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The Conservation of Resources

The propaganda for the conservation of our national resources, inaugurated by President Roosevelt, is now assuming a tangible and practicable form. In its early days it was seized upon as a peg on which to hang a good deal of nonsensical talk, especially by the bureaucracy at Washington, which in its desire to plant more jobs to flourish like the bay tree was ready to undertake to show the miners, smelters and all other industrialists how little they knew about their own business. This was to be expected. Fortunately there has been a disappearance of this kind of promotion and a concentration of attention upon something that can be done, and moreover ought to be done, viz., the proper management of the Government's own resources and the prevention of their passage into the hands of monopolists to be loaded with interest charges that posterity will be required to pay. In his message to Congress on Jan. 14, Mr. Taft goes right to this point.

"All the principal land statutes," he says, "were enacted more than a quarter of a century ago. The homestead act, the preemption and timber culture act, the coal land, and the mining acts were among these. The rapid disposition of the public lands under the early statutes, and the lax methods of distribution prevailing, due, I think, to the belief that these lands should rapidly pass into private ownership, give rise to the impression that the public domain was legitimate prey for the unscrupulous, and that it was not contrary to good morals to circumvent the land laws. This prodigal manner of disposition resulted in the passing of large areas of valuable land and many of our

national resources into the hands of persons who felt little or no responsibility for promoting the national welfare through their development. The truth is that title to millions of acres of public lands was fraudulently obtained and that the right to recover a large part of such lands for the Government long since ceased by reason of statutes of limitation."

"Among the most noteworthy reforms initiated by my distinguished predecessor were the vigorous prosecution of land frauds and the bringing to public attention of the necessity for preserving the remaining public domain from further spoliation, for the maintenance and extension of our forest resources, and for the enactment of laws amending the obsolete statutes so as to retain governmental control over that part of the public domain in which there are valuable deposits of coal, of oil, and of phosphate."

"The present statutes, except so far as they dispose of the precious metals and the purely agricultural lands, are not adapted to carry out the modern view of the best disposition of public lands to private ownership, under conditions offering on the one hand sufficient inducement to private capital to take them over for proper development, with restrictive conditions on the other which shall secure to the public that character of control which will prevent a monopoly or misuse of the lands or their products."

"It is now proposed to dispose of agricultural lands as such, and at the same time to reserve for other disposition the treasure of coal, oil, asphaltum, natural gas and phosphate contained therein. This may be best accomplished by separating the right to mine from the title to

the surface, giving the necessary use of so much of the latter as may be required for the extraction of the deposits. The surface might be disposed of as agricultural statutes, while the coal or other mineral could be disposed of by lease on a royalty basis, with provisions requiring a certain amount of development each year; and in order to prevent the use and cession of such lands with others of similar character so as to constitute a monopoly forbidden by law, the lease should contain suitable provision subjecting to forfeiture the interest of persons participating in such monopoly. Such law should apply to Alaska as well as to the United States.

All of this meets with our approval except the suggestion that the existing laws as to the disposal of lands containing the previous metals do not require change. In fact they are inadequate, antiquated and in as much need of revision as are any of the other laws.

We have already, in commenting upon one of Mr. Roosevelt's messages, expressed our approval of leasing the Government's remaining coal lands. This would be no innovation in governmental policy. The first important mineral resources that came into the possession of the Nation were the lead lands acquired by the Louisiana purchase. By Act of Congress in 1907 a lease system for the exploitation of these lands was inaugurated, the Government collecting a royalty, and this continued to be the law until 1847. The retention of their coal lands and their exploitation under lease is even now the policy of several States. There is no better method of preventing the monopolization of such resources and the preservation to the people of the unearned increment.

Anton Eilers

At the end of 1909 Anton Eilers retired from the American Smelting and Refining Company, with which he had been connected, as director and member of the executive committee, since its organization. It is appropriate at this time to review the important work that he has done in the art of silver-lead smelting, in which he has been engaged for nearly 40 years, covering the major portion of his professional career. Indeed it would not be far out of the way to

call Mr. Eilers the father of the modern practice of silver-lead smelting.

In his early days, a young graduate of Clausthal, Mr. Eilers became assistant to Dr. R. W. Raymond, then U. S. Commissioner of mining statistics, and in the course of that work, which extended from 1869 to 1876, was delegated to report upon the districts like Eureka and Cerro Gordo where the silver-lead-smelting practice of America was inaugurated. His earliest contributions to technical literature are to be found in those admirable volumes upon the mineral resources west of the Rocky Mountains; they were good and may still be read with interest and profit after these many years. We are bound to admire the insight and thoroughness of some of the pioneer investigators, among whom Mr. Eilers was preëminent.

It was natural that Mr. Eilers himself should become interested in smelting enterprises and also that this should first be at Salt Lake City, whose destiny of becoming an important metallurgical center was early indicated. Smelting at that place was particularly interesting to an engineer of Mr. Eilers' quality because of the problems, from which Eureka was happily free, that were baffling the less expert metallurgists. Smelting at that time was chiefly a rule of thumb affair. Ore was shoveled into the furnace with the hope that it would make its own slag. Sometimes it would and sometimes it wouldn't. Freeze-ups and the digging out of sows were matters of everyday expectation, and at the best the ratio of ore to fluxes was such as to be destructive of profits.

In 1876 Mr. Eilers became associated with the late Gustav Billing in leasing the old Germania works at Salt Lake City, which was idle after a rather dismal career as a lead refinery. With characteristic thoroughness he followed up the causes of the furnace irregularities that were then the rule rather than the exception, and found that when slags of certain definite types were made the irregularities largely ceased. He found, moreover, that these types were characterized by a tendency to form definite crystalline forms, which while not invariable, were strongly indicative, and that they corresponded to certain chemical formulas. The realization of this principle permitted a long step to be taken in the art, and the utilization gave the

firm foundation upon which the success of this and many subsequent enterprises was based. Other contemporaneous metallurgists coöperated with him in the practical experimentation and determination of successful slag types, among whom may be mentioned Hahn, Raht and Schneider.

The final result of this study was to make American lead-smelting practice preëminent in the world, and give a degree of scientific and economic certainty to such enterprises, which have fostered the growth of a gigantic industry. The enormous waste of valuable metals that characterized the old haphazard practice was done away with, and even allowing generously for the natural improvement in skill and efficiency which would undoubtedly have taken place under any circumstances, it must be recognized that the prompt discovery of this fundamental principle was responsible for the saving to the country and the utilization of almost incalculable quantities of lead, copper, silver and gold, which would otherwise have been thrown away in the mountains of smelter slag that lie scattered over the western country.

With the better understanding of the theory, improvements in furnace design and smelter construction kept pace, and in this field also Mr. Eilers was a leader. He designed the sectional water jacket of cast iron with the flaring lip, at one time called the "Eilers jacket," but now so almost universally used that the identity of the original designer has been forgotten. He first adapted to the lead-smelting furnace the water-cooled tap-jacket, previously used by Lürman in iron smelting, and by thus replacing the clay breast of the furnace, greatly increased the length of a continuous campaign. He was one of the first if not indeed the first in our western practice to adopt the Raschette rectangular blast furnace, which permitted of increasing the smelting capacity without increasing the furnace width at the tuyere level. In brief, he was preëminent among those who pointed out the lines of permanently successful growth of this branch of metallurgy, and the modern lead and copper blast furnace of today is to a great extent a monument to his skill and thoroughness.

In 1879 when Leadville was just coming into prominence as a producer of silver-lead ores, the Billing & Eilers

smeltery was built. It was afterward known as the Arkansas Valley works, and is still in operation, after 31 years of practically continuous operation under many changing conditions of ownership and ore supplies. It is the sole survivor in Leadville of the great smelting industry of the early '80s, though few signs of the old regime remain except the old log-cabin residence which Mr. Eilers built, and which is still used as the office of the works.

Early in 1882, Mr. Eilers organized the Colorado Smelting Company in conjunction with the owners of the Madonna mine at Monarch, Colo., and recognizing that thenceforth custom smelters must establish themselves at railroad centers, he built his smelting works at Pueblo, Colo. With his Madonna ore furnishing an ideal supply of lead carbonate and oxidized iron in large tonnage, he was able to buy silicious ores at his own figures, and the enterprise was phenomenally successful, both metallurgically and commercially, and was conceded to be the model works of its day.

When the great lead deposits in Idaho were opened up, Mr. Eilers began to be interested in the northwest, and in 1888 he organized the Montana Smelting Company, and built a large plant at Great Falls, Mont. This soon after was merged with the smeltery at East Helena, Mont., and the National refinery at Chicago, under the name of the United Smelting and Refining Company. All of these plants went into the American Smelting and Refining Company upon its organization in 1899, and the Helena and Chicago works are still in operation.

The smeltery at Pueblo, which remained in operation until a few years ago, was under Mr. Eilers a great training school for young metallurgists. The staff lived at the works and met daily at the mess with the superintendent at the head of the table and the juniors in their order. When the chief retired to go to a larger field the others moved up a place. Thus passed through these works such men as Hahn, Sticht, Dwight, Aldridge, Karl Eilers and Smith who have made great names in the art of metallurgy. Mr. Eilers himself, amid his multifold cares of business, maintained ever the keenest interest in purely technical affairs and bestowed upon them the largest part of his attention. We do not think that his retirement from

some of the more active phases of his work will mean cessation of interest in the art to which his life has been devoted, but are rather inclined to think that in his relief from routine cares science will be the gainer.

The Relation of Dividends to Stock Value

When a mining company like the North Butte reduces its quarterly dividend from \$1 per share to 50c., we wonder how many investors know really what it means, i.e., as to the actual value of the shares in the market. What this may be depends primarily upon the rate of interest that a mining investment ought to pay. As to this, opinions naturally differ to some extent. However, there is no question in any mind that the best mining investments ought to yield more than good railway stocks, from which about 5 per cent. is expected, and more than good industrial stocks, from which about 6 per cent. is expected, since mines—even those which are optimistically classed as "manufacturing propositions"—are subject to unfavorable, unforeseen contingencies for which allowance must be made in a larger rate of interest.

Mr. Hammond in the address recently published in the JOURNAL expressed the opinion that the best mining investments ought to yield 8 per cent. We are inclined to be a little more optimistic and say 7 per cent., but we should limit that rate strictly to the highest class of mining enterprises.

Now, a mine besides paying interest on the money invested in it must return the principal itself before the investment becomes a sound one, or must pay enough in addition to real interest to redeem the principal in a period of years. Upon an investment of \$1000, there must be set aside annually the sum of \$30 in order by reinvestment at 5 per cent. interest to regain the sum of \$1000 in 20 years. Consequently, a mine that is going to produce for 20 years must yield annually 10 per cent. upon the investment in order to pay 7 per cent. net. If the life of the mine is to be shorter than 20 years, the payment required annually goes up with leaps and bounds.

When, therefore, the North Butte company pays \$2 per annum, the shares would be worth only \$20, on the basis

of present price for copper (a reasonably safe assumption) and the expectation that the mine will continue producing at the present rate for 20 years to come, which is a long look ahead for a mine like North Butte, wherein the amount of ore in sight is never very great, when it is at its best, and quite unsafe as a basis for reckoning when it has come into *borrasca* in its lower levels as now appears to be the case.

The average investor, or perhaps we should better say speculator, does not figure in this way. He buys stocks because he thinks they are going up and sells them when he thinks they are going down. This is equivalent to playing faro and betting on horse races. It is not investment at all. Investment exists only when it is based to the chief extent upon visible value. The theory of the speculator is "the devil take the hindmost." He expects to get in and out nimbly, and let the lambs eventually have the empty shells. This is often practised successfully for a long time, but some day the speculator finds that he himself has got a shell and in one big slump beholds the disappearance of the proceeds of many scalping operations.

Daniel Guggenheim on Conservation

Daniel Guggenheim is the latest exponent of the idea that prices can and ought to be regulated. His own word is "stableized." Having had some unsuccessful experience, antedating that of the U. S. Steel Corporation, as to the ability of a great industrial combination to do this, he goes a step further and holds up the cartels and conventions of Germany, some of which have the aid and abettal of the government, as examples that are worthy of emulation, showing how the producers of commodities may by combination restrict production and obtain in the markets of the world the very highest price for their product. As a new argument in favor of this policy, Mr. Guggenheim blows the trumpet of conservation of resources. Thus do our captains of industry hike on toward paternalism. This is the logical outcome, although for the moment the *entrepreneurs* think only how lovely a thing it would be to have the world working to pay interest on their watered investments in the natural resources that they have gobbled.

CORRESPONDENCE AND DISCUSSION

VIEWS, SUGGESTIONS
AND THE EXPERIENCES OF READERS

Mining Investments

James Douglas' advice to investors to "never invest in any mining enterprise what you cannot conveniently afford to lose," can only be prompted by his extreme modesty. Surely a man who has achieved such technical and commercial success in mining, both for himself and for Phelps, Dodge & Co., a man who is responsible for the magnificent mines and plants of the Copper Queen, the Detroit and the Moctezuma companies, cannot think that this trinity of successes is due to mere fortuitous circumstances.

J. PARKE CHANNING.

New York, Jan. 17, 1910.

Stamp Drop Sequence

In the JOURNAL of Nov. 20, 1909, I notice a paragraph on stamp-drop sequence which mentions trouble experienced on changing to the so-called standard drop. Many others, including myself, have gone through this experience. About 15 years ago I had 10 stamps running on gold quartz, using inside plate amalgamation and what I call the California order of drop, 1, 4, 2, 3, 5, and by way of experiment changed them to what I call the Homestake order of drop, 1, 3, 5, 2, 4. Trouble began at once, the feed being piled up at one end of the mortar while the stamps pounded at the other end. The remedy was soon found to be to run the stamps as fast as possible without camming and to keep the feed low. Under these conditions the stamps worked well enough, but were never so satisfactory as with the old order of drop. On considering the matter closely I saw that the cause of the trouble lay in what I call the secondary drop of the stamps, which in this case is a regular succession of drop, at intervals of one (i.e., omitting every alternate drop), from stamp No. 5 to No. 1.

To make my point clear, let us consider the order 1, 3, 5, 2, 4. The stamps are numbered from left to right, 1, 2, 3, 4, 5. The first to drop is No. 1, second No. 3, third No. 5, fourth No. 2, fifth No. 4, or this may also be expressed thus:

Stamp Nos. 1, 2, 3, 4, 5,
Sequence 1st, 4th, 2d, 5th, 3d.

Now begin with any stamp, but, for convenience, say No. 5, omit one, then take the next and so on. By this method

we get: Stamp No. 5 drops third; omitting one, the fifth to drop is No. 4; again omitting one, the second to drop is No. 3; the fourth is No. 2, and the first is No. 1; the secondary drop is thus seen to be 5, 4, 3, 2, 1, from which it is evident that once in every two revolutions of the cam shaft there is a succession of drop 5, 0, 4, 0, 3, 0, 2, 0, 1 from one end of the battery to the other, and it is this secondary drop which works the feed up to one end of the mortar. This is not a theory; it is a condition which anyone can observe by looking at a battery running on this drop and watching the steady run of the stamps from one end to the other.

Note also that the intervening primary drop is so placed as to be of little effect in stopping the progress of the feed toward No. 1 stamp. After No. 5 drops and before No. 4, the one to drop is No. 2; between Nos. 4 and 3 comes No. 1; between Nos. 3 and 2 comes No. 5; between Nos. 2 and 1 comes No. 4. That is, the first two intermediate primaries are separated by two stamps from the one they follow, and the second two occur behind the secondary sequence and actually help it to transfer the feed toward No. 1 stamp.

By way of comparison, consider the California drop in the same manner, the order being 1, 4, 2, 3, 5. We have as secondary drop 1, 2, 5, 4, 3, or, beginning with No. 5 again, 5, 4, 3, 1, 2, in which, although the first three drop as in the Homestake, the last two are reversed, giving a drop which tends to work toward the center of the mortar, and which indeed would be quite workable as a primary drop.

While it is generally claimed that the Homestake drop crushes more than the other, it has the disadvantage of being very sensitive to changes of feed and of stamp speed, any slowing being at once followed by a piling up at one end of the mortar, and this is more noticeable with soft ores than with hard, with which the feed can be kept low. Moreover, the California drop gives a better amalgamating wash in the mortar, this being plainly visible on the screen, where the wave is seen to travel clear from one end of the mortar to the other, which in the other case it does not. Also the stamps sound better with the old drop.

In large plants where there is little likelihood of any departure from the proper speed, and where the stamps are

regarded merely as a crushing machine, this is perhaps not of sufficient importance to offset an increased output, if there is any, but for a smaller mill, practicing inside amalgamation and where the battery is valued as an amalgamating machine, and where the load is variable on account of the intermittent use of a rock breaker, etc., and the engine government not of the best, I consider the California drop far preferable. Several subsequent experiences with both orders of drop confirmed me in this opinion.

It seems to be impossible to get a perfectly even feed distribution in a five-stamp battery. With the California drop there is a slight tendency to pile up under No. 5, and I always used to give this stamp about an inch more drop than the others on that account. In fact, a two-stamp battery seems to be the only one containing more than one stamp in which a perfectly symmetrical drop can be arranged (unless we drop two at a time as they are said to do somewhere in the wilds of Australia!).

The Homestake drop is, however, the only one in which the secondary drop runs completely from one end of the battery to the other, and this curious result is the consequence of that feature which is generally considered its greatest recommendation; that is, that no two adjacent stamps drop in succession, it being indeed the only possible arrangement of five stamps in which that is the case.

I have never seen this point raised by anyone else, although I have mentioned it occasionally to mill men; and I offer it now as the correct explanation of the difficulty.

RALSTON BELL.

Edinburgh, Scotland, Dec. 1, 1909.

Sweeping Coal Dust from Mines

I would like to offer a suggestion as to a possible method of abating the dust nuisance in dry coal mines. In mines equipped for electric haulage, I believe it might be feasible to rig up a dust-collector train, consisting of a light gathering locomotive and a string of five or six pit cars. The locomotive should carry a 5- or 10-kw. motor and a powerful suction fan capable of pulling 5 in. of mercury. One of the pit cars is to have a couple of small "cyclones" in parallel

to separate the coarse dust, the rest of the cars to be lined with blankets and a tight cover of two or three layers of burlap and cotton cloth. These cars, connected by sections of cotton hose in series with the cyclones would entrain all but a small quantity of the finest dust.

The suction fan would have a number of flat nozzles similar to the ones used by vacuum cleaners. By running the dust train about four times over the haulageways and alternately sweeping the roof ribs and floor, it seems the roads should be thoroughly cleaned, not only of the fine dust, but also of the coarser particles that, if left on the roads, would later be ground up into potentially explosive dust. The dust cars could be sent to the surface to have the accumulated dust removed, or the fan could be coupled to a discharge pipe running up the shaft and the collected dust sucked out of the cars. In mines piped up for air machines the piping system could be used on nights and Sundays for suction pipes by cutting in a vacuum fan, and the partings, where most of the fine dust usually settles, could be swept with a nozzle and suction hose.

GEORGE C. MCFARLANE.

Omaha, Neb., Dec. 27, 1909.

A Bureau of Mines?

I believe many mining engineers will voice my sentiments when I say that it is both a surprise and a disappointment to see the stand, or perhaps I had better say lack of stand, the JOURNAL, the most influential mining paper in this country, has taken in regard to the establishment of a mining bureau. A paper that is supposed to represent the best interests of the mining and engineering profession should have something more to say in its editorial columns in regard to this very serious matter than I have been able to detect there lately.

The craze which has been raging violently now for the last five or six years to establish government bureaus for the investigation of every conceivable thing, seems at last about to fasten itself permanently upon the mining-engineering profession. The provisions of the bill now before Congress in regard to the Bureau of Mines are familiar. There is to be a commissioner at \$6000 per annum; the bureau is to "foster, promote and develop the mining industries of the United States; to investigate diligently the methods of mining, safety of miners, . . . the treatment of ores and other mineral substances, . . . and other technologic investigations and inquiries pertinent to said industries, and from time to time make such reports of the work, investigations and information obtained as the secretary of said department may direct with the recommendation of said bureau."

INDIVIDUAL RESEARCH IS BEST

If this isn't invading the field of an honorable and self-sustaining profession with the worst species of government paternalism, I would like to know what it is. Every single purpose named above is properly the subject for private and individual effort, and is no more to be made the basis for a government bureau than would be the inauguration of government bureaus for medicine, dentistry, law, or any other profession. Certainly medicine, dentistry, etc., concern every one of us some time or other; they are desirable and useful; then why not let a generous Government establish suitable bureaus where we may get the benefits of government-paid professional advice?

Because we have recently had some appalling coal-mine disasters, this is no sound reason why the Government should begin forthwith the establishment of a mining bureau. The mining engineer has back of him many years of fruitful endeavor, experimenting and experience, and there are at the present day multitudes of keen and trained workers in the field. The results of new discoveries, investigations and practice are eagerly sought by our best professional journals, and the best find their way into print.

Again, it is a notable fact that in many of our coal mines especially, the salaries attached to the positions of managers and mine superintendents are not sufficient to attract and retain men of the highest qualifications.

OUR METAL-MINING PRACTICE

It is unfortunate for the mining industry, particularly coal mining, that so many comparisons with practice in European countries to the detriment of America have been made. But comparisons are always odious, and if we are to compare the higher death rate among American miners with those in other countries then why not investigate why the American must pay more for what he wears and eats, why our army and navy cost more per man in the service, why efficiencies in all our government agencies are lower than in commercial enterprises doing much the same work, and a hundred other things?

As contrasted with the coal-mining industry of our country, which has always been hedged about by more laws, regulations, inspectors and inspection, etc., than any other branch of the mining industry, let us examine the practice in our metal mines. In the mining and reduction of copper, gold, silver and lead ores, which has hitherto been reasonably free from Government intervention and interference, we have attained the highest efficiencies and our practice is abreast of or leads the world. This is because private capital, initiative and brains have been free to work out their

own salvation. What better refutation to the insinuating appeal of the bureaucrat for the pressing need of government aid and intervention can there be than the maintenance of a practically fixed price for our common metals during a period of 20 years or more in spite of an unprecedented consumption and without the discovery of any new bonanza deposits? It may be said, on the whole, that the increased demand has been met by an improvement in mining and metallurgy in known producing districts. In other words, when it has been put squarely to the American mining engineer to solve a complex mining and metallurgical question, he has never failed; and that, too, without any aid from a government bureau. The steady pursuit of this policy has resulted in making the practice in our metal mines and reduction plants the standard of the world, and the American engineer the leader of his profession.

BUREAU WILL NOT ADVANCE MINING

It seems a pity that in America we have no unified body of mining engineers whose voice would carry weight to oppose this proposed mining-bureau scheme. It is true we have the venerable Institute of Mining Engineers that might well serve as a center around which to crystallize professional and public opinion, but it seems highly improbable that it will ever take to itself this task.

The establishment of a mining bureau means not the advancement of the mining industry, but its slow strangulation. Let the mining industry, particularly the metalliferous end of it, remain free from government bureaucracy; let our young mining engineers receive a thorough training in the well known principles that are at the foundation of his profession; train him in the use of at least one other foreign language, that he may be able to follow his collaborators in other countries; stimulate in him the desire to investigate, observe and experiment on his own initiative; do not cheapen his profession by turning it over to the politician; and, above all, pay him according to his deserts and give him the facilities and authority to carry out those measures that he knows to be essential to the safety and well being of those under him; and the last shadowy reason ever assigned for the establishment of the mining bureau must disappear.

ROYAL P. JARVIS.

Knoxville, Tenn., Jan. 8, 1910.

[Instead of the JOURNAL having failed to take any stand on the question referred to in the above communication, it has repeatedly, strongly and at length expressed its opinion. That opinion, as most of our readers are aware, has been to a large extent on the same lines as discussed by our correspondent, who has evidently failed to see our previous editorials upon this subject.—EDITOR.]

