphides from Sulphide Ores. Thomas John Greenway, Armadale, near Melbourne, Victoria, Australia, assignor to Potter's Sulphide Ore Treatment, Ltd., Melbourne, Australia. (U. S. No. 1,045,970; Dec. 3, 1912.)

MAGNETIC SEPARATOR. George Ulrich, Broken Hill, N. S. W., Australia. (U. S. No. 1,046,685; Dec. 10, 1912.)

SEPARATION—Machine for Separating Metal from Ores. Charles Ross, Denver, Colo. (U. S. No. 1,045,083; Nov. 19, 1912.)

SEPARATION—Process of Separating Ores. Alfred Arthur Lockwood, London, Eng., assignor to Murex Magnetic Co., Ltd., London, Eng. (U. S. No. 1,043,850; Nov. 12, 1912.)

SEPARATION—Process of Separating Ores, Etc. Alfred Arthur Lockwood, London, Eng., assignor to Murex Magnetic Co., Ltd., London, Eng. (U. S. No. 1,043,851; Nov. 12, 1912.)

METALLURGY—GENERAL

BAFFLE PLATE for Chimneys. Zigler Hoenstine, Anaconda, Mont. (U. S. No. 1,043,837; Nov. 12, 1912.)

CHARGING Device for Gas Producers and Other Furnaces. Heinrich Bittmann, Frankfurt-on-the-Main, Germany, assignor to Corporation of Metallbank & Metallurgische Gesellschaft A. G., Frankfurt-on-the-Main, Germany. (U. S. No. 1,045,768; Nov. 26, 1912.)

CRUCIBLES—Improvements in Crucibles Used in Metallurgical and Similar Furnaces. S. N. and E. R. Brayshaw, Manchester, Eng. (British No. 15,623 of 1912.)

ELECTRIC FURNACES—A Process for Carrying Out Gas Reactions in an Electric Furnace. A. Helfenstein, Vienna, Austria. (Brit. No. 2637 of 1911.)

GASES—Treating Furnace Gases. Utley Wedge, Ardmore, Penn. (U. S. No. 1,046,915; Dec. 10, 1912.)

PRODUCER GAS—Method of Making Hot Producer Gas. Emil Fieischer, Dresden-Altstadt, Germany. (U. S. No. 1,041,058; Oct. 15, 1912.)

REDUCTION FURNACE. Arvid W. Ekstrom, Los Angeles, Calif. (U. S. No. 1,044,763; Nov. 19, 1912.)

ROASTING—Metallurgical Furnace. Utley Wedge, Ardmore, Penn., assignor to The Furnace Patent Co., Philadelphia, Penn. (U. S. No. 1,040,071; Oct. 1, 1912.)

ROASTING—Ore Roasting Furnace. Thomas Edwards, Ballarat, Victoria, Australia. (U. S. No. 1,036,814; Aug. 27, 1912.)

SINTERING FURNACE. Milton Henry Kauffman, Denver, Colo. (U. S. No. 1,045,853; Dec. 3, 1912.)

SMELTER SMOKE—Means for Recovering Dust and Other Materials. Charles Ebenezer Goodrich, Daggett, Calif. (U. S. No. 1,041,617; Oct. 15, 1912.)

SULPHATES—Process for the Reduction of Sulphates. Vittorio Bollo and Ettore Cadenaccio, Genoa, Italy. (U. S. No. 1,045,769; Nov. 26, 1912.)

SULPHIDE ORES—Improvements in or Relating to the Treatment of Sulphide Ores. E. A. Ashcroft, Balestrand, Norway. (Brit. No. 24,170 of 1911.)

WATER JACKET. Henry C. Holhoff, Milwaukee, Wis., assignor to Allis-Chalmers Co., Milwaukee, Wis. (U. S. No. 1,047,055; Dec. 10, 1912.)

WELDING—Portable Electric Welding Tool. John W. Sheffer, Berwick, Penn., assignor to American Car & Foundry Co., St. Louis, Mo. (U. S. No. 1,045,332; Nov. 26, 1912.)

Alabama Consolidated Coal and Iron Co.

The reorganization plan of the Alabama Consolidated Coal & Iron Co. is based on raising \$750,000 from the present stockholders, \$375,000 from each class. The balance of the cash necessary to wipe out the floating debt will be raised by the sale of a new first preferred stock (the present preferred becomes a second preferred), and new 6% 20-year bonds. Each preferred stockholder will pay \$30 per share and on deposit of 100 shares of stock and payment of \$3000 would receive:

First preferred.....	\$2,500
New Bonds.....	500
New second preferred.....	10,000
New common.....	4,000

Each common stockholder is to pay \$15 per share and on deposit of 100 shares of common stock and payment of \$1500 would receive:

First preferred.....	\$1,250
New Bonds.....	250
New common.....	10,000

Under the present bankruptcy proceedings the assets of the company will shortly be put up at auction, and the committee hopes to have enough money to bid in the property for the benefit of the present stockholders.

The financial position, before and after reorganization is shown in the accompanying table.

CAPITAL LIABILITIES OF THE ALABAMA COAL & IRON CO.

	Before Re-organization	After Re-organization
First 6% Bonds (Overdue).....	\$406,000	\$406,000
First Consol. 5's (Issued).....	1,663,000	1,663,000
Floating Debt.....	1,150,000	.....
New 6%, 20-Year Bonds.....	.....	800,000
First Preferred Stock.....	.....	625,000
Second Preferred Stock.....	1,250,000	1,250,000
Common Stock.....	2,500,000	3,000,000
	<u>\$6,969,000</u>	<u>\$7,744,000</u>

A Sulphur Operation in New Zealand

A correspondent of the London *Mining Journal* writes that a syndicate, representing Australian, British, Canadian and other capital, has purchased White Island, a conical island in the Bay of Plenty, New Zealand, for sulphur mining purposes. The island is the summit of a dormant volcano, arising out of deep water. It is on one of the lines of weakness which strike transversely across the North Island, through the Hot Lakes district, and the pumice zone. The activity, extending seaward about 30 miles (if not more), found a vent in what is now White Island. On it is a lake of strong mineral water, which is fed by geysers and boiling springs; it is the crater of the old volcano. Various attempts have been made to work the sulphur deposit, but the new owners evidently mean business, and will import

all the necessary plant. The former owner states that it is estimated that there are 750,000 tons of sulphur on the island.

November Oil Dividends

The dividends paid by California oil companies for the month of November total \$673,448. Adding the Mexican Petroleum, Ltd., preferred and common, swells the total to \$1,073,448. The accompanying table shows the list as made public, says the *San Francisco Chronicle*.

Amalgamated.....	\$1.00	\$50,000
American Pet. pfd.....	0.005	8,755
American Pet. common.....	0.00 1-3	39,607
Caribou.....	0.00 1-3	8,070
Central.....	0.0075	7,500
Claremont.....	0.01	5,000
Del Rey.....	0.005	3,928
Empire.....	0.40	80,000
Home.....	0.01	5,000
Monte Cristo.....	0.025	12,500
Mount Diablo.....	0.015	7,500
New Pennsylvania.....	0.005	5,000
Paraffine.....	0.01	3,000
Record.....	0.01	5,000
Republic.....	0.12	60,000
S. F. and McKittrick.....	0.01	5,000
Sauer Dough.....	0.0075	2,992
Section Twenty-five.....	0.50	20,000
State Consolidated.....	0.01	5,000
Traders.....	0.006	9,000
Union Oil.....	0.006	194,743
Union Provident.....	0.006	91,402
United Petroleum.....	0.006	48,457
W. K.....	0.02	10,000
Western Union.....	0.005	5,000
Total Cal.....		<u>\$673,449</u>
Mex. Pet. Ltd. pfd.....	0.00 2-3	80,000
Mex. common.....	0.001	320,000
Grand total.....		<u>\$1,073,449</u>

George Burnham

George Burnham, Sr., Philadelphia, Penn., formerly a partner in Burnham, Williams & Co., Baldwin Locomotive Works, and an associate of Matthias W. Baldwin, the founder of the works, died Dec. 10, aged 95 years. Mr. Burnham became identified with the Baldwin Works in the early days of locomotive building, and in 1867, following the death of Mr. Baldwin, became a member of the firm, then styled M. Baird & Co. On Mr. Baird's retirement, in 1873, Mr. Burnham became senior member of the firm then known as Burnham, Parry, Williams & Co., and later as Burnham, Williams & Co., which continued until the incorporation of the business in 1909 as the Baldwin Locomotive Works. Mr. Burnham's connection with the industry covered 73 years. He was born at Springfield, Mass., and when about 15 years of age went to Philadelphia. He leaves two sons and a daughter.

Zinc-Barium Paints

As is well known, lithopone is produced by the double precipitation of zinc sulphide and barium sulphate. In the *Revue des Produits Chimiques*, Sept. 1, 1912, G. Krüger calls attention to the fact that zinc sulphide and barium sulphate when precipitated separately and then mixed, do not give the same results as the lithopone. He says the compounded pigment

is not of as uniform a white as the lithopone; has a greater tendency to blacken, does not work so well under the brush, has not so great a covering power, and does not last so well.

Wolverine Copper Co.

The report of the Wolverine Copper Mining Co. for the year ended June 30, 1912, shows a production of 9,408,960 lb. of copper, which sold for \$1,327,031. The working expenses at the mine were \$635,148; melting, freight and all other New York expenses, \$78,702, leaving a net profit of \$613,181. From this \$540,000 dividends were paid, leaving \$73,181 to be carried to surplus account, which now stands at \$746,520.

The rock hoisted amounted to 414,544 tons; the rock stamped to 401,308 tons, from which 12,164,780 lb. of mineral were produced, giving the 9,408,960 lb. of copper as above mentioned. The yield of copper was consequently 23.45 lb. per ton. The cost per ton of rock hoisted was \$1.53; the cost per ton of rock stamped, \$1.58. The cost per pound of refined copper at the mine was 6.75c., while the total cost of refined copper was 7.586c. per lb. Shaft sinking in 1912 amounted to 541 ft.; drifting to 3779 ft. and crosscutting to 514 ft. Openings on the Kearsarge lode were in about the same grade of ground as in previous years, except on the 35th and 36th levels, between Nos. 3 and 4 shafts, where the vein was not so continuously mineralized as in the levels above. Work on the Osceola lode, consisting of 516 ft. of shaft sinking, 669 ft. of drifting, and 795 ft. of diamond drilling, was disappointing, as nothing of value was encountered. The vein is wide and well defined, but is mineralized in spots too widely scattered to give it commercial value. A drift was driven 82 ft. north of the Old Colony amygdaloid lode, but nothing of value was disclosed by this work. However, more work must be done at this point before any definite conclusion as to commercial value can be reached. General conditions of the mine and reserves of stoping ground created during the last year give promise of satisfactory returns for the year to come.

Manufacture of Manganese-Silicon

Manganese-silicon is manufactured now from rhodonite, according to *l'Echo des Mines*, Nov. 21, 1912. Three thousand kilograms of rhodonite are heated with 500 kg. of coke. Ninety kilograms of electrodes are consumed in the process, and 5400 kilowatt-hours of electric energy are required per metric ton of manganese-silicon produced. The slag, it is said, can be employed for the production of a 50% ferrosilicon containing some manganese.

PERSONAL

Mining and metallurgical engineers are invited to keep *The Engineering and Mining Journal* informed of their movements and appointments.

H. C. Miller, of Saginaw, Mich., is now at Berkeley, Calif.

C. T. Nicholson, of San Francisco, is in the East on business.

Corey C. Brayton has returned to San Francisco from Nome, Alaska.

Franz Cazin, of Denver, Colo., has left for Mexico on professional work.

C. P. Perin sails this week for India, where he has professional engagements.

L. F. S. Holland has returned to Telluride, Colo., from Arizona and Nova Scotia.

John G. Kirchen, manager for the Tonopah Extension Co., has been visiting in San Francisco.

C. H. Macnutt is visiting some of the principal mining districts in the United States, Canada and Mexico.

F. H. Pettingell, of Colorado Springs, will make his headquarters at Los Angeles, Calif., during the winter.

Robert E. Cranston sails on Dec. 28 for Brazil, where he is going to direct an extensive exploration of mineral resources.

A. Hulshof Pol left San Francisco for the Dutch East Indies on Dec. 7, and will visit the mining districts of Sumatra and Celebes.

Frank H. Johnson, supervisor of labor for the Illinois Steel Co., at its South works, has resigned and will remove to Pittsburgh.

Arthur W. Burgren is with the American Smelters' Securities Co., as engineer of the Dolores mines at Matehuala, San Luis Potosi, Mexico.

C. B. Lakenan, general manager of the Nevada Consolidated and the Steptoe Smelter, McGill, Nev., was married Dec. 17 to Mrs. Floribel White.

M. N. Colman has returned to San Francisco from Costa Rica, where he has been constructing a cyanide plant for the Panama & Costa Rica Mining Co.

W. Weston, Denver, Colo., has gone to Arizona and California on professional business. He will make his headquarters at La Jolla, Calif., for the next 30 days.

A. R. Campbell, formerly superintendent of the Needles Smelting & Refining Co., at Needles, Calif., is now assistant manager of the American Zinc, Lead & Smelting Co., at Dearing, Kan.

W. W. Johnson, president of the Union Construction Co., has returned to San Francisco from Alaska, where he has been during the past mining season superintending the operation of the York Dredging Co.'s tin dredge.

J. N. M. Shimer, late of L. & R. Wis-ter & Co., Philadelphia, and general

manager for the receiver of the Dunbar Furnace Co., has associated himself with Shimer & Co., having offices in Philadelphia and Pittsburgh.

Ambrose G. Todd, Dr. J. R. Jacoby and Sidney Abenheim were recently elected directors of the New York & Honduras Rosario Mining Co., to succeed L. F. Valentine, William Kengel and Ernest Shernikow. The annual report will be issued in the near future.

J. Nelson Nevius, after attending the meeting of the California Miners' Association at San Francisco, left for Kennett to study the bag-house system of fume control at the plant of the Mammoth Copper Co., in the interest of the Los Angeles Chamber of Mines and Oil.

Howard C. Holmes, of San Francisco, has been appointed consulting engineer of docks and waterfront construction for the Panama-Pacific Exposition. Mr. Holmes was formerly chief engineer of the California State Board of Harbor Commissioners, and has been a director of the Mechanics' Institute of San Francisco.

W. H. Lewis, general superintendent of the Aliquippa works of the Jones & Laughlin Steel Co., will retire Jan. 1 and will be succeeded by F. B. Hufnagel, at present general superintendent of the company's South Side works in Pittsburgh. Mr. Lewis will leave for California about Jan. 15 to take a much needed rest and recuperate his health.

Okura Okoshi, chief electrical engineer for the Japanese government on the island of Formosa, recently spent two days in an inspection of the work being done in the electrification of the Butte, Anaconda & Pacific R.R. between Butte and Anaconda. Mr. Okoshi is making a tour of the United States for the purpose of gathering data to be used in building an electric railroad in Formosa.

OBITUARY

Thomas E. Jones died, Oct. 27, at Round Valley, Inyo County, Calif. He was born in Wales in 1836, came to America in 1858 and worked in coal mines in Pennsylvania. He went to California by way of Nicaragua, arriving in 1863, and was a member of the Walker filibuster expedition. He mined on the Comstock, and also in California mining districts, but since 1870 had been engaged solely in farming. He planted the first wheat in Inyo County.

William O. Madden died at Goldfield, Nev., Dec. 17, aged 61 years. He had been a miner for many years, and was one of the pioneers of the Goldfield district. In the boom days of the Comstock he was employed on the Consolidated Virginia, and later went to Grass Valley, Calif., where he was superintendent of the Brunswick. At Goldfield he

was superintendent of the Florence and Little Florence. Several years ago he retired from active work on account of failing health. He leaves a widow and five children.

Isaac Copeland died at Alameda, Calif., Nov. 17, aged 68 years. He was born in Nova Scotia and went to California about 44 years ago. He was for many years engaged in mining in Calaveras, Tuolumne, Plumas and Sierra Counties.

Elias Crandall died at Jackson, Ohio, Dec. 8, aged 82 years. He was born in New York and went to Ohio when a young man. In 1851 he secured employment with Empire and Junior charcoal furnaces in Scioto County, Ohio. Some years afterward he became superintendent of those furnaces, continuing in that capacity until he removed to Jackson, Ohio, in 1873. At that time the Globe Iron Co. was organized and purchased Globe and Fulton furnaces, of which Mr. Crandall became superintendent. He continued in the active management of the business until the time of his death. His long experience had covered the manufacture of pig iron with charcoal, with raw bituminous coal and with coke. He served in the Ohio State Senate for two terms. He leaves a widow and two daughters.

Cyrus Elder, at one time prominent in politico-economical circles and widely known by American manufacturers, died at Philadelphia, Penn., Dec. 14, aged 79 years. He was born in Somerset, Penn., in 1833, admitted to the bar in 1856, served in the Union army in 1861-2, and engaged in the practice of law at Johnstown, Penn., in 1863. He became solicitor and general agent of the Cambria Iron Co., now Cambria Steel Co., and continued as such until 1901, when he retired from business. During this period, he was interested in political economy and for several years was secretary of the Industrial League, whose headquarters were in Philadelphia, and acted as editor of its publications. He was an advocate of the protective policy and wrote numerous pamphlets as well as a few more ambitious arguments in its support. He also wrote many poems, some of which were collected and published in book form. He took a deep interest in local affairs and organized the Johnstown Savings Bank, Cambria Mutual Benefit Association, Cambria Public Library, and Union Benevolent Association. He lost his wife and daughter in the memorable Johnstown flood of 1889. His wife was a sister of James M. Swank, the eminent statistician. For the past few years he resided in Philadelphia. He leaves two sons and a daughter. His eldest son, George R. Elder, Easton, Penn., is vice-president and general manager of the Ingersoll-Rand Co.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Dec. 18—The farmers' protective associations in Shasta County and in Amador, Calaveras and San Joaquin Counties have renewed their complaints against the copper smelters. The Shasta County association has elected new officers because it was contended that the former officers had been derelict in duty. The new officers will endeavor to close the Mammoth smeltery permanently, unless, possibly, a demand for damages may be met satisfactorily. The farmers in Amador, Calaveras and San Joaquin Counties who complain of the Penn Mining Co. smeltery at Campo Seco are not satisfied with the results of the experiments that are still in progress, and declare they are suffering damages the same as caused their complaints a year ago.

In the agreement of sale of the controlling interest in the Union Oil Co. of California to the General Petroleum Co. it is stated that the minority stockholders will be protected, the personnel of the Union organization will remain unchanged and the policy maintained. The head office will remain in Los Angeles. None of the majority shares covered by the option are to be delivered to the purchaser until all the minority shares, which are not a part of the option, shall be afforded equal opportunity to participate in the sale. The Stewart family shares are not included in the option, but will continue to be a part of the corporation. The same price will be paid by the purchasers for the minority as for the majority shares. The United Petroleum and the Union Provident are included in the deal, the latter company being the holder of more than 50% of the stock of the Union Oil Co. of California; \$500,000 of the purchase price has been paid, and the agreement calls for payments of \$100,000 on Apr. 1, 1913, and an equal amount every three months thereafter until \$1,000,000 is paid, when the purchasers are to pay the balance, \$19,000,000, of the price. Robert Watchorn is said to receive \$1,000,000 for the option.

The reported strike of high-grade ore in the Chipps mine at Sierra City, Sierra County, is worthy of attention for the twofold reason that it is in a producing district and in a community not easily excited by rich finds of gold-bearing quartz. The mine has been a producer, but was allowed to remain idle for a number of years, as has been the case

with many producing mines in Sierra and other counties through lack of proper methods of operation and inability to economically take care of low-grade while exploring for richer ore. The Chipps mine is now owned by the Swastika Mining Co., composed of Eastern men, for whom Lawrence Holley, of Sierra City, is superintendent. The new shoot of ore was found in the lowest workings and at some distance from the old pay shoot. Sierra County has long been handicapped by lack of transportation, and the whole county is practically shut in during the winter season, though neither fact has wholly discouraged development and production. Should the present strike prove to make a permanent mine, there will be some encouragement for the hope of improved transportation facilities. If the find is a mere pocket, the people of Sierra County will not be long in making the fact known. A fake boom is not likely to be started.

Denver

Dec. 20—A curious enactment happened at the recent election in Colorado wherein the people voted overwhelmingly for one law for miners, and then killed it by passing another measure by a small majority. One measure was the "eight hours for miners," a referred bill; the other was "to limit the hours of employment in mines," an initiated bill. The former passed by a vote of nearly two to one, while the second received a majority of only 3751. The former provided that an employer who required an employee to work more than eight hours in 24 should be subject to fine and imprisonment, but it appears that the latter bill also passed and while practically a duplicate of the eight-hour law, it has two additions to it. One of these is a qualification making the law applicable only to those underground workers who are in constant contact with noxious fumes. The other is a sentence included in the enactment paragraph, stating, "This bill shall repeal the so called eight-hour law for miners passed by the last General Assembly."

Mine operators declare that the enforcement of the eight-hour law would mean the reduction of the output of coal mines, etc., by 20%, or a 20% increase in the number of employees, with a resultant increase in the cost of the product to the consumer.

For more than a year plans have been made for merging some of the big pro-

ducing mines of the Cripple Creek district into a \$30,000,000 holding corporation, the El Paso Consolidated Gold Mining Co. being the leader in the movement. It is now announced that the preliminaries have been definitely arranged. Other mines talked of as being acquired by the new company are the Mary McKinney, Henry Adney and Golden Cycle. Last summer Pierre Eugene Caplane, vice-president of the Bank Intermediare of Paris, and A. Ehlinger, of Switzerland, became interested in El Paso and visited the property. The capital stock was changed from \$1 to \$5 par value and the headquarters of the company was moved from Colorado Springs to Denver; the stock was listed on the New York Exchange, Joseph Walker & Sons being named as the brokers for the company. The company's engineer has just completed a report on the mine, the collecting of the data for which took him and eight assistants two months to make. On this report, it is stated, depends the erection of a mill of 500 tons daily capacity.

The Denver & Salt Lake R.R. Co., with a capitalization of \$10,000,000, has now been incorporated under the laws of Colorado with powers to acquire all the properties and franchises of the Denver Northwestern & Pacific Ry., better known as the "Moffat Road" and now being operated between Denver & Steamboat Springs on the eastern edge of the Yampa coal field of Routt County, comprising 1160 square miles of bituminous coal and 40 square miles of anthracite area.

Butte

Dec. 18—Notwithstanding the fact that as the result of the labors of the state railroad commission fair and reasonable freight rates are now in effect on coal between places in Montana, the price of coal continues to advance. In November the commission began an investigation to ascertain the cause of this condition, and found that the mines of the Bear Creek district, the largest source of supply in the state, have been unable to ship at full capacity at any time since the autumn business began. The mine operators allege as the cause of the high prices and their inability to fill orders, a lack of service and cars on the Montana, Wyoming & Southern R.R., the only line into the Bear Creek district, causing spasmodic and intermittent operation of the mines, with consequent higher prices of coal production.

Acting Governor W. R. Allen, in the

absence of Governor Norris, has communicated with Senators Meyers and Dixon in the interests of 1500 small mining operators in Montana. He urgently requested them to use their influence to have reinstated in the list of government appropriations, the usual amount for the maintenance of the government assay office at Helena. At the time that the appropriations were made the assay offices of Montana, Utah and Idaho were not allowed for. The small operator is largely dependent upon these offices for a ready and convenient market for his bullion, and the loss of time and expense of shipping to a greater distance would mean the discouragement of many of those upon whom the development of the mining industry largely depends.

Salt Lake City

Dec. 18—With announcement that a normal surface force was handling 20,000 to 21,000 tons of ore daily at the Utah Copper, came another of an increase in wages, affecting unskilled labor chiefly, and dependent on an average monthly price of 17c. per lb. of copper. This went into effect Dec. 1, applying to track men, pit men, other classes of labor, and employees in mechanical departments. The last mentioned receive an increase of 25c. per day, and the rest 20c., their wage per 10-hr. day being \$2.20. This increase is similar to that granted Sept. 1 to underground workmen, and Nov. 1 to Garfield employees and trainmen, the rate of increase being in both these cases 25c. per day, also dependent on the price of copper.

Negaunee, Mich.