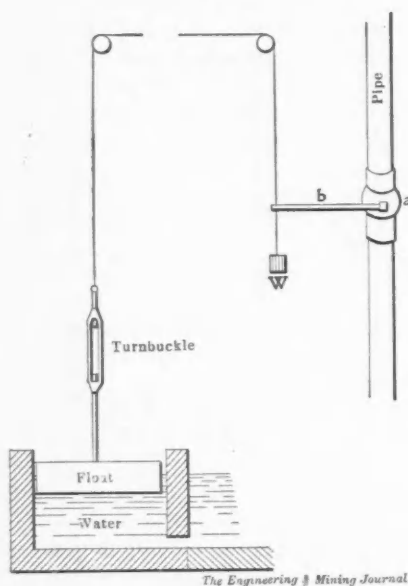
DETAILS OF PRACTICAL MINING

NOTES OF INTEREST TO OPERATORS OF SMALL AS WELL AS LARGE MINES
THINGS THAT HAVE TO BE DONE IN EVERY DAY MINING

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Automatic Water Cut-off

In many milling operations it is necessary to keep a constant head of water. This may be accomplished by means of the apparatus shown in the accompanying illustration. The one here described



AUTOMATIC WATER CUT-OFF

is used in connection with a Hancock jig. The valve *a* in the water pipe is operated by an arm *b* about 20 in. long. To this lever is attached a cord which runs over pulleys to a float where the water is to be kept at a constant head. The rope is adjusted to the proper length as nearly as possible, and the final adjustment is made by means of a turnbuckle near the float. Also attached to the arm *b* is a weight *w*. As the water lifts the float the weight *w* pulls the arm down and this closes the valve. When the flow of water is too small the float sinks and the arm *b* opens the valve. The control of the flow of the water is entirely automatic.

Steel Shaft Sets on the Mesabi Range

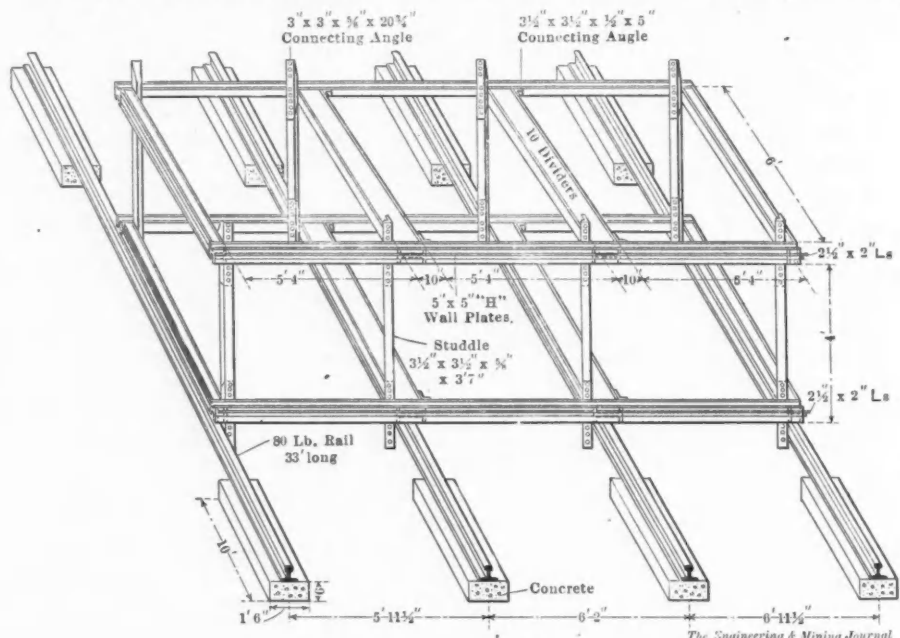
BY F. A. KENNEDY*

The accompanying sketch shows the steel sets used by the Shenango Furnace Company in its Whiteside mine near Buhl, Minnesota. The inside measurements are 6 ft. x 18 ft., 8 in. The wall plates and end pieces are 5-in. H's weighing 18.7 lb. per ft., with 10-in. I-beams for dividers. The sets are spaced 4 ft. center to center and held together with eight 3½-in. angle studdles. All angles are shop riveted to the end pieces and dividers so that little time is lost in putting a set in place. Machine bolts were used

tion was encountered. Bearers like the last named were put in every 60 ft. down the shaft. This is found to be a satisfactory method of sinking.

Tube Mill Linings

Rand tube-mill operators have not as yet settled on the best type of lining, and some curious theories have been advanced in discussions of the several types. It is generally admitted elsewhere that the object should be to prevent the slipping of the pebbles on the lining as much as possible. Yet some operators in Africa advocate the silex because "by far the greater bulk of the grinding done in a tube mill is done on the liner of the tube,"



STEEL SHAFT SETS AT WHITESIDE MINE

with nut locks for bolting the steel together. The shaft was wet and it took but 2 hours' labor at the most to put a set in place. Norway plank were used as slats and are held in place by means of small 2x½x2-in. angles shop riveted to the back of all wall plates and end pieces. Later on it is proposed to replace the slats by concrete.

The sketch shows how the first bearing set was placed under the second set. The rails are 33 ft. long, resting on concrete foundations each 10 ft. in length. Another bearing set of 12-in. x 14-ft. I-beams was put in when the rock forma-

a statement which might meet with vigorous denial from operators in Mexico. Based on the quoted statement, the ribbed lining is not so effective, and the fact that more power is required to run a mill with ribbed lining is considered a disadvantage. The average life of the silex lining which is used on the Rand is given as 85 days, and the time required for replacing a lining as 24 hours. The ribbed lining lasts from 20 to 24 months. The "peg" lining, made by embedding short lengths of drill steel or round iron in a shell lining of cement, is being experimented with, though few mines could provide the necessary quantity of short drill steel without buying it specially.

*Chief engineer, the Shenango Furnace Company, Chisholm, Minn.

Furnace Charging Car

At the Fundicion smeltery of the Pacific Smelting and Mining Company in southern Sonora, Mex., a device in connection with a furnace-charging car is used, which is of interest and of utility under some conditions. Instead of having a car into which the charge was weighed from the various scales, a side-door, gable-bottom car is used, which is divided vertically into four or five compartments. Each compartment is numbered to correspond with a number on the bins containing respectively the ore, flux, lime and fuel. The metallurgist makes up the charge by calculation and places a mark by means of a peg in a series of holes on the side of each one

Removable Foundation Bolts

Foundation bolts are usually built permanently into the concrete or masonry, but this is bad practice especially in large and expensive foundations, for if the thread on a bolt happens to get stripped or the bolt is injured in any other way, it is an expensive and tedious job to tear out the foundation around the bolt sufficiently to allow of putting in a new one. The accompanying sketch shows a method of putting in the bolts, so that they can be removed at any time without disturbing the foundation at all.

Howard M. Nichols describes this method in *Power* Nov. 23, 1909, as follows: A cast-iron pipe is built into the foundation where each bolt goes through,

dig the dirt away from the bottom of the foundation and thus obtain sufficient room for the work.

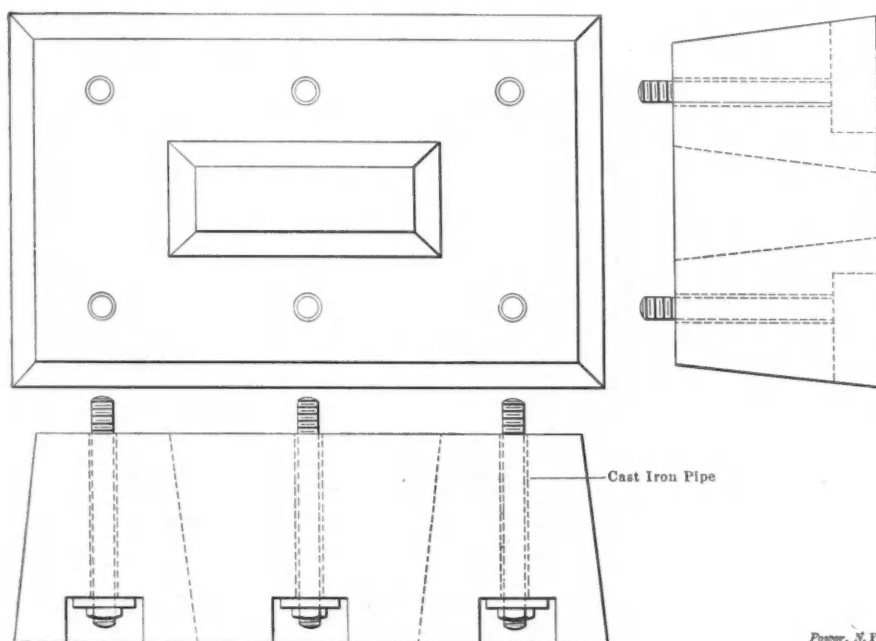
Use of High Explosives in Mining

At a great many mines and quarries a prejudice exists among the miners against the use of dynamite of a higher grade than 40 per cent., this regardless of the hardness of the rock mined. In mining a moderately hard and easily fractured material 40 per cent. explosive gives good results, and has the advantage of being comparatively safe. However, even 40 per cent. dynamite is not a material with which one can afford to be careless. If a man is careful and uses ordinary intelligence in handling dynamite, 60, 80 or even 95 per cent. blasting gelatin can be handled with a reasonable degree of security. In many of the mines of the West where ore with a hard, tough quartz gangue is encountered, 60 and even 80 per cent. dynamite has proven far more satisfactory than the lower grade material, giving a broken product which can be easily shoveled in the cars without previous cobbing or popping. In several instances, nitro-glycerin and even gun-cotton have been used with success.

The pyrrhotite ore encountered in the mines of the Tennessee Copper Company is extremely hard and tough in many places. In the Eureka open-cut mine, where the ore is very tough and cemented with a blue quartz gangue, the company is experimenting with 95 per cent. blasting gelatin manufactured by the Du Pont Powder Company. As far as can be seen from the work already done, this explosive is giving excellent results. Owing to the prejudice of the miners against high explosives, it was introduced at first without telling the miners of its grade. Now, however, after the men have become accustomed to using it, they feel no more fear of it, seemingly, than they do of the ordinary 40 or 60 per cent. grade dynamite. It has been found to shatter the rock much more than a lower grade powder, and about eight or nine sticks of the gelatin will do as much work or break down as much rock as nearly double that many sticks of 40 per cent. dynamite.

In the underground workings, objection is made to the use of gelatin even where the men are not afraid of it, as they find it will not stay in upcast holes. In tamping it acts like so much rubber and unless some paper is stuffed in the mouth of the hole is very liable to roll out, this of course being a source of danger.

The decision as to the grade of dynamite to be used should depend upon the results obtained. In a locality where labor is expensive it may be more economic to use high-grade explosive on account of the labor saved from blocking or sledging the ore shot down, whereas,



REMOVABLE FOUNDATION BOLTS

of the respective compartments, corresponding to the amount of load from each bin which must be taken to make up the calculated charge. The native workman pushes the car, which in this case is on the surface level, under the bins and takes a load up to the respective pegs. The whole car is then moved over a discharge way in the track and is dumped into the elevator boot by opening the side door. It is claimed that this device is fool-proof, an item of some importance in connection with the use of Mexican labor, and also that the arrangement of having the charge delivered in a succession of streams from the side doors results in a desirable and suitable mixture of the charge in the boot of the elevator, from which it is elevated to the charging floor. The device was tried and found to work successfully at the plant above mentioned.

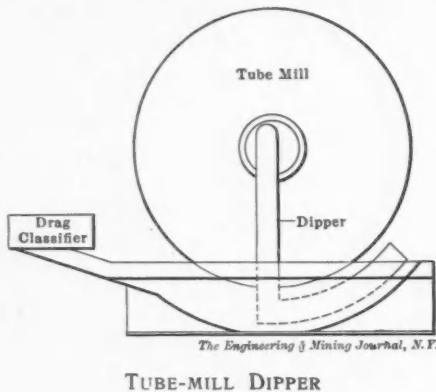
and this pipe terminates in a square pocket near the bottom of the foundation. At the top of this pocket a cast-iron plate is built into the concrete. The bolts are held in place by large cast-iron washers and nuts.

When putting a bolt in place, the nut and washer are laid on a plank and pushed into the pocket, so that they come directly under the iron pipe. The washer should be considerably larger in diameter than the bolt so that it can be easily centered. The nut and washer are pressed up hard against the top of the pocket and held there with the plank while the bolt is screwed in from above. A short piece of plank is left permanently in the pocket to keep the bolt from dropping to the bottom of the pocket while placing the bed of the machine on the foundation. This method of building a foundation is applicable only where it is possible to

with similar ore, in another region where cheap labor is available it may prove cheaper to use a lower grade of dynamite and cob the large blocks of ore by hand. Each superintendent must determine the grade of explosive best adapted to his conditions. However, with the present tendency toward labor saving, the usefulness of the higher explosives is bound to become more and more recognized.

Tube Mill Dipper

A tube-mill dipper can be easily and inexpensively made of pipe and attached to the mill where it is desired to elevate the feed only a few feet, as in returning oversize. As will be seen from the accompanying sketch, there are no wearing parts, the dipper being flanged rigidly to the tube-mill trunnion. Where a drag classifier is used, this dipper will replace plunger or spiral pumps with their possible leaks and delays. This attachment



is particularly serviceable with short tube mills, for which the dipper can be made short. With this attachment the classifier can be set to receive both the original pulp stream from stamps or Chile mills and the tube-mill discharge, returning the total sand content to the tube mill. By making the dipper of sufficient diameter the regular addition of pebbles can be made through it, with the supposed advantage of having the larger pebbles at the head end of the mill.

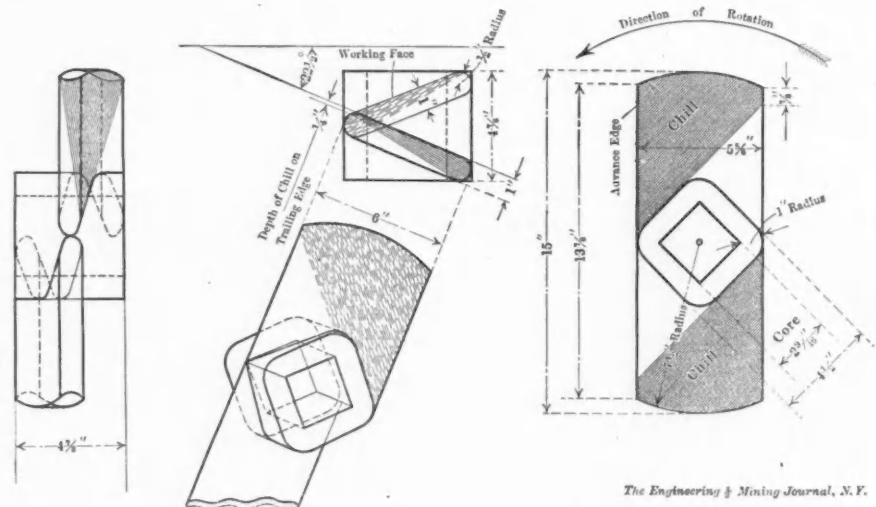
Inclined Shafts at Joplin

The inclined shaft is something of an innovation in the Joplin district and at present there are not more than one-half dozen in operation. The Yellow Dog mine has three, the Herald one, and the Temagami one. All are operated on a 45-deg. slope to a vertical depth of 175 to 250 ft. At the Temagami mine the 45-deg. slope is 300 ft. long with an additional inclined surface haul of 350 ft. A 9x7 hoisting engine is used for the mine slope. The ore is brought to the surface in 1½-ton self-dumping skips, which dump into a car of like ca-

capacity, the latter being drawn to the mill by a small hoisting engine. The surface car makes a round trip in the same time as does the skip in the shaft.

The Herald mine hoists in 2-ton self-dumping skips which are run by a 50-h.p. electric hoist. The loading arrangement is rather unusual in the Joplin district. The inclined shaft extends beneath the orebody. From the working level a winze was sunk to the inclined shaft. The bottom of this winze is timbered so as to form a bin, with a gate which delivers the ore direct to the skip. The winze being 40 ft. deep forms a bin which will hold a supply of ore so that the hoist can be run to its full capacity when in use. The top of the winze is covered with railroad rails which form a grating and upon which all the coarse ore is broken by hand to about 6-in. size.

At the Yellow Dog mine are two in-



SKETCH OF CHILLED FEEDER TOOTH

clined shafts in which link-belt bucket conveyers were installed, one of which, however, was taken out recently. The one in use is fed by an automatic feeder at the bottom of the shaft. This conveyor has been in use a number of years. A new inclined shaft has been opened recently, and this will be equipped with 2-ton skips run in balance. A 75-h.p. electric hoisting engine has been installed which, by the way, is one of the largest hoists in the district. The total haul is 600 ft., 250 ft. of which is 45-deg. slope, and the remainder on the surface is 7 per cent. At this mine a large acreage has been taken out in the sheet-ground deposits 6 to 10 ft. thick. There yet remains a floor to be taken up which is about 15 ft. thick. Most of this will be handled in the new inclined shaft. The shaft extends deep enough to provide for a loading bin below the working level so that the cars will be dumped into the bin, and from here the ore will be delivered by gravity to the skip, the same as at the Herald mine.

Pug Mill for Mixing Furnace Charge

A pug mill is used with very satisfactory results for mixing the charge for the oxide furnaces of the Bertha Mineral Company, at Austinville, Va. The pug mill is fed by a 16-in. screw conveyor and delivers its product upon a 12-in. conveyer belt carrying the mixed charge to a bin. Formerly, much trouble was experienced from the excessive wear of the teeth of the screw conveyor. Soft iron and angle iron were tried, but lasted only about six weeks. Finally, it was decided to try chilled-iron teeth constructed as shown in the accompanying drawing. The shaded areas in the drawing indicate the depth of chilling required. These teeth give very satisfactory results, and after nine months' continuous usage, are still in fair condition. The teeth are

twisted through an angle of 22 degrees, so that each tooth in one revolution carries the material to a point where the next tooth will pass it forward.

On the pug mill, cast-iron holders are used with 2½x½-in. tool-steel blades, these having been found to give good service for this purpose. The mill used at Austinville will handle about 70 tons of material (pulverized coal, Bertha mud ore and flux) in 24 hours, and it is in great measure due to the homogeneous mixture obtained through using the pug mill that excellent results are obtained with the oxide furnaces.

The usual small mill in Rhodesia consists of 3, 5 or 10 gravity stamps, or a Tremain steam stamp or a Huntington mill, and is usually "designed," built and operated by the two or three men owning the mine. No attempt is made to treat the slime produced in milling beyond what can be leached with the sand.

Porcupine Lake Region, Ontario

The Porcupine gold fever continues unabated, and judging from present indications it is safe to assume that the first part of this year will witness a rush into this district. Daily between 50 and 100 men are going in and this number will shortly be largely increased. The Temiskaming & North Ontario Railway Commission, recognizing the importance of the discoveries, sent its engineer to make a report. The report was exceedingly favorable and the engineer believes the district to be one of great promise. Free gold occurs in the townships of Tisdale, Whitney, Shaw and Carmen, and daily

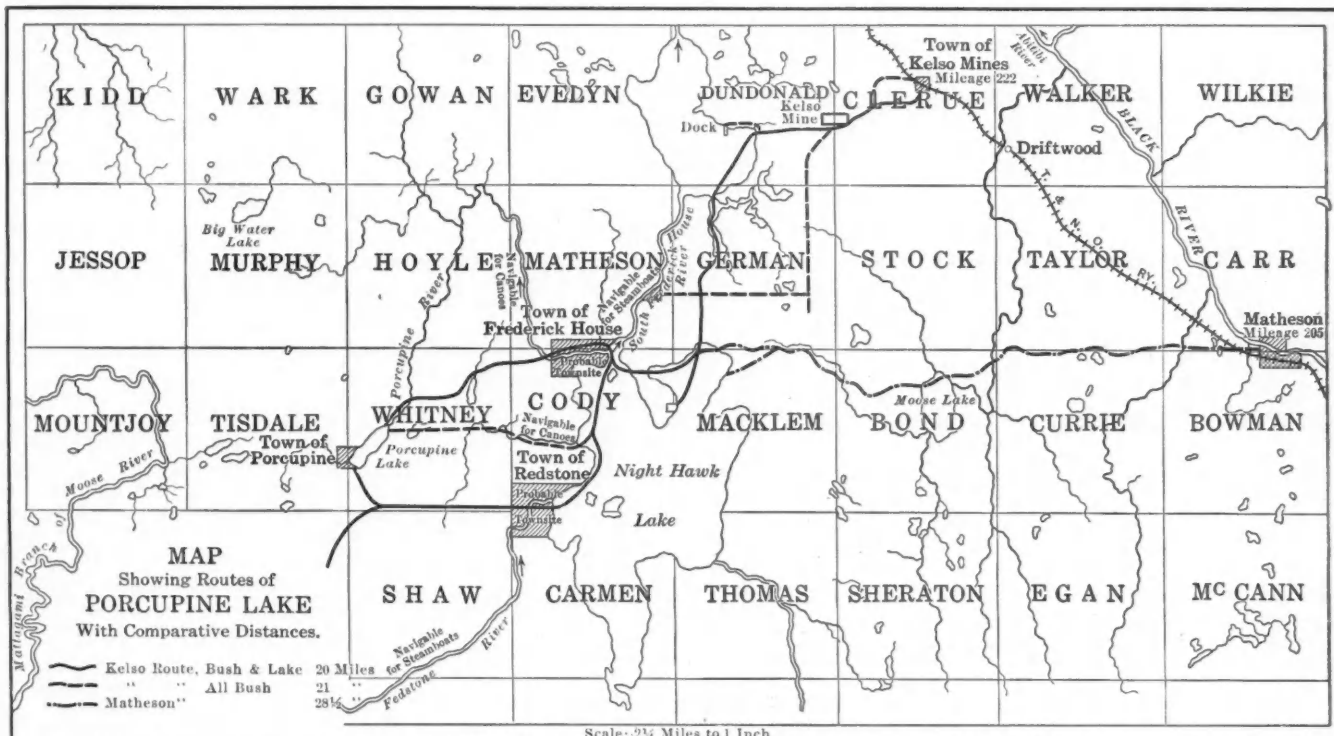
has returned to Toronto after ten days' inspection of the Porcupine lake gold area, and states that there are 2000 claims staked out. The entire townships of Whitney and Tisdale, excepting lots reserved for location by veterans, have been staked, as well as two-thirds of Shaw township, south of Whitney, and two-thirds of a township as yet unnamed, south of Tisdale. Several hundred prospectors are doing development work on claims staked during the last two months.

The road from Mileage 222 (Kelso mines) on the Temiskaming & Northern

to being shorter than the road from Matheson. He states that there are fine water powers easily accessible for the development of the mines. The accompanying map, from one compiled by G. W. Dixon, of Cobalt, show the three routes to the district most used at present.

SOME OPINIONS

Henry Timmins, part owner of the Hollinger property where gold was first discovered in large quantities, states that surface indications are wonderful, but much development must be done before



MAP SHOWING ROUTES TO PORCUPINE LAKE REGION, ONTARIO

The Engineering & Mining Journal

discoveries are being made that are widening the mineral-bearing areas. The veins vary in width from a few inches to 70 ft. and several have been traced for 500 ft. and over.

The new roads into the district are rapidly being put in shape and regular stages will soon be running. Arrangements have already been made to put steamers on the lakes next spring, and the necessary capital to carry out this work has been obtained. Some of the claims are held at a high figure and options have been given, ranging in price up to \$350,000. Bilsky & Jacobs, of Montreal, recently purchased three claims, and it is said that about \$100,000 was paid for them.