Dec. 20—In reference to the record shipment of 47,500,000 tons of iron ore from the Lake Superior region, the figures on the Iron River district are especially interesting, as that district has been enjoying a boom during the last year. The Iron River shipment was by far the record one in its history, totaling 1,750,000 tons, and thus passing the Crystal Falls and Iron Mountain districts on the same range. Practically all the ore came from 13 mines, and by next season there will probably be 20 shipping mines, an unusual number for one district. The following mines shipped during the past season: Caspian, Hiawatha, Zimmerman, Dober, Chicagon, Chatham, Davidson Nos. 1 and 2, Baltic, Fogarty, Youngs, James, Wickwire and Berkshire. Of these the Caspian has the record for the district at 306,720 tons; Pickands, Mather & Co., owning the Caspian, Baltic and Fogarty mines, shipped nearly 500,000 tons. The Munro Iron Mining Co., a Rogers-Brown subsidiary, is next with 220,105 tons from the Hiawatha mine and 141,258 tons from the Chicagon mine. Five years ago the Chicagon mine was supposed to have no ore and to be a "lemon"

mine, and the Hiawatha was supposed to be exhausted. Next year, the Munro Iron Mining Co. will add its Rogers mine to the shipping list, and Pickands, Mather & Co. will add the Bengal mine.

The Zimmerman mine ranks next to the Hiawatha with 188,591 tons; this property was explored and abandoned by the Munro Iron Mining Co. before the Spring Valley Iron Co. found the ore. Fourth in the list is the Dober, the only one of these mines owned by the Oliver Iron Mining Co., with 175,942 tons. The Chatham mine, of Oglebay, Norton & Co., was a heavy shipper with 135,000 tons, and the Davidson shafts of the New York State Steel Co., which have only recently been sunk, shipped 126,000 tons. The Youngs mine, of the Huron Mining Co., and the James mine, of the Mineral Mining Co., were not very active with 83,077 tons and 75,000 tons, respectively.

The Wickwire mine, of the Wickwire Steel Co., accounted for 70,000 tons; at the Berkshire mine, of Oglebay, Norton & Co., only the stockpile of 33,000 tons was shipped, as this mine was closed down until a few weeks ago.

Following the action of the state tax commission at Crystal Falls in radically raising the valuation of real estate and lowering that of mining property, a determined protest is being made by the local taxpayers' association. The citizens contend that the value of the real estate in a mining community varies directly with the value of the mines that support the community, whereas the tax commission appraised the business houses and residences just as it is done in the lower peninsula of Michigan, where real estate always has a comparatively stable value. The taxpayers' association argues that if developments in the Bristol mine showed that its value as an asset to the company had decreased over \$200,000, then dependent local property should be lowered in the same proportion. In many cases at Crystal Falls and Iron River the assessed valuation of real estate was this year increased several hundred per cent.

Deadwood, S. D.

Dec. 20—The directors of the Homestake Mining Co. have placed before the stockholders a proposition to increase the capital stock of the company 15%, the stock to be distributed *pro-rata* among present holders. This will undoubtedly be approved at the next meeting of stockholders. The property of the company is more valuable today than ever before; it is producing at a greater rate, and has a brighter future, so that with the good expectations, a stock dividend of this size is warranted. Among other items contributing to greater worth of the mine, was the acquisition this summer of nearly 1000 acres of ground adjoining the main holdings on the north. Ed-

ward H. Clark, of New York, managing director of the company, was recently in Lead, and made a thorough inspection of the property. The annual report of the state mine inspector, R. L. Daugherty, shows that for the year ended Oct. 31 the company milled 1,529,474 tons of ore, recovering bullion to the value of \$6,596,000, an average of \$4.312 per ton. All three of these items are higher than previous reports. It is confidently expected that the annual report of the company, covering the calendar year, will show that the surplus has greatly increased during the year, and such a showing would warrant paying the regular 6% dividend on the capital stock increased by 15%.

The Hearst Mercantile Co. and the First National Bank of Lead, each closely allied with the Homestake, have followed the lead of the latter and announced a bonus to all employees that will amount to 7% of the wage earned by each individual during 1912. This will affect about 200 persons.

Toronto

Dec. 22—The report of R. O. Wynn-Roberts, commissioned by the provincial government of Saskatchewan to investigate the feasibility of developing gas and power from the lignite-coal deposits of the province, states that there are 2,000,000,000 tons of lignite in the fields south of Regina and Moose Jaw, in addition to extensive deposits reaching from Estevan to North Battleford. The development of both power and gas and the manufacture of briquettes from lignite would be not only practicable but economical and would prove an important factor in the building up of the cities, both in the southern and the northern parts of the province.

Cobalt

Dec. 21—At a meeting of the Cobalt Lake shareholders, held Dec. 20, the option of the English syndicate to purchase control of the mine, was favorably received. Sir Henry Pellatt made a full statement in regard to the scheme, pointing out that when he had been approached to sell his controlling interest, he had insisted on every shareholder being given an opportunity to participate on terms similar to those offered to him and that this has been embodied in the agreement. Any shareholder, by depositing his stock with the British & Colonial Land & Securities Co., Ltd., can participate in the agreement.

It is understood that W. R. P. Parker, president of the Cobalt Townsite, and Casey mining companies, and J. P. Watson, vice-president, will be added to the directorate of the Cobalt Lake, representing the Rose Van Cutsen syndicate. No public statement has as yet been made regarding the terms of the agreement.

The Mining News

The Current History of Mining

Alaska

McCarty-Furseneau—The little Giant mill, owned by these men, is reported to be giving excellent satisfaction.

Kuskatina Copper Co.—This company is opening a deposit of chalcopryrite through which run seams of copper sulphate.

Regal Mines Co.—This company has just completed a 4½-mile trail connecting the mine with the trail across the Kennecott glacier to the railroad at Bonanza.

10 Below—It is the intention of O. P. Gaustad and A. C. Troseth, owners of this mine, on Cleary Creek, to employ a crew of 20 men this winter while opening up a new block of pay gravel and they hope to have between 140,000 and 150,000 wheelbarrows of gravel on the dump by the time the water runs.

Alaska Gold Mines Co.—David C. Jackling recently inspected the Perseverance mine and announced that the recently burned stamp mill would be rebuilt on Sheep Creek to receive ore when the 10,000-ft. tunnel from the Perseverance mine to Sheep Creek is completed.

Hallum—Another deal for the development of free-milling quartz properties in the Juneau district has been consummated and involves the consolidation of the Lemon Creek lode claims and placers and the Hallum properties, embracing 13 quartz claims, halfway up the slope of Mt. Juneau. E. R. Chapman, president of the Hudson Trust Co., of New York, closed the deal and George R. Noble attended to the details of the purchase of the Lemon Creek properties; water rights were also secured for developing 1500 hp. It is planned to begin to extract ores on the Gold Creek side where millsites have been located, and sufficient electric power will be transmitted from Lemon Creek to operate the mine and mill machinery.

Arizona

GILA COUNTY

Black Warrior—Lessees Fisk & Snell are shipping daily about 60 tons of ore to the old Dominion smeltery. All parts of the mine are being worked and about 50 men are employed in the extraction of the ore.

Idaho Group—Lyman Wood, of Globe, and associates are developing this property in the Dripping Springs country, between the Miami and Ray districts. A

whim and three months' supplies have been sent to the property. The property is near the Renfro and is in lime and diabase formation intruded by porphyry. Development work has shown copper ore along the contact.

MARICOPA COUNTY

Placer mining on an extensive scale will soon be under way on a number of claims near the Hassayampa River, below the Brill ranch, south of Wickenburg. The property is owned by J. C. Reed, Dr. J. W. Foss and C. T. Willis, of Phoenix, and A. J. Kellis, of Wickenburg. Water for sluicing will be obtained from the pipeline of the Monarch Mining Co. Much coarse gold has been found on this property.

Red Dog—At this mine, in the Winnifred district, much coarse gold has recently been found in a heavy iron-stained porphyry. Active development work on the property has been started by D. W. Steele. A mill will probably be built in the near future.

SANTA CRUZ COUNTY

Conquest—This group, in the Agua Caliente region, in the Santa Rita mountains, has been bonded by the owner, James Cunningham.

Austerlitz—Woodworth & Layne have made a new strike on claims adjoining the Austerlitz.

World's Fair—This mine has been examined by the engineers of the Copper Queen company, and it is now reported that they have made the owners an offer for the mine. Frank Powers, the owner, is shipping a carload of silver ore, which makes the record for this mine. There will be 1000 sacks of this ore, or about 50 tons, and the average value of the lot is a little more than \$100 per sack. The ore is brought under guard to Patagonia, and while locked in the cars, is guarded by three shifts of armed guards, reminding one of the old bonanza days; armed guards will likewise accompany the shipment to the Selby smeltery on San Francisco Bay. This ore has been taken out of the mine during the last year or so.

Grady—It is reported that this group of claims has been bonded by George Grady to the Calumet & Arizona Mining Co.

Wieland—George Wieland will ship another carload of ore from his mine; there is an immense amount of lower-grade ore developed in this mine and

plans are being considered for a mill to treat the ore locally; an occasional shipment of the higher-grade ore has more than paid all expenses.

Black Cap—The Mansfield company has started up again on this mine and is employing six men. On the adjoining group, belonging to August Yarick, a number of men are employed on a good showing of copper-silver ore.

Augustus—This mine, which was under bond to A. G. Fraser and Colonel Posey, is now shipping its regular run of ore to El Paso. The shipments average about \$50 per ton.

R. R. R.—This mine has increased its daily shipments to nearly 125 tons per day and another increase will be made in the near future.

Arizona-Pittsburgh—A strike of high-grade copper ore has just been made on this property, in Bond Cañon, in the Santa Ritas. This ore is found in the South vein, which is now showing six feet of shipping ore. Driving is in progress on this strike.

California

AMADOR COUNTY

South Eureka—The ditch and flume built to take care of the stamp-mill tailings are completed. The tailings are distributed on flats so situated as to prevent the filling in of a natural stream, and overflowing farm lands. A new oreshoot has been opened on the 2800-ft. level.

Central Eureka—A good vein was recently encountered in an east crosscut on the 2500-ft. level. A winze is being sunk on good ore from the 2800-ft. level.

Mountain King—High-grade ore continues in the shaft, which is only 40 ft. deep. Although only a prospect, the property produced \$4200 in October. It is in Pine Grove district, and is owned by B. W. Pitts.

Hardenburg—A station and 300-ton ore bin have been made at the 1000-ft. level, and another ore bin and station will be made at the 850-ft. level.

Kennedy—A wheel elevator for disposing of the mill tailings is being built. The tailings will be impounded on company land.

CALAVERAS COUNTY

Campo Seco Copper Mining & Development Co.—This is a new company, organized to develop and operate copper claims near the Penn copper mine. Rob-

ert S. Brown is president and Elvus Brandon is secretary, both of Petaluma.

Fazzi—A good vein of ore is reported in this property, north of Altaville. The ore is similar to that in Angels Camp, two miles south. An extension of the find has been disclosed on an adjoining ranch; Andrew Fazzi, owner.

Hardy-McCreight—A large amount of ore is on the dump and preparations are being made for the installation of a five-stamp mill. The mine is an old one, recently reopened on Charral Hill, south of Angels; James C. Maltman, superintendent.

South Carolina—The new 10-stamp mill is nearing completion at this mine, near Carson Hill. The property was idle for a number of years and was recently reopened by Joseph Peitano & Co.

ELDORADO COUNTY

China Hill—Preparations are being made for starting the five-stamp mill. Some new machinery is being installed. The mine is being developed by W. H. Noy, of Alameda.

Hayes—A shipment of pipe preparatory to reopening this gravel mine has been received at Auburn. The mine is situated in Indian Diggins district; John Graham and Eugene Avery, of Sacramento, owners.

HUMBOLDT COUNTY

Horse Mountain—About 500 sacks, weighing 150 lb. each, of concentrates, are ready for shipment to the Tacoma smeltery. The Huntington mill has been in operation about one month, and the concentrates about two weeks. This initial run is said to have been entirely satisfactory. The mine has been extensively developed and the indications are that it will prove a large copper producer; George Wilson, of Eureka, manager.

KERN COUNTY

Consolidated Mines Co.—A five-stamp mill, ore crusher and 25-hp. electric motor will be installed. The water for the mill will be taken from the Wedge shaft, to be raised by an electric pump. There are 45 tons of ore in the bins and 25 tons in the chutes underground, which will be held with additional ore that may be extracted, until the new mill is ready. A contract is said to have been made with the Southern Sierra Power Co. to furnish electric power upon completion of the mill in January. The supply of water in the Wedge shaft, which was recently encountered, is reported to be practically inexhaustible and can be pumped at low cost. This is said to be the first water found in the mines near Randsburg.

Placer Gold Co.—A reservoir 90x60 ft. has been built south of the sluice plant for the dumping of tailings from the sluices. Two elevators, 30 ft. high, have been installed for raising the tailings into the steel sluices, which are 150 ft. long.

A second pump has been installed at the settling tanks to pump water into the tailings sluices. The tailings are flushed into the reservoir and the water is drained back into the settling tanks. The gold, scheelite and black sand are separated in a Cummings separator.

Diamond Salt Co.—This company, recently organized, is reported to have acquired the salt lands at Kene Springs, 25 miles west of Randsburg. The brine is pumped and the salt is separated by solar evaporation.

SAN BERNARDINO COUNTY

Atolia Mining Co.—Of the nine claims owned only two, the Churchill and East Union, are at present being worked. The tungsten occurs in association with white scheelite. The ore is hauled by team a distance of about one mile to the plant at Atolia. The plant is composed of a 5-ft. Huntington mill and six Wilfley tables. Water is shipped from the wells at Hinkley, a distance of 37 miles by the Santa Fé Ry. About 100 men are employed.

MARIPOSA COUNTY

Whim Shaft Lease—A two-drill compressor has been installed. The old shaft has been cleaned out 200 ft. to the bottom and a 2-ft. vein uncovered. The shaft is believed to be in the hanging wall of the Mariposa mine. If this theory is proved and the ore warrants, the Mariposa will be unwatered by the Mariposa Commercial & Mining Co. A 75-hp. electric motor has also been installed at the Whim shaft.

Melvina—The concrete foundations for the compressors are being built and timbers hauled for reopening the tunnel.

NEVADA COUNTY

Birchville—A new Straub mill has been built at this mine, near Graniteville. The mill is of new design, built by the Straub Manufacturing Co., of Oakland. It has a rated capacity of 30 tons in 24 hr. The mill is at present operated by water power. The compressors are driven by electricity generated by water power. The power house is of corrugated iron, the foundations of concrete; John A. Bunting, of Oakland, general manager.

PLUMAS COUNTY

Crescent Mills Gold Mines Co.—The installation of the Chilean mill and Wilfley tables is completed, and crushing of ore was begun about the middle of December. The mill is of 20-ton capacity and is driven by a West Coast gasoline engine. The concentrators are operated by Westinghouse motors. Should the results warrant, the present capacity will be increased or the necessary changes will be made in the plant if the method is not adapted to the ore. Mr. Oddie, of Crescent Mills, is manager.

SHASTA COUNTY

Mammoth—The break of the fan blower at the baghouse caused a shutdown of

the smeltery for several days, but the repairs have been made and the operation resumed.

SISKIYOU COUNTY

John B. Farish and associates have taken a bond on the copper claims of W. J. Brown, of Happy Camp. It is expected that operations will be started in January.

Sunshine—The recent strike of rich gravel in this mine, at Gottville, on Klamath River, is reported to have caused the sale of the property to J. W. Liley, of Butte, Mont. H. S. Crane and C. R. Whitten, of Klamath Falls, were former owners.

TUOLUMNE COUNTY

Columbus—A drift is being driven on the vein at the 200-ft. level, and will be advanced to a distance of 700 ft. from the shaft. The ore is low grade, but the ore-shoot is large. The mine is equipped with an electric hoist; T. G. Winwood, of Tuolumne, superintendent.

Cosmopolite—This property of four claims and mill site, machinery, buildings and other improvements, has been purchased at sheriff's sale by H. M. De Ferrari, of Groveland.

Colorado

CLEAR CREEK COUNTY

Bellevue-Hudson—On Dec. 10 the compressor plant at the mine was completely destroyed by fire, probably caused by defective wiring.

Gem—A 5-ft. streak of \$40 ore has been opened on the 13th level by lessees Bradley & Erickson. A crosscut 150 ft. long is being driven from the Gem vein to the Freighter vein, by lessees Shaffer & King.

Idaho-Bride—A contract has been let to sink the shaft an additional 50 ft., at which depth levels will be driven each way on the vein. The company contemplates letting a contract for 800 ft. of work on the Seaton vein on the Newhouse-Tunnel level. During the week ended Dec. 14, the company shipped one car of smelting ore and two cars of concentrates.

Vindicator—The crosscut tunnel has intersected the Tom Tuck vein at a distance of 850 ft. from the portal. A drift on the vein has been advanced 75 ft. in ore of a milling grade. The drift will be advanced to intersect the Gold Leaf vein; Mr. Hoban, manager.

LAKE COUNTY-LEADVILLE

Robert E. Lee—This mine, on Fryer Hill, keeps up its usual tonnage and grades of iron ore. Zinc-carbonate ore is also being opened, but too low grade for shipment.

Leadville District Mill—The power contracts have been signed and the power brought into the mill. Contracts have

been signed with lessees on the Ibez, the Hopmore, etc., and it is understood that other contracts will be secured from the California Gulch region. Some material from the Resurrection dumps will be run through the mill as a test and if successful a large tonnage will come from that part of the district.

Result—This mine, on Carbonate Hill, near the Emmert, is shipping four carloads per week of iron-silver ore of good grade.

SAGUACHE COUNTY

Rawley Mining Co.—A drainage and development tunnel more than 6000 ft. long was recently completed at this property, near Bonanza. The silver-copper lode was cut 1200 ft. below the surface or 600 ft. below the lowest workings from the surface. The recession of water in the upper workings is 5 ft. per day and when drained these workings will be connected with the tunnel. W. C. Russell is the engineer in charge.

SAN JUAN DISTRICT

The shipments from the Ouray station of the Denver & Rio Grande R.R. for November amounted to 71 carloads or about 1600 tons. The shipments for the year to date amounted to 16,600 tons, 84 carloads of concentrates were shipped from the Telluride station in November, and from Lake City during the year, 1868 tons of ore have been shipped.

SUMMIT COUNTY

The Wellington Mines Co., Breckenridge, shipped from Dec. 1, 1911, to Dec. 1, 1912, 15,225 tons of ore. The Colorado Gold Dredging Co. has ceased operations for the season of 1912. The boat dredged on the rich pay streak in Swan Valley, at and above Summit Gulch, with excellent results. It is understood the boat took out more than twice as much placer gold this season as it did last year.

TELLER COUNTY-CRIPPLE CREEK

Acacia—A strike of gold ore is reported from the South Burns claim of this company by lessees, Hammond and Le Barge. It was opened in a raise from the fourth to the third level on the same property. Lessee Kushman opened ore said to average \$60 per ton in gold and already developed for 30 ft. in length.

Free Coinage—A carload per week of fair-grade ore is being shipped by Berry & Co., lessees, in the Pinto shaft on Bull Hill.

Isabella—Three carloads per week of good-grade gold ore are being shipped by Kellum & Co., lessees on Emma No. 1, of the Isabella estate.

Jerry Johnson—A new discovery on the third level is reported and shipments of ore are being made by J. Dwark, lessee, operating through the Damar shaft.

Hoosier—This mine, on Tenderfoot Hill, owned by the Grafton Gold Mining Co., is shipping again and active operations have been resumed. It is stated that a large shoot of ore has been opened by Lessee Conby.

Sratton Estate—This estate, owning more than 400 acres of Bull Hill, Iron-clad Hill and other mining ground in Victor and Cripple Creek, offers extremely favorable royalty terms to lessees. The output for November was: American Eagles, under lease to the Colorado Mines & Investment Co., six cars; Abe Lincoln, leased to the Hahnwald Bros., of Avan, four cars; Deerhorn, Globe Hill, operated by William Fitts, three cars, and Six Points, worked by Chillson & Polly, 11 cars of medium-grade ore.

Idaho

BLAINE COUNTY

Arkoosh-Comet—The Boise Credit Men's Association has taken over this property and plans to resume operation after liquidating old claims against the former company. Considerable new equipment will be installed, all of which will be electrically operated.

IDAHO COUNTY

C. B. & Q.—A good strike of milling ore is reported from the 200-ft. level of this mine on Clark's Fork.

Center Star—A new shoot of ore has been struck in the lower level and a raise to the surface commenced on it.

KOOTENAI COUNTY

Idaho Continental—The electric drill equipment is installed.

LEWIS COUNTY

Deer Creek—A 1000-ft. flume has been built to operate a sawmill and compressor.

SHOSHONE COUNTY

Copper King—The vein which was lost for a time has been found again and shows a width of five feet.

Blue Bell—The 800-ft. crosscut has cut the vein at a depth of 450 feet.

Missoula Copper—Arrangements have been made with the National company for the use of its tunnel for further exploration work on the Missoula property. This tunnel attains a depth of 1700 feet.

Federal—A process for the recovery of zinc by flotation recently devised by George H. Wyman, of the University of Idaho, is to be tried out in the mills of the Federal Mining & Smelting Co.

Empire—In driving the crosscut toward the main lead-silver vein a 5-ft. vein of commercial antimony ore has been disclosed and will be prospected further.

Hunter—Clean galena 2½ ft. wide and 25 ft. of milling ore have been encountered on the 400-ft. level.

Blue Star—The force at this property has been doubled.

East Hercules—Work has been resumed at this property near Burké.

Stewart—Since stoping was begun in the lower level the force has been increased steadily until now 336 men are employed. The property now ranks third in the district in number of men employed.

Michigan

COPPER

Superior—The railroad connections to afford this company shipping facilities to the stamp mill at Point Mills are about completed and as soon as they are ore shipments will go forward to the Lake Milling, Smelting & Refining Co. mill for treatment, which will result in an increased production and greater saving. The company has curtailed shipments to the Atlantic mill, devoting attention to the putting of the West lode in shape to meet the new conditions.

New Arcadian—In cutting a station at the 250-ft. level for the establishing of a sump, a copper-bearing lode was encountered showing good copper contents. The shaft is being sunk between two formations exposed in the drilling and at a depth of 500 ft. crosscuts will be extended and the formations opened at this depth.

Mohawk—The foundation for the new structural-steel rock house have been completed. The other buildings for the permanent equipment have been erected and this shaft will be ready in the early spring to maintain a large tonnage, which will materially benefit the property, as the ore coming from these openings is highly mineralized. The shaft is down over 1000 ft. and will have an ultimate depth of about 3000 feet.

IRON

Purcell—Hoisting with steam has been started at this new mine of the McGreevy Steel Co. Three eight-hour shifts are being worked in shaft sinking.

Buckeye—This mine of Oglebay, Norton & Co., at Commonwealth, Wis., has been reopened and is now in operation. The stockpile of 50,000 tons was shipped during the last season, but the mine has been closed for more than a year.

E. J. Longyear Co.—These interests are exploring the old Banner property at the eastern end of the Gogebic range. Diamond drills have been brought in. Low-grade ore is known to be in the vicinity.

Sherwood—The Republic Iron & Steel Co. has been diamond drilling this property, at Iron River, for two years. The uncertainty as to what the company has found is dispelled by the action of the state tax commission in raising the assessment from \$75,000 of last year to \$740,000 this year. With the property still in the exploratory stage, this is a

large assessment for the nonbessemer ore of the Iron River district.

Republic Iron & Steel Co.—This company, operating mines in Michigan and Minnesota, is paying taxes on about 90,000,000 tons of ore.

Hiawatha—An electric-haulage system will shortly be placed in the seventh level where development by drifts and crosscuts has been proceeding for over a year. Electric-haulage systems are at present in use on the fifth and sixth levels. Baldwin-Westinghouse locomotives are used. The electrical power is generated by steam in the company's engine house. This mine was a heavy shipper during the past season.

Missouri

JOPLIN DISTRICT

Crane & Miller have begun drilling their 75-acre tract between the Betsy Jane and Mary C. mines, at Thoms Station.

South Shoal Creek—A rich strike of "cog" lead has been made at a depth of 54 ft. Pieces weighing up to 200 lb. having been taken out. A drift has been driven in 20 ft. with good ore prevailing.

Athletic Mining Co.—Extensive improvements have been made recently by this company, operating in the north Webb City sheet ground. Oil burners have been installed under the boilers because of weakened gas pressure. Fine grinding of the tailings and subsequent sludge treatment has been found to give an increased recovery due to the chatty character and thinness of the ore. An efficient sludge plant consisting of 8 slime tables and settling tanks has been developed to handle 100 tons of sludge per day.

Oronogo Circle—A new compressor plant consisting of three units of 880-cu.ft. capacity each, each driven by a 150-hp. motor, has just been installed; 24 drills are operated and the full compressor capacity is required only in the middle of the day. This is one of the few mines in the district where the ore is concentrated at a central plant of 1000 tons capacity.

National Zinc Co.—This company, a steady purchaser of Joplin ores, has taken over the properties of the United Zinc & Chemical Co., which includes a zinc roaster at Argentine, Kan., and a smeltery of five blocks at Springfield, Ill.

Parshley—A new 150-ton concentrating plant is being erected near Parshley, 12 miles southeast of Carthage. It will be ready to operate in about two weeks on a 30-ft. face of ore, extent not known. The mine is in virgin territory.

Picher Lead Co.—Improvements estimated at several hundred thousand dollars are being made by this company at its plant, which will materially increase

its production of litharge and red lead. A modern two-story brick laboratory is being built and equipped, as well as new office space, reinforced-concrete warehouses, furnace buildings, etc.

Montana

BUTTE DISTRICT

Butte-Minnesota—At a meeting of the stockholders, held recently at Butte, plans were made to begin operations shortly after the first of the year at this property, consisting of seven claims situated about a mile south of Rocker. New financing has been completed, assuring the company sufficient funds to complete the development work begun some time ago, but discontinued for lack of money. A strong vein has been traced across the claims, in granite. A shaft was sunk 45 ft. and a tunnel driven 400 ft. in oxidized ore. It is planned to continue the shaft to the 300-ft. level, and cross-cut south to the vein at that depth.

DEER LODGE COUNTY

Hidden Lake—At this property, in the Georgetown district, a force of men is now engaged in sinking a shaft from the tunnel, the intention being to reach a depth of 300 ft. by next spring. As the result of last summer's operations there is about \$30,000 worth of gold ore on the dump. The company is preparing to begin the erection of a 50-ton cyanide plant early in the spring.

Bonanza—Thomas McGraw, owner of this property, at Silver Lake, has recently driven a tunnel 200 ft. on the vein. Samples taken in the breast gave returns of 62 oz. silver, and \$7 gold per ton. Mr. McGraw intends to thoroughly develop the mine, and will continue work in the tunnel.

FERGUS COUNTY

Barnes-King—At the North Moccasin property, near Kendall, recently acquired by this company, the crosscut on the 500-ft. level has reached the vein about 100 ft. from the Santiago winze, and a raise has been started on the vein. A sump has been sunk in the shaft below the 500-ft. level and a skip chute is being cut at that level. The mill is ready to be used to a limited extent, and it is planned to begin the treatment of a small tonnage daily in a short time.

LEWIS & CLARK COUNTY

North Star—This mine, eight miles from the town of Jay Gould, has just been closed for the winter, after a run of six months under the direction of George Edwards. A vein of copper and silver ore, 4 ft. in width, has been opened, and the company is now contemplating the erection next summer of a 50-ton concentrating plant.

MADISON COUNTY

Broadway—Since the recent death of F. R. Merk, at Twin Bridges, W. W.

Merk, his son, has been making preparations to reopen this mine, in the Silver Star district. This property produced a large amount of high-grade gold ore in the early days, but in recent years it has not been operated, except spasmodically by a few lessees. It is proposed to reorganize the company and issue stock, proceeds from the sale of which will be used for development work and the erection of a mill.

Dead Beat—At this claim, in the Rochester district, owned by Dr. H. H. Hanson, of Butte, a vein has just been opened, assaying from \$12 to \$14 per ton in gold, for a width of 2½ ft. William McLeay is doing the development work on the property.

Butte-Virginia—Some members of this company, which is operating the Bell mine near Virginia City, spent several days in that vicinity recently. Ore has been treated in the Grant mill, leased for that purpose, and numerous changes have been made toward the more economical treatment of the ore. In addition to their interest in this property, members of the company have, during the last few months, been having a thorough examination of the Alder Gulch district made by experts, with the intention of erecting a custom mill at a central point in the district. There are many quartz properties in that region which the owners are unable to operate profitably on account of the expense of wagon-haulage to Alder and shipment by railroad from there to the Washoe smeltery at Anaconda. As the result of the experts' report a syndicate is about to be formed at Butte for the erection of a stamp mill at Virginia City, the work probably to begin in the spring. The intention is to purchase direct from producers all ore yielding \$4 or more per ton.

Nevada

COMSTOCK LODGE

Ophir—The annual election occurred Dec. 18, at which the old officers were chosen for another year, including Franklin Leonard, Jr., of New York, president; B. F. Shaw, of San Francisco, vice-president; John W. Twiggs, of San Francisco, secretary; Thomas F. McCormick, superintendent. The annual report of the superintendent upon mine conditions was favorable, showing that during the year, 8436 tons of second-class ore was mined, and 9495 tons of ore shipped to the Kinkead mill of an average assay value per battery sample of \$28.40 per ton. During the year, a new 100-ton cyanide plant was built and placed in operation. Tailings impounded during the year included 9183 tons of an average value of \$6.51 per ton. There was stored previously 13,519 tons of tailings, all of which is now being treated at the new plant.

Consolidated Virginia—At a recent

meeting of the directors a resolution was unanimously passed ordering Superintendent McCormick to submit a report at once on all work as far as can be ascertained from maps and records, that has been done in the company's ground on and above the 1200-ft. level, with the purpose in view, should the report warrant, of starting prospecting work there or on the 1000-ft. level. The big Bonanza extended only a few sets above the 1200-ft. level, at least it was not followed up further on account of the fire. A drift is being considered from the 1200 station of the shaft, to pick up the east vein, which has proved as profitable in the deep levels, but which has never been prospected to any extent, as far as is known on the levels above. This work, if undertaken, will not interfere with the search for new oreshoots on the 2300, 2500 and levels below.

Sierra Nevada—Improving conditions are reported from the raise in the vein on the 2500-ft. level, where excellent milling ore is being saved. The raise is being carried up three sets wide, and from two to three feet of good ore is on the hanging wall, at a place 15 to 20 ft. above the sill floor. The pay streak is apparently widening above, late car samples showing ore assaying as high as \$40 per ton.

HUMBOLDT COUNTY

The latest strike of note was made at Rochester Cañon, where silver ore is found about 10 miles east of Oreana, a station on the Southern Pacific Ry. The rush to the new strike is so great that a post office has been asked for.

Barber Cañon Placer Mines—There has been a revival of the old Chinese placer-mining property in Barber Cañon, which Denver men have acquired, and are about to install a five-table concentrating mill, a pumping plant and pipe line. The property consists of 23 claims, about four miles east of Dun Glen, in Barber Cañon.

Kennedy Consolidated Mines Co.—This property, 65 miles south of Winnemucca, will be worked again.

NYE COUNTY

Shipments in tons from Tonopah mines to date and for the week ended Dec. 14, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3400	168,019
Tonopah Belmont	3482	127,360
Montana-Tonopah	980	51,048
Tonopah Extension	1080	50,548
West End	1050	39,177
Midway	45	910
MacNamara	610	19,342
North Star	...	401
Mispah Extension	...	40
Jim Butler	300	5,300
Tonopah Merger	350	855
Totals	11,297	463,000
Estimated value		\$211,908

Jim Butler—A new shoot of good ore has been opened on the sixth level.

A. S. Ross, manager of the Pittsburgh-Idaho Mining Co., has purchased a large interest in the Tonopah Mining & Leasing Co., operating a lease on the Cash Boy claim.

Tonopah Mining Co.—This company has resumed the sinking of its Sand Grass shaft from the 520-ft. level. This is its most western claim and has not yet been prospected. Crosscutting on the 800-ft. level of the Red Plume claim has been started, all work having hitherto been done above that level.

Tonopah-Belmont—The ore in the winze at a depth of 90 ft. below the 13th level averages \$100 a ton across a width of seven feet.

Tonopah Merger—Shipments have been increased to 50 tons daily. On the 1070 level the vein is 20 ft. wide and 16 ft. average over \$30 per ton.

West End—The capacity of the mill has been worked up to 150 tons of ore per day. Sinking of the main shaft from the 600- to the 1000-ft. level has been resumed.

MacNamara—The output of the mill has been worked up from 65 tons to 80 tons daily.

Tonopah Extension—The North vein has been opened on the 660-ft. level where the ore is of good grade. This is 160 ft. deeper than the other ore workings.

Boston-Ely—In crosscutting on the 1200-ft. level a new vein was recently discovered.

New Mexico

SOCORRO COUNTY

Ernestine—This company treated 680 tons of ore in a recent week. The first two cleanups in November yielded 1500 oz. of gold and silver bullion and 16,700 lb. of concentrates were also produced. The installation of 10 new stamps is nearly completed. This will give the mill a 40-stamp battery. Mine developments are showing up well throughout.

Oaks Co.—The winze and raise between the upper and lower tunnels were connected, Dec. 1, in the Pacific mine, giving excellent ventilation in all of the workings. The lower tunnel will now be pushed with the shifts to the end line and connections made with the south shaft. It is expected that this work will be completed in five months. During November, 500 tons of ore were sent to the Deadwood mill from November development. The Johnson, F. A., and other claims of the company are also producing good milling ore.

Socorro—At these mines over 5000 tons of ore were treated during the month of November.

Deadwood—The mill is running steadily, handling about 50 tons per day. Rich ore is coming from the winze below the

third level, some specimens assaying over \$1000 per ton.

Mogollon Gold & Copper Co.—This company is now stoping over 1000 tons per month from the Little Charlie mine.

Banner Group—It is reported that good ore has been opened on the Olympian claim of this group.

Oregon

JOSEPHINE COUNTY

County Line—George E. Howland, of Grants Pass, and other Oregon men, owners of this mine, have just found a vein for which they have been hunting for two months. They have exposed the ore in three different places, and picked up the vein at a depth of 100 ft. in the old workings. The vein is exposed in places on surface.

Ramsay—W. H. Ramsay, of Grants Pass, owner, operates an arrastre in which the ore, a decomposed porphyry, yields well in gold. Mr. Ramsay expects to put in modern machinery in the spring as soon as heavy hauling can be done, the roads now being impassable. He also owns a placer mine which he is working.

MALHEUR COUNTY

Reports of rich gold strikes in the vicinity of Malheur City are causing considerable excitement in this region. D. K. Worsham, F. L. Johnson and others, of Vale, have brought in specimens weighing from 2 to 10 lb. each, showing free gold. For many years this has been a gold-producing region supporting such mines as the Golden Eagle, Red White & Blue, Black Eagle and others, but owing to difficulties which have involved lawsuits they have been closed for several years.

Worsham—Claude Worsham and others, owners of this property, have bonded it to Baker City men.

Utah

JUAB COUNTY

Tintic shipments for the week ended Dec. 13, amounted to 208 cars.

East Crown Point—A statement to stockholders from the president and secretary gives the holdings of the company as 125 acres lying east of the Iron Blossom and Chief Consolidated, and between the Crown Point on the north and the East Tintic on the south. Drilling carried on in the eastern part of the property was abandoned, and the drilling equipment sold. Shaft sinking was then undertaken in the western end, and the shaft completed for 335 ft. Returns from the sale of the drilling machinery paid the debts of the company, and funds for development were provided from an assessment of 2½c. per share.

Eagle & Blue Bell—It is stated that this company will declare a dividend of 5c. per share, amounting to \$45,000. Connections between the upper workings and the bottom of the shaft sunk to the 1350, the lowest level in the mine, are making possible an increased tonnage. Shipments for the week ended Dec. 13 were 15 cars. This mine is owned by the Bingham Mines Co., which is controlled by Boston men.

SUMMIT COUNTY

November shipments amounted to 6473 cars of an estimated value of about \$260,000; those for the week ended Dec. 7 were 3,100,620 lb., the shippers being the Silver King Coalition, Daly-Judge, Daly West, and American Flag.

Silver King Coalition—A dividend of 25c. per share, amounting to \$312,000, has been declared, payable Dec. 24. November shipments amounted to 2520 tons.

Mines Operating Co.—In its trial runs, when the roasting capacity of the newly remodeled mill was found to be insufficient, the company produced about 1500 lb. of bullion. Since then, two new roasters of 35 tons capacity each have been completed, and the plant will soon be ready for continued operation.

Canada

BRITISH COLUMBIA

Granby Consolidated—Contracts aggregating \$700,000 have been let for equipment for the Hidden Creek mines and machinery for the smeltery. The Pelton Water Wheel Co. secured the contract for a waterwheel; Traylor Engineering & Manufacturing Co., the furnaces, converters, settlers, ore crushers and sampling machinery; Connersville Blower Co., the blowers; Nordberg Manufacturing Co., equipment for the compressor plant; Hallidie Co., traveling cranes and similar machinery; Brown Hoisting Machinery Co., hoisting apparatus, and the Westinghouse Electric & Manufacturing Co., the rolling stock, consisting of two 43-, six 12- and eight 6-ton electric locomotives and twenty-five 25-ton steel ore cars. Development at the Hidden Creek mines and construction of the smeltery and power buildings at Granby Bay are progressing on schedule, and there is assurance of enough ore being blocked out for treatment by the time the smeltery is completed to provide material for a number of months in advance of its needs.

Phoenix—Matt Trewhella, lessee, recently began to ship ore to the Trail smeltery.

Utica—Shipments will continue regularly all winter. A find of native silver is reported in the stopes on the east vein.

Leadville—Lead-silver ore has been crosscut for 27 ft. and it is the intention

of the management to increase the force and install a compressor.

Lucky Jim—The working force has been increased in order to open up ore as rapidly as possible for the contemplated concentrator which will be installed in the spring.

Levina—Work has been resumed and the management plans to do extensive development before attempting production, though several cars of high-grade ore have been shipped from the property.

Van Roi—Tunnel No. 10 was started recently.

Yankee Girl—Proposals for bids on the new 100-ton mill have been submitted to contracting companies.

McAllister—Ore of milling grade has been struck in the north drift in the new lower level.

Kirkpatrick-Coulthard Group—Engineers representing Victoria men recently examined this property with a view to purchase.

Tribby—Work has been resumed and as soon as the mine is unwatered extensive development work will be undertaken.

Standard—The force has been increased to 120 men and new work has been begun on the No. 7 tunnel. Most of the ore being shipped or milled is being taken from the orebody opened up between the No. 4 and No. 5 levels.

Goodenough—Average assays of \$175 per ton for lead and silver are reported to have been obtained from a series of samples taken from this mine at Sandon. The ground from which the samples were taken is in a 120-ft. strip near the Dundin property. A tunnel has been advanced to a point with 30 ft. of the Dundin lines.

ONTARIO

Homestake—A carload of electrical machinery, including four large transformers and two motors, has been received at this mine in the Lake of the Woods district, which will enable putting the power line from Kenora into commission at an early date.

ONTARIO-COBALT

Peterson Lake—It is understood that Sir Henry Pellatt is negotiating a deal for this property similar to the one just completed for the Cobalt Lake shareholders.

Seneca-Superior—It is understood that an initial dividend of 5% will be declared shortly.

Twentieth Century—The plant was damaged to the extent of \$3500 by the recent fire.

La Rose—A dividend of 2½% with a 2½% bonus has been declared. The net profits for the year will be over \$1,000,000. The surplus now amounts to \$1,788,000.

Sterling Silver Mines—This company has been organized with a capital of \$1,250,000, and has taken over the claims of Dr. C. W. Haentschal and Samuel Tongue in the Hubert Lake section of Elk Lake district. B. A. Schoerke is president, and E. E. Hale secretary-treasurer.

Ophir—This company is being financially reorganized. After the first of the year operations will be resumed at the No. 2 shaft now down 160 ft. on a cobalt and calcite vein. The shaft will be put down to the 300-ft. level.

ONTARIO-PORCUPINE

Rea—The water is being pumped out of this mine and it is expected that a new deal leading to its reopening will shortly be negotiated.

Mexico

CHIHUAHUA

American Smelting & Refining Co.—The Chihuahua smeltery has been closed for 10 days, dating from Dec. 4, on account of a shortage of coke, and it is not likely that the furnaces will be blown in for at least 10 days more, by which time it is anticipated that ample coke will have been received to insure of an extended run. Shipments of fuel are now *en route* from the United States via both the Mexico Northwestern and National Rys., the damage recently done by rebels to the latter road having just been repaired. Regular train service between Chihuahua and El Paso has been resumed over the National since the guarantee of federal military protection. The Chihuahua smeltery has received ore interruptedly, so that the Santa Eulalia mines have not been affected by the shutdown, but it is not certain that this policy will be maintained for a much longer period by the smeltery management. The mines also have an abundance of fuel for several weeks.

Alvarado Mining & Milling Co.—This company is operating continuously and handling a constantly increasing tonnage at the cyanide plant, at Parral.

The El Rayo and Tecolotes properties, in the Santa Barbara region of the Parral district, are operative at partial capacity.

SONORA

Press reports state that 750 miners went out on strike, Dec. 18, at the Cananea and Democrata mines, demanding an increase in pay of 25 centavos per day and an 8-hr. day. Later dispatches state that the strikers have surrounded the Americans in the camp and will endeavor to starve them out.

Creston-Colorado—The cyanide plant is now being operated continuously at a capacity of 350 tons per day. Several veins have lately been opened and pay ore mined. Yaqui Indians are frightening the woodcutters employed by the company, but so far have made no attack.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

COAL TRADE REVIEW

New York, Dec. 24—Colder weather has given some impetus to the coal trade, but the continued absence of storms which would interfere with transportation has been a favorable feature. There is still a scarcity of cars in the West, but conditions in this respect are slightly improved. The Seaboard bituminous trade remains in the same condition as for some weeks past. Supplies are hardly up to the demand yet, especially in the coastwise trade. Prices have eased off, but only a little, and the year is closing with quotations at a fair level.

The anthracite trade is still behind in deliveries. Work at the collieries has been active through December, but this week the holidays are cutting into production. Cold weather is putting quite a strain on local dealers in domestic sizes. Steam sizes, however, seem to be in sufficient supply. A heavy snowstorm set in today, which will undoubtedly cause a delay in deliveries.

British Coal Exports—Exports of fuel from Great Britain, with coal sent abroad for use of steamships engaged in foreign trade, 11 months ended Nov. 30, long tons:

	1911	1912	Changes
Coal.....	58,805,355	58,747,636	D. 57,719
Coke.....	948,883	928,612	D. 20,271
Briquettes.....	1,481,829	1,394,032	D. 87,797
Total exports....	61,236,067	61,070,280	D. 165,787
Steamer coal.....	17,696,757	16,734,586	D. 962,171
Total.....	78,932,824	77,804,866	D. 1,127,958

The later months almost, but not quite, made up for the losses during the strike early in the year.

IRON TRADE REVIEW

New York, Dec. 24—The conditions remain unchanged, and there are still differences of opinion as to whether the slackening in new orders is due only to the season, or is likely to continue into the new year.

Some large orders from car works for plates and shapes have improved the reports of new business for the week just closed. The railroads, in fact, have been the heaviest buyers and orders for new cars and for rails on a large scale. The mills are still very busy, and are getting some chance now to work up to time. Structural work also promises well, as a number of large contracts are under negotiation for spring work. Upon the

whole there seem to be fair chances for an active half-year at any rate.

Export business is good, and promises well. Several large foreign orders for rails are on the market, and are likely to come here, owing to the high prices abroad and the congested condition of German and British rail mills.

The pig-iron market is quieter and new orders have not been individually large, though making a fair total. In the Central West prices are firm. In Seaboard territory, some resales of speculative iron—chiefly Southern—have given the market an appearance of weakness which is not wholly justified by underlying conditions. The coke question continues a point of difficulty.

Statistical Work of the Iron Trade—A circular letter from James M. Swank, formally announcing his retirement from the position of the American Iron & Steel Association, and the pending transfer of its work, has been issued. The essential portion of the letter is given below:

A special committee of the directors of the American Iron & Steel Institute called at the office of the American Iron & Steel Association on Dec. 9, to inquire personally into the details of the work of the association and to consider the advisability of continuing this work with the present clerical force of the association and with its existing office facilities. The gentlemen composing the committee who represented the institute were Hon. E. H. Gary, E. A. S. Clark, E. C. Felton, Powell Stackhouse and J. G. Butler, Jr. James T. McCleary, secretary of the institute, was also present.

The gentlemen present decided to recommend to the full board of directors of the institute that the institute will, on Jan. 1 next, establish a Statistical Bureau in the present office of the American Iron & Steel Association, the bureau to be controlled absolutely by the institute and to be devoted to the collection and publication of the statistics of the American iron trade, the publication of a "Directory to the Iron and Steel Works of the United States," and the maintenance of necessary correspondence. All other work heretofore performed by the association will be attended to by the institute at its office in New York.

It was further stated that the institute would retain for an indefinite period and for such a time as may be mutually satisfactory, such members of the present clerical force of the American Iron & Steel Association as have had charge under Mr. Swank of the work of the asso-

ciation, placing William G. Gray in charge of this work and making him solely responsible. Mr. Gray has been principal statistical assistant for many years. Mr. Swank will transfer all statistical records of the American Iron & Steel Association to the new Statistical Bureau of the Institute, and will give it the benefit of his advice.

Birmingham

Dec. 23—Quiet rules the pig-iron market in the Southern territory so far as the sales go, but there is much activity in the delivery line. Considerable iron is moving out for export; several cars of the product went this week to Chile. Some inquiries are still being received for iron for delivery during 1913. The quotations are rather firm, \$14.25 being a minimum price mentioned for first-quarter delivery, with \$14.50@15 for second-quarter iron. Reports that some iron had sold as low as \$13.50 per ton, No. 2 foundry, are not to be verified. Special brand iron as well as basic and other special analysis iron carry the usual premium. For instance, a few days ago one of the companies sold iron as high as \$16 per ton, \$2 above the regular foundry prices. The shipments of pig iron from Southern territory, together with the local melt, are larger than the production.

Steel activities in Southern territory are still attracting attention, and there is a healthy outward movement of the various products. Cast-iron pipe production and demand are active.

As anticipated, there will be less time lost at plants through the holidays this year than ever before.

Chicago

Dec. 23—With the shadow of the coming holiday over it, the market remains quiet, but is firm as it has been for some time past. Most large consumers are well covered for the first quarter at least, many for the first half, and sales are mainly of a small order, to melters who have not yet covered, or whose business has run ahead of anticipations. The local furnaces are well sold up, orders covering most of their probable make for the first half of 1913. They are not hunting for business, and neither sellers nor buyers are ready yet for business over the second half of the year.

Prices are firm at \$14@14.50, Birmingham, equal to \$18.35@18.85, Chicago,

for No. 2 Southern foundry. Northern No. 2 foundry brings \$18@18.50, at furnace, or \$18.50@19, delivered. Lake Superior charcoal is in some demand, but prices are irregular, \$19 being the lowest, while for some lots over \$20 has been paid. Sales of this iron have been limited to small lots.

Finished products are in good demand. Railroad supplies are still the strongest feature. Structural steel is being taken for spring deliveries in a way which promises building activity in the spring. Bars, both steel and iron, are firm; local mills are full for some time ahead and are not in position to take orders for early delivery. Plates, sheets and other lines are in much the same position, and no early deliveries can be had. Prices are firm all around.

Cleveland

Dec. 23—Talk about Lake carrying rates for next season is going on. It is fairly certain that there will be an advance of 5c., possibly 10c., per ton.

Pig Iron—There is a steady run of orders of moderate size. Most large buyers are supplied for the present. Prices are firm, but with no quotable change.

Finished Material—Pressure for deliveries is strong still. New orders are slower than they were. Jobbers report business very good.

Philadelphia

Dec. 24—The pig-iron market has quieted down. The larger consumers are very well covered, some being supplied into mid-summer. Several lots of pipe iron have been arranged for, but most of the buyers are for small lots. Southern irons are the subject of much talk and correspondence, but only small lots have sold. Mills are cautious about buying for further delivery. Basic has been less active and could remain so, as many consumers are well supplied into the second quarter. Current production is considerably divided around to keep all supplied, but many urgent requests are made for compliance with terms. Basic fell back a little from its high-water mark and the belief is expressed here and there that other kinds will weaken, and that the excited conditions of the autumn months will be followed by conservative winter months. Prices, as a rule, are about the same as a week ago, but there is an impression that the highest level has been reached. Close inquiry fails to disclose solid reasons for this belief. One reason is that forward foundry commands the highest price of the season; 2X foundry is \$18.50@18.75; forge, \$18.25, and basic, \$18.25 per ton.