J. F. Whitson, assistant chief of the Provincial Surveys Branch of Ontario,

Ontario was finished recently and road houses along the way have been built. The O'Brien Mining Company and the New York Syndicate have each 25 men at work developing properties near the southwest corner of Tisdale. One of these properties, which is being managed by Mr. Timmins, of the La Rose, has a quartz dike passing through it, which has been stripped for 1300 ft. and in many places shows a width of 20 ft. Free-milling gold appears across the whole dike in many places. There are about 50 people starting to build stores and stopping places at the northeast end of Porcupine lake. People are coming in at the rate of about 50 per day. Mr. Whitson strongly favors the route from Mileage No. 222 as an all-land road, level and in good condition, in addition

it can be predicted that it will be a great gold-mining region. On the Hollinger, where 35 men are at work, a depth of 15 ft. has been reached, at which indications are equally good as those at the surface.

A. M. Hay, president of the Trethewey, says that while recent discoveries of free gold on some large quartz dikes are remarkable, it must not be forgotten that the occurrence of these dikes has been known for several years and claims staked four or five years ago in the district; and that a large number of the dikes under previous examinations failed to show a gold content of importance.

The present rush is largely a stampede, not of prospectors so much as claim-stakers, who are tying up the really valuable locations without reference to bona fide discoveries in the hope of selling out

at high figures, Ninety per cent. of the staking now being done in low-lying country without rock-outcropping, cannot show any indications to warrant location under the Mining Act.

Frank Cochrane, Ontario Minister of Lands, Mines and Forests, sounds a note of warning to investors. He states that information has reached the department that "snow-shoe staking" is going on extensively in the district, and that it is only fair to warn the public against buying claims staked out when the whole country is covered deeply with snow, as there can be no certainty of the *bona fide* discovery of minerals under such circumstances. Under the Mining Act the department has power to appoint inspectors to inspect claims for discovery, and it may possibly be necessary to consider whether inspectors should not be appointed for the purpose of stopping this claim staking if it is persisted in. The best safeguard for investors is to examine the claims offered them or have them examined by competent and trustworthy engineers.

W. J. Loring, of the British firm of Bewick Moreing & Co., who do an extensive mining business in various countries, has returned from an examination of the Porcupine district. While favorably impressed with its possibilities, he stated that he had made no investments for his firm because of the unreasonable prices asked by the holders of undeveloped properties. He thought that, while with careful handling profitable mines would be opened up, it was doubtful whether any English firm would care to make investments until more development work had been done or more reasonable terms could be obtained.

North Butte Copper Company

SPECIAL CORRESPONDENCE

As I have previously reported to the JOURNAL, the North Butte company is mining on a number of levels including the 1000, 1200, 1600, 1800, 2000 and 2200. On the 1000, 1200 and 1600 the orebodies have not changed very much in the last year, so far as I am able to learn, but the ore on these levels is nearly worked out.

On the 1800 level the ore was a distinct disappointment, both in the Edith May and the Jessie veins and was considerably inferior to what was found in these veins at the 1600. The 2000 and 2200 levels are the most recent developments, and at these depths the showing appears to be still poorer.

Although the output of the company has been kept up pretty well, having averaged 1500 tons per day, I understand that a large part of this has been second-class ore, whereas some three years

ago, the major part of the tonnage was first-class. By first-class ore is understood that which runs 6 per cent. copper, or over.

On the 2200 level of the Edith May vein, which is the vein nearest the company's main shaft, there has been nothing but barren ground opened for over a month, to the best of my knowledge. On the 2000 level of the Edith May vein the ore is all second-class, i.e., under 6 per cent. copper.

On the 2200 level of the Jessie vein drifts are being run both east and west from the crosscut. In the East drift the ground is barren; in the west drift second-class ore is being mined. On the 2000-ft. level the Jessie vein has not been cut at all as yet. Just why this has not been done I do not know, but it is possible that the company wishes to open the 2200-ft. level first, to determine to what depth the richness of the vein extends.

It is the general impression in Butte that the company has been in no position to pay the dividends which it has recently done, since the amount of ore now in sight or blocked out has not justified them. It is extremely difficult to get any authentic information in regard to the company. The management refuses to make any statement whatever, except as to the amount of the production which it can't very well keep secret.

The Guggenheim Coppers

James Phillips, Jr., president of the Nevada Consolidated, last week issued to the stockholders of that company a letter advising them to refuse to go into the proposed consolidation with the Utah Copper Company. He states that the action of the Utah directors was taken only a few days after a meeting at which strong protests were made against any merger upon the proposed terms, and at which meeting Messrs. Smith, Kuhn and himself secured the unconditional promise of the Messrs. Guggenheim that no steps would be taken toward any merger until the figures submitted by the Guggenheim engineers had first been verified by metallurgical experts, and the accounts of the Utah company had been submitted to the examination of auditors. All agreed that there was not any mining necessity nor any economic reason for a union of the two properties at this time. Messrs. Smith, Kuhn and Phillips urged that the Utah company should pay for its own necessities, and that the Nevada company should not be called upon to pay more than the real value of Boston Consolidated, which the Utah company was forced to buy owing to the physical conditions at the Utah mine.

According to Mr. Phillips, the chief engineer for Messrs. Guggenheim re-

fused to certify to the correctness of the estimates as to quantity of ore and extraction until he had a week's time or more to go over the data. Assurance was given that sufficient time would be allowed for examination and certification before any further action would be taken and also that auditors would examine the financial conditions of both the Utah and Boston companies. The said engineer stated at this time that it would take from 2½ to three years to put the Utah company in a position to increase its production. The Guggenheims declared definitely that unless their statements as to dividend earnings could be substantiated, the deal would fall through and no further attempt would be made to combine the Nevada with the Bingham properties. Without the fulfilment of any one of these promises, the Utah offer was forced through the Utah board on the following Friday on the terms presented.

Mr. Phillips follows with a great deal of data to show that the Nevada stockholders would be unfairly treated in the proposed trade.

Replying to the above letter, Daniel Guggenheim issued a statement to the effect that when negotiations looking toward an exchange of the stock of these companies was begun, the whole matter was referred to eminent engineers for a thorough examination. These gentlemen finally united in a recommendation that an exchange on the basis of one share of Utah for 2¼ of Nevada was just and fair. The same conclusion was reached by the Guggenheims themselves, who also were of the opinion that the exchange would result in benefit to both companies. They insisted that all the stockholders of the Nevada company should have exactly the same terms and rights as was given to them (the Guggenheims) and that they should have ample time to make up their minds about the exchange.

Mr. Guggenheim's reply does not throw any great illumination upon the matter. On the street it has been compared to Doctor Cook's promises to tell "later on" how he discovered the north pole.

In the meanwhile, new trouble in the consolidation project has arisen through injunction proceedings against the directors of the Utah Copper Company, inaugurated by Col. E. A. Wall, which prevented that company from increasing its capital stock as contemplated on Jan. 17. Curiously, Colonel Wall objects to the proposed plans on the ground that the Utah Copper Company will suffer by taking in Nevada Consolidated. The claims of Colonel Wall in this action, however, do not harmonize very well with those that he has previously made respecting the Utah Copper Company in his suit for damages against it for illegal extraction of ore from a piece of his own property.

The Safety of Judicious Mining Investments

Good Mining Stocks Yield Better Returns Than Industrials;
Methods of Valuing; Information Company Reports Should Contain

BY J. PARKE CHANNING*

If we omit the comparatively insignificant industry of fishing, one can say without contradiction that the wealth of the world is derived from the two industries of agriculture and mining. Raw material, combined with man's labor and brains, produces wealth. Even in its final analysis the wealth produced by the farmer is really mineral wealth, because the growing crops absorb the potash and phosphorus from the ground and combine them with the carbon of the air to make those products which enter into our daily life and existence. Still, the broad division of agriculture and mining can with propriety be established.

Unfortunately, the general idea of mining among most of the public is confined to glowing prospectuses with requests to purchase stock at from 1c. to \$1 per share with the promise that these shares will be advanced after three o'clock on next Thursday to double the price at which they are offered to the investor. Few realize, for example, that the mineral production of the United States for the year 1907 was valued at over \$2,000,000,000; that of this, pig iron was valued at \$530,000,000, silver at \$37,000,000, gold at \$90,000,000, copper \$177,000,000, the total of the metallic products being \$900,000,000; the other \$1,000,000,000 being the nonmetallic products, that is, fuel, structural material, abrasives, chemical materials, pigments, and miscellaneous items, such as asphalt and sand for glass manufacture. The total of these products has grown from \$1,000,000,000 in 1899 to more than \$2,000,000,000 in 1910.

If one takes into consideration how much wealth mining adds to the world he can realize the importance of the industry. A mining operation if properly conducted adds to the world all its wealth, and takes nothing from the pockets of either the producer or the consumer. A legitimate mining venture properly financed does not produce the paper dollar which so often represents supposed good will in an industrial concern. I say properly conducted because, unfortunately, so many mining investments have been conceived in iniquity and born in sin. One cannot expect, however, that mining investments can ever be as prosaic as other investments because of the fact that there is forever present the great chance of unexpectedly uncovering

a large or a rich body of ore in the particular mine under consideration. John Hays Hammond, in his lecture a few weeks ago, gave some good advice as to what to beware of in a mining investment; follow his advice, but remember that there is no type of investment which one can so successfully make as a mine, if he takes the proper precautions.

RETURNS ON MINING INVESTMENTS

The return on mining investments, as on everything else, depends upon the risk which one runs. The greater the risk the larger the returns. The risks which one undertakes in mining are the same to a certain extent that one undertakes in agriculture. The first is the varying price of the product, that is, the varying price at which coal, iron, copper, silver, lead or spelter sells, and to this one may even add gold because, although gold is considered as a standard of value, there is no doubt that an overproduction of gold tends toward increasing prices, hence an increased cost for its production. The second risk that one runs is the sudden end of the particular ore deposit which is being exploited by the property under consideration. The chance of a coal seam being terminated underground is, of course, a minimum, the main thing being to secure sufficient acreage at the time of starting out. The price of coal does not vary much because it is really the cost of production that determines its selling value. Roughly, one may state that the profit on the production of soft coal is 10 to 15c. per ton, and on anthracite coal it is probably 50c. per ton. It would be easy for a moderately careful student of the annual reports of coal companies to determine from the figures given what his probable rate of interest would be upon his investment.

In iron mining the risk is somewhat greater, and was markedly so until the discovery of the Mesabi iron range in Minnesota, with its enormous deposits of ore now largely controlled by the United States Steel Corporation. It is quite likely that there is on the Mesabi range 1,250,000,000 tons of ore actually developed by shafts and drill holes, while on the older ranges, which have been operated for the last 40 years, it is doubtful if there is actually visible more than 250,000,000 tons of ore. It is the ownership of these large tonnages of iron ore, and of the large acreage of coking coal that puts the United States Steel Corporation in such a strong basic position. I doubt even if the corporation itself in its

early day recognized the extreme value of this raw material.

J. R. Finlay, in his admirable book,¹ has estimated the cost of laying a ton of pig iron down in New York at about \$12.50 per ton. If we can assume the selling price of pig iron to be \$16.50 per ton, this would mean a profit of \$4 per ton, or upon the ordinary run of a Lake Superior iron ore a profit of from \$1.50 to \$2 per ton.

The next group in which the risk is greater, and consequently the returns are greater, are copper mines. The average cost of producing copper is probably 10c. per lb., the lower minimum being 7½c. and the upper maximum being 12½c. The price of copper has fluctuated all the way from 11 to 25c., but one may figure the average price at from 14 to 15c. per lb. For a great number of years, with the possible exception of such regular deposits as those of Lake Superior, there was a great deal of risk in copper mining, and there were violent fluctuations in the price of copper stocks. The geology of the deposits was not understood, the particular phenomenon of what is known as secondary enrichment of the ores in the upper levels having been unrecognized. It frequently happened that when a mine got below this level, large sums of money were expended in looking for the downward extension of this rich zone, which existed only in the imagination of the manager. Within the last six or seven years attention has been turned toward the so-called disseminated orebodies, and there are now half a dozen mines in this country, the proved tonnages of which are calculated in the millions. This type of property requires a large initial investment and considerable time for development and equipment, but when in proper shape is one of the best mining investments which is known.

Gold mining is always in a category by itself, and, as you know, from the addresses of Mr. Hammond and Mr. Paish, is a favorite source of investment by the English public. The tendency now in gold mining is toward the development and exploitation of low-grade deposits in which a relatively large tonnage is exposed and available for treatment.

Silver mining at present is rather more speculative than any other, not only on account of the tremendous fall in the value of the product in the last 20 years and the fact that a large proportion of

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NOTE—An address delivered before the Finance Forum of New York, Jan. 19, 1910.

¹"Cost of Mining." McGraw-Hill Book Company.

the world's consumption is produced as a byproduct in the production of other metals, but also from the fact that the strictly silver mines themselves are always more or less irregular. As showing this, last week there was a certain silver-mining stock selling at \$9 per share, which was paying a dividend of \$2 per year, and a certain copper stock selling at \$90 per share, which was paying a similar \$2 annual dividend. In each case the question of security and probable life were the governing factors in determining the price, though I think that, as often happens, the public had gone to the extreme in each case, and that one mine was selling at too low a valuation, and the other too high. However, one can say that without doubt a stock paying \$2 per year and selling at \$9 was doing so for the reason that it was a question as to how long it would last. In this connection it is probably not improper for me to say that the mineral reserves of the world and of this country are not unlimited, and that I strongly believe in the conservation of our metal resources as much as I do in conserving our timber resources. In fact, even more so, for a forest, if cut over, can by intelligent management be made to produce another crop in from 50 to 100 years, but a mine from which all the ore is extracted is valueless, and, as we know, it takes countless ages to produce merchantable mineral.

DEVELOPMENT OF MINES

I presume that in an address to a body of this kind it is unnecessary to explain the steps that take place in the development of a mine. In a country like the United States, where the natural resources are not all known, there is a class of man who devotes himself to tramping over the western country looking at the various outcrops of rocks. As a rule, good ore does not stick up above the surface, but on the contrary it is never so deep seated as the ordinary promoter would have one believe. The prospector in scouring the country finds on some hill a red, iron-stained showing, and he sinks a small pit on it, and at one or two feet from the surface he finds some mineral. He then stakes this out and records a claim in the nearest land office, and to some people he now has a mine. Such, however, is far from the case; it requires time and money to determine actually whether the vein or deposit has value. Either he or the person to whom he sells his claim for a small consideration spends money upon it, and it may or may not turn out to contain a deposit of ore sufficiently valuable to be exploited. If the showing turns out well, the property finally increases in value until there is enough ore in sight to warrant the erection of a plant. This money is furnished, and the property is now in a development

stage. When this is completed it then comes to a productive stage, and from now on its actual intrinsic value starts to decrease, for it is but a logical deduction from the statement that ore reserves do not grow in a mine. It would be wrong, though, to assume that the possibilities of the mine decrease, because during the time of extraction of ore, development work may be continually opening up new bodies, and it is the possibility of discovering new and larger tonnages of ore that make for the speculative end of the property. However, in all mining investments the fact of this ultimate extraction of the ore should be taken into consideration. Roughly speaking, in a property that can show it has 30 years' ore ahead, the question of ultimate extraction need not be of great importance at the moment.

VALUATION OF MINES

In determining the value of a mine we have two main points to consider. First, the net profit in the amount of ore which the mine has developed; second, the possibilities of finding other ore-bodies. If the successful mining investor will study mining conditions and mining reports in the same way that Mr. Harriman and Mr. Hawley in their early days studied railroad reports, and will get an idea of values and disregard prices, he will find that a mining investment gives him one of the best returns for his money that he can find. As Mr. Hammond has pointed out, unless you are actually in the mining business yourself, or unless you make a thorough investigation of it, it is not for you to invest your money in prospects. The investment of money in prospects must be left to those people who are distinctly in the mining business, or to development companies who can afford to have nine failures out of ten. It is for them to weed out those properties which in their early stages appear upon the surface as good as the successful one, but will not stand the test of the shaft or the drill. If you do wish to go into a prospect, it is better for you to do it by owning stock in one of the companies which does development work. Do not, if you are a merchant, be led away by the alluring tale of your friend who has gone West, and met in the hotel the prospector coming in with his burros and his samples of ore from his new strike. The chances are 10 to 1, yes, 100 to 1, that neither he, nor your friend, nor yourself, will ever get anything out of it.

VALUING MINING STOCKS

When you come to study a mining investment look first to the question of the amount of ore which the property has developed, and the profit per year which it can make. Take into consideration the fact that if no ore were found during the five, 10 or 20 years that the mine will

exist, that not only has it got to pay you back interest on your money, but it also has to return to you your capital. In this connection I call your attention to the two tables which are published by Herbert C. Hoover in his book² on mining, published last year. In this book the first table shows the present value of an annual dividend over... years at... per cent., and replacing capital by reinvestment of an annual sum at 4 per cent. If, for example, you have a mine which can pay \$1 per share per year for 20 years, and you feel that you will be satisfied with 6 per cent. interest on your money, then you can afford to pay \$10.68 for each share of stock, and out of the \$1 which you receive you may consider 64c. as interest on your investment, and 36c. as return of capital, the idea being that if this 36c. were invested at 4 per cent. and each year you compounded your interest, at the end of 20 years it would produce for you your \$10.68 original investment. I say to you that when you buy your mining stock take this into consideration, but do not let it be the whole point governing your investment. You must, from the reports of the engineers or the manager, take into consideration the possibilities of finding further ore. If these possibilities are good, and if at the same time you consider that the price of the metal which this mine produces is going to advance, then you certainly have a good investment. One can get into few businesses and get 6 per cent. return on his money, have absolute security, and at the same time a chance of having the business and the profits double or treble as is often the case with good mining investments.

If you wish to look at it from the other point of view, the third table in Mr. Hoover's book will give you some idea of the means of determining value.

J. H. Curle, of London, who is considered one of the best valuers of gold mines, considered that any gold mine that looked good in the bottom, and that had 60 per cent. of its selling value in sight, was a good investment. However, I do not wish you to be carried away by the idea that ore in sight is of necessity the most important thing in a mine. Four or five years ago, when the question of ore in sight was receiving a great deal of attention by engineers, I wrote an article asking the question, if it might not be possible for a mine to have too much ore in sight. I advanced reasons for this which I think were correct, the principal thing being that often the cost of development is wasted inasmuch as the ground caves in, or, as has happened in some of the Lake Superior mines, the interest on the money, where development has been done for 20 years ahead, has added a large factor to the cost of operating. Tonnage of ore is the main thing

²"Principles of Mining," McGraw-Hill Book Company.

to be considered, if it is actually developed or simply prospective.

AMORTIZATION

Referring to the question of return of capital in mining industries, there are those who advocate that the companies themselves should start a fund to repay the capital to the stockholders. I do not approve of this for two reasons: First, the selling price of the stock may vary greatly at different periods in the mine's history, and hence the sum to be returned may vary accordingly; and, second, I believe that as this capital belongs to the stockholders it is for them to decide how and when they shall reinvest it. I believe that after accumulating a sufficient cash surplus to allow for the purchase of adjoining properties or radical changes in the reduction works, that all money should be repaid to the stockholders from year to year. In this connection it is unnecessary for me or you to look too closely into the par value of a mining stock. You should know the total number of shares and the selling price.

For the reasons as given above, the value of the shares at different periods may be a fraction of or a multiple of the original par value. The par value of the 100,000 shares of Calumet & Hecla, for example, is \$25, of which, if my memory serves me right, only \$10 was ever paid in, and still this stock is today selling on the Exchange at over \$600 a share, and the laws of the State of Massachusetts permit trust funds of widows and orphans to be invested in it. The question might naturally arise, if one followed the theory of the mining company establishing its own amortization fund, as to whether this fund should be on a basis of the \$10 paid in, the \$25 par value, the \$600 present selling price or the \$1000 price at which the stock sold some time prior to 1907.

WHAT COMPANY REPORTS SHOULD CONTAIN

The Mining and Metallurgical Society of America, of which I have the honor of being a member, last year discussed the question of what information a mining company should give its stockholders each year, and it was finally decided that such a report should embody the following things:

(1) Details as to capitalization of the company; the number and classes of shares outstanding at date of the report; the respective rights of these shares; the number of shares remaining in the treasury; any options or contracts on such shares; any bonded indebtedness.

(2) A brief review of the past history of the property, the work accomplished and the results obtained, with tabulated statement of expenditures and receipts from the beginning, marketable products made each year, and the sums received

from the sale of same, the annual net earnings and the disposition made of such earnings.

(3) A similar review, but in more detail, of the work of the year, with statements of the assets and liabilities, receipts and disbursements, cost sheet and other information as to work accomplished and results obtained.

(4) A statement of ore reserves at the date of the report, compared with the reserves of the previous year, with an estimate, by competent authority, of the probable life of the mine.

When mining companies give this information then one will be able to get a good idea of the value of a property, and you, who are studying finance, can by a little training be able to as carefully analyze mining reports as you can railroad reports. It is, of course, necessary that you know the men connected with the particular mining company under discussion, and the reputation of the engineer who makes the statement contained in the last paragraph, and I take it that his reputation in this case would be subject to perhaps the same scrutiny you might give to the statements of the chairman of the board of directors of a railroad company, who was predicting the growth of traffic on his line. In both cases the personal equation has largely to do with the matter. The day has long since gone by when, because a man was a noble duke, a merchant prince, a triumphant admiral or a well-known general, that his name as president or director in a mining company had any weight with the public. The question is, is the engineer who makes the annual report of such standing in his profession that his statements may be relied upon.

The capacity to be a successful mining man is one born and innate and cannot of necessity be derived simply by a course in a mining school. Great engineers, like great inventors, are born, and are not made, though no one will be less ready to decry technical training for an engineer, or a lawyer, or a physician than myself. This, however, is not everything, as former President Eliot, of Harvard, said: "Many a \$2000 education has been wasted on a \$2 boy."

Suppose that the millenium arrives, and that every mining company makes full and complete reports, you yourself in your investigation of these reports must ever be on the lookout for fallacious bookkeeping. Mr. Finlay in his book previously referred to has made two cost figures, one of which he calls "dividend cost" and the other "selling cost." The dividend cost is the one which subtracted from the annual profit gives the balance which is left for dividends. The selling cost is the one which takes into consideration the total ultimate investment including capital. By this I mean to warn you that in a mine, which is a business in a

constant state of liquidation, it must at the time of the extinction of the mine have made enough money to have paid its regular running expenses, and also returned its capital, in addition to paying dividends. This is often neglected in mining companies, and you will find every year a certain amount is charged to construction and from that into the capital account, which, in reality, should have gone into the operating expense account. Keep this clearly before you, and remember that nothing should go against capital account but that which increases the productivity of the property, or I might even go still further and say, which tends toward shortening the time of extraction of the ore. See that everything that is spent for replacement goes into operating costs.

OREBODIES HAVE REAL VALUE

In conclusion, I wish to reiterate that if one uses the same care in investing in mining stocks that one does in investing in railroad stocks, that his return will in the long run be greater. I would, from my point of view, put mining stocks far above industrials for the reason that industrials, to a large extent, depend upon processes that may over night be rendered worthless. Who does not recall the fact that in the early days aluminum was made by what is known as the sodium process, and the minimum price at which the then new metal could be sold at a profit was 60c. per lb. The discovery of the Cowles electrolytic method made it possible to sell aluminum at a profit at 30c. per lb., and over night the property of the Hall company, which produced aluminum by the sodium process, fell from several million pounds sterling to nothing. Here was a purely industrial concern whose property was rendered worthless by a new discovery. Had the dominant factor in the production of aluminum been the ore from which it was produced, and had the Hall company control of the supply, or even part of it, this change in the process would not have affected them.

Today the value of the South African mines and our mines in the Black Hills is the gold in them; the value of our mines in Montana, Michigan, Utah, Nevada and Arizona is the copper within enormous orebodies; the value of the United States Steel Corporation is its iron ore and its coal; the value of the deposits in Leadville, Colo., and Missouri is the lead and silver that they contain, and no change in process can in any way affect their intrinsic basal values. Nothing can destroy the value of the anthracite lands in Pennsylvania, and nothing can destroy the value of the soft-coal lands near Pittsburg. If you take this into consideration you can realize that a good mine, like 640 acres in the valley of the Red River of the North, has a value that cannot be destroyed.