Steel Billets—The sales late last week denote an anxiety to secure large dependable stocks. While there are signs that consumers regard as weakness, there are no facts in the market to make

a foundation for such hopes. There are many inquiries for steel billets on both domestic and foreign account, and most of this business will go through. Basic openhearth, \$32 per ton.

Bars—Bars are on the eve of another advance. Business is done at outside figures. Many mills sold iron ahead of capacity, and a good deal of kindly forbearance has to be eventually exercised.

Sheets—Mills are still gaining in their volume of business and prices have again been practically advanced.

Pipes and Tubes—Tubes are exceptionally active. Early deliveries are urgently insisted on where possible. Large consumers keep their purchases well to the front.

Plates—Buyers are crowding manufacturers for promptest delivery. Manufacturers are unable to keep strictly to terms in isolated instances. The week reports a good volume of business, some of it being in large orders for latter part of first-quarter delivery. Plates have about reached their highest level according to large buyers, but the continued payment of premiums and the knowledge of much pending business gives but little encouragement to this view.

Structural Material—A very large volume of business has shaped up for closing, but it may be early January before the last details are closed. Much of the material wanted is for mid-winter delivery throughout the South and Southwest. Work for early spring delivery is urgent.

Steel Rails—Some of the heaviest orders of the year for domestic requirements have been placed and two heavy orders for export are now under consideration.

Scrap—All lines of scrap are held at top prices and ready scrap commands premiums. Heavy melting steel and railroad scrap command high prices. The supply is below the needs of the trade.

Pittsburgh

Dec. 24—Mills report no diminution in the demand for delivery of finished-steel products. Open weather has permitted the continuance of outside work at practically the fall rate, and as such work had largely fallen behind schedules on account of congestion at mills, shipments of material for outside work are as heavy as ever. The slowing down in pressure upon mills, which usually occurs upon the opening of winter, tends in general to be less marked as the proportion of steel used in inside work is increasing, as compared with half a dozen years ago.

While in some directions there is a decrease in specifications against old contracts, in some departments there is an actual increase. For instance, the leading interest has been booking record tonnages of sheet specifications, breaking all records in November, and this month

running 25 or 30% heavier in specifications than in shipments.

Premiums for early shipment continue to be paid freely in several lines, particularly for sheets, plates and merchant bars. In these products the markets for early and for far forward delivery are quite distinct from each other.

New records by large margins have been made in the year just closing in nearly all departments of the iron and steel industry. Lake Superior iron-ore shipments, with about 48,500,000 tons moved out of the region, show a gain of 5,000,000 tons over the best previous year, 1910. Pig-iron production has been about 29,600,000 tons, against 27,300,000 tons in 1910. Sheets, tinplates and wire have made large gains over previous records, and it is possible that plates and rails will prove to have made new records.

The local iron and steel market has shown practically no change from conditions of a week ago. While pig iron has been extremely dull, prices are firmly maintained and the operating furnaces seem to be very well sold up. Contract business in finished-steel products continues relatively light, but the pressure for deliveries is, if anything, accentuated. Consumers of partly finished steel are complaining more than ever about inability to obtain all the steel they want. Rivet makers, for instance, assert they are getting only half the steel they could use, while the sheet and tin mills are losing time from insufficient supply of sheet bars. This condition affects the leading interest as much as the independents, or possibly more.

Pig Iron—The market on foundry iron is not well defined. In some quarters it is claimed \$18, Valley, can readily be obtained for No. 2, but it appears that in some circumstances there is iron to be had at \$17.50. There is a moderate inquiry for steel-making iron, but transactions are very light. The Valley furnaces appear to be well sold for the first half of the new year, and are not making any effort to sell at this time. We quote: Bessemer, \$17.25@17.50; basic, \$16.50; No. 2 foundry, \$17.50@18; malleable, \$17@17.50; forge, \$17@17.50, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The scarcity of ferromanganese continues and prospects are for a more serious shortage early in the new year. The market is not quotably changed: Prompt carloads, \$75@80; Contracts, first half, \$70@75; second half, \$65, f.o.b. Baltimore, freight to Pittsburgh being \$1.95 per ton.

Steel—The mills are practically out of the market as sellers of billets or sheet bars for any delivery, and quotations are purely nominal. Brokers appear to have limited supplies of steel for first quarter, but are evidently rather indisposed to sell. Occasionally quotations are made

as high as \$29 or \$30, Pittsburgh. It is reported that the Steel Corporation has bought some billets in Alabama for use at the Pencoyd plant, in eastern Pennsylvania. We repeat former quotations: Bessemer billets, \$27; sheet bars, \$27.50; openhearth billets, \$28; sheet bars, \$28.50, f.o.b. maker's mill, Pittsburgh or Youngstown. Rods are quotable at \$30, Pittsburgh, but are not easy to secure at the price.

Sheets—Probably more than half of the independent sheet mills are now quoting prices above the regular figures of the leading interest, which are applicable to contracts for second quarter, but cannot be done for an early delivery. Such mills have been slow to book contracts and their specifications are now considerably smaller than they were 30 days ago, as their contract business is being worked off. The leading interest, on the other hand, is in receipt of very heavy specifications, materially exceeding its current shipments. This interest is operating its sheet mills at about 85% of capacity, being unable to do better on account of steel shortage, and the independents which do not make their steel are not doing any better, while independents making their own steel are running practically full. We quote, depending on delivery: Black sheets, 28 gage, 2.25@2.40c.; galvanized, 28 gage, 3.40@3.60c.; blue annealed, 10 gage, 1.65@1.80c.; painted corrugated, 2.45@2.50c.; galvanized corrugated, 3.45@3.50c. per pound.

St. Louis

Dec. 22—The pig-iron market is about the same. No large orders are reported, and probably none will come in until after the turn of the year. There is, however, a pretty steady run of small orders from mills and foundries. Makers are not soliciting orders, having plenty of work on hand. No. 2 Southern foundry is quoted \$14, Birmingham, or \$17.75, St. Louis, for early deliveries; for 1913, the quotations are \$14.50, Birmingham, or \$18.25, St. Louis, and some sellers ask \$15, furnace, for second quarter. Northern No. 2 is steady around \$19, St. Louis.

The demand for finished material, especially railroad supplies, is strong and mills are getting all the business they can handle.

Coke is scarce and high; good Connellsville foundry is \$7, St. Louis, but higher prices have been paid for spot lots. Byproduct coke is higher and is being taken wherever it can be had.

Iron Ore Trade

The figures compiled by the Cleveland *Marine Review* show that the stock of iron ore on Lake Erie docks on Dec. 1 were 9,494,628 tons, the largest ever re-

ported. The shipments to furnaces during the season were as follows:

Stocks, May 1, 1912.....	5,891,245
Receipts for the season.....	38,624,108
Total on dock.....	44,505,353
Stocks, Dec. 1.....	9,494,628
Shipments to furnaces.....	35,010,728

The shipments to furnaces compare with 23,178,370 tons in 1911, and 30,060,096 in 1910. The receipts at Lake Erie docks for the season were 81.4% of the total Lake movement. The balance went chiefly to Lake Michigan ports, principally South Chicago and Gary.

British Imports—Imports of iron ore into Great Britain, 11 months ended Nov. 30, were 5,850,335 tons in 1911, and 5,931,119 in 1912; increase, 80,784 tons.

Baltimore

Dec. 23—Exports for the week included 660 lb. selenium to Hamburg; 723,600 lb. steel pipe to Rotterdam; 3,425,520 lb. billets and sheet bars to Liverpool; 1,121,160 lb. skelp steel to Glasgow. Imports included 5900 tons pyrites from Huelva, Spain; 15,700 tons iron ore from Cuba.

Foreign Iron Trade

British Iron Trade

The scarcity of pig iron in Great Britain, says the *Iron Trade Review*, is more manifest than ever, with the result that every consumer is complaining of short deliveries. It is impossible to satisfy the demand for material. In the Sheffield district, the position has been aggravated by insufficient transit facilities. Many furnaces would be started, but for the high cost and scarcity of fuel. Prices eased a little during the week, apparently in response to European political complications. Yesterday's selling price for Cleveland warrants was 67s. 3d. (\$16.46), a shilling below the highest of the year, which was on Nov. 18, sales then being on the basis of 68s. 3d. (\$16.70). This is exactly 20s. above the figure of a year ago. Sales have been made for the first half of the next year at 68s. A very heavy demand is expected in the first quarter. Manufacture is carried on with great difficulty, owing to the great scarcity of coke. Small lots command fancy prices, and in the north of England, the probability of a fuel famine is being seriously discussed. There has been a considerable addition to warrant stock, during the past few days, but taking the month as a whole, the addition to stocks was only about 80 tons. The shipments have been considerably affected by the weather. They amounted in November to 90,000 tons, as compared with 110,000 tons a year ago. The amount in store at Cleveland is 250,000 tons. At some of the blast furnaces, great inconvenience has been

caused by inability to get fuel and ore to meet daily requirements. At present there is practically no prompt iron available, though the nominal quotation has been 82s. (\$20.08). Next year's contracts are on the basis of 82s. 6d. (\$20.20), and buyers count themselves fortunate if they can find furnacemen to accept orders for a long period at this price.

Austrian Iron Trade

At the meeting of the Austrian Iron Cartel, it was decided to leave unaltered the price of iron prevailing at present, as far as sales over the first quarter of 1913 were concerned, the uncertainty of the general situation being considered as justifying a waiting policy. During the course of the meeting, members of the Cartel reported a slight decline of fresh orders in Galicia, where credit is stated to be somewhat strained. From other districts of Austria, however, no diminution of orders was reported, wars and rumors of wars not having, as yet, exercised any restraining influence on the employment of capital.

French Iron Trade

The Comptoir des Aciers Thomas has put up prices for the first half of 1913 by 10 francs (\$1.90) per ton. The makers of finished and half products have thus the basis for their own price levels and will now be more disposed to accept orders for delivery next year. The market generally has undergone no material change, remaining active and firm almost throughout; and political developments, apart from making buyers somewhat cautious and limiting fresh business, have had no effect, late prices being fully maintained.

Bar iron is now quoted 2.50 francs higher (47½c.) in the Centre and Loire district at 207.50 francs (\$39.42½) and 2.50 francs (47½c.) to 5 francs (95c.) higher, in the Meurthe and Moselle at 210 francs (\$30.90) per ton.

German Iron Trade

The make of pig iron in Germany in October, as reported by the German Iron & Steel Union, was 1,589,262 metric tons, being 109,998 tons more than in September. For the 10 months ended Oct. 31 the total production was, in metric tons:

	1911	1912	Changes
Foundry iron....	2,520,116	2,715,161	I. 195,045
Forge iron.....	436,910	445,608	I. 8,698
Steel pig.....	1,434,666	1,794,539	I. 359,873
Bessemer pig....	296,278	318,463	I. 2,185
Thomas(basic) pig	8,154,720	9,174,867	I. 1,020,147
Total.....	12,842,690	14,448,638	I. 1,605,948

Total increase this year, 12.5%. Steel pig includes spiegeleisen, ferromanganese and all similar alloys.

German Foreign Trade—Exports and

imports in the German Empire, nine months ended Sept. 30, in metric tons:

	Exports	Imports	Excess
Iron and steel...	4,392,917	499,287	Exp. 3,893,630
Machinery.....	385,788	64,036	Exp. 321,752
Total.....	4,778,705	563,323	Exp. 4,215,382
Total, 1911.....	4,238,994	502,445	Exp. 3,736,549

The increase in exports this year was 539,711 tons; increase in imports, 60,878 tons.

British Foreign Trade—Exports and imports of iron and steel, and of machinery, in Great Britain, 10 months ended Oct. 31, as valued by the Board of Trade returns:

	Exports	Imports	Excess
Iron and steel	£39,523,957	£10,489,972	Exp. £29,033,985
Machinery...	27,502,255	5,645,823	Exp. 21,856,432
Hardw're, etc.	10,491,337	6,787,806	Exp. 3,703,532
New ships....	5,673,942	.....	Exp. 5,673,942
Total.....	£83,191,491	£22,923,600	Exp. £60,267,891
Total, 1911..	73,972,952	19,345,691	Exp. 54,627,261

Increase in exports, £9,218,539; increase in imports, £3,577,909. The quantities of iron and steel were, in long tons:

	1911	1912	Changes
Exports	3,681,253	4,015,661	I. 334,408
Imports	1,442,942	1,623,189	I. 180,247

Exports of tinplates to the United States decreased from 13,312 tons in 1911 to 1684 tons this year.

METAL MARKETS

New York, Dec. 24—The metal markets remain rather quiet, in view of the approaching holidays and the end of the year.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
Nov. 1912..	\$ 2,709,594	\$ 4,474,480	Imp. \$1,764,886
" 1911..	13,941,443	3,458,321	Exp. 10,483,122
Year 1912..	46,768,138	55,151,765	Imp. 8,483,627
" 1911..	36,188,397	52,737,854	Imp. 16,549,457
Silver			
Nov. 1912..	5,823,845	3,417,397	Exp. 2,406,448
" 1911..	5,052,238	3,338,956	Exp. 1,713,282
Year 1912..	64,343,611	44,402,933	Exp. 19,940,678
" 1911..	59,667,286	40,439,844	Exp. 18,227,442

Exports from the port of New York, week ended Dec. 2: Gold, none; silver, \$1,663,532, chiefly to London. Imports: Gold, \$2,805,970, principally from London; silver, \$261,857, from Mexico and South America.

Gold—Prices on the open market in London remained at the usual level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. Some gold was taken for Germany; also some for Brazil and India.

Iridium—This metal is still rather scarce and prices continue high, \$73@75 per oz. being asked.

Platinum—The market is quiet and prices unchanged, both here and abroad. Dealers here ask \$45@46 per oz. for refined platinum, according to quantity; \$47.50@48.50 per oz. for hard metal, up to 10% iridium.

Our Russian correspondent reports, under date of Dec. 12, that the market and prices are unchanged. Speculators are buying freely all the small lots offered by miners, although they are already carrying large stocks. The quotations for crude metal, 83% platinum, are 9.80 rubles per zolotnik at Ekaterinburg and 37,700 rubles per pool at St. Petersburg—equal to \$36.85 and \$36.95 per oz., respectively. The high prices this year have caused an increase in prospecting and exploration, and additional deposits have been found. Of especial importance is the discovery of platinum in the Irbit district south of the known fields of the Ural region.

Silver—The cessation of India Mint buying and the approach of the Christmas holidays has had the effect of causing a slack market and decline to 28¼d. in London. At this price there seemed to be good buyers and with the resumption of moderate buying by the India Mint in the near future we may look for some improvement in prices.

SILVER AND STERLING EXCHANGE						
Dec.	19	20	21	23	24	25
New York....	63¼	63	62¾	62¼	62¼	.....
London....	29½	29¼	29	28¾	28½	.....
Sterling Ex..	4.8535	4.8545	4.8550	4.8550	4.8520	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver. 0.925 fine.

Shipments of silver from London to the East, Jan. 1 to Dec. 12, reported by Messrs. Pixley & Abell:

	1911	1912	Changes
India.....	£8,542,000	£11,469,000	I. £2,927,000
China.....	990,300	1,674,500	I. 684,200
Total.....	£9,532,300	£13,143,500	I. £3,611,200

Exports of gold to India were £113,250 for the week.

Imports of gold into France, nine months ended Sept. 30, were 186,113,000 fr.; exports, 28,793,000 fr.; excess of imports, 157,320,000 fr., which compares with an excess of exports of 15,799,000 fr. last year.

Imports of silver into France, nine months ended Sept. 30, were 204,779,000 fr.; exports, 206,972,000 fr.; excess of exports, 2,193,000 fr., which compares with an excess of imports of 43,990,000 fr. last year.

Coined silver in the United States, Dec. 2, as estimated by the Treasury Department: Standard dollars, \$565,065,020, of which \$489,978,000 are held in treasury against silver certificates outstanding; subsidiary coins, \$173,340,766; total, \$758,405,786, an increase of \$1,285,222 during November.

Gold in the United States, Dec. 2, as estimated by the Treasury Department: Held in treasury against gold certificates, \$1,068,346,169; in treasury current balances, \$177,795,980; in banks and circu-

lation, \$621,206,112; total, \$1,867,248,261, an increase of \$10,513,104 during the month.

Imports of silver into Great Britain, 10 months ended Oct. 31, were £14,333,391; exports, £13,372,020; excess of imports, £961,371. This compares with an excess of exports of £2,099,092 last year.

Imports of gold in Great Britain, 10 months ended Oct. 31, were £41,884,763; exports, £37,222,996; excess of imports, £4,661,767, which compares with £7,589,696 last year.

Sales of gold bars at the United States Assay Office, in New York, in November, amounted to \$2,948,647, comparing with \$3,862,641 in October, and \$2,971,692 in September. The total for the 11 months ended Nov. 30, was \$28,523,387, or only \$250,024 less than the total for the full year 1912. These sales are almost entirely for use in the arts.

Foreign commerce of the United States 10 months ended Oct. 31, as valued by the Bureau of Foreign and Domestic Commerce, Department of Commerce and Labor:

	1911	1912
Merchandise		
Exports.....	\$1,665,866,850	\$1,870,857,254
Imports.....	1,265,522,936	1,511,129,557
Excess, exports.....	\$400,343,914	\$359,727,697
Add excess of exports, silver.....		17,534,230
Total.....		\$377,261,927
Deduct excess of imports, gold.....		6,618,741
Net export balance.....		\$370,643,186

The gold and silver movement in detail is given in the table at the head of this column.

Copper, Tin, Lead and Zinc

LONDON

Dec.	Copper			Tin		Lead, Span-ish	Zinc, Ordinar-ies
	Spot	3 Mos	Best Sel'td	Spot	3 Mos		
19	74½	75½	80	226½	227	18½	26½
20	75½	76½	80½	227½	227¾	18½	26½
21	.....	.....	.....	.....	.....	.....	.....
23	75½	76½	81¼	228½	228¾	18½	26½
24	75½	77	81¼	227½	228	18	26½
25	.....	.....	.....	.....	.....	.....	.....

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, spot and three months, and for best selected, price for the latter being subject to 3 per cent discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; £25 = 5.44c.; £70 = 15.22c. Variations, £1 = ± 21¼c.

Copper—The market has continued dull but the improvement in the London standard market has created a better sentiment. The cheap lots of copper recently offered

NEW YORK							
Dec.	Copper		Tin	Lead		Zinc	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
19	17 1/2 @17 3/4	17.35 @17.40	49 1/2	4.25 @4.30	4.10 @4.15	7.10 @7.20	7.05 @7.10
20	17 1/2 @17 3/4	17.35 @17.40	50	4.25 @4.30	4.10 @4.15	7.10 @7.20	7.05 @7.10
21	17 1/2 @17 3/4	17.35 @17.40	50 1/2	4.25 @4.30	4.10 @4.15	7.10 @7.20	7.05 @7.10
23	17 1/2 @17 3/4	17.35 @17.40	50 1/2	4.25 @4.30	4.10 @4.15	7.10 @7.20	7.05 @7.10
24	17 1/2 @17 3/4	17.35 @17.40	50 1/2	4.25 @4.30	4.10 @4.15	7.10 @7.20	7.05 @7.10
25	.....	.....	.....	.....	.....	.....	.....

The quotations herein given are our appraisal of the market for copper, lead, spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgment, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

seem to have been well cleaned up, and there has been a better inquiry from buyers. Copper has been offered at 17 1/2 @ 17 3/4c., delivered, usual terms, but there is an increasing confidence that the btg producers will ere long realize their pegged price of 17 3/4c. Under these conditions there has been more business done in the last week than for some time past. Most of it has been for early shipment to Europe, thus confirming the general impression that the stocks in the hands of European consumers are depleted. It appears as though the business consummated has about absorbed the copper in second hands and the smaller producers, and as if any further demand would have to be filled by the larger producers.

There has also been some business done in this country, and as a whole, the market closes more cheerful, in what we might call a Christmas spirit.

Lake copper is quoted 17 1/2 @ 17 3/4c.; electrolytic in cakes, wirebars or ingots 17.35 @ 17.40c.; casting is quoted 17 @ 17 1/8c. as an average for the week.

The London standard market has been strong and advancing. On Dec. 19 it was £74 10s. for spot and £75 12s. 6d. for three months prompt. On Dec. 20 it advanced £1. On Dec. 23 it advanced further 5s., spot being £75 15s. and three months £76 17s. 6d. It closes on Dec. 24 at £75 17s. 6d. for spot and £77 for three months.

Copper sheets are 23 @ 24c. per lb., base for large lots; full extras are

charged and higher prices for large quantities. Copper wire is 19 @ 19 1/4c. base, carload lots at mill.

Exports of copper from New York for the week were 3596 long tons. Our special correspondent gives the exports from Baltimore at 4629 tons.

Tin—A very satisfactory business developed for future delivery tin. These orders were placed both in the London and Far Eastern markets, imparting a firmer tone to the same. Consumers, however, refrained from buying near-by material, partly on account of the pending holidays, and also for the reason that they are fairly well covered. The close is somewhat easier at £227 10s. for spot and £228 for three months, while January tin in this market is quoted at about 50 1/2c. It will be noticed that three months' tin was higher than spot all the week, the backardation which has prevailed for a long time having disappeared for the present.

Lead—The lower prices that have ruled are attracting the attention of consumers, who have been buying more liberally. The demand has been freely met and a fair volume of business has resulted. The market as a whole is somewhat firmer, St. Louis being quoted 4.10 @ 4.15c. and New York 4.25 @ 4.30 cents.

The European market is unchanged, cables reporting a considerable business at about last prices. At the close, Spanish is quoted £18, and English 7s. 6d. higher.

The average price of lead for the week was 4.275c., New York.

Spelter—The market is unchanged in price, but there seem to be more supplies available and producers who offer January metal at 7.10c., St. Louis, report that they fail to get the business. Otherwise the market is without special feature. There is a fair volume of business doing at last price, 7.05 @ 7.10c., St. Louis. The New York market is quoted 7.10 @ 7.20 cents.

The market abroad is unchanged and quiet. Good ordinaries in London are quoted £26 10s., specials 12s. 6d. higher.

Zinc dust is quoted at 7 3/4c. per lb., New York.

Base price of zinc sheets is \$9 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Other Metals

Aluminum—The market has not been especially active, and prices are firm, though not quotably higher. The current price continues 25 1/2 @ 26c. per lb. for No. 1 ingots, New York. More activity is looked for after the holidays.

Antimony—Only a small business has been done this week, chiefly owing to the holiday. Most buying is postponed until after the New Year. The underlying

conditions here are good and the foreign markets are very firm. Cookson's is unchanged, at 10 @ 10.25c. per lb.; in Hallett's there is an unusually wide range, 10.25 @ 10.75c. being quoted. Chinese, Hungarian and the outside brands are unchanged, 9 @ 9.25c. per lb. being asked.

Quicksilver—Business has been quiet and prices remain about the same. The New York quotation is \$40 per flask of 75 lb., with 58 @ 59c. per pound asked for retail lots. San Francisco, \$40 for domestic and \$37.50 for export orders. London price is £7 7s. 6d. per flask, with £7 5s. named from second hands.

Bismuth—The syndicate which controls the European production quotes 7s. 6d.—equal to \$1.80—per lb. in London. In New York a quotation of \$1.72 per lb. is made for metal produced from American ores.

Cadmium—The latest quotation from Germany is 725 @ 750 marks per 100 kg., f.o.b. works in Silesia. This is equal to 78.27 @ 80.97c. per lb. at works.

Nickel—Shot, blocks and plaquettes bring 40 @ 45c. per lb., according to quality. Electrolytic nickel is 3c. per lb. higher.

Magnesium—The price of pure metal is \$1.50 per lb. for 100-lb. lots, f.o.b. New York.

Selenium—Producers of this metal quote large lots at \$2.75 @ 3.50 per lb., according to size of order; while as high as \$4.50 @ 5.50 is paid for retail lots.