The Santa Gertrudis Mine, Pachuca, Mexico

Sold to Camp Bird, Ltd., for £922,000. Ore Reserves 526,283 Tons.
Estimated Net Profit £2 per Ton. Action of London Meeting

EXCERPTS OF ENGINEERS' REPORTS

The completion of the negotiations for the purchase of the Santa Gertrudis mine at Pachuca, Hidalgo, Mexico, is announced by the Camp Bird, Ltd., of London. In connection with the announcement are three interesting and important engineering documents, excerpts of which are presented herewith. The maps show in detail the vein widths and the estimated contents throughout, but owing to the necessary reduction it was not possible to reproduce these. The three reports are noteworthy for their directness and simplicity and for their unmistakable definiteness. In all the reports the money values are in United States currency, unless otherwise indicated, and the weights are in metric tons of 2204.6 pounds.

REPORT OF EDWIN E. CHASE

An excerpt of the report of Edwin E. Chase, of Denver, under date of Sept. 7, 1909, follows:

"The property embraces over 600 acres, and is situated at an altitude of 8000 ft., the distance from Mexico City being but 62 miles by rail so that all kinds of supplies are readily obtainable; water shipments can be made via Veracruz, the mine having therefore the advantage of both rail and water connections.

GEOLOGY

"The Santa Gertrudis vein is a large persistent fissure in andesite (eruptive) rock. Its course is generally east and west, with a dip of about 65 deg. to the south. The dip of the vein, combined with the irregular shaped surface holdings, results in a peculiar underground boundary line, which, however, is to the advantage of the Santa Gertrudis as compared to the Barron and the La Blanca. The vein filling is a friable, easily broken quartz, carrying clean argentite (silver sulphide) as the precious metal, with some gold. There are practically no base metals whatever, such as iron, copper, lead or zinc, with the ore, and for this reason the ordinary cyanide treatment results in a high percentage of recovery. The vein varies from 10 to 30 ft. in width, and has been developed, more or less, for over a mile in length. The main oreshoot averages about 2500 ft. in length, extending from Santa Gertrudis through the well known properties of the Barron and La Blanca to the east.

"Within the Santa Gertrudis territory and to the west of the main oreshoot is a smaller orebody, separated from the main shoot by from 300 to 600 ft. of ground which is either barren, or in some

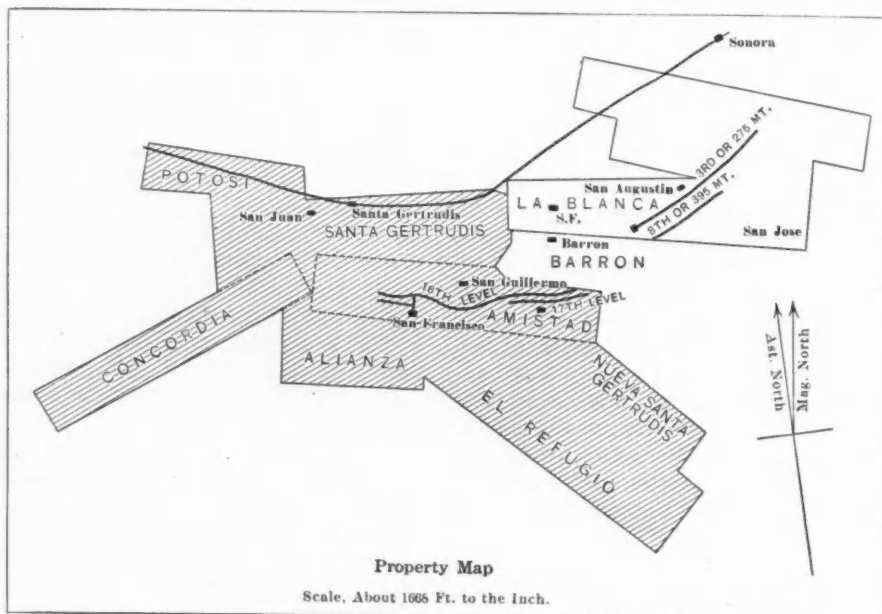
places, carrying low-grade ore. The indications are that these two shoots are approaching each other in depth, and doubtless will, at several hundred feet greater depth, merge into one continuous orebody. The main vein is characterized by having various branches and spurs from the hanging-wall side of the vein and these are all more or less productive. Two branches especially are very marked, and are designated on the various maps as south branch Nos. 1 and 2. The ore carries 5 grams gold to each 1000 grams silver to the ton, and this percentage is almost invariably constant.

SAMPLING

"In the course of my investigations I

by him gave an average of 1560 grams or \$29.58 per metric ton, this sampling being also in continuous 10-ft. sections. My own sampling followed, selecting cuts half-way between the first line of sampling, so that the vein has now been sampled on the 17th level at every 5-ft. interval and practically all samples covering 5 ft. or less in length. My sampling gave \$28.62 per ton. As near as I can ascertain the ore actually mined from this 17th level gave \$29.10 or an exact mean between the two samplings.

"The figures I shall use will be the lowest results, or my own sampling of \$28.62, figuring silver at 50c. per oz., and allowing 15 cu.ft. of ore in place per ton, or 20 cu.ft. in case of old fillings. I



MAP OF SANTA GERTRUDIS PROPERTY, PACHUCA, HIDALGO, MEXICO

took 1300 samples averaging 75 lb. each, or 44 tons in all. The sampling of this property was greatly facilitated by having the use of a power sampling mill for reducing crude ore samples to assay pulp. Wherever the vein was of great width, as for example 25 ft., then five samples of 5 ft. each were separately taken and assayed. On the 17th, or bottom level, the vein was sampled in this way at 10-ft. intervals along its course. As so much depends on the reliability of this 17th level sampling, I will further state that the following checks were had on its accuracy. The level was first sampled by another engineer under my general observation, with one of my own men as party to the work. The results as taken

might add that every conceivable precaution was taken to avoid any possible salting of the ore, and the assaying itself has been checked up by two other assayers.

"The sampling of the territory above the 16th level was somewhat difficult owing to the ground being inaccessible and to the mine custom of using stone-masonry arch work in the levels, so that samples could only be taken in many cases by cutting holes through the masonry. Then again the levels are not always driven on the vein so that in many cases negative results marked on the map means simply that country rock was really the material sampled, rather than vein matter or old fillings.

ORE RESERVES

"The Santa Gertrudis main oreshoot has extended from its highest point at the 4th level down to the 17th level, a distance of over 1000 ft., with about the same width and grade of ore all the way, as near as can be ascertained, for which reason, figuring ore downward is not as speculative as pertains to figuring more thoroughly blocked out ore in some mines of more erratic mineralization.

"Without going into full details of how I arrive at mining, milling, and other costs, I will state that I have used figures a little in excess of what I believe will eventually prevail after the mine is in full swing. In arriving at the net value of the ore I have made the following de-

"I have divided the ground longitudinally into three sections marked Blocks 1, 2 and 3, No. 1 being over the 17th level proper, No. 2 in the region of the winzes, and No. 3 embracing the west stope.

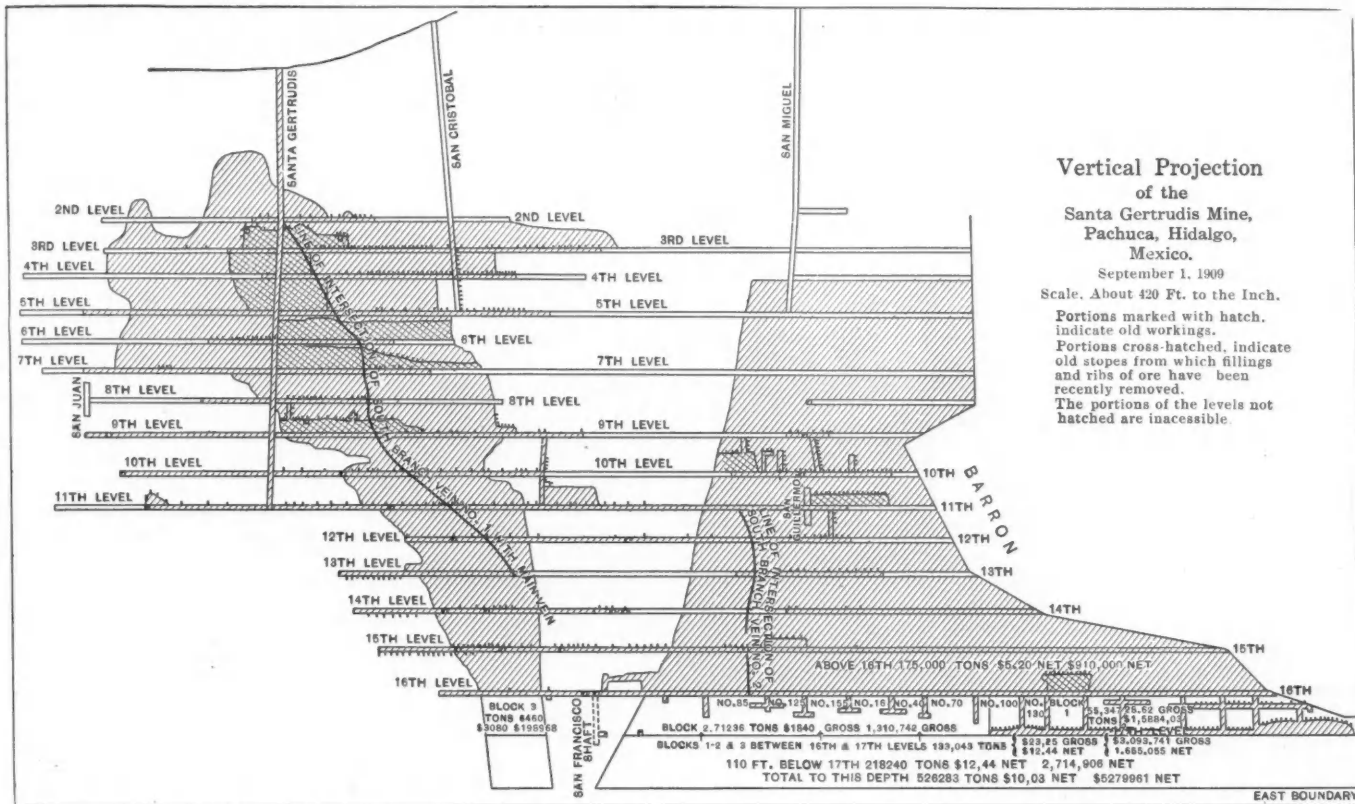
"The estimation of ore above the 16th level is based on whatever sampling was possible but takes into account, also, the general impressions which one gets in a two months' study of this property and the constancy with which valuable ribs of ore and fillings are encountered whenever the old workings are opened up. Also from the fact that since Jan. 1, 1908, the Santa Gertrudis Company has mined 30,000 tons of these old ribs and fills, keeping the grade up to 1100 gram or \$21 ore.

on the same basis as 17th level, there would be an additional return of 198,400 tons; \$12.44 net; \$2,468,096 total net."

SUMMARY AND CONCLUSIONS

"My conclusions then are that the ground between the 16th level down to a depth of 110 ft. below the 17th, together with what may be expected from the old workings, will yield a net profit of \$5,279,961 from 526,283 tons of ore and that each 100 ft. additional depth will yield 198,400 tons of \$2,468,096 net value, for a reasonable depth impossible to predict exactly.

"The remarkable length, width and value of this oreshoot combined with the fact that there are no faults or breaks



VERTICAL PROJECTION—SANTA GERTRUDIS MINE, PACHUCA, MEXICO

The Engineering & Mining Journal

ductions from the gross value, to wit: Cost of mining, development, pumping, transportation to mill, milling, metallurgical losses, Mexican taxes of every description amounting to seven per cent. of the recovery value, general expenses, royalties, English income tax, and in general every expense except amortization of the milling plant and any new equipment which may be required. Using the data given on the various maps and keeping in mind that measurements as to the length should be made on the irregular courses of the plan map, rather than on the contracted projection of a section map, I arrive at my estimate of ore reserves. All ore above the 17th level I will designate as 'positive ore,' while that below the 17th I will class as 'probable ore,' although the first 100 ft. of the latter I regard as practically certain, for reasons set forth later.

"For each succeeding 100 ft. in depth

whatever in the vein, that the pay shoot has already extended to over 1000 ft. depth from its starting point at the 4th level with no change in size or value as far as known; that the ore reserves counted upon are away below the line of water level which is the danger point in many mines; that there is nothing in the character of the inclosing country rock to indicate any probable change in the ore deposition and that no indications exist of any base metals appearing in the ore as greater depth is attained, all of these facts make me feel confident that the present grade and size of ore prevailing at the 17th level will extend many hundreds of feet below that level and I certainly think that the first 100 ft. estimated, can well be classed as 'positive ore.'

"I should have stated that my estimation of costs is based on an output of

160,000 tons per year, or about 530 tons per day for say 300 working days in the year. I have not gone into the matter of mine or mill equipment as that has been investigated by special engineers."

REPORT OF WILLIAM J. COX

Under date of Sept. 8, William J. Cox, of Ouray, Colo., in a supplemental report directed to the chairman of the Camp Bird, Ltd., transmits Mr. Chase's report with his own comment and indorsement. The following is an excerpt of his report:

"Enclosed herewith I hand you the report of Edwin E. Chase, of Denver, Colo., the engineer, whom, after mature deliberation, I considered to be the most suitable person to put in charge of the sampling and measuring of orebodies in the mine. This gentleman was assisted by a staff of expert samplers from the Camp Bird mine. The work involved a re-survey of the mine workings.

"The methods adopted for sampling, as set forth in the report by Mr. Chase, are in every respect most thorough, and are the result of a careful study of the conditions and character of the ore deposits. These methods included a system of check

I was ably assisted by Godfrey D. Dove-ton, of Spurr & Cox (Inc.), of New York. Exhaustive tests extending over a period of several weeks on bulk samples of ore were conducted by Mr. Dove-ton, and from the results of these were deduced the percentage saving of values, and the cost of treatment. These results are fully confirmed in cyanide practice on similar ores within both this district and the republic.

"In conclusion, based on my investigations, the money that it is proposed to invest in this business should be returned in a period of between three and four years from the starting of the cyanide mill, say one year hence, and until a point is reached where there is diminution of the size and value of the vein, each additional 100 ft. of depth should yield a net profit of nearly \$2,500,000."

RECENT DEVELOPMENTS

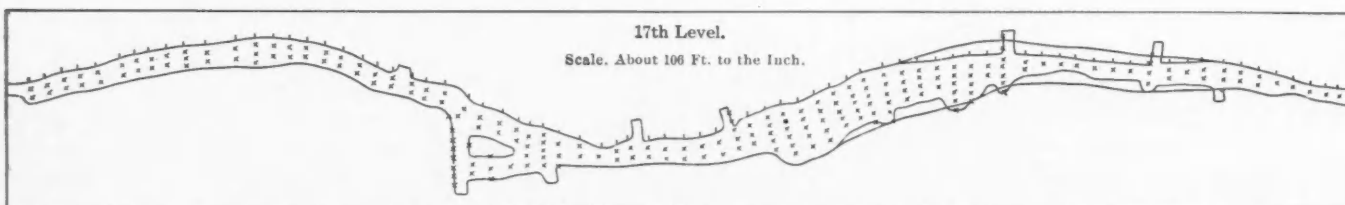
Under date of Dec. 20, 1909, R. J. Frecheville made a supplemental report to the chairman, treating of the new conditions developed since the other reports were made and giving his own definite, specific conclusions and figures. An ex-

\$401,200. This makes the corrected figures for the ore reserves at date of Messrs. Cox and Chase's reports to be as follows: Positive and probable ore down to 110 ft. below 17th level, 485,698 tons; net value, \$4,878,761.

The mines should be worked at the rate of from 150,000 to 160,000 tons of ore yearly, and an uptodate mill with cyanide plant erected for treating this output. On this basis the net profit should be in round figures £300,000 per annum. For the installation of the mill and other plant, and the development of the mine to a greater depth, a working capital of £150,000 should be provided."

CAMP BIRD LONDON MEETING

An extraordinary general meeting of the shareholders of Camp Bird, Ltd., was held at Salisbury house, for the purpose of considering the following resolutions: "(1) That the company hereby authorizes the formation of a separate company to acquire the option over the Santa Gertrudis mine and the subscription of the whole or any part of the capital of such company. (2) That the capital of the company be increased to £1-



The Engineering & Mining Journal

SANTA GERTRUDIS, 17TH LEVEL—790 FT. LONG; VEIN, 15.5 FT. THICK; ESTIMATED VALUE, \$26.62 PER METRIC TON

sampling which I instituted with the object of protection against possible errors, or tampering with samples.

"It will be observed that in casting the estimates on probable ore, the vein is assumed to maintain its size and value for an undeveloped depth of 110 ft. below the bottom level, and in view of the fact that the main orebody has been continuous in depth for approximately 1000 ft., has maintained its length and average width with apparently no falling off in values, and no change in the country rock inclosing the vein, I consider this assumption unquestionably justified, and am of opinion that the ore will continue for considerably greater depth than the distance assumed. I am further strengthened in this view by the opinion of Fred J. Pope, an economic geologist who has not only made an examination of the geology of the Santa Gertrudis vein, but quite recently finished an examination of other prominent veins in the district.

"In order to fully confirm the estimate of mine working costs the services of E. E. McIntyre, superintendent of mine operations of the Guanajuato Development Company, were employed. As to the costs of milling and extraction of metals,

cerpt of Mr. Frecheville's report is as follows:

"In your interests I was present during the examination made of the above company's property in July and August last by your manager, William J. Cox, and the staff of engineers that he selected to assist him, and can testify to the great care and thoroughness with which the investigations were conducted. Since the date of the reports of Messrs. Cox and Chase a great deal of development work has been done on the 17th level east of the San Francisco shaft, and this work has opened up the western fringe of the main oreshoot and enabled its western limit to be more accurately defined.

"Last month I sent my own engineers to the mines to investigate and sample the new development work, and having now received their reports find that it is necessary to recast the previous estimates and make a reduction of 23,115 tons of positive ore in the western portion of pay shoot above the 17th level, and 17,470 tons of probable ore in the corresponding ground below the 17th level, making together a reduction in the reserves of positive and probable ore of 40,585 tons of an estimated net amount of

350,000 by the creation of 250,000 additional shares of £1 each. A. M. Grenfell, chairman of the company, presided and said in part:

"The purchase price of the mine, excluding all commissions, is £922,000. The actual profits in sight, as certified by R. J. Frecheville amount to £924,000. The mine is bought as a going concern, and, in addition to the profit in sight, has a plant in operation; but this is not a new and up-to-date plant, and we are therefore arranging to provide £150,000 for working capital, which will be sufficient to equip a thoroughly uptodate mill and cyanide plant to treat 160,000 tons a year. Besides this there are two haciendas and other assets. Under the terms of purchase we have to complete the organization of a subsidiary company by Jan. 26, 1910.

"This company will be called the Santa Gertrudis Mine, Ltd., or some such name. It will have a capital of £1,275,000. As I have already told you, the purchase price of the mine is, approximately, £922,000 in cash, in addition to which we have to find a further £150,000 for working capital, making £1,072,000 which we have to subscribe in cash

Cyaniding at the Montgomery-Shoshone Mill

Sands, Slimes and Concentrates Cyanided Separately; Crushing by Rolls and Chilean Mills; No Amalgamation at This Nevada Mill

BY P. EDWIN VAN SAUN*

The mill of the Montgomery-Shoshone Mines Company is situated at Rhyolite, Nev., and has been in operation since the summer of 1907. It is treating about 6000 tons per month of that company's ores, which average \$10 to \$12 per ton and carry silver and gold in a ratio of about 12:1. The milling costs average about \$2.25 per ton. The ores occur both as oxides and sulphides in quartz stringers in the matrix of rhyolite.

The treatment is based in general on crushing to pass through 30-mesh screens and separating the sand and slime products, which are concentrated on tables and vanners respectively, the ratio of concentration being about 200:1. The crushed product is thus divided about equally into what is here termed, for convenience of reference, sands and slimes. These two products are then cyanided separately. The concentrates are ground in tube mills and separately cyanided by agitating, settling and decanting.

Since building, the mill has been modified to suit variations in the ores. The tests previous to designing the plant indicated that crushing to pass a 16-mesh screen would give most economical results in extraction and produce the proper balance between sands and slimes. Subsequent development of the mines, however, resulted in finding that the gold and silver were more finely divided than was evidenced at first, and that finer crushing was needed to effect quicker and closer extraction. For accomplishing this two 6-ft. chilean mills were installed to follow the 42x14-in. rolls previously in use.

By this means, as well as through corresponding changes in the slime department to meet the conditions, the saving has been maintained, under the management of John G. Kirchen and superintendence of E. M. Kirchen, at a combined average of about 90 per cent. for the sand and slime treatment, and from 97 to 99 per cent. in the treatment of the concentrates. It is therefore interesting to note the present mode of operation which has been evolved to treat successfully this class of ore.

CRUSHING AND CONCENTRATION

The ore is hoisted by cage from a vertical shaft and trammed to the mine-run bin. Referring to the accompanying flow diagram, it is then broken in a Blake crusher to pass a 2-in. ring and elevated to the mill-feed bin, from which a plunger feeder uniformly delivers it to the No. 1

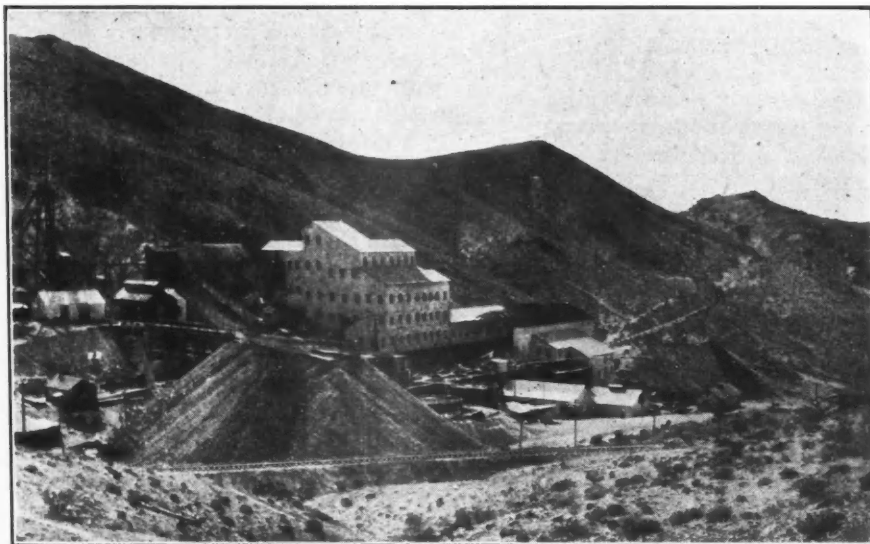
roughing roll, set to effect a reduction of about 4:1. From this roll it is elevated to revolving screen No. 1 with ½-in. perforations. The oversize returns to the same roll and the undersize passes to roll No. 2. From this roll it is elevated to two revolving screens, Nos. 3 and 4, fitted with 6-mesh cloth, water being added. The oversize product is returned to roll No. 2, and the through product flows to the dewatering screen. This screen is fitted with 30-mesh cloth and takes out that portion of the product already crushed sufficiently fine, and removes the surplus water.

From the dewatering screen the over-

ried out separately and will be referred to in sequence.

TREATMENT OF SAND TAILINGS

The tailings flow by gravity launder from the concentrating tables, and after being partially dewatered are discharged into either of two sand-collecting tanks, each of these tanks being provided with three roller-blind decanting gates, arranged so that the water will flow over continuously as the tanks are filled. The surplus water is elevated by centrifugal pump to two cone-bottom clarifying tanks, the clear overflow water from which is pumped to the main storage tank.



MONTGOMERY-SHOSHONE MILL, RHYOLITE, NEVADA

size is fed to roll No. 3, and elevated to two revolving screens, Nos. 4 and 5, fitted with 30-mesh cloth. The crushing is thus evenly divided between the rolls so as to effect the maximum reduction commensurate with their capacity at each stage. The oversize from screens Nos. 4 and 5 is delivered to two chilean mills. The through product and that crushed to pass 30 mesh in the chilean mills and the undersize from the dewatering screen, are delivered to two mechanical classifiers which separate the sands from the slime product.

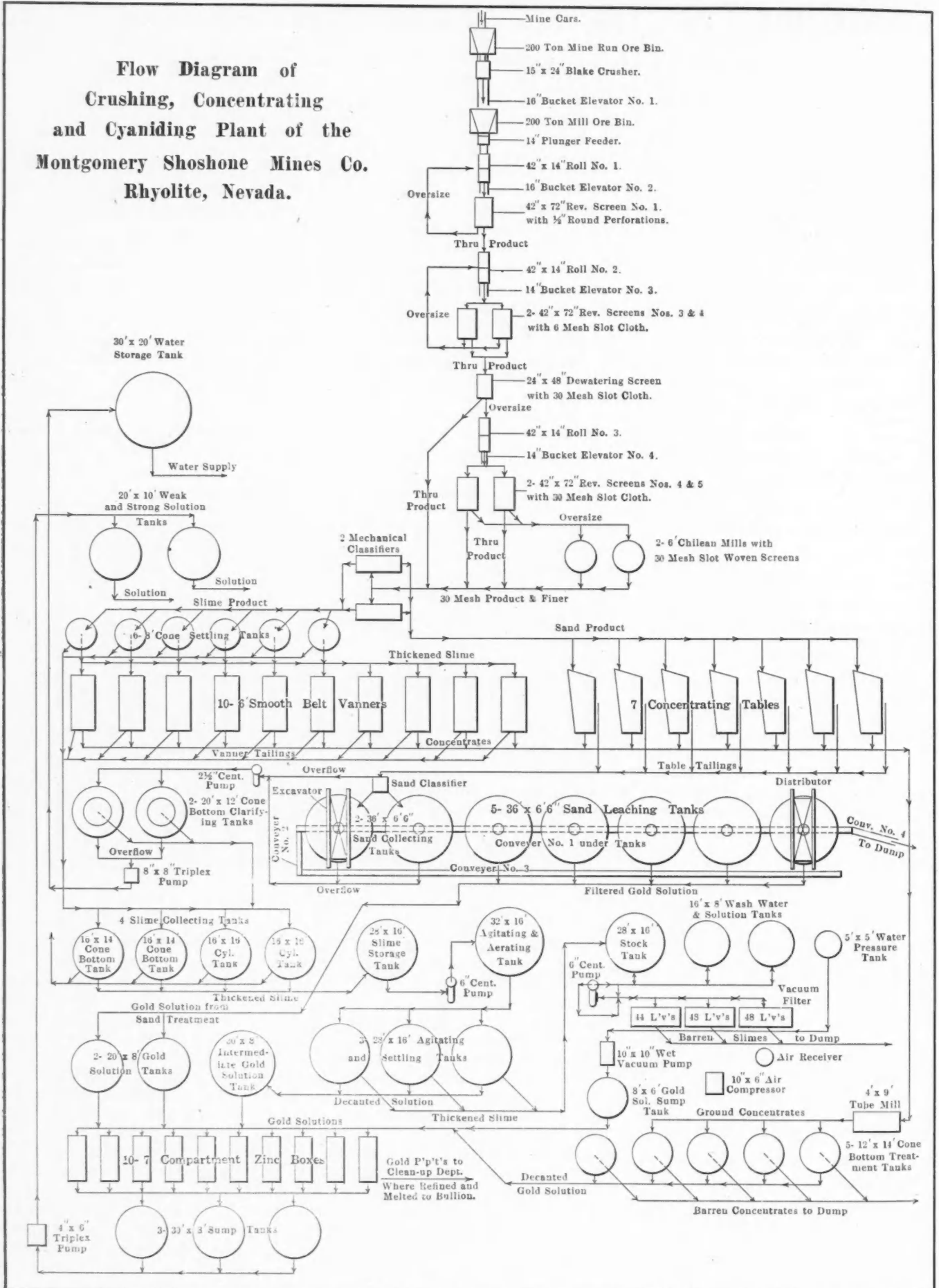
The sands are fed to seven concentrating tables. The slime product is delivered to six 8-ft. cone settling tanks, from which the thickened pulp is concentrated on ten 6-ft. smooth-belt vanners. The treatment of the sand tailings, slime tailings and concentrates is car-

ried out separately and will be referred to in sequence. When either of the two collecting tanks is filled with sand the central plug gate is drawn and the contents discharged by means of the excavator to belt conveyer No. 1, running beneath the tanks. This is run in such direction as to discharge to the incline-belt conveyer, No. 2, which raises and delivers the sand to conveyer No. 3, placed alongside and above the tanks and discharging by use of a tripper to any of the five leaching tanks. The product is spread uniformly over the area of the tank by a distributor.

The intervals of treatment of the sand product are as follows: Time of filling each collecting tank, 2 days; time of treatment with strong solution in the five leaching tanks, per tank, 4 to 5 days; time of treatment with weak solution, per tank, 6 days; total time of treatment, per tank, 10 to 11 days. No water wash is

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**Flow Diagram of
Crushing, Concentrating
and Cyaniding Plant of the
Montgomery Shoshone Mines Co.
Rhyolite, Nevada.**



The Engineering & Mining Journal

FLOW SHEET, MONTGOMERY-SHOSHONE MILL, RHYOLITE, NEVADA

used. The five leaching tanks are fitted with the usual construction of filter bottom, consisting of canvas and cocoa-matting laid over a false bottom of wooden grilling. The filtered solutions flow by gravity to the two gold-solution tanks.

When the treatment in any of the leaching tanks is completed the central plug gate is withdrawn and the excavator discharges the contents on belt conveyer No. 1. This conveyer is now run in the opposite direction from that in the previously described operation of filling, so that in this case it delivers the leached sand to conveyer No. 4 and thence to the dump.

SLIME TREATMENT

The slimes from the vanner tailings overflow from the six cone settling tanks, and the settled products from the two clarifying tanks are together delivered to four slime-collecting tanks from which the thickened product is delivered to the slime-storage tank. From this it is transferred by a 6-in. centrifugal pump to the agitating and aerating tank where it is agitated for four hours with solution consisting of 1.2 to 1.4 lb. sodium cyanide, 0.2 lb. lead acetate and 6 lb. lime per ton of ore. After agitation the product is transferred to the three agitating and settling tanks where it is settled for 15 hours and decanted to the gold-solution tank as indicated. The slime is then diluted with weak solution, agitated and transferred to the filter-stock tank.

The vacuum-filter plant consists of 140 filter leaves, each 5x10 ft., in three tanks. It is operated in the usual manner by the return system with solution and water washes. The intervals of operation are as given in an accompanying table.

TIME REQUIRED IN FILTER PLANT.

| | |
|---|----------|
| Filling | 15 min. |
| Forming 1 1/2-in. cake..... | 40 min. |
| Pumping slime product back into stock tank..... | 30 min. |
| Filling and washing with solution | 115 min. |
| Returning solution..... | 30 min. |
| Filling with wash water..... | 10 min. |
| Washing and dropping cake.... | 25 min. |

Total time per cycle of operation 4 hrs. 25 min.

The gold solution withdrawn by the vacuum pump is delivered to the sump tank provided for it.

TREATMENT OF CONCENTRATES

The table and vanner concentrates resulting from a 24-hour run are charged together into the 4x9-ft. closed-type tube mill, where they are ground continuously for about 20 hours in cyanide solution. The ground product is then run into any one of the five cone-bottom treatment tanks. In each of these tanks the product is given about 28 days' treatment by agitating with compressed air, settling and decanting, and replacement with fresh solution. That is to say, the material is agitated for about four hours and allowed to settle; the clear solution is then decanted; other solution is again added,

and agitated for about six hours, when the slime is allowed to settle and the clear solution again decanted. This is done continuously until the tank is needed for a fresh charge of concentrates. After final washing and decanting the barren product is run to dump without further treatment.

The extraction by this method of treatment of the concentrates is stated to be close to 99 per cent. The consumption of cyanide does not seem to be excessive—in fact, since this method has been employed the total consumption is not noticeably greater than before the concentrates were cyanided.

The decanted gold solution resulting from the treatment of concentrates, and those from the vacuum filter, decantation of slime-settling tanks and sand treatment are run through ten 7-compartment zinc-shaving precipitating boxes from which the solution is delivered to any of three sump tanks. From the latter it is pumped to either of the two weak and strong solution tanks, and is there re-standardized.

The cleanup is made by the usual method, employing an acid tank for dissolving fine zinc, washing, filtering in gravity sand filter and drying in cast-iron muffles. The precipitate is mechanically mixed with the necessary fluxes and melted to bullion in an oil-fired tilting furnace. An ozone generator has been installed to facilitate extraction, but as yet insufficient data have been obtained to afford trustworthy conclusions.

Buena Fe Mining Company

The Buena Fe Mining Company has acquired a number of *antiguas* situated on what is known as the Cerro del Torro, about midway between the cities of San Luis Potosi and Aguascalientes, Mexico. The distance by wagon road to San Luis Potosi, the shipping point, is about 65 miles. Running across the mountain is a series of parallel veins, striking approximately east and west. The country rocks are shale and slate, capped by rhyolite, a flow subsequent to the formation of the veins.

Mining was going on here before the earliest time recalled by the oldest inhabitants. The ore was sorted and shipped on burros to Guanajuato, a distance of about 100 miles, where it was treated by the patio process. About 20 years ago the Salvador mine was operated by a Mexican company. When water level was reached a tunnel 500 m. long was driven past the vein, and from that a vertical shaft was sunk by means of a *malacate* and by that means the water level was lowered about 60 ft., but then an increased flow checked further progress, though 120 horses were at one time in use, in 30-min. shifts, four at a time. After all the available high-grade ore had been shipped, operations ceased.

The present company has completed a 2-compartment incline shaft on the vein and has installed a 40-h.p. gasolene hoist (Fairbanks Morse) driving an Ingersoll Rand compressor on the surface. The shaft is now timbered to a depth of 300 ft., and still has 50 ft. to go to reach water level. Work was started in August, 1909, and the hoist was installed Nov. 1. A 60-h.p., 3-cylinder, Westinghouse producer-gas engine is now being installed to drive an electric generator, the current to drive electric track pumps (Goulds); with these, in connection with bailing skip, no trouble in handling water is anticipated.

The vein matter is quartz, the silver occurring in the form of *plata verde* or horn silver. The shale on either side of the quartz often contains silver for a distance of several feet. According to F. B. Irvine, the general manager, the ore left by the ancients carries 20 to 150 oz. silver per ton and \$1 to \$5 gold. The extraction by cyanide process should approach 90 per cent. A 25-ton cyanide plant is to be installed.

Two other of the old mines are now in process of development; the Concepcion, about one mile distant from the Salvador, is a larger and more promising vein, but has not been developed to a depth of more than 150 ft. A 25-h.p. gasolene hoist (Western) will operate the compressor. The Providencia mine, midway between the Salvador and Concepcion, outcrops higher up the mountain, and was profitably mined for many years through a series of irregular shafts and winzes along the vein, the ore being packed up "pigeon ladders" on the backs of peons. A Mexican company drove a tunnel a kilometer long to tap the vein at a depth of only 350 ft. and left some milling ore above tunnel level. A small gasolene hoist has just arrived here to sink from tunnel level.

The scanty supply and high price of wood and the prohibitive cost of coal hauled 65 miles from the railroad has prevented the use of steam for power or hoists, and the necessity of economy in fuel led to the selection of producer-gas engines for power purposes, to run on native charcoal laid down here at \$25 per metric ton. The fact that the hoists were scattered over a large area led to the selection of gasolene hoists, which are proving very economical. They are quite a rarity in this region where electric power is so widely available. Freight-ing costs are low, the minimum rates being \$5 and \$5.50 per ton respectively for hauls of 60 and 65 miles.

A 1500-h.p. producer-gas plant is to be installed here by Thomas R. Bremner, who installed the power plant at San Luis Potosi.

Exhaustive tests will be made to determine the relative economy and consumption of various kinds of fuels.

Le Roi Mine at Rossland, British Columbia

No Ore Now Being Mined; Three Veins Came Together at 900-ft. Level; Developing at 1650-ft. Level by Drives and Diamond Drills

BY ROY HUTCHINS ALLEN*

Less than two years ago the Le Roi mine was the largest and most important of the Rossland mines, and within the year it ranked only second among the large producers, being surpassed by the Center Star group, but in March the shipments of ore were stopped and all attention was directed toward prospecting and development work. By reason of its past importance and the chance that it may again attain its prestige, an account of the methods which were employed there are of interest.

MINE EQUIPMENT

The Le Roi property lies between the Center Star and Josie mines, and contains several of the veins found in those two properties. The ground was first opened by a shaft near the eastern edge of the property, but this has been abandoned for several years. The Le Roi shaft, which is near the center of the property, is a five-compartment shaft, 29x8 ft. in the clear, and 1650 ft. deep, and one manway 4½x6 ft. in the clear. The shaft was sunk on the Le Roi vein and has an inclination of 68 deg. 12½ min. toward the north. The wall plates are made of 10x10-in. timbers in two sections, one 16 ft. 9 in., the other 12 ft. 3 in., with plain butt joints. The end plates and one divider are 10x10 in. in section, the other three dividers are each of 8x10-in. timbers. Each hoisting compartment is fitted with heavy rails, the track being of 48-in. gage, and with guide timbers. Two of the compartments have 5-ton skips, while the other two have cages for handling men and supplies. The skips, as well as the cages, are provided with guide shoes and safety appliances.

The skips are operated in balance by an Allis-Chalmers first-motion corliss hoisting engine of 800 indicated horsepower, having cylinders each 24x60-in. stroke. The two cylindrical drums are 10 ft. in diameter and have a 5-ft. face, taking a 1¼-in. hoisting rope. The speed of hoisting is 2000 ft. per min. with an unbalanced load of five tons. A Vulcan Iron Works first-motion hoisting engine, set at an angle to the shaft, operates the two cages in balance. This hoist has cylinders 18x30 in., and two cylindrical drums 6 ft. in diameter with a 3-ft. face. The power used is compressed air at a pressure of 100 lb. All brakes, clutches and reversing gear are actuated by compressed air. The mine ore was

crushed in the headframe and dropped into one of three bins, each of which was discharged on a pan conveyer leading to the sorting house. The sorted ore was conveyed by an aerial tramway, 900 ft. long, to the railroad bins over 250 ft. below, and shipped to the company's smeltery at Northport.

STOPES TIMBERED AND FILLED

Three veins were worked by the company: the Le Roi, which was the principal vein, and the North and South veins. These were approximately parallel in strike, the strike being a little north of east, but they converged in depth and came together at the 900-ft. level. Below this point the vein was less regular, and though the value of the ore in gold

a set was placed and filled as much as possible as soon as there was room for it. Even with the heavy sets and filling the weight of the roof was often sufficient to crush the timbers before the stope could be exhausted. All stoping was carried on by the overhand method, Rand 3½-in. and Sullivan 2½-in. drills being used. The veins were worked out right up to the shaft, no pillars being left, and both sides of the shaft and also the stations at the levels are lined with cribs and bulkheading.

The mine chutes are 2 ft. 6 in. in width, and are for the most part provided with arc gates. End-dumping cars holding about one ton of ore were trammed by hand and the ore dumped into pockets at the shaft. These pockets each hold



LE ROI MINE, ROSSLAND, B. C.

still persisted a relatively larger amount of dead work was required to obtain the ore.

The stopes varied from 3 ft. to over 100 ft. in width, the widest stope being next the Josie dike. Where the vein was less than 15 ft. in width stulls were used in timbering. The ore was drawn off as fast as it was broken, and rows of stulls placed about 20 ft. apart. In only a few cases, and that where the vein was very narrow, was the ore allowed to accumulate in the stope.

Where the vein was over 15 ft. in width the stopes were timbered with heavy square sets, 10x10-in. and 12x12-in. timbers being used. The sets were kept right up to the roof when working, and

150 to 250 tons of ore and are provided with a single gate raised and lowered by compressed air.

DIAMOND DRILLS NOW WORKING

Development work is done by contract, the company furnishing all of the supplies. The drifts are run 6x8 ft. in the clear, and cost from \$15 to \$16 per foot. Such a drift has been advanced 100 ft. in ten days. The men work three 8-hour shifts, and usually blast a round of ten 5- to 6-ft. holes every 14 or 15 hours. Diamond drills are extensively used for prospecting, two being in use constantly, and four much of the time. The present method of prospecting the ground below the present mine workings is to drive

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crosscuts from the drift on the 1650-ft. level for 200 ft. into the hanging-wall. At the end of the crosscuts a chamber is cut sufficiently large for the convenient working of the diamond drills. The holes are put down diagonally so as to cut the planes of the veins at nearly right angles.

The mine workings are also connected with the surface by the Black Bear adit, at the third level. At the mouth of this adit are the power plant, shops and mill belonging to the company. The adit contains the air, steam and water pipes, and the electric cables. All supplies are received through it, and when the mill was running it was used as a transportation tunnel for the low-grade ore. The power plant has nine tubular boilers of 100 h.p. each, made by the Jenkes Machine Company, and two 150-h.p. Heine safety boilers. Four 6x4x7-in. duplex boiler-feed pumps supply water to them.

There are two Canadian Rand, cross-compound, corliss air compressors, one

with steam cylinders 22 and 40x48 in. and air cylinders 36 and 22x48 in.; the other having steam cylinders 22 and 40x48 in., and air cylinders 34 and 22x48 in. The capacities are respectively about 3000 and 2800 cu.ft. of free air per min. compressed to 100 lb. per sq.in. The last mentioned compressor is not used at the present time and the other is run at about half its capacity, the steam being furnished by the two Heine boilers at 120 lb. pressure. Condensers are attached to the low-pressure cylinders and a normal vacuum of 21 in. is obtained.

The various shops of the company are exceptionally well equipped and are fitted to do all ordinary repair work, as well as to make new cars, skips, cages, etc. The machine shop contains a power shears, a power punch, three lathes, a planer, a slotter, two drill-presses, a hack saw, and a large and small pipe threader and cutter. The blacksmith shop has six forges, and in addition to a full equip-

ment of the ordinary tools has a large power hammer and two Word Brothers No. 10 drill sharpeners. The carpenter shop contains circular saws, both cross-cut and rip saws, and a Denver Engineering Works Company timber-framing machine.

The company formerly employed from 400 to 800 men and shipped 500 to 700 tons of ore daily, 1000 tons frequently having been hoisted in a day. During the first few months of the present year, before work was stopped, the shipments had been cut down to less than 200 tons daily. In common with most of the other large operators of the district, the Le Roi company spent large sums of money in vain attempts to adapt theoretic processes to the treatment of its low-grade ores, and it is to be hoped that when shipments are resumed the resulting profits will be expended under more practical advice, or returned to the stockholders as dividends.

Stage Crushing

BY H. W. HARDINGE *

Referring to the excellent paper by W. A. Caldecott, entitled "The Development of Heavy Gravitation Stamps," read before the Institute of Mining and Metallurgy, of South Africa, I must say that it is full of material for consideration by metallurgists, for, if studied carefully by the experienced, unprejudiced millman, it will, I think, prove that the stamp should be "scrapped" rather than continued in its present waste of energy, even though it does perform some of the work desired. I have read and re-read the facts and figures stated, and am reminded of the conclusion I reached 15 years ago, that the stamp, as both a preliminary and final reduction medium, is economically wrong. This conclusion owing to press of professional work was relegated to my experimental scrap heap for a period of 10 years, after which time it again received consideration.

At the time mentioned, experiments were made in crushing by stamps through a ¼-in. mesh battery screen with a low issue, the product being passed to a Huntington mill for final grinding. The tonnage per h.p. was greatly increased, but when the repairs on the Huntington mill had been charged against this increased tonnage, it was ascertained that but little had been attained from an economic standpoint. From that time to the present, I have realized the great waste of energy, when endeavoring to crush a springy mass of sand and gravel by pounding it between the shoe and die of a stamp.

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STAMPS NOT ECONOMICAL

Mr. Caldecott by his thorough experiments has proved the truth of the fact that the efficiency of the stamp passes beyond the economic range when used for fine crushing. He also proves that the efficiency of the stamp is greater on the run-of-mine ore (as received from the crusher) than upon material after passing rolls set at ½ in., for from the latter size the division is rather through abrasion than by impact crushing. The energy of the stamp is wasted by springing, compression and readjustment of the particles among each other.

The stamp is a most efficient crusher of solid rock, a single drop of an ordinary 1000-lb. stamp being sufficient to crush a 2-in. cube, three-fourths of a pound, into a mass of pieces finer than ½-in. cubes, provided the die is clear at the time of the drop. The effect of subsequent drops upon this mass depends upon the thickness of the fine material between the shoe and the die. If the material is allowed to remain on the die the amount of divisional work performed from this point seems to be inverse to the amount of the fine cushioning material present. Mr. Caldecott explains that with a heavy stamp of 1337 lb., the capacity to finality, or through 30 mesh (about 90 per cent. through 60 mesh) is a little over 5 tons per day of 24 hours, or possibly 2 horsepower-tons per day.

In the case of the 2-in. cube crushed into a mass of coarse particles and sand, provided the die were cleared at each drop we would have at 100 drops per

min., 100×0.75 , or 75 lb. per min., equaling 54 tons per stamp per 24 hours, or something over 20 tons per horsepower-day, instead of a possible two tons per horsepower-day as at present. There is something radically wrong, either in mechanical construction or method, for the 2-in. cube would occupy less than 1/12 of the die area before crushing, and after crushing into a mass ½ in. in thickness, would still occupy less than ¼ of die area. If it is the intention of designers of machinery to utilize all of the area of a die, then we would have a possible capacity of something like 200 tons per stamp per 24 hours down to a ½-in. size. This capacity of 20 tons per horsepower-day on the coarse rock compares favorably with the capacity of a rock crusher for reducing material to ½-in. cubes and finer.

Both methods are effective, but not equally so, for the crusher ceases consumption of power, except bearing friction, when work is not performed, while in the case of the stamp, energy is consumed in lifting the stamp whether or not it does work upon material below its shoe. As the resistance to the crushing strain is dependent upon the condition of the mass, there is something radically wrong in using the same medium to crush the ½-in. cube, as was employed to crush the 2-in. cube (1:64). While we can perform effective work in driving a spike with a sledge-hammer, we would hardly consider this sledge-hammer for driving a tack! This, however, is exactly what we have done for years in using the stamp as both the initial and final crusher. In the instance of the

2-in. cube crushed to pass $\frac{1}{2}$ -in. mesh, we used our stamp on a single unit, reducing it so that its relation to the 2-in. cube is as 1:64. We have then gone on using the same power to carry it to the 60-mesh finality desired, where the relation of the original cube to the final reduction would be as 1:1,728,000.

USE OF COARSE STAMP-BATTERY SCREENS

A late experiment made at my suggestion along this line, covering a period during which several hundred tons of hard quartz were crushed, showed results given in the accompanying mesh test. The battery of 1000-lb. stamps was equipped with $\frac{1}{4}$ -in. mesh screens, and had a capacity of 10 tons per stamp, or about 4 tons per h.p. Formerly when crushing through 20-mesh screens, the capacity was $2\frac{1}{2}$ tons per stamp, or 1 ton per horsepower.

SCREEN ANALYSIS AFTER PASSING A 4-MESH BATTERY SCREEN.

| | Per Cent. |
|------------------------------------|-----------|
| Product remaining on 10 mesh..... | 13 |
| Product remaining on 20 mesh..... | 11 |
| Product remaining on 40 mesh..... | 17 |
| Product remaining on 60 mesh..... | 10 |
| Product remaining on 100 mesh..... | 17 |
| Product passing 100 mesh..... | 32 |

Note that 20-mesh and finer crushing was desired for amalgamation and concentration. In the above, 76 per cent. filled the requirement, leaving 24 per cent. to be finished by an auxiliary grinder at the rate of 4 tons per h.p. In other words, for less than 25 h.p. for 10 stamps, and 5 h.p. to finish the 20-mesh oversize, a total of 100 tons per day was the result, or an increase in crushing duty of about 300 per cent. by "step reduction."