Spanish Metal Exports

Exports of metals and minerals from Spain, nine months ended Sept. 30, as reported by the *Revista Minera*, in metric tons:

Metals	1911	1912	Changes
Pig and manuf. iron	31,156	28,646	D. 2,910
Copper	11,207	17,598	I. 6,391
Copper precipitate	10,183	10,524	I. 341
Lead	124,671	140,483	I. 15,812
Zinc	1,717	2,454	I. 737
Quicksilver	1,480	1,489	I. 9
Minerals			
Iron ore	5,640,791	6,408,520	I. 767,729
Manganese ore	24,500	23,138	D. 1,362
Copper ore	231,449	110,601	D. 120,848
Lead ore	2,177	2,786	I. 609
Zinc ore	95,145	81,114	D. 14,031
Pyrites	2,043,820	2,264,828	I. 221,008
Salt	426,528	461,337	I. 34,809

Pyritic ores are not classed as copper ores unless they carry 2.5% or over in copper; below that they are classed as pyrites. Last year the dividing line was 1% copper.

Zinc and Lead Ore Markets

Joplin, Mo., Dec. 21—The high price paid for zinc sulphide ore was \$59, the base per ton of 60% zinc, \$52 @ 56 per ton. Zinc silicate sold at \$28 @ 32 per ton of 40% zinc. The average price, all grades of zinc, is \$52.12. The high price of lead ore is \$53.20, sold on a base price of \$53 per ton of 80% metal

content. The average price, all grades of lead, is \$52.74 per ton.

SHIPMENTS WEEK ENDED DEC. 21

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	5,352,120	.....	593,740	\$160,240
Joplin	2,975,270	.....	492,650	93,285
Miami	703,300	.....	403,620	26,770
Galena	648,290	.....	162,270	21,800
Duenweg	763,720	.....	27,150	21,325
Jackson	518,660	.....	23,030	14,363
Granby	26,300	727,140	13,900	12,745
Alba-Neck	387,920	.....	36,610	11,812
Spurgeon	244,740	257,360	30,770	11,146
Oronogo	301,130	.....	83,930	9,634
Carl Junction	320,610	.....	.....	9,137
Cavo Springs	278,810	.....	.....	7,667
Carthage	275,800	.....	.....	7,446
Lawton	131,310	.....	.....	3,499
Aurora	62,700	62,050	.....	2,620
Totals	12,990,680	1,046,550	1,807,670	\$413,489

51 weeks...565,516,940 36,323,200 92,015,340 \$18,369,082
 Blende val. the week, \$349,235; 51 weeks, \$15,180,451
 Calamine, the week, 16,585; 51 weeks, 579,035
 Lead value, the week, 47,669; 51 weeks, 2,609,596

MONTHLY AVERAGE PRICES

Month	ZINC ORE				LEAD ORE	
	Base Price		All Ores		All Ores	
	1911	1912	1911	1912	1911	1912
January	\$41.85	\$44.90	\$40.55	\$43.54	\$55.68	\$58.92
February	40.21	45.75	39.16	43.31	54.46	62.39
March	39.85	51.56	38.45	49.25	54.57	54.64
April	38.88	52.00	37.47	50.36	56.37	54.18
May	38.25	55.30	36.79	53.27	55.21	52.45
June	40.50	55.88	38.18	54.38	56.49	55.01
July	40.75	58.85	38.36	56.59	58.81	58.83
August	42.50	55.13	41.28	53.27	60.74	57.04
September	42.63	59.75	41.29	57.07	59.33	61.26
October	42.38	57.00	40.89	55.97	54.72	63.22
November	45.40	55.69	43.25	53.98	57.19	56.55
December	44.13	.....	40.76	.....	62.03	.....
Year	\$41.45	.....	\$39.90	.....	\$56.76	.....

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

Tungsten Ore—Ferberite, wolframite and huebnerite ores, \$6.50@7 per unit per ton of 2000 lb. of ore containing 60% of tungsten trioxide. For scheelite ore, 50c.@\$1.50 per unit less. These prices are delivered.

Manganese Ore—Late quotations for manganese ore in Great Britain are, for ores, c.i.f. United Kingdom ports; Indian and Brazilian, 50%, 24@25c. per unit; 45%, 22½@23c. Caucasian, 50% manganese, 21@21½c.; 48%, 20½@21c. per unit.

Chemicals

New York, Dec. 24—Trade has been quiet generally, owing to the approaching end of the year.

Arsenic—Prices continue at \$4.87½ per 100 lb. on small business.

Copper Sulphate—Trade is dull and prices are unchanged at \$5.50 per 100 lb. for carload lots, and \$5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Trade is small for the present. Quotations remain at 2.60c.

per lb. for spot and futures up to Apr. 30. Futures are 2.57½c. for May, 2.55c. for June and 2.52½c. for July and later deliveries.

Petroleum

Exports of petroleum and its products from the United States, 11 months ended Nov. 30, were: Crude petroleum, 165,741,784 gal.; illuminating oils, 942,166,661; lubricating oils and paraffin, 197,130,983; naphthas, gasoline, etc., 164,028,296; residuum and fuel oils, 232,048,515; total, 1,701,116,239 gal., an increase of 101,175,911 gal., or 6.3%, over last year.

MINING STOCKS

New York, Dec. 24—Dec. 19 the Exchange was rather unsteady at the outset, but rallied toward the close. Mining stocks on the Curb were quieter, with only small changes in quotations.

Dec. 20 and 21 the Exchange rallied and was stronger. On the Curb a rather active business was done in copper stocks, at irregular prices. Other mining stocks were quiet.

Dec. 23 and 24 the Exchange was affected by the holiday influences. There was less liquidation, but the market was still affected by the high rates for money and the uncertain conditions abroad. Dealings on the Curb were in fair volume, but quotations were not strong, except for a few of the copper stocks. Such declines as appeared in mining stocks were of the fractional order entirely.

Boston, Dec. 23—The market for mining shares has taken a right-about-face attitude since the last writing, and although there is little animation, there is a degree of strength following some rather sharp advances in prices during the week. Amalgamated set the pace with a \$7.37½ advance to \$78, although not all of this advance has been retained. As usual, the so called Cole-Ryan issues have been in the fore. Calumet & Arizona is up \$4.50 from last week's low to \$71, while North Butte rose \$3 to \$33.50 per share.

There has been no special news to account for the advances during the week, except that the demoralization witnessed last week has ended and market conditions have once again become normal. Money continues high at this center and will likely continue so until the turn of the year. Sentiment is hopeful, even though the copper-share market has been disappointing the greater part of the year, in that prices did not reach the levels justified by the high price for the metal.

Calumet & Hecla, after making a low price of \$512 per share, came back to \$540, although it is under the latter price now. The management of this company announces that it will soon issue state-

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	Sept.	October	Nov.
Alaska shipments	1,726,715	1,435,235	.....
Anaconda	24,500,000	25,250,000	24,250,000
Arizona, Ltd.	3,340,000	3,200,000	3,000,000
Copper Queen	9,103,861	8,184,575	8,807,940
Calumet & Ariz.	4,462,000	4,404,000	4,918,000
Chino	3,217,369	3,638,500	3,911,169
Detroit	1,881,668	1,934,828	1,968,620
East Butte	1,250,000	.....	.....
Mammoth	1,834,937	1,883,283	.....
Giroux	1,005,208	.....	.....
Mason Valley	1,200,000	1,563,700	.....
Nevada Con	5,607,578	850,741	.....
Ohio	635,000	.....	.....
Old Dominion	2,204,000	2,523,000	2,758,000
Ray	2,978,404	.....	3,201,500
Shannon	1,142,000	1,210,000	1,436,000
South Utah	225,568	.....	.....
United Verde*	2,750,000	2,750,000	.....
Utah Copper Co.	6,616,887	2,022,352	.....
Lake Superior*	19,250,000	21,500,000	20,400,000
Non-rep. mines*	8,094,792	8,250,000	8,250,000
Total production	103,025,987	.....	.....
Imports, bars, etc.	25,149,329	.....	.....
Total blister	128,175,316	.....	.....
Imp. in ore & matte	7,142,232	.....	.....
Total American	135,317,548	.....	.....
Miami	2,949,150	2,577,750	2,972,000
Brit. Col. Cos.:	.....	.....	.....
British Col. Copper	.....	1,022,904	.....
Granby	2,083,118	2,018,424	.....
Mexican Cos.:	.....	.....	.....
Boleo†	.....	2,612,400	2,315,040
Cananea	3,500,000	4,248,000	5,064,000
Moctezuma	771,844	3,045,667	2,112,377
Other Foreign:	.....	.....	.....
Cape Cop., S. Africa	678,720	757,120	907,200
Kyshtim, Russia	1,750,000	.....	.....
Spassky, Russia	981,120	974,400	.....
Tilt Cove, Newf'd.	.....	86,785	.....
Exports from:	.....	.....	.....
Chile	6,048,000	8,512,000	4,816,000
Australia	7,616,000	9,520,000	10,752,000
Arrivals in Europe†	8,518,720	13,771,520	12,976,320

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER

Month	U.S. Refin'y Product'n	Deliveries Domestic	Deliveries for Export
XI, 1911	111,876,601	68,039,776	67,049,279
XII	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912	119,337,753	62,343,901	80,167,904
II	116,035,809	56,228,368	63,148,096
III	125,694,601	67,487,466	58,779,566
IV	125,464,644	69,513,846	53,252,326
V	126,737,836	72,702,277	69,485,945
VI	122,315,240	66,146,229	61,449,650
VII	137,161,129	71,094,381	60,121,331
VIII	145,628,521	78,722,418	70,485,150
IX	140,089,819	63,460,810	60,264,796
X	145,405,453	84,104,734	47,621,342
XI	134,695,400	69,369,795	55,906,550

VISIBLE STOCKS

	United States	Europe	Total
XII, 1911	111,785,188	164,281,600	276,066,788
I, 1912	89,454,695	158,323,200	247,777,895
II	66,280,643	154,851,200	221,131,843
III	62,939,988	141,142,400	204,082,387
IV	62,367,557	136,819,200	199,186,757
V	65,066,029	134,176,000	199,242,029
VI	49,615,643	117,901,600	167,417,243
VII	44,335,004	108,186,000	152,521,004
VIII	50,280,421	113,299,200	163,579,621
IX	46,701,374	113,568,000	160,269,374
X	63,065,587	107,408,000	170,473,587
XI	76,744,964	103,801,600	180,546,564
XII	86,164,059	96,947,200	183,111,259

ments summarizing estimated profits and costs for its dividend-paying subsidiaries for the second half of the year.

Trading on the Curb has been in specialties, notably Mexican Metals, which is up \$1.87 1/2 to \$3.87 1/2 on very heavy trading. Alaska Gold rose to \$13, which is its record price. Goldfield Consolidated is up from its recent low price.

Assessments

Table with columns: Company, Delinq, Sale, Amt. Lists various companies like Butte & Anaconda, Consolidated Imperial, etc., with their assessment details.

Monthly Average Prices of Metals SILVER

Table with columns: Month, New York (1910, 1911, 1912), London (1910, 1911, 1912). Shows monthly price averages for silver.

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Table with columns: NEW YORK (Electrolytic, Lake), London, Standard (1911, 1912). Shows monthly price averages for copper.

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

TIN AT NEW YORK

Table with columns: Month, 1911, 1912, Month, 1911, 1912. Shows monthly price averages for tin.

Prices are in cents per pound.

LEAD

Table with columns: Month, New York, St. Louis, London (1911, 1912). Shows monthly price averages for lead.

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

SPELTER

Table with columns: Month, New York, St. Louis, London (1911, 1912). Shows monthly price averages for spelter.

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

PIG IRON AT PITTSBURG

Table with columns: Bessemer, Basic, No. 2 Foundry (1911, 1912). Shows monthly price averages for pig iron.

STOCK QUOTATIONS

Table with columns: Name of Comp., Bid. Lists stock prices for COLO. SPRINGS, SALT LAKE, and TORONTO.

TORONTO Dec. 21

Table with columns: Name of Comp., Bid. Lists stock prices for Toronto.

SAN FRANCISCO Dec. 23

Table with columns: Name of Comp., Clg., Name of Comp., Bid. Lists stock prices for COMSTOCK STOCKS and MISC. NEV. & CAL.

N. Y. EXCH. Dec. 23 BOSTON EXCH. Dec. 23

Table with columns: Name of Comp., Clg., Name of Comp., Clg. Lists stock prices for N. Y. EXCH. and BOSTON EXCH.

N. Y. CURB Dec. 23

Table with columns: Name of Comp., Clg. Lists stock prices for N. Y. CURB.

BOSTON CURB Dec. 23

Table with columns: Name of Comp., Last. Lists stock prices for BOSTON CURB.

LONDON Dec. 24

Table with columns: Name of Com., Clg. Lists stock prices for LONDON.

†Last quotation.

The Engineering and Mining Journal

Volume 94, No. 26.
Issued Every Saturday.
Hill Publishing Company.

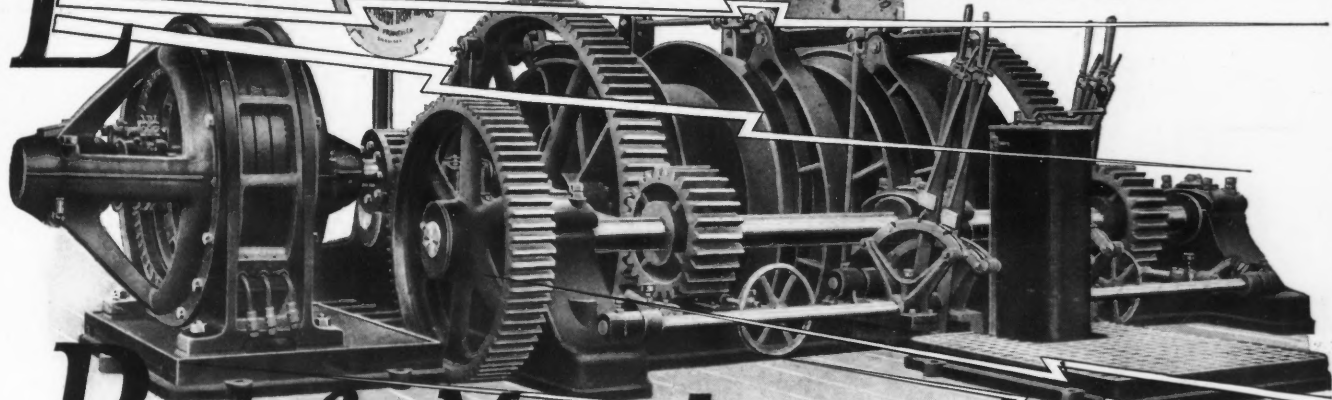
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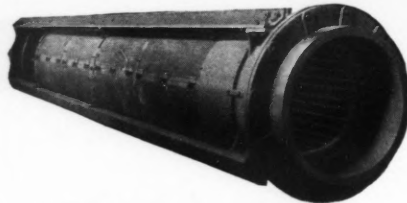
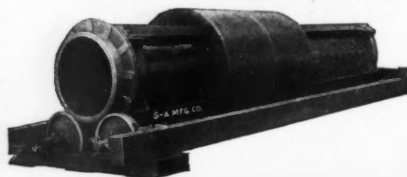
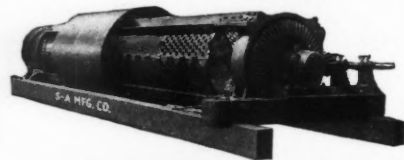
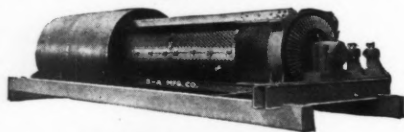
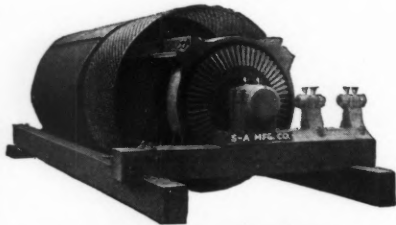
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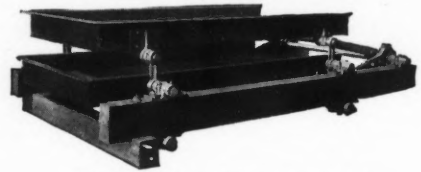


End view of revolving screen with internal protecting bars for discharging heavy lumps.

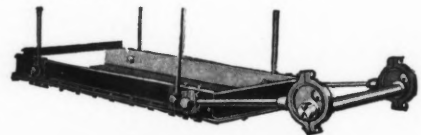
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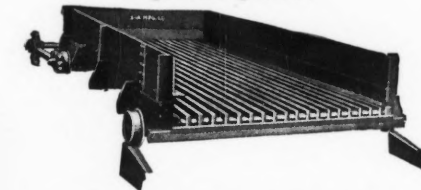
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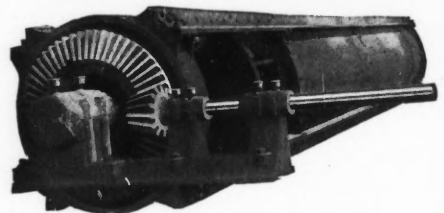
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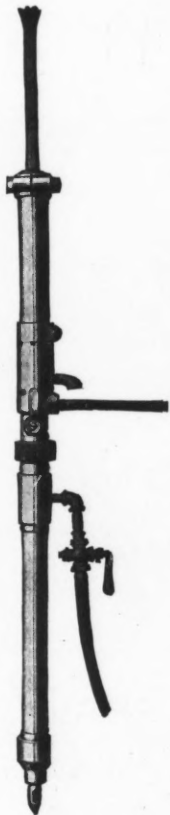
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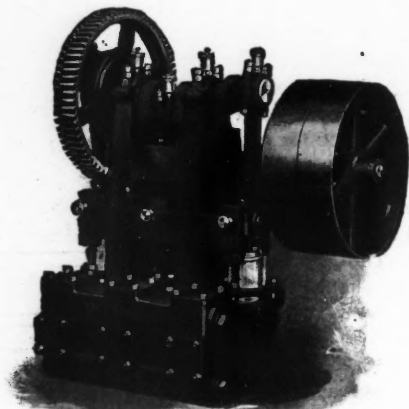
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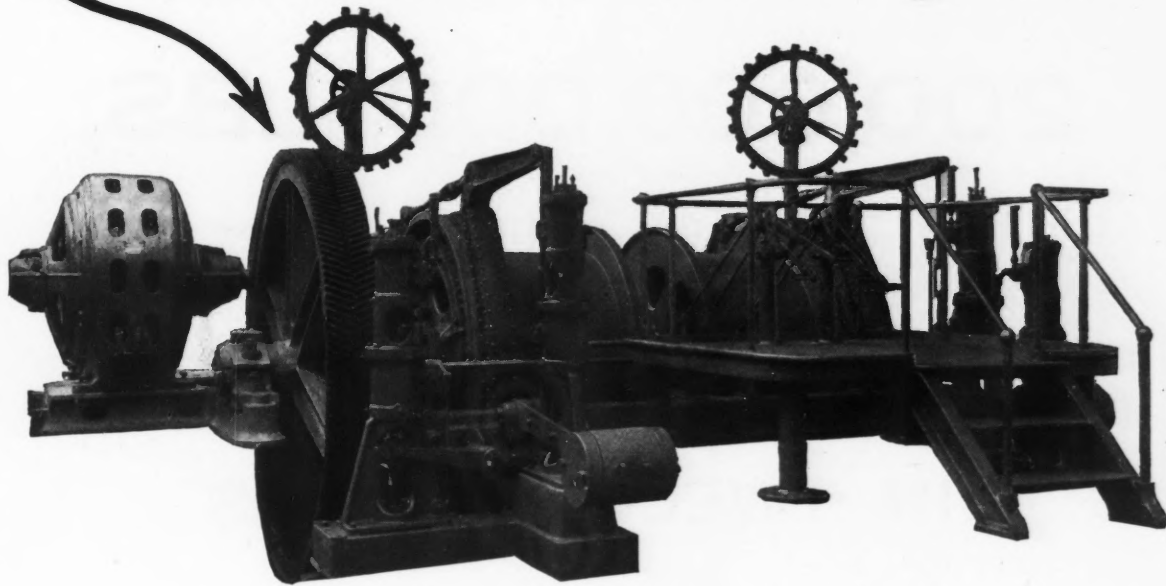
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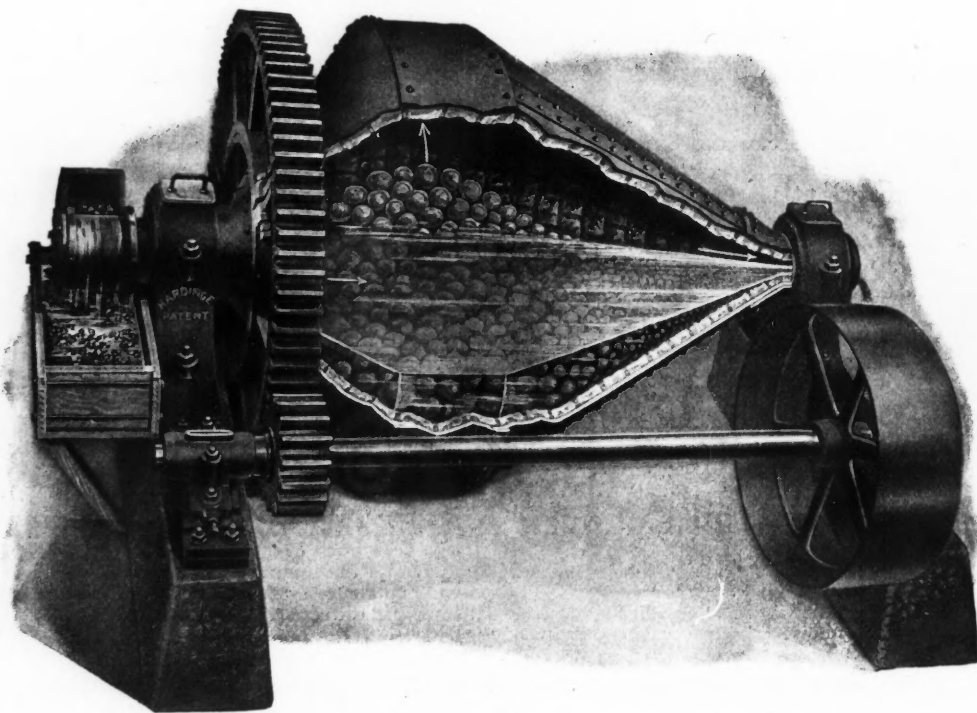
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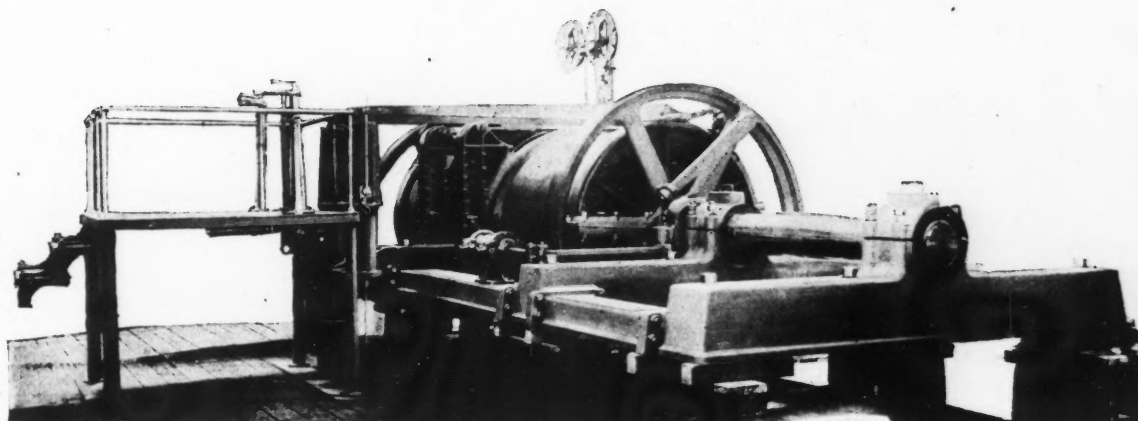
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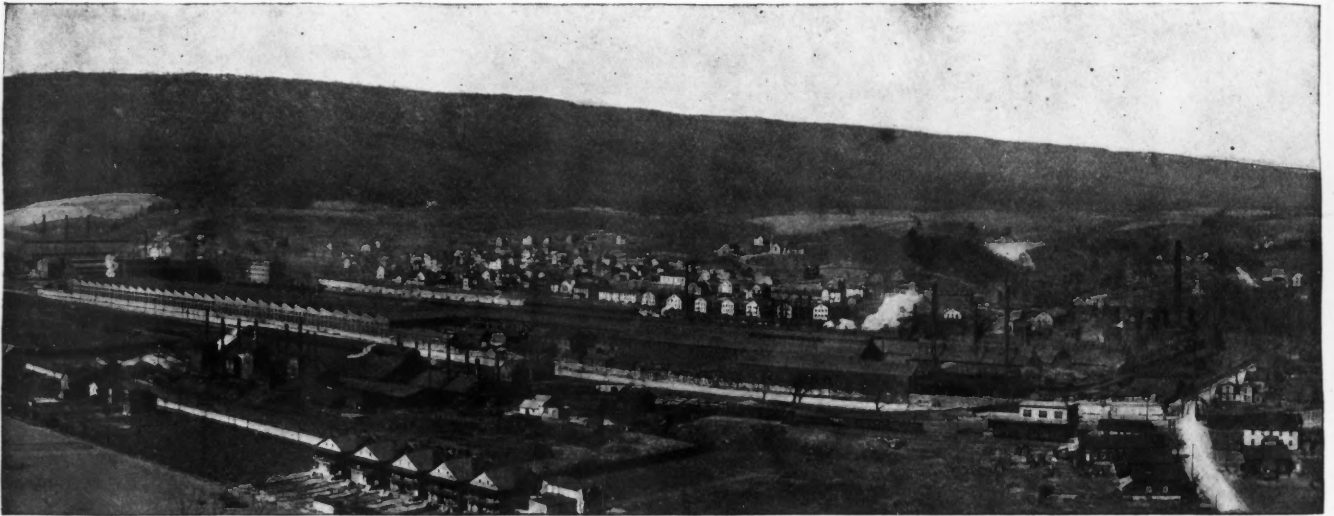
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Sample Grinders
Ore Buckets

STANDARD CRUSHER PARTS



Where Standard Crusher Parts Are Made

The oldest and the largest steel tire and crusher parts producing plant.

“Standard” Crusher Parts in their quality, in the service they give, reflect the expert and efficient organization behind them.

Made of the best material in the most modern and scientific way. They reduce your crushing costs and eliminate, to a large extent, those delays and expenses that frequent breakdowns and parts that wear out quickly mean.

Specify “Standard” on your next Crusher Spares order.

Write for our Catalogue. It is to your advantage to investigate.

Standard Steel Works Company

Morris Building, Philadelphia, Pa.

New York, N. Y.
Richmond, Va.

Pittsburgh, Pa.
Portland, Ore.

Chicago, Ill.

St. Louis, Mo.
Denver, Colo.

San Francisco, Cal.
City of Mexico, Mex.

Steel Tires, Steel Tired Wheels, Solid Forged and Rolled Steel Wheels, Rolled Steel Gear Blanks, Steel and Iron Axles, Steel Springs, Steel and Iron Forgings, Steel and Iron Castings, Rolled Steel Rings, Steel Crusher Rolls and Shells, Steel Pipe Flanges.

Utility Is The Long Suit Of The BALDWIN LAMP

When you buy a carbide lamp you want utility—you expect better results and a reduced lighting cost. An imposing appearance in a carbide lamp is not a guarantee of satisfaction.

Real utility in a carbide lamp depends upon three things: Correctness of design, best quality of materials and expert workmanship.

Carbide lamps have been adopted extensively in mines because the Baldwin (the pioneer carbide lamp) gave satisfaction at the start, and

has continued to do so. It demonstrated that the use of a carbide lamp in mines was thoroughly practical.

The Baldwin gave satisfaction at the start because its design was absolutely and scientifically correct.

Other carbide lamps may be attractively finished to preclude the possibility of close scrutiny into their mechanical construction but they lack the utility which dominates in the Baldwin.

The Baldwin Success

lies in the fact that every point in its construction and operation has been worked out by thoroughly competent experts.

Why The Baldwin Design Is Correct

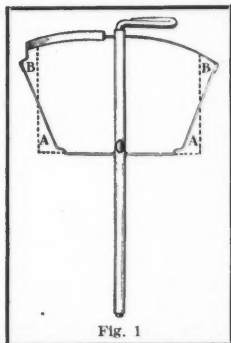
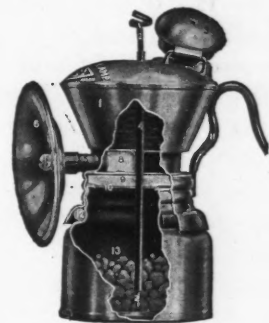


FIG. 1

To get the best results the gas should be consumed at a water column pressure of 2½" to 3". To obtain this with a minimum of weight and a maximum water supply we taper our water tank as shown in figure 1, putting the water which would occupy space, A, if we made the tank as shown by dotted line, into space B and thus gain the additional 1" of head for that amount of water.

The raking wire and water tube are each a part of the water compartment, and control the uniformity of the automatic water feed which makes the Baldwin the only satisfactory carbide lamp.



The automatic feed controls the dropping of the water on the carbide more accurately than any man can operate and adjust a screw valve, or any of the so-called automatic feed lamps. It insures a steadier and more uniform light and eliminates the trouble and fussing constantly present in a valve lamp. Insist on getting the

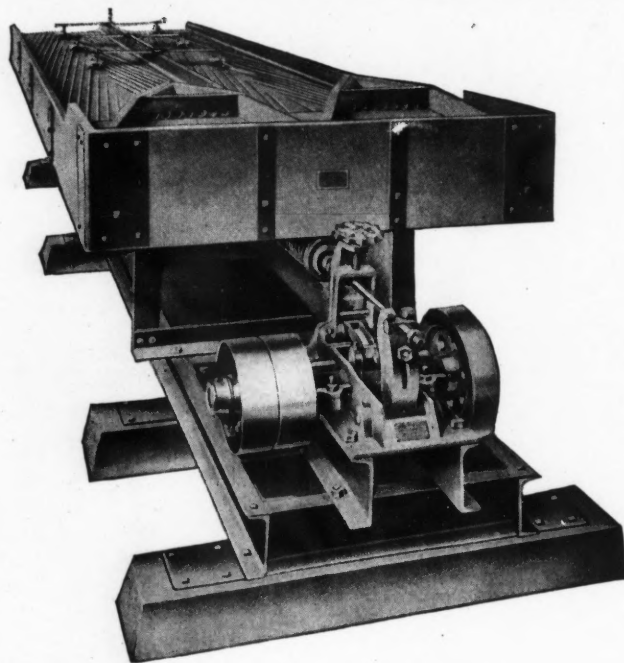
Baldwin because in buying the Baldwin you get quality and correct design which insures service. The genuine Baldwin Carbide Pit Lamp has the name stamped on every lamp where you see it in the illustration. The only lamp with a positive automatic water control.

The Baldwin comprises the most complete line of carbide lamps—made in ten different styles and finishes—send for a free illustrated catalogue. Any Superintendent, who has never used a Baldwin Lamp, can get a FREE sample and find out for himself why the Baldwin design is most advantageous.

John Simmons Company
104 Centre Street New York

BRANCHES } 266 Market St., San Francisco, California
56 St. Nicholas St., Montreal, Canada

JOHN SIMMONS COMPANY, 104 CENTRE STREET, NEW YORK
Baldwin Lamps are not used in our mines. I will thoroughly test a lamp if sent
Name of mine and company.....
Signed.....
Address.....
We usually buy our supply of lamps, etc.
From.....
FREE OF CHARGE



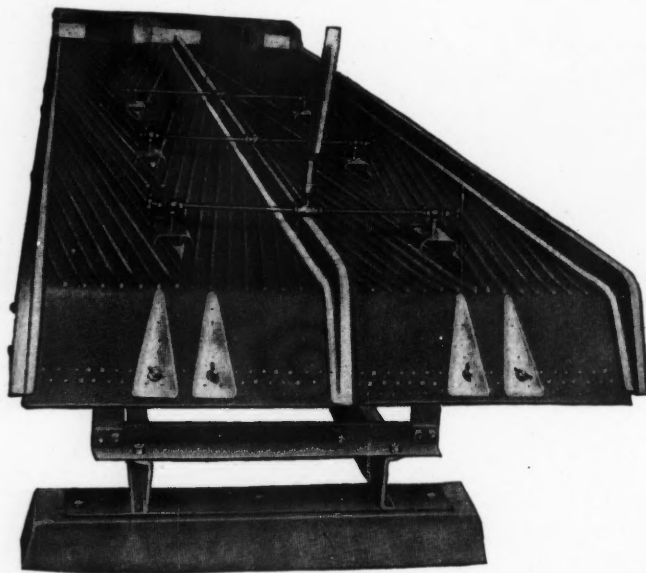
The Isbell Universal Concentrator Guarantees A Greater Saving Of Mineral Values

Results show that this is the table which is bound to revolutionize present practices of concentration. In the face of the savings effected there remains nothing but to give credit to the Isbell Universal Concentrator for being the greatest step forward in the science of modern concentration.

No sizing, classification nor use of Vanners.

The Isbell Universal Concentrator saves the slimes along with the process of concentration, and does it entirely without other or additional treatment. It does the work of six of the cross water riffle type of tables and the same number of additional vanners. And the savings do not stop here, but include a saving of mill space, labor, power, water, repairs, freight charges and cost of installation.

The quality of middlings produced from two tables can be cleaned on one table of the ordinary finishing type. Feed direct from regrinding mill or from 20 mesh, or finer screens. 50 to 100 tons of ore may be handled per day.

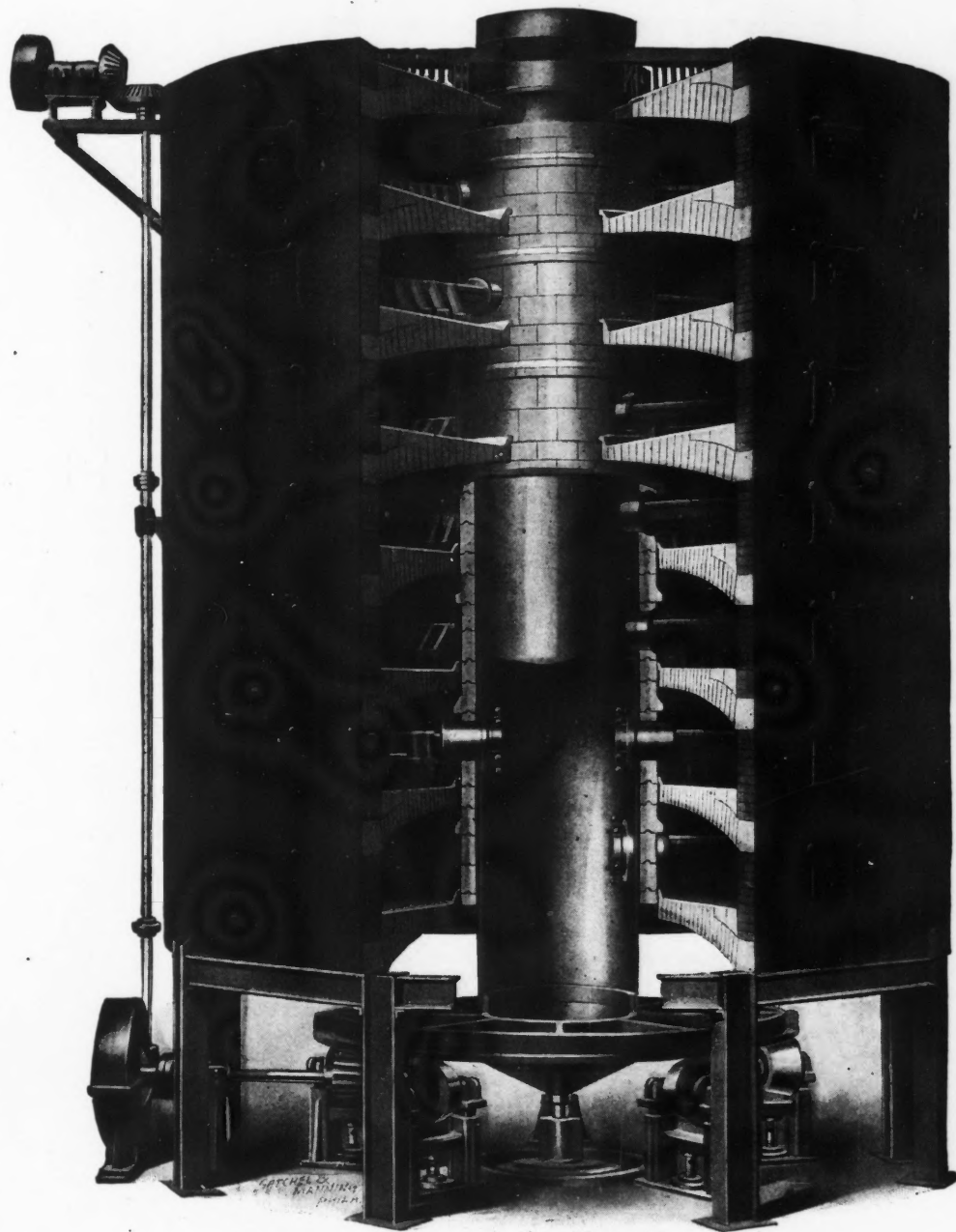


Write at once for the full story; you cannot afford to miss the details of this new machine.

Isbell Mining Machinery Co., Suite 1113L, 9A Investment Bldg.
Los Angeles, Cal., U. S. A.

The Wedge Mechanical Furnace

Patented



Lead Matte Or Lead Ore Roaster

The above roaster, with special detail not shown in cut, is in commercial use, operating at about one half the cost heretofore secured in other types of furnaces.

Write us giving complete analysis of your ore matte, number of tons you roast per day, results you desire in the calcine, and type of furnace you are now using.

Wedge Mechanical Furnace Company
Philadelphia, Pa.

To Infringers Of The Moore Patents

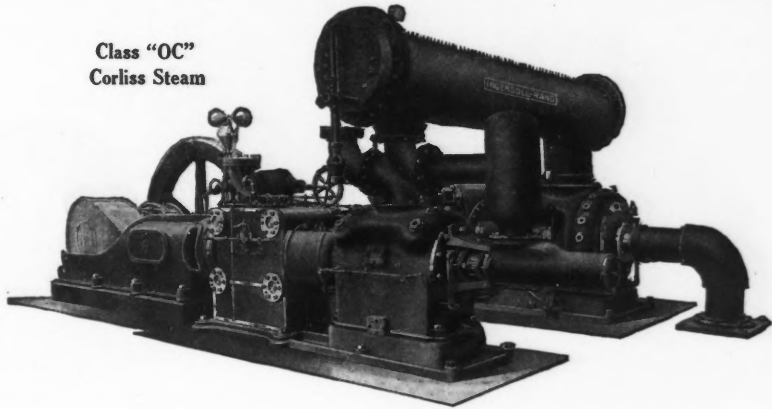
After continuous and unwarranted misrepresentations as to the scope of the claims covered by our patents, having finally been awarded a far reaching *unanimous* judgment of the United States Court of Appeals before Judges Gray, Buffington and McPherson sustaining the Moore Process as a fundamental and basic patent, from which judgment there is no appeal, any statement oral or published to the contrary notwithstanding, we wish to inform all users of slime filters whether of the "Movable," "Stationary" (designated as "Butters" or otherwise), Revoluble, Drum or Pressure type, that we still stand ready to enter into agreements with them providing for the use of our patents upon royalties, terms and conditions similar to those we have been making with our licensees right along.

Naturally, this proposition will not long remain open and it is our intention to proceed later on against all who continue to deny our rights, or persist in infringing our patents and to exact payment of the entire amounts made or saved by the unlicensed use of our process.

The Moore Filter Company
New York, U. S. A.

Air Compressors

Class "OC"
Corliss Steam

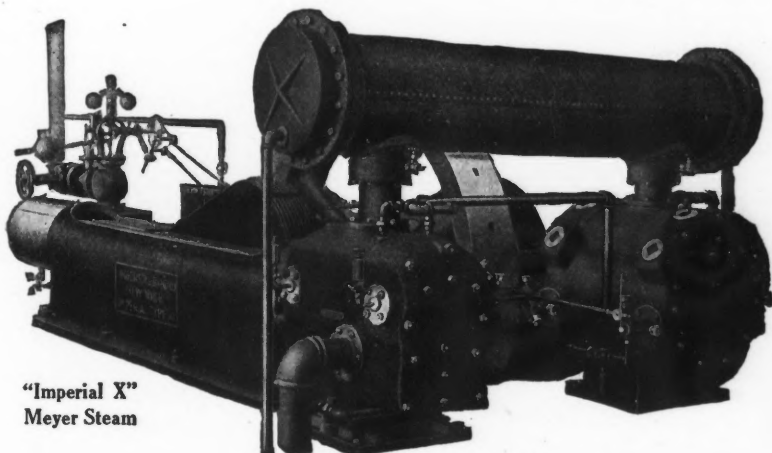


So long as compressed air lies at the very root of mine operation, the air compressor is the first part of the machine equipment claiming attention as a factor in mining costs.

You want a compressor suited to your needs, as to method of drive, capacity and pressure. And having determined upon the general type, you want the machine that will give you—and continue to give you—compressed air at the lowest cost consistent with its type and size.

Your best assurance of getting the right type lies in buying from the builder who has the largest line and who is interested only in satisfying you, with the right type from his large line.

Bulletin 3101



"Imperial X"
Meyer Steam

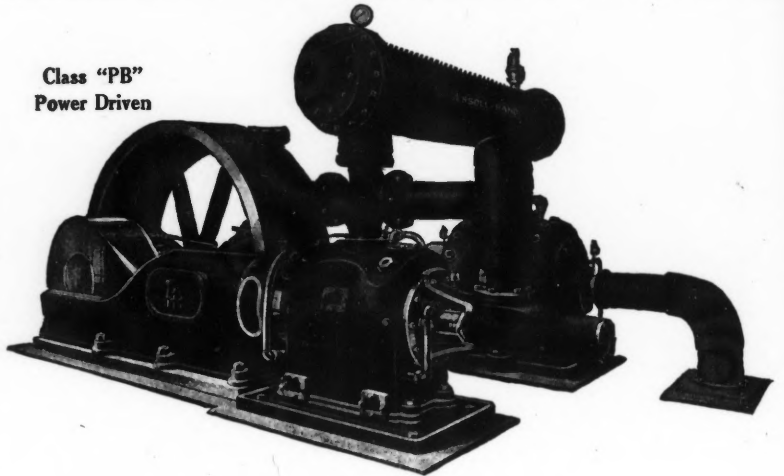
NEW YORK

INGERSOLL-RAND CO. LONDON

Offices In All Principal Cities Of The World

Air Compressors

Class "PB"
Power Driven



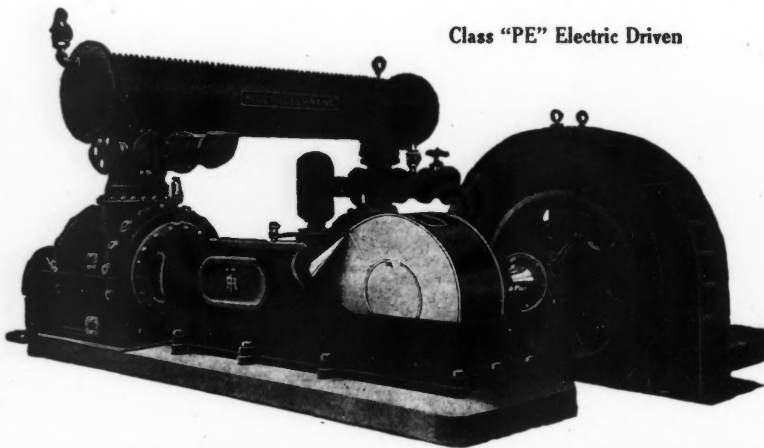
And your assurance of securing maximum economy—both initial and sustained—lies in buying from the builder with a reputation to maintain for integrity and high-class construction.

The Ingersoll-Rand line of Air Compressors is the largest, most complete, most diversified on the market. It includes every type of recognized merit—every method of drive—all capacities up to 10,000 cubic feet—all pressures up to 3,000 lbs.

It represents every up-to-date improvement—every refinement of design and construction—every element entering into economy and durability.

Bulletin 3101.

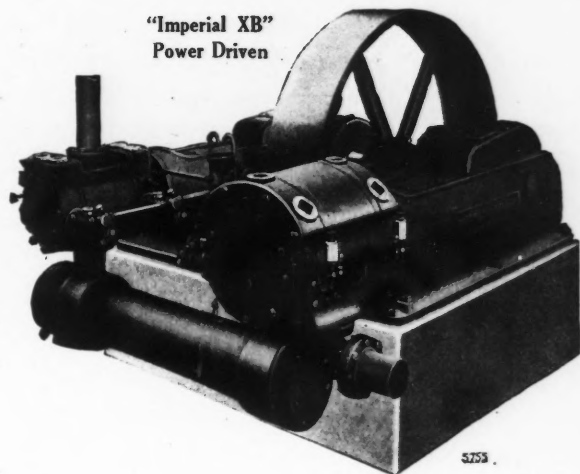
Class "PE" Electric Driven



NEW YORK **INGERSOLL-RAND CO.** LONDON

Offices In All Principal Cities Of The World

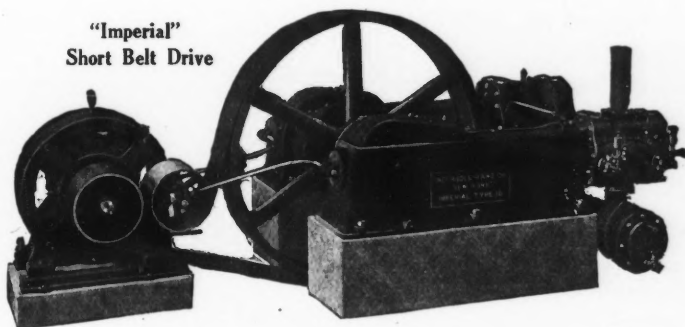
Air Compressors



The Ingersoll-Rand Company has been building compressors for forty-one years. Its total compressor output approximates 15,000,000 H.P. It has a world-wide repute as the oldest, largest and most responsible builder in its line.

The experience gained in building this vast gross output—the reputation gained by adherence to the highest standards over this long period—the facilities growing out of this enormous business—the service afforded by a world-wide organization—these are the safeguards protecting the interests of every buyer of an Ingersoll-Rand Compressor.

Bulletin 3101.



NEW YORK **INGERSOLL-RAND CO.** LONDON

Offices In All Principal Cities Of The World

Rock Drills

The measure of rock drill efficiency is the total drilling cost per ton mined. The most efficient drill is the one which uses the least air, demands the least repairs, is on the job the most of the time, puts in the largest footage per shift, calls for the least labor.

To-day, the Ingersoll-Rand "Butterfly" Rock Drill represents the standard of rock drill efficiency. The explanation is simple.



The "Butterfly" stands as the consummation (to date) of forty-one years of drill building. It is the outgrowth of the largest practical experience with rock drill practice in the world. It is a drill built by drill men to meet the mining conditions of today.

Every-day operation under all sorts of conditions has proved the "Butterfly" to use less air, to drill faster, to last longer, to have a greater footage, than any other rock drill on the market.

Bulletin 4005.

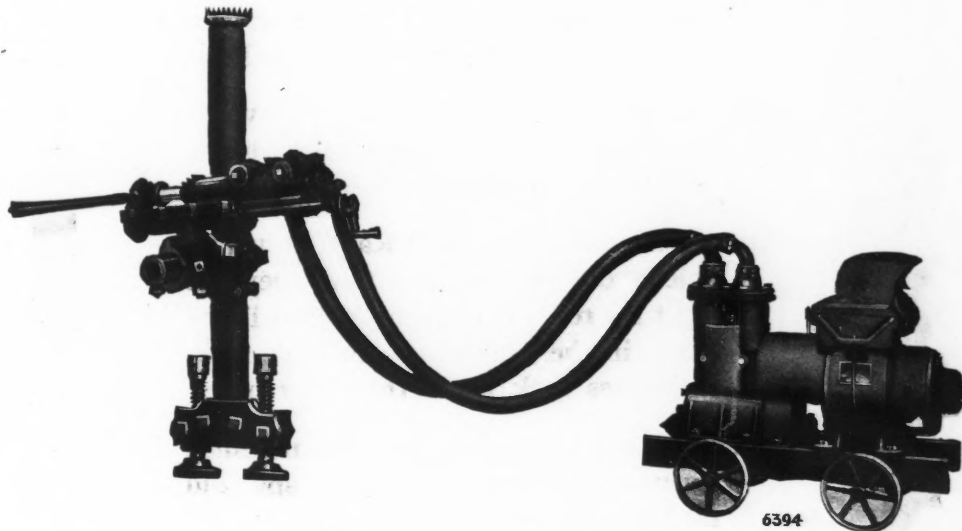
NEW YORK **INGERSOLL-RAND CO.** LONDON

Offices In All Principal Cities Of The World

“Electric-Air” Drills

Ever since electricity became a commercial fact, the “electric drill” has been a dream of inventors and engineers. It remains a dream, today. But the need for a means of drilling rock by electric power continues—indeed, grows from year to year.