DEFICIENCY BETWEEN POWER AND EFFECT

To overcome this great deficiency between power and effect, many fine-crushing machines have been devised. In most cases the change has been one of method rather than effect, in fact most of these reducing devices have reversed the condition needed, have increased rather than decreased the weights, e.g., the Chilean mill type (a larger sledgehammer on our tack—instead of using a number of smaller media). This latter idea is utilized in the pebble mill, where the multiplicity of grinding bodies is in proportion to the work desired. The transition, however, from the 1000-lb. stamp, to the 1-lb. pebble is out of all proportion, and should be supplemented by a "nail-hammer." The nail-hammer effect is possible of production through using a larger number of 10- to 15-lb. iron balls. In other words, the ordinary ball mill would be a reasonable solution were it not for screen interference. Balls of the size mentioned will readily reduce the $\frac{1}{2}$ -in. cube to 10 or 16 mesh, a pebble ("tack-hammer") reducing the

particles to a finality if properly employed.

A well understood principle among metallurgical engineers is that the ideal step reduction would be 1:4, which ideal it is impossible to attain; but the present applied relation of 1 to 1,728,000 (the relation of the 60-mesh particle to a 2-in. cube), or even 1 to 216,000 (the relation to a 1-in. cube) is certainly subject to modification through critical investigation and exhaustive tests such as those made by Mr. Caldecott. Instead, however, of remedying the difference as above suggested, 2000-lb. stamps are being tried out in South Africa.

In further corroboration of my opinion and the drift of modern ideas and methods, I note in an article in the *South African Min. Journ.* under date of Aug. 21, 1909, the mention of a recent use of 8-mesh screens (64 meshes to the sq.in.) on stamp batteries. As stated above, I used 4-mesh screens many years ago. The same article says: "Such schemes as stage grinding in tube mills is likely to affect the use of coarse screens on battery mortars." It is this awakening to present necessities, and the innovation of new methods that justifies the opinion that the stamp is coming to be an obsolete crushing device and the time is not far distant when the stamp will find a noiseless resting place in the scrap heap. The latest advices from South Africa indicate decided progress along this line, in the adoption of 3-mesh screens on heavy stamp batteries with a duty of 15 to 20 tons per stamp per 24 hours.

Antimony in 1909

The market for antimony during 1909 was very quiet. The only occurrence of any importance was the imposition by the Government of an additional duty of $\frac{3}{4}$ c. per lb., making a total duty of $1\frac{1}{2}$ c. per lb. This was done expressly to stimulate the production of American ores, but as this was not evidenced when antimony sold at 25c. per lb., it is not reasonable to suppose that the additional duty of $\frac{3}{4}$ c. will stimulate the production of ore. As a matter of fact there is not a pound of domestic ore being used today for antimony smelting. The low prices are due as of old to the heavy production in Australia and southern Europe and also to the large supply being furnished by China. Price of Cookson's antimony in January was $8\frac{1}{4}$ c. It declined to about 8c. in the early summer. On the prospect of an increase in duty it gradually advanced to $8\frac{7}{8}$ c., at which price it now stands.

The other brands closely followed the lead of Cookson's and U. S. is selling today at $7\frac{1}{2}$ @ $7\frac{3}{4}$ c. for delivery over the entire year 1910. Speculators are paying an

advance of $\frac{1}{4}$ @ $\frac{1}{2}$ c. per lb. on these prices. Without doubt the present low figures will decrease production and it would not be surprising to see a satisfactory advance in 1910 until prices reach a more remunerative level.

ANTIMONY OXIDE

A little over a year ago the Harshaw, Fuller & Goodwin Company, of Cleveland, O., works at Elyria, O., entered the field as a producer of antimony oxide. Heretofore all of that consumed in the United States was imported, chiefly from Germany and France. The Cleveland company after a long series of experiments succeeded in producing a commercial grade of oxide from the sulphide or needle antimony, using natural gas as fuel, and, during 1909, exploited the use of the oxide in the paint, ceramic, glass, and enameling trades to a great extent;

AVERAGE PRICES OF ANTIMONY. (IN CENTS PER POUND.)

| | 1908. | | | 1909. | | |
|--------------|------------|------------|-------------|------------|-------|-------------|
| | Cookson's. | Hallett's. | Ordinaries. | Cookson's. | U. S. | Ordinaries. |
| January.... | 9.344 | 9.031 | 8.344 | 8.202 | 8.075 | 7.675 |
| February.... | 9.266 | 9.016 | 8.406 | 8.125 | 8.000 | 7.531 |
| March..... | 9.000 | 8.650 | 7.988 | 8.047 | 7.843 | 7.500 |
| April..... | 8.969 | 8.672 | 8.297 | 8.250 | 8.031 | 7.718 |
| May..... | 8.875 | 8.625 | 8.250 | 8.387 | 8.150 | 7.887 |
| June..... | 8.734 | 8.531 | 8.094 | 8.312 | 8.062 | 7.893 |
| July..... | 8.594 | 8.375 | 8.125 | 8.375 | 8.150 | 7.875 |
| August..... | 8.313 | 8.150 | 8.850 | 8.525 | 8.125 | 7.625 |
| September... | 8.234 | 8.227 | 8.609 | 8.687 | 8.125 | 7.506 |
| October.... | 8.284 | 8.227 | 8.625 | 8.537 | 8.012 | 7.500 |
| November... | 8.640 | 8.075 | 7.775 | 8.437 | 7.937 | 7.687 |
| December... | 8.200 | 8.063 | 7.688 | 8.437 | 7.937 | 7.687 |
| Year..... | 8.704 | 8.419 | 8.004 | 8.360 | 8.015 | 7.466 |

especially in the first where its use is new in this country.

The position of domestic antimony oxide was further strengthened by the recent tariff revision by which the 25 per cent. *ad valorem* duty on imported material was increased by a specific duty of $1\frac{1}{2}$ c. per lb. The price quoted by the manufacturers of antimony oxide is 8c. per lb. in a large way, but it is understood that concessions are made when any danger from foreign competition is feared. The domestic product controls practically 90 per cent. of the United States market for this material.

Gas Engines in Rhodesia

Gas engines up to 300 h.p. are becoming quite common in Rhodesia. Coal is mined at Wankie but this is too far from the mines. Charcoal is substituted and is used in gas producers. It costs at the mine about \$12 per ton, which makes the cost of a h.p.-day about 18c. If the price of coal is taken as \$6 per ton the cost of steam power in the ordinary small milling plant would reach 50c. per h.p.-day.

Geological Notes on West Coast of Mexico

Ores Connected] with [the First Volcanic Period and Believed to Occur under the Rhyolite Capping; Classification of the Ore Deposits

B Y C . W . B O T S F O R D *

The following is a generalization made up from a great many notes taken along the West Coast in the states of Sonora (south of Guaymas), Sinaloa, western Chihuahua, Durango and Lower California, and is to some extent provisional and dependent on more detailed work.

Topographically, this section of Mexico may be divided into three general types of country; namely, the coastal plain, the foothills, and the sierra country, which areas except the sierras are wedge-shaped, getting narrower as they extend south.

The coastal plain from a maximum width of about 70 miles at Esperanza, narrows to 30 at Culiacan, 20 at Rosario, and finally disappears in the Territory of Tepic. This area is nearly level, few elevations of more than 200 ft. being noted. It was plainly the bottom of the Gulf of California until very recently. There are no rock exposures and no mining.

East of this coastal plain is the foothill

SUCCESSION OF THE FORMATION IN WEST COAST REGION.

| | |
|--|-------------|
| Coastal Plain..... | Recent |
| Rhyolites and Dacites..... | Miocene (?) |
| Granites } | Eocene |
| Diorites } | |
| Andesites } | Mesozoic |
| Shales and Limestones (mostly Cretaceous)..... | |
| Schists and Limestones } | (?) |
| Old Schists } | |
| Old Granites..... | Archean |

country. Beginning with small, detached, rounded, isolated hills rising from the plain, the country becomes more and more broken as the sierras are neared. The width of this area at Guaymas is about 100 miles, at Alamos about 60 miles, and narrowing to 20 and 30 in the southern part of Sinaloa and Tepic. In general, these hills are more rounded in the southern part of the district, due to less volcanic and other disturbances and a greater recent erosion. The average elevation of this district is less than 2000 ft. with only occasional peaks rising to 5000 ft. or less. East of the foothills the country rises abruptly into the sierras with elevations of from 6000 to 9000 ft. This area is very rugged and greatly cut by erosion.

RECENT EARTH MOVEMENTS

It is clear from the extent and characteristics of the later rhyolites and dacites in Sonora and Lower California that these beds were originally continuous and even extended some distance out into the Pacific. The present valley of the Gulf

of California is the result of erosion by the Colorado river since the (Miocene?) rhyolitic-dacitic eruptions. The country at that time had a greater general elevation (probably 2000 ft.) above the sea-level than at present. The maximum erosion of this ancient Colorado river has been in this section at least 6000 ft. Since then the country sank, bringing the sea level considerably above the present position, and lastly has gradually risen to its present elevation. This caused much gentle folding and a little minor recent faulting, but no breaks of any extent accompanied these movements. The fault system which has been mineralized is much older and much more extensive than any of those resulting from recent movements.

The general sequence of the various formations is as given below. The age of some of these is very uncertain as fossils are rare and it is only possible to place them from their relation and resemblance to determined formations in other parts of the country.

THE OLD GRANITES AND SCHISTS

The whole country has for a basement rock an extensive granite formation which is probably Archean. This granite shows evidences of having been eroded to an ancient peneplain before the later sedimentaries were deposited. It is usually rather a coarse-grained, hornblending rock, easily weathered into the typical coarse, sandy, light-colored soil characteristic of this formation where exposed. This is possibly the same granite that occurs in Veracruz and the other Gulf states and is probably the basement rock of this section of the continent. The granite seldom appears above an elevation of 2000 ft. in Sonora and less in Sinaloa. This formation contains few orebodies and it is usually an unfavorable sign when veins pass from other formations into it.

There are a few isolated areas of schists remaining, these having been mainly removed by erosion. They are possibly the remains of a southern extension of the Cambrian rocks of Arizona. These old schists are highly metamorphosed and are of a different general character from the younger schist formations, being much harder, darker colored and higher in iron minerals and quartz.

SEDIMENTARIES

Sedimentaries older than the Mesozoic were probably once present over most of

this country, but have since been mainly removed by erosion. These rocks were limestones and lime-shales but have been metamorphosed to a great extent and subjected to a complicated folding resulting in the formation of a variety of schists and dolomitic limestones. The limestones comprise the bulk of these rocks. It is probable that there is a thinning out and a final disappearance of these beds to the south in Tepic, their places being taken by the Mesozoic rocks.

Following these older sedimentaries came very extensive Mesozoic beds consisting of many varieties of shales and limestones usually somewhat folded and metamorphosed but never to anywhere near the condition of the older sedimentaries. The great bulk of these rocks belongs in the Cretaceous period. This formation probably underlies the entire country to the east and south and will be found continuous with the shale formations of Guanajuato, El Oro, etc. In southern Sonora and Sinaloa there are few exposures of these rocks as they are usually covered by the later eruptives.

THE VOLCANIC PERIODS

The first volcanic formations are of great extent and importance as they are connected in every case with the mineral deposits of the West Coast. The andesites follow unconformably the Cretaceous sedimentaries and are probably Eocene. They consist usually of both fragmental and massive beds of usually a normal andesitic composition. Some areas of this formation are still of great extent although erosion has removed many times the amount at present exposed. Toward the close of this period of andesitic eruptions there occurred many intrusions of andesites and porphyrites or trachytes which opened channels for the ore-bearing solutions.

Closely following the andesites and probably marking the close of this first period of volcanism were many intrusions of porphyries and quartz diorite porphyrites in dikes, sheets, intrusive masses, etc. Some of these dikes can be traced cutting the andesites. These intrusions also had favorable effects in opening channels for the primary ore solutions and it is quite certain that the strains arising from the intrusions of these igneous rocks caused the breaks which are followed by the usual vein systems. The faults, shear zones, and contacts in the neighborhood of these intrusives are generally mineralized. This was also a period marked by

*Mining engineer and geologist. Springville, N. Y.

extensive erosion and necessarily a long period of time must have intervened before the volcanic activity again started.

The second eruptive series was very general and extensive and covered at the time practically the entire country and was undoubtedly continuous with similar rocks in Lower California before the Colorado river eroded the valley of the Gulf of California. This formation consists of a bedded series of tuffs and breccias with some massive flows of a rhyolitic nature. In large areas these rocks tend to grade into the composition of dacites and trachytes. This eruptive series is later than most of the mineralization and it is usually little disturbed by folding and faulting. Its thickness is at least 5000 or 6000 feet.

TYPES OF DEPOSITS

In a general way the distribution of the various metals coincides with the topographical areas above described. The coastal plain shows nothing as the rocks are not exposed, but it is probable that under the sands is a continuation of the foothill area. The latter usually has base-metal ores with the silver contents in more complex sulphides of copper, lead and zinc, antimony, arsenic, etc. Many of the deposits show principally copper ores. This base-metal area wedges out to the south near the town of Sinaloa and below here are only scattered occurrences of the base ores until the state of Jalisco is reached. The ores of the sierras and of the foothills south of the town of Sinaloa are usually of gold and silver and free from any quantities of the base metals. There are many exceptions to the above generalization but in the majority of cases it will be found correct.

COPPER

The copper deposits occur in several ways. Contact deposits occur usually along the contacts of the eruptives and the limestones or shales and generally carry some silver with the copper. Occurrences of this type are common in Sonora and northern Sinaloa but little work has as yet been done on any of them. The ores on surface are carbonates and oxides and in the deeper workings begin to show sulphides.

The Bachaca, Sonora, shows a common form of a combination of the vein and contact types of copper deposit. Here the ore occurs along faults and slips in the limestones on and near the granite contact. There is usually a great deal of garnet and epidote developed along these contacts. Specular hematite occurs with chalcopryrite in many of these orebodies. In the case of the Porfirio Diaz claims ore occurs for over two miles along one of these granite-lime contacts. Work on these deposits has been confined to working out a few of the richer, concentrated pockets and practically no systematic exploration or development has ever been done on any of them.

The vein deposits usually carry a higher silver content than any of the other forms of copper deposits and in most cases have their principal value in silver and would be classed as silver ores. These veins always occur in connection with the intrusive rocks.

The orebodies of the only developed mines in this part of Mexico, the San Antonio and Anita mines of the Douglas Copper company, now the Mexico, are concentrations along fracture zones in andesites. These ores, except in the San Antonio, usually carry silver and gold besides the copper and will average probably 5 per cent. copper and \$5 combined silver and gold. There are other occurrences of this type farther south which have not been exploited as yet because of the lack of means of transportation and of smelting facilities.

Disseminated copper ores occur in several localities but as yet not enough work has been done at any of them to prove their value. They usually occur in schists of obscure origin, probably both sedimentaries and eruptives originally but now highly metamorphosed with a great deal of sericitization. The Piedras Verdes near Alamos, Sonora, is the largest and best known of these deposits.

SILVER AND GOLD

The silver veins are the most common form of mineralization of this part of Mexico. In the foothill area and as far south as the town of Sinaloa these ores are usually base. The silver occurs below the oxidized zone largely in the antimonial ores and in tetrahedrite with copper and frequently some lead and zinc. In the Alamos district these ores will average about 2 per cent. copper with an appreciable silver content. The most common occurrence for these veins is in the andesites or on the contact of the andesites with other rocks, and also in the sedimentaries. The granites are usually unfavorable rocks in this section, the veins showing a tendency to narrow and tighten up when they run into them. In this class of deposit belong the large mines of this district as the Quintera, Promontorio, Zambona, etc.

In the sierra country and along the foothills south of the town of Sinaloa the silver ores are generally less refractory and are easily amenable to cyanide treatment. There has been very little modern work done in this section, largely due to the absence of transportation facilities, but this part of the district shows more activity than the other parts. The contact deposits are few in number and are likely to be of silver with lead and zinc.

There are a few veins in this section of the country which have their principal value in the gold contained. Of this nature are Sobia and many other camps farther south. At Sobia, it is probable that silver will be found at depth. The Lluvia de Oro seems a gold mine pure

and simple. From Copalquin south is a belt of country with many gold occurrences. The general average of gold and silver shipments from the state of Sinaloa show a content made up of 15 per cent. gold and 85 per cent. silver. There are quite extensive placer deposits through all this section with the better ones in the northern part. Some of these are quite rich but are worked only by the Mexicans in a primitive manner.

IRON AND OTHER DEPOSITS

Iron, as specular hematite, occurs quite commonly along the limestone-eruptive contacts and sometimes in immense bodies. Most of these carry too much sulphur in pyrite and chalcopryrite to be commercially valuable for anything except fluxes. Two large deposits, one near Quiriego, Sonora, and the other near Las Tapias, Sinaloa, are of a good grade of iron ore apparently free from sulphur and phosphoric minerals. These are of present some distance from the railroad and hence not available. There are also occurrences of antimony, bismuth, mercury, nickel and cobalt, etc., of uncertain value. Practically no work has been done on any of these except the bismuth deposit and this I have not seen.

The above grouping of the ore deposits is not hard and fast as many of the types grade into each other, as for example, a common occurrence of ore is in a vein along a fault plane which because of the faulting is now a contact deposit, etc. No absolute line can be drawn.

RESUMÉ

In general, the primary mineralization took place at the close of the first eruptive period (Eocene) and during the following long period of quiescence and erosion much secondary concentration must have taken place before the rhyolite eruptions, when the relative elevation of the country above sea level was without much doubt about 2000 ft. higher than at present. During the presence of the rhyolite capping the ore deposits must have been protected so that little, if any, secondary enrichment could have been at work. After the removal of the rhyolite capping by erosion, circulation must have been resumed in the orebodies and more secondary concentration with a higher water level must have resulted. What percentage of the concentration occurred before and what after the rhyolites it is impossible to ascertain.

The amount of erosion in the two periods seems to be about equal and it is possible that at least one-half of the secondary concentration took place in the older period. I therefore consider it quite probable that orebodies occur under the rhyolite capping in many sections where the older rocks are not exposed and that the mining camps of the sierra country are situated at points only accidentally exposed by erosion.

Third Annual Report of Goldfield Consolidated

Output 194,480 Tons of Ore Averaging \$37.98 per Ton at Operating Cost of \$6.77 and Total Cost of \$8.08 per Ton; Ore Found at Depth

R E S E R V E S 8 0 0 , 0 0 0 T O N S

The third annual report of the Goldfield Consolidated Mines Company, Goldfield, Nev., for the fiscal year ended Oct. 31, 1909, states that during the calendar year 1909 the company distributed greater gross dividends than any gold property in the world distributed during the previous calendar year. Four dividends amounting to 30c. per share each, and one extra dividend of 20c. per share made a total of \$1.40 per share, or about \$5,000,000 on the 3,558,848 shares outstanding. Only the first three of these were paid during the fiscal year. The complete profit and loss account and balance sheet are given herewith.

Summarized, the report shows that there were produced 194,480 tons of ore of an average gross value of \$37.98 per ton, from which a recovery of 92.5 per cent. was realized. The operating cost for the year was \$6.77 per ton mined. The costs for the last 10 months of the fiscal year are given separately as representing the period in which the Consolidated 100-stamp mill was operating. The total operating cost per ton during this period is detailed in an accompanying table and was \$6.34, or 43c. per ton less than the average for the year. However, only \$1.56 was charged to development as compared with \$1.94 for the entire year. The total cost per ton, including the above, concentrate treatment, plant operation, taxes and all other expenses, would be \$8.08 per ton.

During the year the outstanding stock was increased from 3,539,811 shares to 3,558,848 shares, in order to absorb the stock of the subsidiary companies. The Goldfield Consolidated Mines Company now owns in fee all the property (380 acres) of the Mohawk, Red Top, Jumbo, Laguna and Goldfield Mining, together with their assets, liabilities, etc.

The railroad, water and milling facilities were organized under the laws of Wyoming as the Goldfield Consolidated Milling and Transportation Company, all of which stock is owned by the Consolidated Mines company.

GRADE OF ORE WORKED

Regarding the grade of ore worked, the management seems to be able to output almost any average desired. As before stated, the average for the year was \$37.98 per ton and the manager, J. H. Mackenzie, says of this matter:

"With the commencement of operations in the new 100-stamp Consolidated mill, Dec. 26, 1908, the grade of ore was held at about \$15 per ton for a

few weeks while all details of operation were being perfected, and then raised to a point which would insure the accumulation of a cash surplus of sufficient magnitude in excess of dividend requirements to form an ample safeguard against any unforeseen events which might occur. When this result was attained, the value of ore production was reduced to an average which would result in additional economies through the mining of a larger proportion of lower grade together with ore of higher grade, and continue to produce current profits in excess of dividend requirements of about \$360,000 monthly. During the last month of the fiscal year, however, ore of such high grade was exposed on the 750 level from the Clermont shaft, that the small quantity extracted in the course of development work increased the net profit nearly \$200,000 in one month."

ORE RESERVES

Mr. Mackenzie estimates the profitable

that time it was decided to increase the capacity of the Consolidated mill so as to handle 850 tons daily, and this addition is expected to commence work in January, 1910.

The new installation includes six 6-ft. Chilean mills as regrinders between stamps and tube mills, 24 Deister concentrators, two agitators and an air compressor. It is to cost about \$60,000. Other installations include a 150-h.p. air hoist at the Clermont shaft together with buildings and bins for a 600-ton daily production, safety devices on the large hoists, and a 30,000-gal. tank for fire protection; also 1795 ft. of track.

MINING

A total of 40,668 ft. of development work was done, of which 13,199 ft. were driven by lessees. This work was generally successful in opening ore in the newly developed portions of the older levels and in the new deeper levels from the Clermont shaft. Development work

OPERATING COSTS FOR 10 MONTHS ENDED OCT. 31, 1909.

| | Labor. | Supplies. | Power. | Department. | Construction. | General. | Total. |
|---------------------|--------|-----------|--------|-------------|---------------|----------|--------|
| Stopping..... | \$1.24 | \$0.66 | \$0.03 | \$0.25 | \$0.02 | \$0.18 | \$2.38 |
| Development..... | 0.80 | 0.36 | 0.02 | 0.20 | 0.08 | 0.10 | 1.56 |
| Milling..... | 0.71 | 1.10 | 0.36 | 0.09 | ..... | 0.04 | 2.30 |
| Transportation..... | 0.063 | 0.029 | ..... | 0.008 | ..... | ..... | 0.10 |
| Total..... | \$2.81 | \$2.15 | \$0.41 | \$0.55 | \$0.10 | \$0.32 | \$6.34 |

ore now exposed at least 800,000 tons, sufficient to supply the Consolidated mill at the rate of 850 tons per day for nearly three years. He bases this estimate on the present and past production of the property, and the conditions which have hitherto appeared to govern in general the distribution, value and size of the orebodies. It is safe to assume that Mr. Mackenzie's estimate has been made with great care and with the exercise of his best judgment, and that the figures are as nearly accurate as the acknowledged difficulties of such estimation in this district will permit. No attempt is made to give a value to this ore other than that covered by the word "profitable" as it is impossible to secure even approximate figures by sampling the exposed faces.

CONSTRUCTION

The Consolidated 100-stamp mill was completed in December, 1908, and the concentrate treatment plant two months later. That gave facilities for treating 700 tons of ore per day. In September, 1909, the Hampton stope caved and wrecked the 90-ton Combination mill. At

only was done from the Clermont shaft but this yielded considerable ore.