The “Electric-Air” Drill is the only machine that has met that need. And it is a success because it takes advantage of electrical economy and convenience while retaining the capacity and rugged reliability of the air driven drill.



The “Electric-Air” Drill is not a machine of general adaptability in mines. It has its limitations. But there are conditions where it is pre-eminently superior to any other drill.

The Company’s experience—its disinterested attitude as builders of all drill types—will help you determine whether the “Electric-Air” is the drill you need.

Bulletin 4209.

NEW YORK

INGERSOLL-RAND CO.

LONDON

Offices In All Principal Cities Of The World

Stope Drills

The problem of stoping, too, finds its best solution in the Ingersoll-Rand line, which affords a greater diversity of stoper types than any elsewhere available.

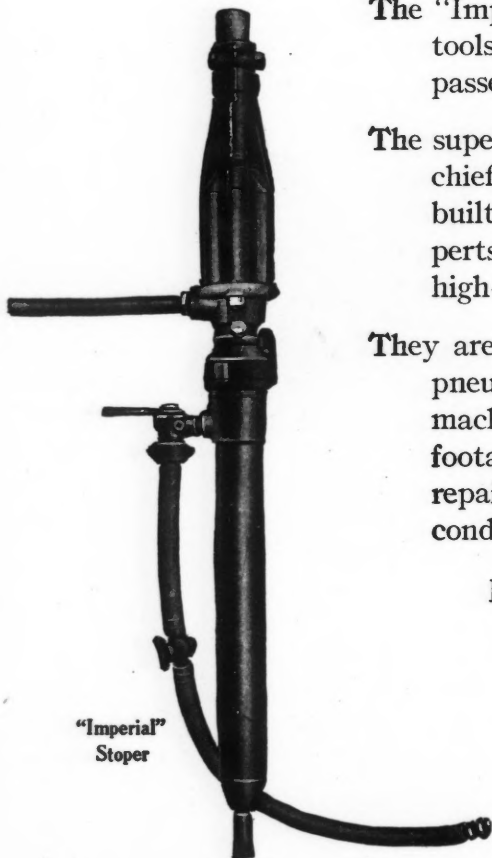
The "Butterfly" line uses the unique valve which contributes so largely to the success of the "Butterfly" Rock Drill.

The "Imperial" line is made up of valveless tools, unequaled in simplicity, unsurpassed in durability and capacity.

The superiority of Ingersoll-Rand Stopers is chiefly due to the fact that they are built for rock drilling, by rock drill experts, in the shops that turn out more high-class rock drills than any other.

They are not toys—they are not modified pneumatic tools. They are splendid machines built to put in the greatest footage at least cost for power and repairs and labor, under actual mining conditions.

Bulletins 4111 and 4116.



"Imperial"
Stoper



"Butterfly"
Stoper

NEW YORK

INGERSOLL-RAND CO.

LONDON

Offices In All Principal Cities Of The World

Plug Drills

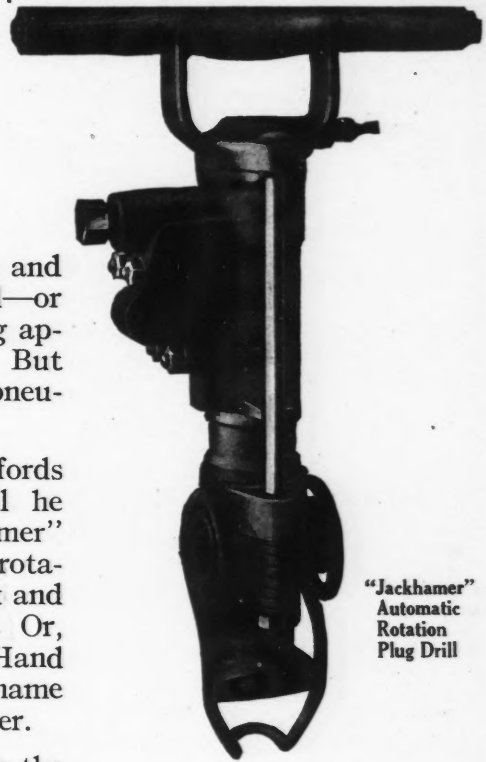
More and more, the convenience and economy of the plug drill—or hand hammer drill—are being appreciated by mining men. But they demand a drill—not a pneumatic hammer.

Again the Ingersoll-Rand line affords the mine manager the drill he wants. It may be a "Jackhammer"—a powerful automatic rotation plug drill for heavy work and moderately deep down holes. Or, it may be a "Butterfly" Hand Hammer Drill, with all that name implies of simplicity and power.

And in the valveless type, there is the splendid "Imperial" series, than which there are no better tools in their class.

Selling the customer the machine he wants and should have—in plug drills as in all other lines of rock drilling machinery—is this Company's invariable policy. The interest of the buyer is the first essential. For his satisfaction is the Company's best sales-maker.

Bulletins 4015, 4017, 4021.



"Jackhammer"
Automatic
Rotation
Plug Drill



"Butter-
fly"
Hand
Hammer
Drill

NEW YORK

INGERSOLL-RAND CO.

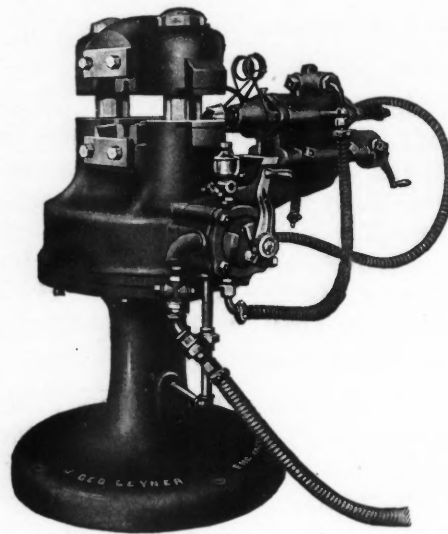
LONDON

Offices In All Principal Cities Of The World

Drill Sharpeners

The best rock drill or stoper or plug drill (which means—to most buyers—Ingersoll-Rand machines) is handicapped if it must use dull or defective or improperly sharpened steels.

Up-to-date mining men know that a thoroughly effective drill sharpener is a primary essential to rock drilling economy. And the Leyner Sharpener, IR Model 5, is the machine that meets their need.



The Leyner makes bits that must be right—cannot make bits that are not right—right as to gauge, alignment, thickness of wings, shape of cutting edge, quality of metal, relation of edges to one another. And it shanks as well as sharpens.

A single lever controls every operation. The skill—or otherwise—of the operator may affect the rate of output but never the quality of the sharpening.

Leyner-sharpened bits are perfect bits. Used in Ingersoll-Rand Drills, they mean the utmost drilling speed and economy.

Bulletin 4022.

NEW YORK

INGERSOLL-RAND CO.

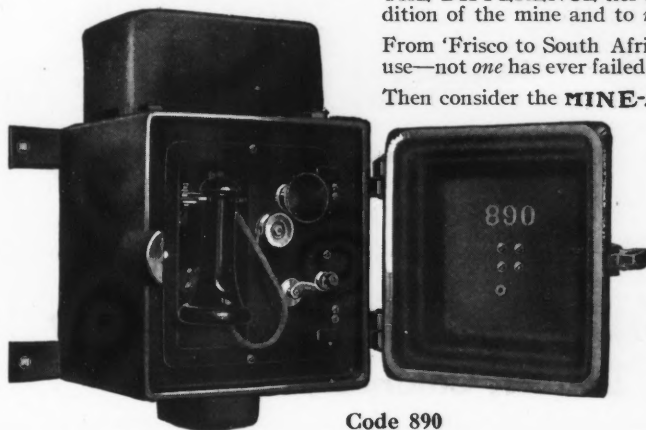
LONDON

Offices In All Principal Cities Of The World

If It Can Be Broken It's Not An Emergency Appliance

An emergency appliance is certainly useless if the emergency itself puts the appliance out of commission. Ordinary telephones, adapted to mine use, proved useless in this very way. Fire, falling weights and dampness ruined them. They could not meet conditions. So we perfected the—

MINE-A-PHONE



Code 890

THE DIFFERENCE lies here—it is *specially built* to anticipate each hard condition of the mine and to *meet* it.

From Frisco to South Africa thousands of **MINE-A-PHONE** are in constant use—not *one* has ever failed.

Then consider the **MINE-A-PHONE** in emergency and in everyday use. We've a book that *proves* how this system will benefit *your* mine. You need it. No obligation.

Just write for Bulletin 2500.

**Stromberg-Carlson Telephone
Manufacturing Company**

Manufacturers of over 2,000,000 Telephones and
8,500 Telephone Exchanges

Rochester, New York, U. S. A.
CHICAGO, ILL. TORONTO, CAN. LOS ANGELES, CAL.
SAN FRANCISCO, CAL. SEATTLE, WASH.

Deister Machine Company

Shoaff Building, Fort Wayne, Ind., U. S. A.

Announcement

The Deister Machine Company (*note carefully the new name*) are now fully equipped to manufacture and give prompt delivery on Deister Bros. Latest Improved Concentrators.

Deister Simplex Concentrator
for sands

Deister Simplex Slimer
for slimes

Deister Multiple Deck Tilting Slimer
for finest slimes overflow


Undoubtedly the best concentrators on the market.
Thoroughly Tested—Merit Proven.

Write for full particulars.

1860

COLORADO IRON WORKS COMPANY


**ORE SMELTING
EQUIPMENTS**



**ORE MILLING
MACHINERY**

1912

“WE don't realize it's in the mill” has been said by many users of the Akins Classifier, so little trouble does it give. There are none of those irritating hitches to continued operation experienced with other devices accomplishing similar results. It separates sand from slime, washes sand, or dewater concentrates and it does it well.



45 IN. BY 13 FT. AKINS CLASSIFIER.

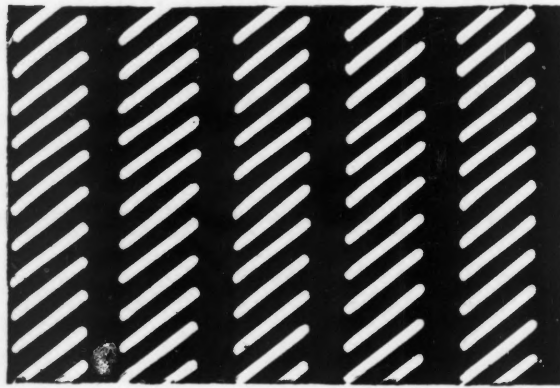
Colorado Iron Works Company

Denver, Colorado, U. S. A.

TIMBER FRAMERS

Our Timber Framer handles any size, length or shape log, giving both ends always *exactly square and parallel*.
Two untrained operators can frame 60 timbers per hour.
Space for machine including countershaft—15 x 24'.
H. P. required—25. Send for information.

Dillon-Box Iron Works Co., Denver, Colo.



You Need The Mundt Chart

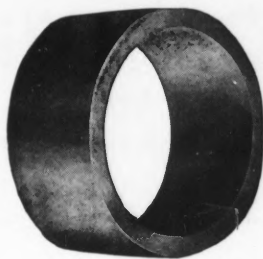
Shows all the various patterns of perforated Screens used in the mining field. A handy reference chart for your office.
Our 43 years manufacturing perforated Screens enables us to serve you promptly.
Write us your requirements.

Ask for the Mundt Chart today.

CHARLES MUNDT & SONS
55 Fairmount Avenue Jersey City, N. J.

CHROME STEEL WORKS

CHROME, N.J., U.S.A.



Trade
Adamantine
Mark

**Forged
Chrome
Steel Shells
And Rings
For Long
Service**

“**A** **DAMANTINE**” Shells and Rings are Hydraulic-Forged, and rolled from a solid Chrome Steel Ingot. This process forges the Ring from a solid mass, giving the Metal the greatest possible work with the result that we are enabled to produce a Shell which has all the elements necessary for *long service, even wear and hardness and toughness* combined.

For Wet Or Dry Crushing

Shells for Cornish Rolls, Rings and Tires for Chilian Mills, Huntington Mills and Griffin Mills, etc., etc.

Guarantee

We guarantee that our Chrome Steel Shells and Rings will, at our price, prove more economical and satisfactory, by reason of superior service, as against any other make now on the market.

“Adamantine” is our registered Trade Mark. To avoid substitution order by that name.

Illustrated Pamphlet “Forged Shells and Rings” if You Write.

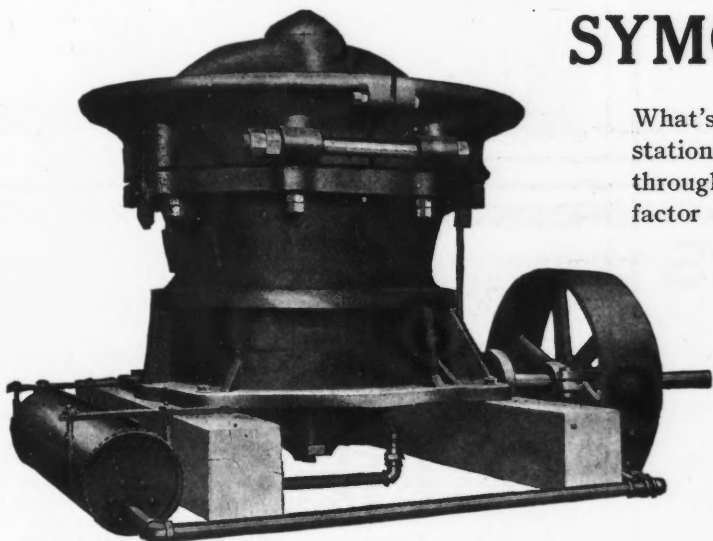
Represented By

J. F. Spellman, 414 1st Nat. Bank Bldg. Denver, Colo.
George W. Myers, Kohl Building, San Francisco, Cal.

You Can't Break It

At Houghton, Michigan, they dropped a sledge into a No. 4 Symons Breaker. A car-wheel fell into a No. 7½ in the plant of the Federal Lead Company, Flat River, Mo. The crushers stalled without damage. Such an accident would have disabled any but the

SYMONS BREAKER



What's the difference? The Symons shaft is stationary. It is a great steel bolt right through the center of the machine—a mighty factor of strength. In every other crusher, this shaft gyrates. That's why the Symons is stronger.

Write for Catalog No. 168

**THE
T. L. SMITH COMPANY**

1338-Majestic Building

Milwaukee

Wisconsin.



Sturtevant Ring-Roll Ore Mill

FOR PULVERIZING DRY ORES

**Large Output — Small Power — Small Upkeep — Complete
Accessibility — Slow Speed.**

Takes 1½ inch feed — Grinds to practically any fineness —
Built in 5 sizes.

Send for Catalogue No. 79.

Sturtevant Mill Co., Boston, Mass.

New York Chicago Cleveland Pittsburgh Atlanta Victoria, B. C. London



Buchanan ALL STEEL Crushers

¶ Built for heavy and continuous service. ¶ Deep frame, acute jaw angle, rapid crushing. Manganese steel wearing parts. ¶ Will crush the hardest rock or ore without heating or breaking down.

Buchanan Rolls and Magnetic Separators.

CRESSON-MORRIS CO.

89 West St., New York 18th & Allegheny Ave., Phila., Pa.



MAXECON MILL

A Grinder for all kinds of ores

Especially adapted for grinding ores for **CYANIDING**

KENT MILL CO.,

New York, Borough of Brooklyn, 10 Rapelyea Street

LONDON, W. C.—31 High Holborn, BERLIN—Charlottenburg 5, Windschied Strasse 31.



“STAG” BRAND

MANGANESE STEEL CASTINGS

EDGAR ALLEN AMERICAN MANGANESE STEEL CO.

Chicago, Ill. New Castle, Del.



Patent Applied For

SINGLE ROLL CRUSHERS

For Limestone, Phosphate Rock and Cinder, Etc. Any Capacity from 5 to 500 Tons per Hour. More Easily Fed, Makes Less Fines than Either a Jaw or Gyrotory Crusher. Information and Prices for the asking.

McLANAHAN-STONE MACHINE CO., Hollidaysburg, Pa.

BACON'S HOISTING ENGINES

SPECIAL UNDERGROUND HOISTS
GRAVITY INCLINES, MINING MACHINERY
SKIPS, CARS, etc. EARLE C. BACON, ENGINEER
HAVEMEYER BLDG. NEW YORK.

BACON \ FARREL ORE & ROCK CRUSHING \ WORLD KNOWN ROLLS-CRUSHERS

EARLE C. BACON, ENGINEER
HAVEMEYER BUILDING, NEW YORK

ATKINS, KROLL & CO. SAN FRANCISCO

Import Merchants

DANISH FLINT PEBBLES, SILEX LINING, CYANIDE,
QUICKSILVER, MINING CANDLES, FIREBRICK,
BORTS AND CARBONS, BLACKSMITH COAL, COKE,
COTTON WASTE, SCHEELITE CONCENTRATES 70%
SUPERIOR QUALITY ZINC DUST.

Stocks Carried.

Buyers of Quicksilver and Platinum, also Ores of Antimony, Bismuth, Molybdenum, Tungsten, Vanadium, Zinc, etc.



TISCO Manganese Steel

Castings for Severe Service

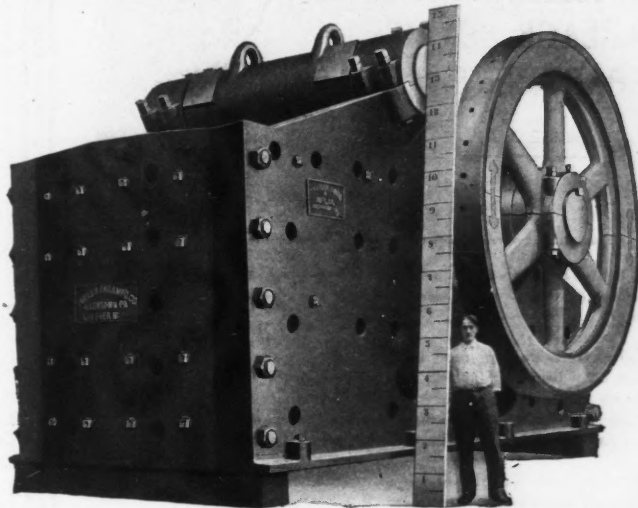
TAYLOR-WHARTON IRON & STEEL CO.

HIGH BRIDGE, NEW JERSEY

JAW CRUSHERS

Reduce your cost of operation by installing large jaw crushers and handling your ore with steam shovels

Our crushers are equipped with features which reduce the cost of maintenance to a minimum, such as **Water Cooled Bearings, Reversible Toggle Seats, Perfect Lubricated Bearings.**



TRAYLOR ENGINEERING & MANUFACTURING COMPANY

Builders of Stamp Milling, Concentrating, Rock Crushing, Cyaniding and Smelting Machinery

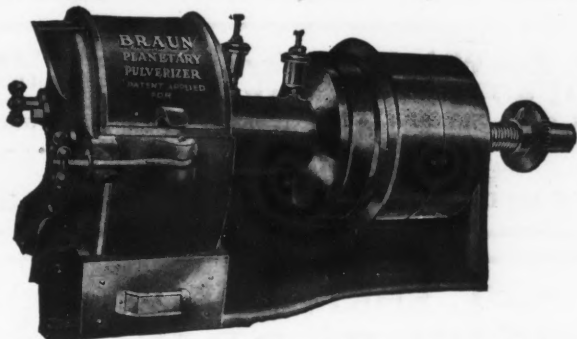
26 CHURCH STREET, NEW YORK

Works—ALLENTOWN, PENN.

AGENTS—Mexican Steel Products & Machinery Co., Apartado 122-Bis., Mexico City
Harron, Rickard & McCone, Los Angeles, San Francisco

THE BRAUN PLANETARY PULVERIZER

is an improvement over the regular *Braun Pulverizer* as it is capable of grinding all classes of material whether hard—soft or talcy.



Patent Applied For

expensive working parts need to be replaced. Grinding discs are renewable. *Send for catalog "SP."*

If you have experienced trouble in pulverizing your ores, this machine should receive your consideration.

It has satisfactorily ground *phosphate rock, ammonia salts, lime* and other materials as fine as 200-mesh with one grinding.

Equipped with a simple but substantial planetary movement that is warranted to last indefinitely. No



SAN FRANCISCO, U. S. A.

Distributed by leading dealers everywhere



LOS ANGELES, U. S. A.

New—and very much needed

Our recently-organized
**HAULAGE SERVICE
DEPARTMENT**



"Where can I turn to secure *really expert advice* on the design of that haulage system, I must have to carry the ore from and about my mine?"

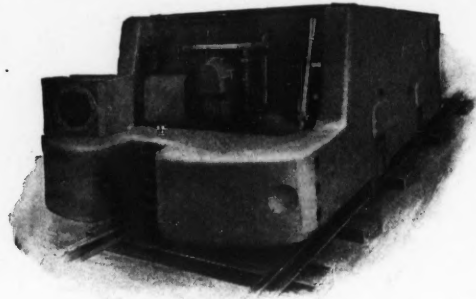
Well—before we organized our Haulage Service Dept.—the answer must have been—"Nowhere." But no longer. For this Engineering Service Dept., is a genuinely specialized haulage department—headed by an engineer who has been designing electric locomotives and cars ever since electricity first began to supplant the mule for hauling cars.

One other point—our engineers are backed by a very capable manufacturing organization.

Just ask us to **PROVE** the value of our "Service Dept." by showing you something definite in the way of designs and costs.

The Electric Locomotive & Car Co.
West Park, Ohio

Whitcomb Gasoline Mine Motors



The first successful gasoline mine motor
—The only successful gasoline mine motor in service today.

Before you buy your next mine motor let us send you the large list of Whitcomb users.

Over 100 mining companies are using them.

Write for Catalog and Bulletins.

Geo. D. Whitcomb Company
Box D, Rochelle, Illinois

"Porter Locomotives"

"Steam and Air"

All Gauges and for Every Variety of Service



A Two-Stage Compressed Air Gathering Locomotive.