The Clermont shaft was placed about equidistant from the Mohawk and Red Top shafts and 800 ft. further east, on account of the rather flat easterly dip of the Mohawk and Red Top veins. All levels below 330 ft. on the Red Top and 600 ft. on the Mohawk vein are being driven from the Clermont shaft, the present levels being approximately at 600, 750, 900 and 1000 feet.

Operations in the Combination mine indicate that this vein joins the Mohawk at about 300 ft. in depth and dips rapidly away from the Combination shaft. A crosscut tunnel is being driven from the Combination Fraction to prospect the extensions of the known orebodies in this vein at a depth of 600 ft. This tunnel had been driven 340 ft., Oct. 31, but had opened no ore. The Combination shaft will not be sunk further unless this tunnel warrants it.

At the Mohawk, mining in the caved portions of the upper levels was successfully carried on, large stopes of high-grade ore were opened and the existence

of a large tonnage of low-grade proved between the 450- and 600-ft. levels, and ore exposed in the foot-wall on the 600-ft. level.

At the Combination, a wholesale-milling plan of using high- and low-grade ores will extend the glory hole. A large body of high-grade was mined from the Hampton stope on the 230 and 280 levels,

this stope reaching a width of 70 ft. Beside the regular production from this stope, 1193 tons of an average gross value of \$684.38 per ton were shipped from it.

On the Red Top, developments proceeded on the 160, 260 and 330 levels. Continuous ore, except 250 ft., was exposed for a distance of 1700 ft. on the

260 level. The ore from this mine is of more even grade than that from the other claims of the company.

On the Jumbo, the Clermont shaft was sunk to 1090 ft. A crosscut on the 600 level was driven 600 ft. north to undercut the Red Top vein 230 ft. below the deepest level from the Red Top shaft, but had not reached commercial ore. On the 750 level, 100 ft. of the Mohawk vein averaged \$450 per ton. The shoot was opened a length of 300 ft. in about \$30 ore on the 750 and 900 levels. The width has not been determined, but is at least 9 ft. The 1000 level had not reached this oreshoot.

MILLING

The 100-stamp mill was operated steadily after Dec. 26, 1908, and a continued improvement made in tonnage, extraction and costs. In October an average of 649 tons per day were milled at a cost of \$1.915 per ton, with an extraction of 94.49 per cent.

The concentrate-treatment plant was successfully operated since March. Its extraction, added to the smelting recovery from residues carrying over \$20 per ton, has equalled the extraction from untreated concentrates which would be paid for by the smelters, and the saving in cost has been \$25 per ton of concentrates. Residues below \$20 are stored on a dump for future treatment.

The primary and secondary amalgamation plates were abandoned, the free gold being allowed to go into the concentrates. Two plates were installed over which the concentrates pass before entering the concentrate-treatment plant, and all the gold which is too coarse to pass readily into solution is amalgamated. The 24 small classifiers below the batteries were replaced by two 8-ft. cones with good results.

FUTURE OUTLOOK

Developments have extended the productive area laterally and downward. Two new bonanzas, the Hampton and Clermont 750, are as rich as any of the older bonanzas. At no time was there difficulty in holding the grade of ore at the average planned; and in spite of the large production the ore reserves have been increased. Ore was discovered in the latite, where it was previously thought unlikely that orebodies existed, at a depth of 1500 ft. along the dip of the vein. The change from dacite to latite did not lessen the size, continuity or value of the orebodies.

The general manager further states that "all facts with regard to the Clermont oreshoots indicate that they may be expected to extend to a greater depth and it is confidently anticipated that the 1000 level will reach ore within a few months." Much virgin ground remains in the upper levels.

COMBINED PROFIT AND LOSS ACCOUNT.

(Year Ended Oct. 31, 1909.)

| | | | |
|---|------------|---------------------|---------|
| <i>Earnings:</i> | | | |
| Ore shipments, gross..... | \$ 818,472 | | |
| Transportation, treatment and charges..... | 83,978 | \$734,494 | |
| Concentrate shipments, gross..... | 205,557 | | |
| Transportation, treatment and charges..... | 32,837 | | |
| | 172,720 | | |
| Concentrates on hand Oct. 31, 1908..... | \$104,990 | | |
| Concentrates on hand Oct. 31, 1909..... | 38,143 | 66,487 | 105,873 |
| Concentrate residue shipments, gross..... | 270,934 | | |
| Transportation, treatment and charges..... | 137,283 | 133,651 | |
| Sales miscellaneous mill products, gross..... | 38,889 | | |
| Transportation, treatment and charges..... | 3,891 | 35,000 | |
| Sales bullion..... | 5,232,987 | | |
| Mint charges and expressage..... | 41,711 | 5,191,276 | |
| Mill products on hand and absorption..... | | 252,386 | |
| Cleanup combination 20-stamp mill..... | | 13,319 | |
| Royalties from leases..... | | 19,004 | |
| Damages Frances-Mohawk suit..... | | 75,000 | |
| Forfeit Consolidated Red Top lease..... | | 5,000 | |
| Interest and discount..... | | 7,285 | |
| Miscellaneous earnings..... | | 26,583 | |
| Total earnings..... | | \$ 6,598,871 | |
| <i>Expenses:</i> | | | |
| Mining..... | \$ 839,178 | | |
| Transportation..... | 18,158 | | |
| Milling..... | 460,646 | | |
| Concentrate treatment plant operation..... | 45,525 | | |
| Bullion tax..... | 117,463 | | |
| General expenses..... | 91,281 | | |
| | | 1,572,251 | |
| Profit for year..... | | 5,026,620 | |
| Dividends paid during year..... | | 3,201,239 | |
| Undivided profit for year..... | | 1,825,381 | |
| Undivided profit to Oct. 31, 1908..... | | 2,442,016 | |
| | | 4,267,397 | |
| *Depreciation and accounts charged off..... | | 373,543 | |
| Undivided profit to date..... | | \$3,893,854 | |

*This item covers a period of three years, no depreciation having been charged off heretofore.

ASSETS AND LIABILITIES,

Oct. 31, 1909.

The Goldfield Consolidated Mines Company.

| | | | |
|---|--------------|--------------|--|
| <i>Assets:</i> | | | |
| Mine properties..... | \$35,353,278 | | |
| Mine buildings, machinery and equipment..... | 192,097 | | |
| Mine development..... | 96,749 | | |
| Office building and furniture..... | 28,868 | | |
| Compressor plant..... | 60,460 | | |
| Power station and pole line..... | 17,965 | | |
| Miscellaneous real estate, buildings and equipment..... | 71,451 | | |
| Stocks owned..... | 1,445,084 | | |
| Unexpired insurance..... | 655 | | |
| Supplies on hand..... | 92,144 | | |
| Ore settlements outstanding..... | 476,983 | | |
| Accounts receivable..... | 113,150 | | |
| Cash in bank and on hand..... | 657,281 | \$38,606,165 | |
| <i>Liabilities:</i> | | | |
| Capital stock issued..... | \$35,588,480 | | |
| Accounts payable..... | 94,945 | | |
| Accrued bullion tax..... | 34,472 | | |
| Undivided profits..... | 2,888,268 | \$38,606,165 | |

Goldfield Consolidated Milling and Transportation Company.

| | | | |
|--|-----------|-------------|--|
| <i>Assets:</i> | | | |
| 100-stamp mill and addition..... | \$361,938 | | |
| Railroad and equipment..... | 25,127 | | |
| Water plants, reservoirs and pipe lines..... | 5,000 | | |
| Concentrates on hand..... | 38,143 | | |
| By-products on hand and absorption..... | 252,386 | | |
| Mill supplies on hand..... | 55,700 | | |
| Bullion and concentrate settlements outstanding..... | 479,341 | | |
| Accounts receivable..... | 421 | | |
| Cash on hand and in bank..... | 708,243 | \$1,926,299 | |
| <i>Liabilities:</i> | | | |
| Capital stock..... | \$400,000 | | |
| Ore purchases unsettled..... | 476,983 | | |
| Accounts payable..... | 43,730 | | |
| Undivided profits..... | 1,005,586 | \$1,926,299 | |

The London Spelter Market in 1909

More than usual interest was displayed at the opening of 1909 in spelter, which registered a substantial advance in value while other metals were mostly depressed. There was some scarcity of supplies due to interruption of traffic, which coincided with improved demand from consumers—chiefly for extended delivery—and considerable firmness displayed by producers. Transactions on the London market were relatively unimportant, but there was a large volume of business elsewhere at home and abroad. The galvanizing trade showed early signs of expansion, and sheet zinc was in some cases advanced in price. Prices opened at £21 5s. for ordinary brands, and £21 10s. for specials; closing at £21 12s. 6d. @ £21 15s. for ordinaries and £22 @ £22.50 for specials.

In February the market showed a declining tendency during the first eight days, due to forced realizations in excess of trade demand. Ordinary brands drifted down to £21, notwithstanding apparent improvement in the galvanizing trade. At this basis some speculative business developed, which was followed by the announcement of the definite formation of the long projected syndicate, whereby the German, Belgian and Dutch producers—with one or two exceptions—had combined to control production and, to some extent, prices also. The announcement that the German selling agency was holding for prices much above those ruling in London was the signal for brisk buying, both speculative and consumptive, which continued up to the end of the month and carried prices to £22 15s. for ordinary brands, and £22 10s. for specials; with a premium of several shillings for extended time of delivery.

March found the market steady in tone but with little business doing, consumers being reluctant to cover more than their immediate requirements. Early in the month the Producers' Convention reduced its price to £22 5s. for London delivery. This was still considerably higher than the price actually ruling, but it indicated weakness and prompted holders of second-hand parcels to accept down to £21 10s. or less. About the middle of the month markets generally were depressed, and the price fell further to £21 5s., which brought out some inquiry for April and May delivery; but the demand was only transient. Thereafter sellers became more reserved, and the market was steady for the remainder of the month; ordinary brands being mostly held for £21 7s. 6d., with £21 15s. for specials.

In April, the prevailing depression was

unrelieved during the first 10 days. By the middle of the month inquiry was stimulated by improved statistics of exports in galvanized iron. Consumers had held off in hope of further concessions in price, but producers remained firm and second-hand parcels were gradually absorbed; moreover, it was found that few consumers had covered requirements beyond May. Little business was transacted on the Exchange but a fair volume developed on private negotiation. Some attention was attracted to the American market where prices ruled at one time about £2 over those current in London, and orders were reported taken in Europe for shipment to America. Prices, however, moved within narrow limits throughout the month, starting at about £21 6s. 3d. for ordinary brands, and closing at £21 13s. 9d.; with £22 5s. for special brands.

May was an active month in the metal trade generally, and spelter was in decidedly better demand, particularly for the galvanizing industry. Fluctuations were narrow, but generally upward. Toward the middle of the month it became known that the leading German producers—who had hitherto remained outside the convention—had now joined it, thereby imparting additional strength to that combination. Another encouraging feature in the market was the purchase of an important quantity of the metal for shipment to America. Trade was fairly active throughout the month. Prices opened at £21 12s. 6d. @ £21 17s. 6d. for ordinary brands, and £22 @ £22.50 for specials; closing at £22 @ 2s. 6d. for the former, and £22 7s. 6d. @ £22 10s. for the latter.

June passed with scarcely any fluctuations in value, as was natural under the control exercised by the producers' syndicate. The galvanizing trade showed considerable expansion, prompting large purchases of spelter for July and August, and other consuming industries afforded normal support. By the middle of the month demand appeared to be satisfied, and business quieted in consequence. Second-hand holders were not overloaded, but the little they held was successfully employed to depress prices by a few shillings while the market lacked support. Opening prices were £22 2s. 6d. @ £22 5s. for ordinary brands; £22 7s. 6d. @ £22 12s. 6d. for specials; and the closing prices were in each case 2s. 6d. less.

July was uneventful on the whole, prices remaining steady throughout at £22 for ordinary brands, and £22 5s. @ £22 10s. for specials. Home trade was quiet at the outset, but the market was

strengthened by large sales made to America, where consumptive demand was strong. Toward the middle of the month the Galvanized Iron Association was dissolved in consequence of keen competition by outside firms.

In August, spelter was supported by good inquiry for export, but prices were uniform at £22 for ordinary brands, and £22 7s. 6d. for specials, until Aug. 27 when the Producers' Convention raised the price. This, with improved demand for galvanizing, was quickly reflected on the London market where prices rose to £22 8s. 9d. and £22 17s. 6d., respectively, and so remained for the rest of the month.

In September, opening at £22 7s. 6d. @ £22 10s. for ordinary brands, values gradually improved throughout the month. Sheet zinc was in good request, and spelter was largely sold to Continental consumers, the demand extending some months ahead. The Producers' Syndicate early advanced prices by 5s. per ton, and met with little outside competition; and these prices were further advanced toward the close of the month. The American demand was correspondingly good. Closing prices were £23 2s. 6d. @ £23 5s. for ordinary brands, and £23 7s. 6d. @ £23 12s. 6d. for specials, and with sustained demand from all the consuming industries.

October was remarkably free from fluctuations in value, ordinary brands being uniformly held for £23 2s. 6d. @ £23 5s. per ton, with good volume of business with consumers, and producers remaining firm and with reduced stocks. Only during the last two days of the month was any variation apparent, final values being £23 1s. 3d. @ £23 3s. 9d. for ordinary brands, and £23 10s. for specials.

On Nov. 19 ordinary brands were quoted £23 2s. 6d. @ £23 5s. per ton, from which point demand slackened, and the month finished as it had begun, with ordinaries at £23 @ £23 2s. 6d. and £23 7s. 6d. @ £23 12s. 6d. for specials.

In December, consuming industries continued well employed, particularly galvanized iron which was increasingly active and with orders booked well into the new year. Consumers bought spelter cautiously, but the market was none the less firm in view of large sales already made. Prices were practically uniform throughout, at £23 @ £23 2s. 6d. for ordinary brands, and £23 7s. 6d. @ £23 12s. 6d. for specials. Consumers bought more freely just before the Christmas holidays when business usually slackens, showing thereby their confidence in the underlying conditions of trade.

Firing Shots in Mines by Electricity

A Discussion of the Causes Leading to Misfires, and Suggestions with Respect to the Selection of High- and Low-Tension Fuses

BY SYDNEY F. WALKER*

I was much interested in reading the article by Mr. Payne in the JOURNAL of Oct. 30, on "Safety Precautions in Shot Firing," and for two reasons: I have known the Roundwood colliery and C. E. Rhodes, the mining engineer who was responsible for the sinking of Silverwood colliery, for something like 30 years, and I have had many opportunities of observing the great care, in the thoroughly practical sense, that he has shown in all his work.

My first acquaintance with Mr. Rhodes was characteristic. I had been doing some work in the neighborhood, and a friend told me that Mr. Rhodes was thinking of going in for some electrical appliances, and that I might get the order if I saw him. My friend told me also, that the only time to see him was about 8 o'clock in the morning. The colliery joined a small station on what was then the Manchester, Sheffield & Lincolnshire Railway, and I took the only available train next morning, and arrived on the pit bank, just as Mr. Rhodes was going down the pit. He was just stepping on the cage as I got there. I explained my business in a few words, and told him where I had done work. "Very well, send a price in," he replied, and down he went. About a fortnight after, not having heard anything about the matter, I appeared again at the colliery, by the same train, and caught Mr. Rhodes again, just on the point of descending. "Will you maintain the apparatus for so much per annum?" "Yes," I replied. "Very well, go on, put it in," and down he went again. That was the commencement of an acquaintance that has lasted up to the present day, with satisfaction, certainly on my side, and I have reason to believe also on his side.

The contract I had accepted to maintain, however, led to a result that I have been very thankful for ever since. I had to do the work of maintenance myself, and I necessarily acquired such an intimate knowledge of the details of the apparatus, as I could not have obtained in any other way. Incidentally I cleared nearly the whole of the maintenance money, though the price allowed me was low. I used to go into the district, see to the maintenance, and hunt up other business. When the usual result followed, and the development of business prevented my attending to the maintenance myself, the workman I put on to attend to it swallowed up a year's main-

tenance in the first quarter. Mr. Rhodes' confidence, however, was so far established in electrical appliances that he had more apparatus put in, and his own man, whom I had personally instructed on my visits, was able to take the whole thing in hand.

PRECAUTIONS AGAINST MISFIRES

The other point of interest in connection with the article is, I should like to make some suggestions that I believe would lessen the chances of misfires with electrically-fired shots. When electrical firing was first introduced, it was claimed by the makers of fuses, and by electrical men generally, that the great advantage of electrical firing over the fuse it superseded, known generally on this side as Bickford's fuse, and over the old damp squib used by miners, was the fact that with either the damp squib, or the gutta-percha fuse, it was necessary to leave the firing place severely alone for some considerable time after the shots had been put off, while with electrical firing it was possible to go immediately to the face where the shots had been fired. Later experience has shown that this is not so. In one inspector's district alone there were over 4000 electrically-fired shots that missed in one year, so that it is evident electrical firing is not infallible.

It is certainly more reliable, however, than fuse or damp-squib firing, and the general consensus of opinion of mining engineers, royal commissions, and everyone who has studied the question is that the general adoption of electrical firing makes for increased safety. In the latest instructions issued from the Home Office in the United Kingdom, shot firers are instructed to wait 30 min. before going to a shot fired with old-time fuses, and 10 min. after firing electrically. Several sources of trouble have arisen in connection with electrically-fired shots, that have led to disastrous results when the shot firers have gone to the shots immediately after putting them off. The point that I wish to refer to now is the possibility of reducing the chance of shots missing.

TWO KINDS OF FUSES

Electrical fuses are of two kinds, sections of which are shown in Figs. 1 and 2.

In Fig. 1 what is called the low-tension fuse is shown, and in Fig. 2 the high-tension fuse. In both fuses there is a copper cap, something on the lines of the old caps that were used with muzzle-loading guns in days gone by, though larger. The cap is filled with fulminate of mercury, for a portion of its length, and two copper wires are embedded in the fulminate, the wires being insulated from each other, usually by gutta percha, or india rubber, and connected to wires

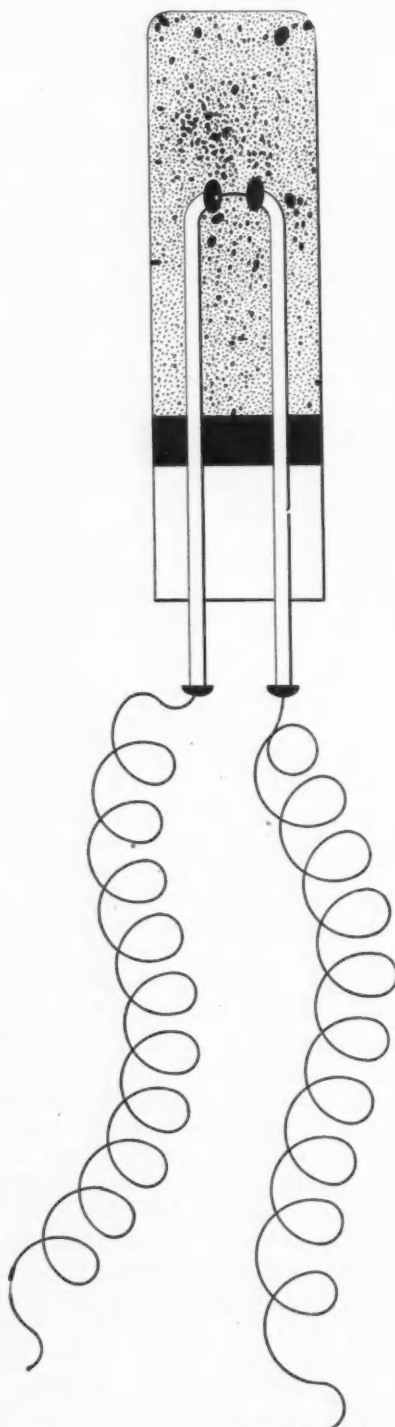


FIG. 1. THE LOW-TENSION FUSE

*Bloomfield Crescent, Bath, England.

outside of the cap, to which the wires from the firing battery can be attached when the fuses are to be exploded. In the low-tension fuse, the two copper wires have a small bridge of very fine platinum wire between them, as shown in Fig. 1. In the high-tension fuses, the copper wires are not connected inside the cap, except by the fulminate of mercury. In the low-tension fuse, a current of a comparatively large quantity is employed, to heat the platinum wire, the wire in turn igniting the detonating composition. The current employed is of the same strength as that of a carbon-filament 16 c.-p. 200-volt lamp, but the pressure across the wire bridge, and the energy expended in the fuse, is only a fractional part of that expended in a 16 c.-p. lamp.

The small platinum wire, when heated in air with the current named, assumes a bright red color. When heated in the confined space of the cap, and surrounded by the detonating composition, the temperature assumed will be higher. At any rate it is sufficient to start the detonator. In the high-tension fuse, the heat necessary to start the detonator is produced by a spark passing between the ends of the copper wires. In the early days of fuses, both kinds gave considerable trouble from the usual difficulties of manufacture. The high-tension fuses in particular were exceedingly troublesome, from the fact that the pressure required to fire them was so varied.

I made a number of experiments a good many years ago, in the early days of shot firing, and I found a range of from 2 volts to 100 volts, in the same batch of fuses. The development of manufacture has overcome this difficulty, and fuses can now be relied upon to fire with a certain definite pressure. The pressure required is higher than that needed for some of the fuses in the early days, but it is uniform. In those days, too, the magnetic exploders were unreliable, and they were made to furnish a pressure much less than might be required by some of the fuses. Magneto exploders of the present day are uniformly made to furnish about 200 volts, when designed for firing high-tension fuses.

The low-tension fuses, in the early days, were thought more reliable, because it was possible to test a fuse, to find out whether the platinum-wire bridge was intact, before going down the pit, while there was no possible test for a high-tension fuse. It appears to me that there are still possible sources of danger of misfires, with both high-tension and low-tension fuses, but more particularly with low tension. With low tension there is the danger of the small platinum wire being broken, even after it has been tested on the bank, before it is actually fired. In the rough and tumble of a mine, however careful a man may be in carrying his fuses, there is always the danger

of a low-tension fuse being jerked, and the wire bridge breaking away from the copper connecting wire in the process. I would suggest, as a precaution against this possibility, that a small battery and galvanometer be taken down the pit, and to the immediate neighborhood of the place where the shot is to be fired, and the fuse be tested with it at the very last minute, after it is actually in place. Testing galvanometers, suitable for the purpose, with small batteries attached, are now made sufficiently light to be

unfortunately there is no means of testing whether the fuse is in order or not, short of actually firing it.

THE FAILURE OF SHOTS ELECTRICALLY FIRED

Another frequent cause for the failure of shots electrically fired, both high and low tension, and particularly high tension, is the failure of the insulation of the connecting wires. For high-tension fuses, the current required is small indeed, and therefore a small wire will carry it from the exploder to the fuse and back again. But there is the question of the ability to spark of the high-tension current, and there is also the question of damage to the covering of the wire.

The exploders employed for firing high-tension fuses all furnish alternating currents, and the difference in pressure of an alternating current of 200 volts is really 560 volts. The alternating current, it will be remembered, rises to a maximum beyond the average, or effective pressure as it is called, falls to zero, and rises to a similar maximum in the opposite direction. So that the actual pressure which the insulation of any wire exposed to alternating currents has to withstand is the difference between these two maxima.

In too many cases the insulation of the wire connecting the exploder with the fuses is poor in quality. I have seen plain cotton-covered wire employed; and the wire that is used for house bells, in which pure rubber, with cotton outside, forms the insulation, is also largely used.

A GOOD INSULATOR

Cotton is a good insulator, if it is dry, and if there is plenty of it to withstand sparking, but the atmosphere of a mine is rarely dry, and consequently a cotton covering quickly loses its insulation. This applies also to a considerable extent to the covering consisting of pure lapped rubber, with a cotton wrapping outside. But what is of far more importance is, in the somewhat rough and tumble conditions at the face, and where the coil or drum of wire has to be carried, and more, in running the wire out from the exploder to the shots, the insulating covering is liable to be damaged. The weaker it is, the more liable it is to damage.