Wireless—Sparkless. Two-stage features add fifty per cent to the efficiency, removing the only objection to the *safest, cleanest, handiest and best* mine haulage in the world. *Write us for full particulars.*

H. K. Porter Company

410 Wood Street, Pittsburg, Penna.

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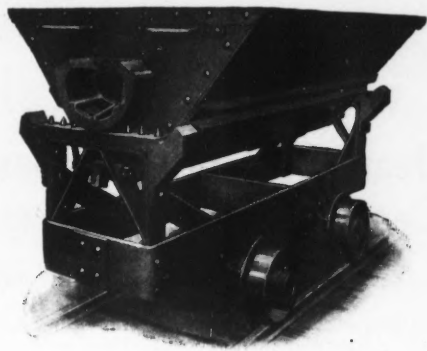
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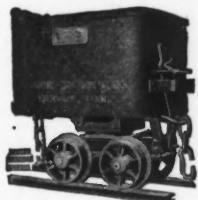
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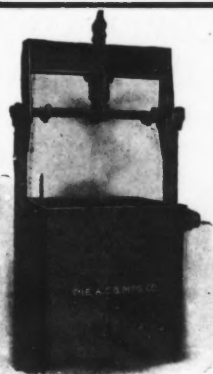
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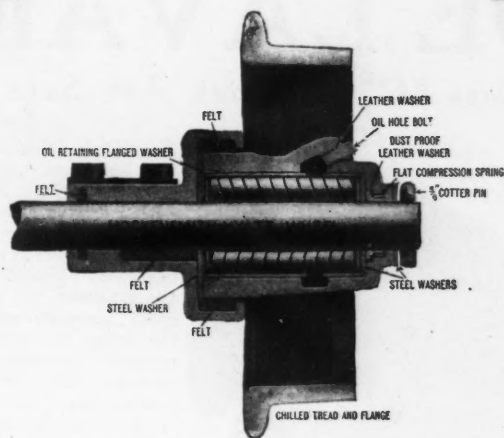
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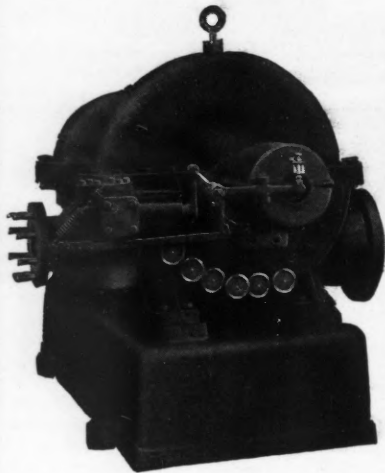
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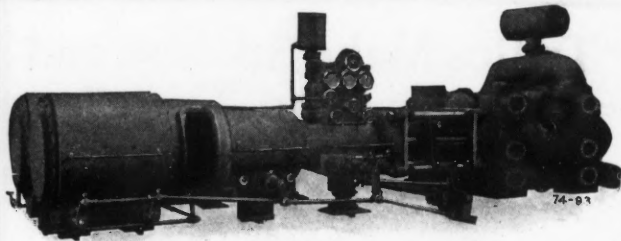
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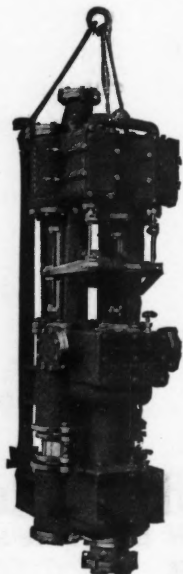
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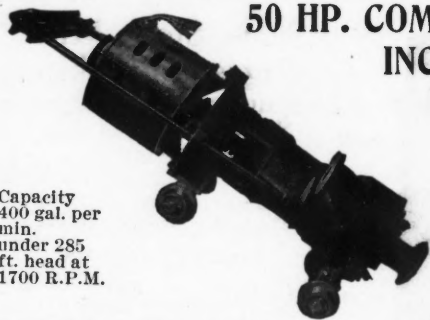
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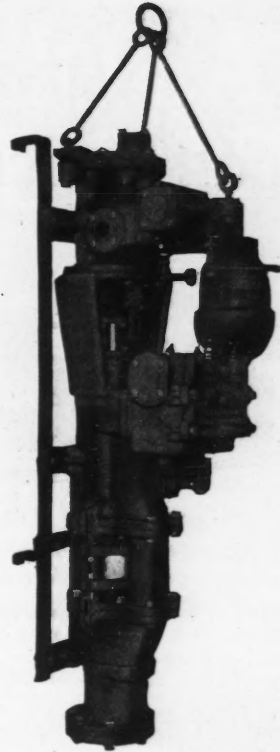
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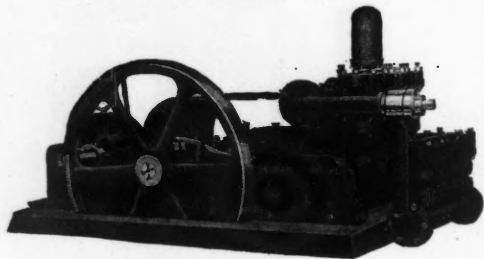
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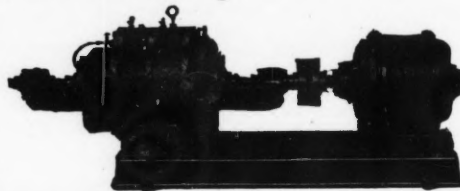
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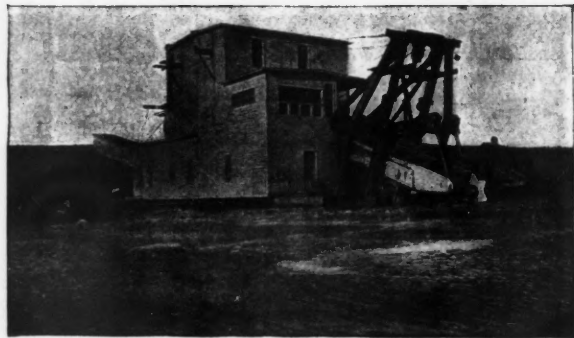
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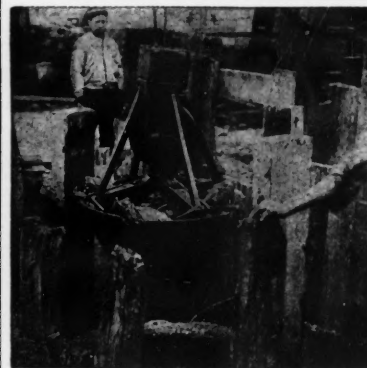


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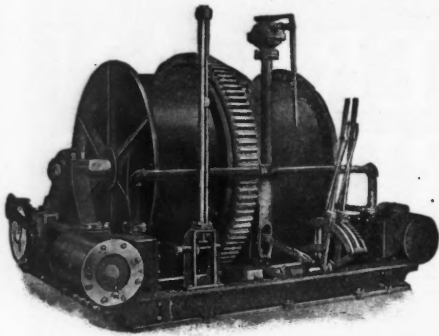
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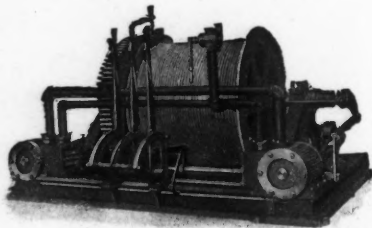
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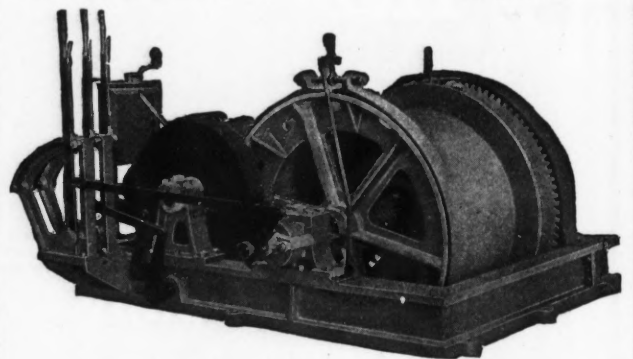
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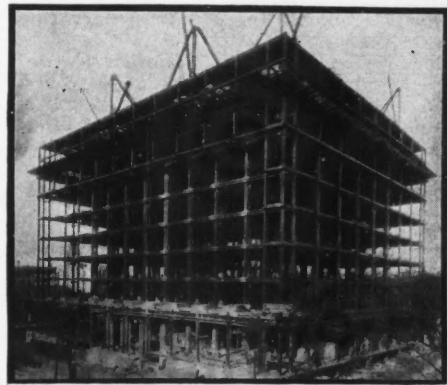
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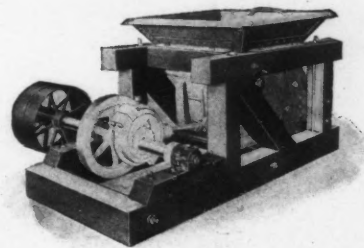
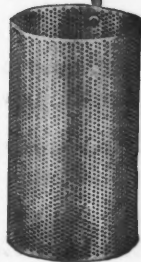
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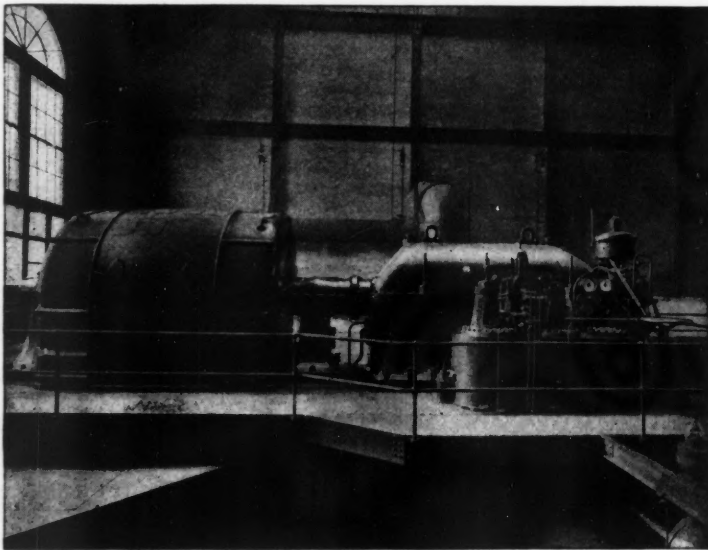
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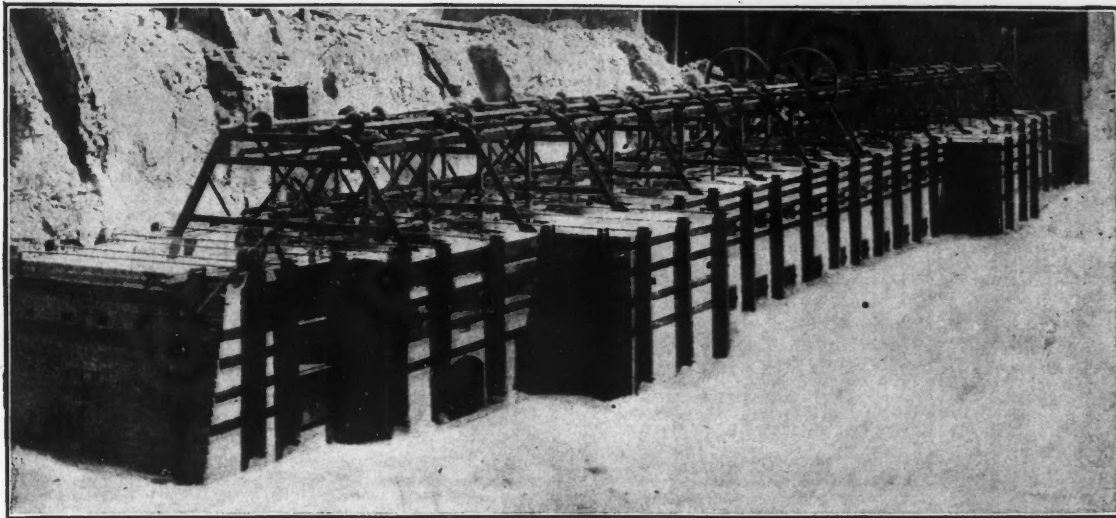
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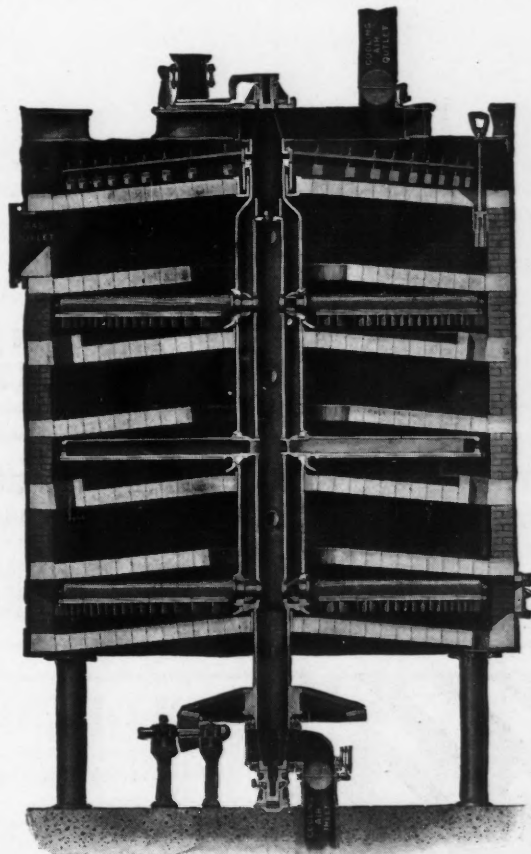
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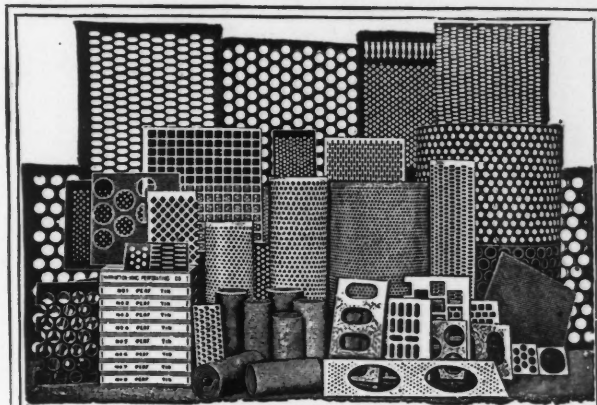
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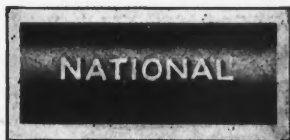
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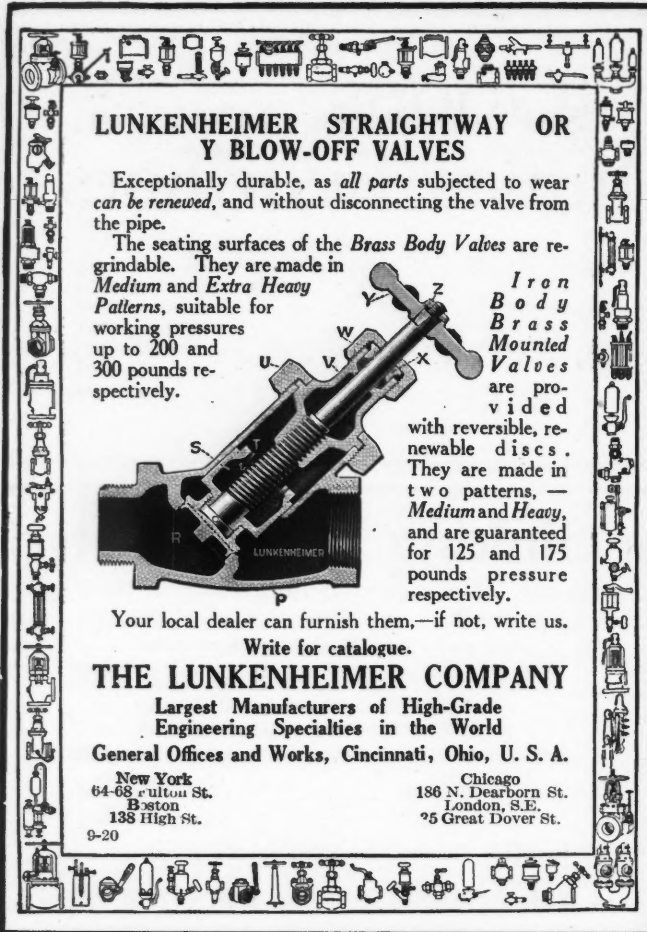
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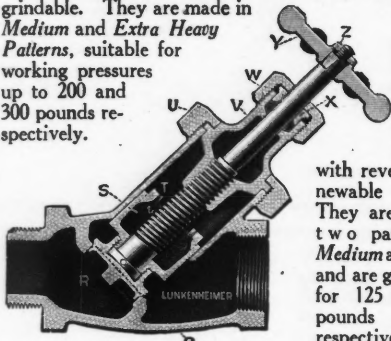
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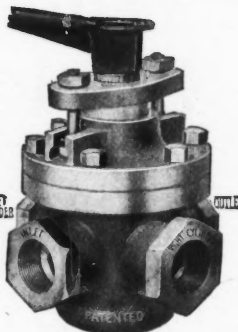
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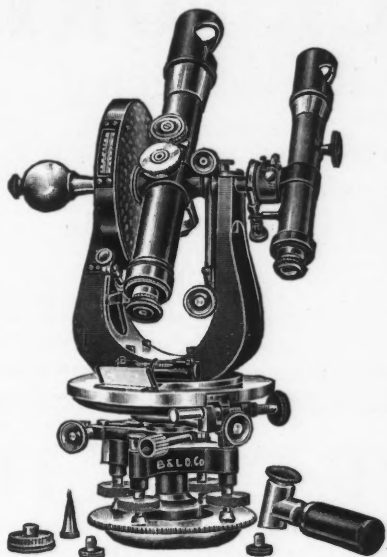
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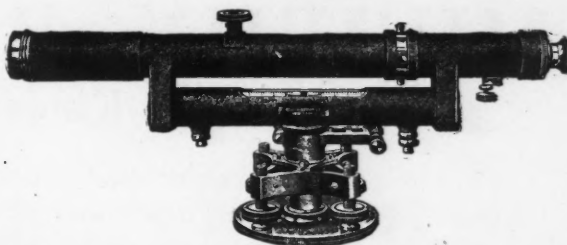
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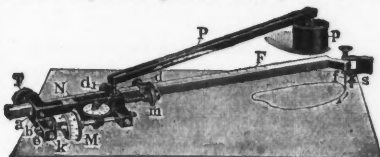
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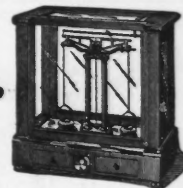
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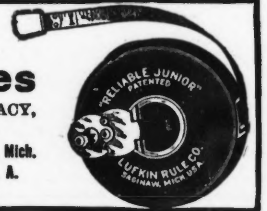
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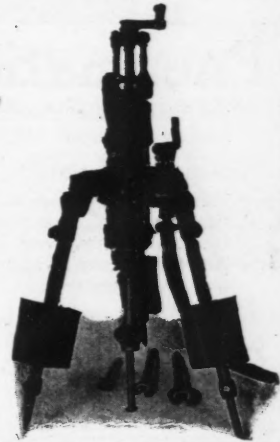
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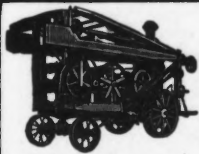


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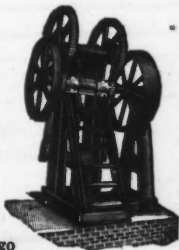
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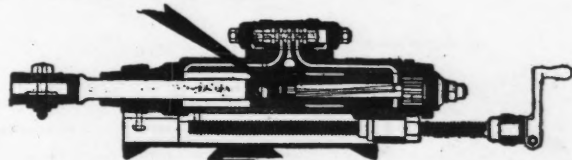
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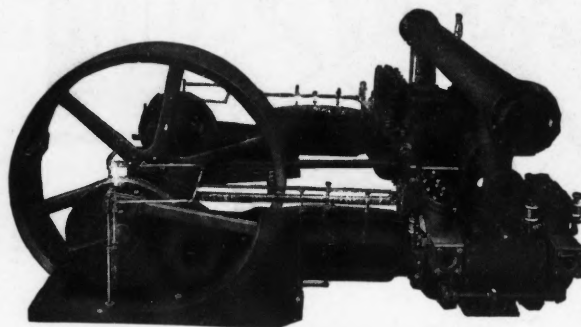
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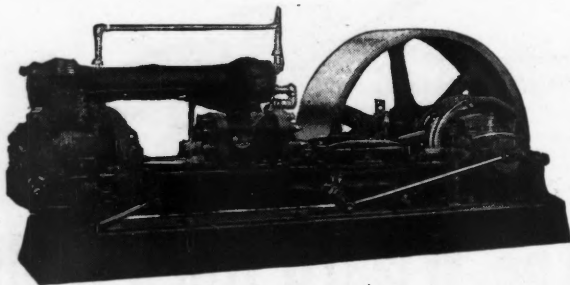


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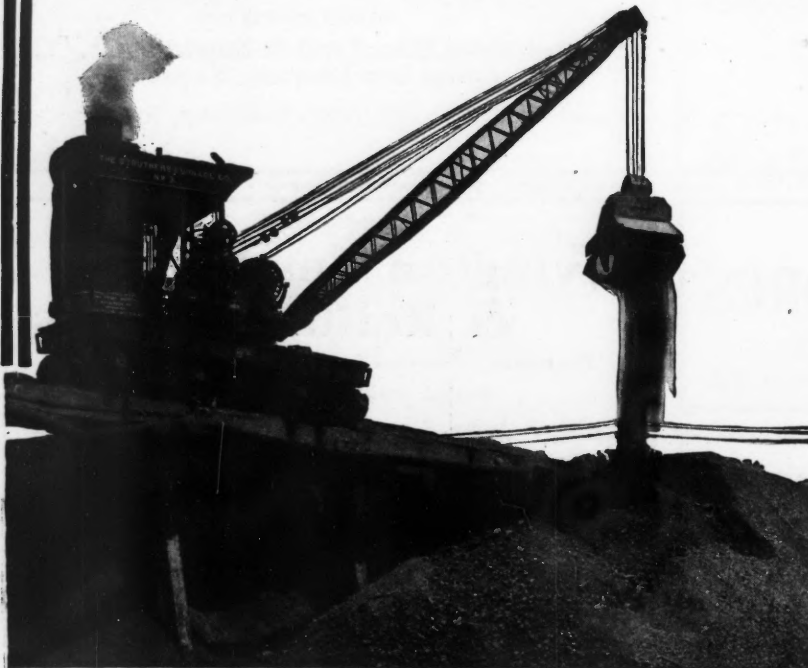
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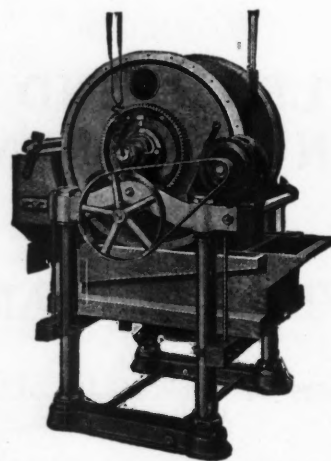
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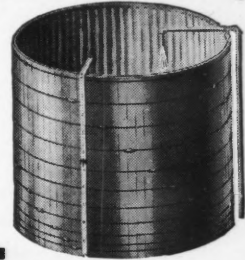
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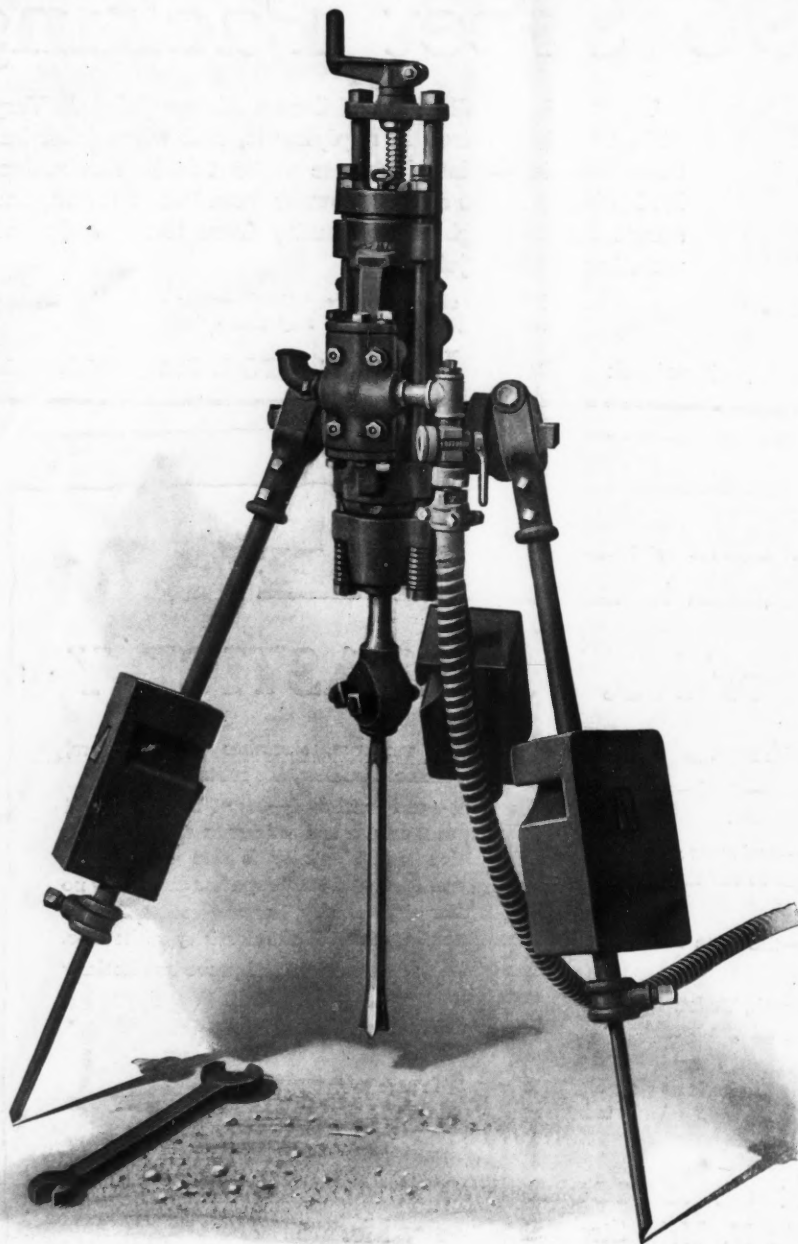
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