It may easily happen that the insulating covering is stripped off two portions of the wire, in close proximity, or if it is not actually stripped off, it may be seriously damaged, so that when the exploder is operated, a spark passes across between these damaged places, taking the current that ought to go to the fuses, with the result that some or all of them misfire. It may also happen that the damaged insulation merely weakens the current sufficiently to prevent the firing of a part of the fuses.

There is a tendency to use too small

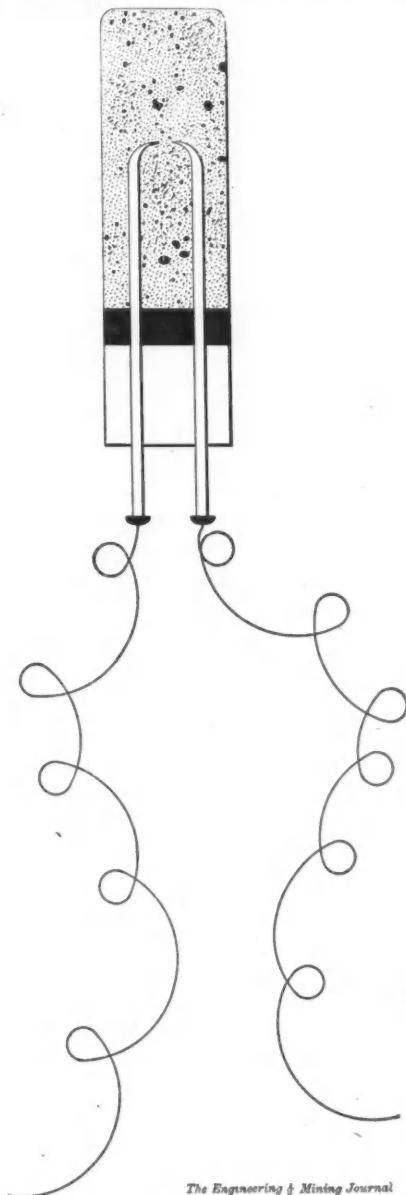


FIG. 2. THE HIGH-TENSION FUSE

easily carried with the other apparatus, and without adding much to the burden of the shot firer.

In the case of the high-tension fuse, there is the possibility of the copper wires between which the spark is to pass, being jerked slightly apart, and therefore out of the range of the firing apparatus, by one of the same accidents that may have broken the wire bridge of the low-tension fuse. This is not so likely to occur as the breakage of the wire bridge of the low-tension fuse, but it is possible, and

wires for connecting the exploder with the fuses, with the result that when the wire has been pulled about a bit, after firing one or two shots, or occasionally even when the first shot is fired, one of the wires may be parted inside its covering, and either no current passes when the exploder is operated, or the current is much weakened.

The remedy for both of these troubles

is, to use substantial wires, certainly not less than No. 20, and I prefer No. 18, or even No. 16; also to insulate them as well as for electric light wires in easy situations; and further, to carefully examine the wire after each batch of shots has been fired, and before firing another set. The tendency to employ cheap wires, thin wires and badly insulated wires, has been accentuated by the fact,

that a portion of the wire is lost every time shots are put off. The more expensive the wire, the greater is the amount that must be debited to this cost. On the other hand, the amount saved by using inferior wire, or to put it in the other way, the extra amount required to be spent by using the superior wire, is only a small fraction of the possible loss that may occur from shots missing fire.

Coal and Coke in British Columbia

BY E. JACOBS

The production of coal and coke in the province in 1909, it seems quite safe to assert, was the largest of any year since coal mining was commenced in British Columbia. Owing to non-receipt of the production figures of one of the larger companies this may not be stated positively, but it appears reasonable to estimate the gross output at nearly 2,500,000 long tons, and the net at nearly 2,000,000 tons. However, to be on the safe side, I estimate the net production, that is after deducting the quantity of coal made into coke and valued as such, at 1,940,000 long tons. Of the gross tonnage about 1,450,000 tons were produced in what is officially known as the Coast coal-mining district (Vancouver island about 1,380,000 and Nicola 70,000 tons) and the remaining 1,050,000 tons came from the Crow's Nest district in southeast Kootenay. About 450,000 tons were made into approximately 277,000 tons of coke. The figures representing the coal and coke production are incorporated in the tables of mineral production of British Columbia in the JOURNAL of Jan. 8, 1910. The nearest approach to this tonnage of coal was that of 1907, when a net production of 1,800,067 tons was officially recorded. The highest previous tonnage of coke was in 1905, when it was 271,785 tons. The older and larger collieries increased their output, and three or four new collieries produced steadily.

The older collieries in the Coast district are those of the Western Fuel Company, at and near Nanaimo, Vancouver island, and of the Wellington Colliery Company (Dunsmuir), at Cumberland and Extension, respectively. The production of the Western Fuel Company's No. 1, Protection island, and Brechin mines reached to higher figures than in any other recent year. The manager of this company states that about 51 per cent. of this coal was disposed of in British Columbia, while 49 per cent. was exported to foreign countries in the proportion of 32 per cent. to California and 17 per cent. to other parts. The Dunsmuir collieries are likewise believed to have increased their output.

The Pacific Coast Coal Mines, Ltd., has coal properties at South Wellington and Suquash, both on Vancouver island, and at Malcolm island, off the northeast coast of Vancouver island. Its more important operations were at South Wellington, in the Nanaimo district, where about three miles of slopes, levels, and roadways were driven in the coal. The power plant installed at the South Wellington colliery included an air compressor and large slope hoist; a tippie having a capacity of 1000 tons a day was built and equipped; seven miles of railway were constructed between the mine and tide-water at Boat harbor; and 6000-ton bunkers, a 400-ton coal washery, shipping wharf and loading plant were put in at Boat harbor. The year's production of coal was about 45,000 tons, of which 11,500 tons were exported, most of it to Mexico. Latterly production was increased to about 600 tons per day. A ready sale was found for all coal produced.

NEW COAL DEPOSITS DISCOVERED

Men from Tacoma, Wash., purchased in August 4800 acres of coal lands in the vicinity of the Dunsmuir Extension colliery. Coal has been found in various parts of the northern country through which the Grand Trunk Pacific railway is being built west of the Rocky mountains to Prince Rupert; the limits of one area discovered on the Morice river in 1908 by W. W. Leach, of the Geological Survey of Canada, were largely determined by that official during the field-work season of 1909; another area, near the headwaters of Skeena river, was examined by Chas. Fergie.

In the Nicola country, the Nicola Valley Coal and Coke Company did much development work in its Nos. 1 and 5 mines, Middlesboro collieries, and also gave attention to Nos. 2, 3 and 4. The coal opened in No. 5 is exceptionally clean and hard and of excellent quality. The additions to mine equipment included the extension of No. 1 tippie for the handling of all coal from Nos. 1, 4, and 5 mines, and the erection of a boiler

and compressor house and the installation therein of two 72-in. by 18-ft. steam boilers and a Rand compound-condensing steam, compound-air compressor having a capacity of 2215 cu.ft. of free air per min., complete with air receivers and necessary connections. This engine is used chiefly for driving hoisting engines, coal-cutting machines, ventilating fans, etc. The company's output of coal in 1909 was about 70,000 short tons. Labor difficulties restricted production during three or four months, but as the year closed production was between 9000 and 10,000 tons per month. Development work was done at the property of the Diamond Vale Collieries, Ltd., also in Nicola valley, but the production of coal was small.

The extension of the railway to Princeton, Similkameen, enabled the Vermilion Forks Mining and Development Company to commence shipping coal. The company's colliery at Princeton is only developed sufficiently to admit of an output of about 100 tons per day, but transportation difficulties having been overcome, additional plant will be installed and production facilities increased.

The Crow's Nest Pass Coal Company is the largest coal producer in the Crow's Nest country. It has three collieries—at Carbonado, Coal Creek, and Michel, respectively. Its output was from Coal Creek and Michel. About 900,000 tons, gross, of coal were mined, and about 250,000 tons of coke made in 1909. Additions to the power plant in 1909 were the installation of three Rand corliss air compressors, one at Coal Creek and two at Michel. At the former colliery the machine put in is a compound-condensing steam, four-stage air compressor, having a capacity of 1300 cu.ft. per min. compressed to 1200 lb. A similar machine was installed at Michel, and also a low-pressure, compound, condensing steam and compound air compressor having a capacity of 4523 cu.ft. per min. The latter, which is equipped with aftercooler, condensing apparatus, etc., supplies air for operating pumps, hoisting engines and coal cutters.

Circular vs. Rectangular Shaft Sinking

It Is Claimed that the Cost of Lining Circular Shafts Is Less, and that Besides Being Safer, the Circular Form Is More Permanent

BY HENRY M. PAYNE*

It may be said in general, that American and Scotch coal mines have rectangular shafts, while English, French, Belgian and German collieries are provided with circular shafts. During the past summer, I made a detailed study of this subject in these various fields, supplementing my observations by persistent inquiries, to determine whether this distinction in method is based on sound reasoning, or solely on habit and custom.

The majority of the mines in England and Wales are deep, and much difficulty is encountered with quicksand and water-bearing strata. The shafts in the Taff and Rhonddha valleys are from 17 to 21 ft. in diameter and the total cost of sinking and lining varies from \$90

water, is to line first with an outer ring of brickwork from 4 to 6 in. thick, carefully packed at the back. Next a 2-in. space is left and the balance of the brick lining is laid, to the finished diameter of the shaft. Sheet-iron lining is then placed in the cavity, in circular segments, and cement grouting poured in until the space is filled. This gives a total lining of from 14 to 16 in. thickness.

The general English and Welsh method of placing shot holes for circular shafts is shown in Fig. 1.

In Belgium, brick lining is almost exclusively employed. In some of the newer shafts, reinforced concrete has been used in addition, but sparingly. The

in Germany have failed, on account of pressure. The circular shafts are lined with steel tubing, brick, or reinforced concrete, or occasionally with brick facing and concrete backing. The German engineers claim that removing the corners in rectangular excavation is very expensive, and that there is also more danger to the workmen, from the pressure.

At Rhein-Elbe No. 5, Alma mine, of the Gelsenkirchen Bergwerks Actien Gesellschaft, a new shaft is now being sunk, under the direction of Herr Lindenberg. This shaft is to be 2600 ft. deep,

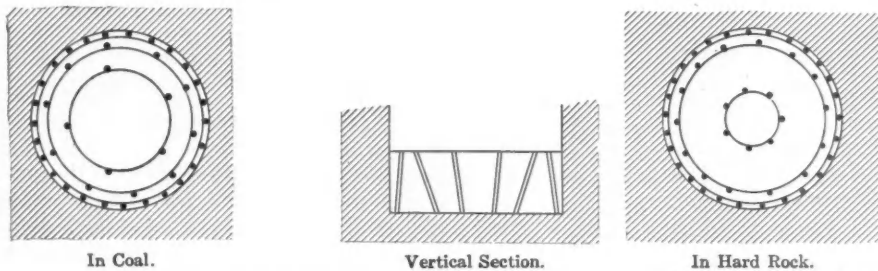


FIG. 1. THE ENGLISH AND WELSH METHOD OF PLACING SHOT HOLES FOR CIRCULAR SHAFTS

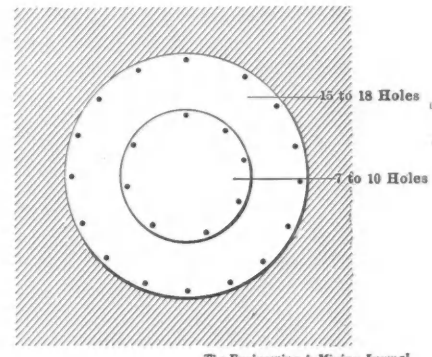


FIG. 2. METHOD OF SINKING USED AT FRENCH COLLIERY

to \$150 per yard. Locked-coil rope guides for the cages are almost exclusively used, under a tension of 3½ to 14 tons each, depending on the depth of the shaft and the speed of hoisting.

In the North of England, the shafts are slightly larger, varying from 20 to 24 ft. in diameter, and are lined with steel tubing. During the sinking process, 4-in. steel rings, 1 in. thick, are suspended 3 ft. 9 in. apart, and packed with poling boards 4 ft. long and 1½ in. thick. These are removed as the permanent lining is placed. This permanent tubing is 6 to 8 in. wide and 1 to 1½ in. thick, with inside flanges secured by ¾-in. bolts. Twelve segments form one complete ring. Some very excellent speed records in sinking have been made by this method, notably at Sherwood colliery, where the last 858 ft. of a 1300-ft. shaft were excavated and lined in 21 weeks, an average of 40.8 ft. per week.

A circular scaffold is used to carry on the lining, while the excavation is going on below, a 7½-ft. square hole in the center of the platform, providing hoisting space. The method of excluding

average cost of excavation runs from \$60 to \$75 per meter (3¼ ft.) and of lining from \$5.00 to \$6.00 for the same distance. Cage guides are usually of timber, fastened to cross buntions set in hitches in the masonry. The Belgians are extremely skillful in keeping their shafts in alinement during the sinking process; many of their shafts exceed 3000 ft. in depth, and are perfectly plumb, notwithstanding their age, and the enormous side pressure from steeply inclined strata and shifting quicksands.

The Kind-Chaudron method is used with greater success in Belgium than in any other country. One of the chief difficulties encountered in this method, is the tendency of the trepan to glance to one side when boring through hard rock on a steep dip. This is largely overcome by increasing the weight of the trepan to 25 or 28 tons.

THE GERMANS DISLIKE SQUARE SHAFTS

The only square shaft found in the Rhenish coal district of Germany, was sunk by a Scotch engineer, true to the customs of his native land. All early attempts to maintain rectangular shafts

and on August 20 last, when I visited it, the excavation had reached a depth of 810 ft. The temporary lining is made of steel rings suspended about 3 ft. 9 in. apart, with sheet-iron lagging in sections 4 ft. long, 5 in. wide and ¾ in. thick, suspended by hooks passing through a hole in the end of each piece, and passing over the ring above. When the excavation has proceeded 30 ft., the permanent lining is begun.

This lining is of concrete, 5 parts clean, washed Rhine river sand, 1 part gravel and 1 part portland cement. The inside diameter of the shaft is 19 ft. 6 in., and the lining will be 3 ft. thick, making the total excavation 25 ft. 6 in. in diameter. The lining is reinforced with iron rods 2/5 of an inch in diameter, so placed as to make a cylindrical network of 8-in. squares. The horizontal rods are curved to fit the shaft, and cut in lengths of 9 ft. 9 in. The vertical rods are 16 ft. 3 in. long, the ties at each intersection being made with wire. This cylindrical network is built in position 1 ft. from the inside surface of the shaft, and 2 ft. from the outside, or line of excavation. The excavation and lining are

*Mining engineer, Morgantown, W. Va.

progressing at the rate of 81 ft. per month, and gelatin dynamite is used for the explosive.

The French collieries do not differ materially in the method of sinking, but their permanent lining is almost exclusively of brick, the temporary iron rings and backing being used during excavation, in advance of the lining platform, the same as in Germany.

On August 25, last, I visited the Puit 13 bis, of the Societe des Mines de Lens, which is being sunk under the direction of Monsieur Dolliger. It requires only one week here to line two weeks' excavation. The holes are placed as shown in Fig. 2.

The center holes are drilled 7 ft. deep, and the outer ones 5 ft. deep. The drills are reduced in diameter as the depth of the drill hole increases, as follows:

From the surface to 19 in., 1.6 in. diameter.

From 19 in. to 38 in., 1.5 in. diameter.

From 38 in. to 59 in., 1.4 in. diameter.

From 59 in. to 84 in., 1.3 in. diameter.

The method of bricking the lining is shown in Fig. 3.

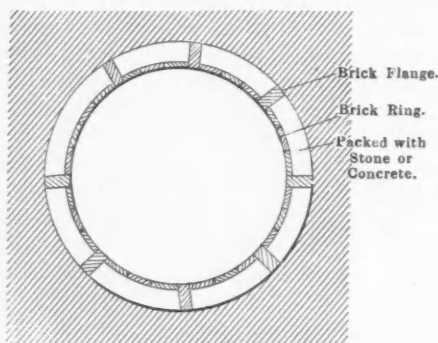


FIG. 3. GENERAL METHOD OF BRICKING THE LINING

The mortar used is 1/6 ordinary cement, 1/6 hydraulic cement, and 2/3 power-house cinder. Every 20 ft. of lining requires 1400 lb. of mortar. The shaft is through solid rock, so that the excavation is carried from 95 to 100 ft. in advance of the lining. A rock bench is left in the usual manner, and a wooden templet of 12x12-in. timber, cut in 3 1/2-ft. segments, to fit, dowel-pinned all around and a key section set, is then leveled and wedged up, and the lining carried up to the preceding templet, whose rock bench is then removed in sections. The shaft is kept in line by heavy plumb bobs suspended at intervals of 3 ft. all around the circumference from the last templet.

In the center, the shaft is divided during construction by a double partition whose sides are 3 ft. apart, and between which are carried the pipes for compressed air, water, etc., and a series of zigzag ladders for a manway. This division serves also for the purpose of ventilation, one side of the shaft being used for a downcast and the other for an upcast.

CIRCULAR SHAFTS ARE MORE PERMANENT

It is evident, that assuming the same hoisting capacity in either form of shaft, the excess area, which makes ventilation possible, should be the same in either a circular or a rectangular shaft. A circular shaft of 20 ft. net diameter would be roughly equivalent to a rectangular shaft 12x20 ft. English mining engineers claim that the cost of lining is as 5:9 in favor of circular shafts, and it is generally conceded that where great pressure is encountered the circular form is the only safe one. A circular shaft, when once properly lined with iron or masonry, is a permanent affair, while timber lining under the best conditions cannot be expected to last more than 18 or 20 years and rarely more than 15 years. It is also well known that for a given area, a circular shaft presents less rubbing surface, or resistance to the passage of the ventilating current, and the segments at the side of the cages furnish space for this air cur-

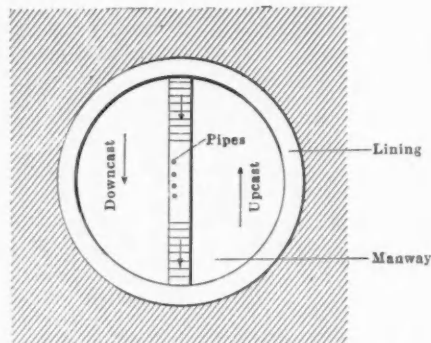


FIG. 4. SHOWING HOW SHAFT IS DIVIDED BY A DOUBLE PARTITION

rent without additional enlargement of the shaft.

The principal arguments advanced for rectangular shafts are that less material needs to be removed for a given cage space, and that in sinking, the permanent lining is at once put in place, as the work progresses.

It is probable that the matter of keeping a shaft in alinement during construction, by either method, is largely a matter of experience and character of labor employed.

While engineers have claimed cheapness of construction as an argument for both forms of shaft, the data at hand would indicate that the circular shaft may be excavated fully as cheaply as the rectangular, but costs more to line; while on the other hand the upkeep and repairs on a circular shaft properly constructed, are very much less than on a rectangular shaft of same capacity, and the danger, especially in deep mines or in quicksand, is very materially reduced, and water much more easily kept out, effecting a saving in pumping.

Review of the Coal Industry in Ohio in 1909

From advance information received from the various large coal-producing districts of the State at this time, it is believed that the coal tonnage for the year 1909 will vary little from that of 1908. Reports from the Hocking Valley indicate that the tonnage will not equal that of the previous year. The Cambridge district will compare favorably with that of 1908, while eastern Ohio will in all probability show an increase over that of the previous year.

There was no shortage of labor in evidence, and no strikes of any importance, the Inter-State wage agreement being still in force during the year, and only minor local troubles of small importance disturbed the status of the coal trade and were quickly disposed of. General activity in the coal trade did not manifest itself until about six months after the beginning of the year, as mills and other industries had not sufficiently recovered from the financial and industrial depression felt all over the country the two preceding years, to warrant a large consumption of the coal products.

PRICES WERE DEMORALIZED

Prices were very much demoralized during the year on account of rivalry between the large companies and independent ones, and from competition from other States. Climatic conditions were also not conducive to a large disposal of the output. A shortage of cars was noticeable during the latter part of October, and through November. No floods or other appalling disasters marred the year in the coal industry. From present indications, the death rate will be somewhat higher than in 1908, especially if the tonnage shows any material loss. The business prospects for 1910, at present, are encouraging, and it is confidently expected that, with anything like normal conditions, the coal trade will once again assume the proportions it attained during the unprecedented prosperity of 1906 and 1907.

What is Ore?

After an unsuccessful search for a satisfactory definition of the word "ore," J. F. Kemp suggests the following: "In the scientific sense an ore is a metaliferous mineral belonging to the group of those which have profitably yielded the metals to the miner or metallurgist. In its technical sense an ore is a metaliferous mineral or an aggregate of metaliferous minerals, more or less mixed with gangue and capable of being, from the standpoint of the miner, won at a profit; or from the standpoint of the metallurgist, treated at a profit."

The Pyrites Industry in the United States

The pyrites-mining industry thrived during 1909, and although few new companies reached the producing stage, the established ones almost without exception showed a tendency toward improving their methods and equipments; a sure sign of a healthy condition of the business. Prices exhibited little range throughout the year, being practically stationary at 11¼c. per unit per long ton for non-arsenical furnace, f.o.b. mines; and 10@10¼c. for the domestic fines. The imported pyrites brought 12@12½c. per unit for the non-arsenical furnace, ex-ship, New York, 12@11¼c. for the arsenical furnace, 10¾c. for the non-arsenical fines and 8¾@9c. for arsenical fines. These are practically the prices which prevailed during 1908, but early in 1909 prices were shaded to quite an extent, foreign fines being reported as offered at Atlantic and Gulf ports as low as 8c. ex-ship. Producers are generally optimistic in looking for better prices in 1910.

The scare over the Ducktown acid production about subsided, for although the Tennessee Copper Company operated one 400-ton unit of its acid plant throughout the year, and is now constructing another unit of equal or greater capacity, and the Ducktown Sulphur, Copper and Iron Company operated its 180-ton plant after the latter part of June, no noticeable curtailment in the market for pyrites resulted. The reported failure of the attempt to organize the new fertilizer combine possibly accounted in part for this.

The Government trade returns show that during the first 10 months of 1909, 585,319 tons of pyrites were imported into the United States, as against 557,418 tons imported during the corresponding period of the previous year. This increased importation of 27,901 tons is a pretty good indication that the American pyrites market was not damaged by competition with acid makers or producers of brimstone. From indications at the principal mines, the home production of pyrites in 1909 will not be materially different from that for 1908. If slightly less, this will be due to the fact that stocks were generally carried over from 1908, rather than to any lack of demand in 1909. As will be noted, a number of the large American companies took advantage of the slackness of trade resulting from stocks carried over and spent a great deal of time during the year in developing fresh ore reserves and refitting their mills.

IMPORTANT OPERATIONS

The larger mines in the mineral belt of Virginia, with the exception of the Boyd-Smith at Mineral, Louisa county,

were regular producers in 1909, but the total production was somewhat curtailed by reason of improvements instituted. Both the Armenius and Sulphur mines at Mineral were engaged in sinking new shafts to further develop their properties, and the latter is expected to enlarge its mill capacity during the ensuing year. As usual these mines produced mostly fines. The Cabin Branch mine, at Dumfries, Prince William county, began operating its new mill in September. Early in the year this company moved its 40-ton smelter from the mine to Barrows Siding, about six miles distant on the main line of the Washington Southern Railway. The furnace was run on selected chalcopryrite ore for a short while. In southwestern Virginia near Chestnut Yard, Carroll county, the Pulaski Mining Company was engaged in developing an immense pyrrhotite orebody by open cut, and also in prospecting with churn drills. The company's acid plant at Pulaski operated throughout the year on this ore.

Farther south at Villa Rica, Ga., the Sulphur Mining and Railroad Company worked its pyrites mine regularly during 1909. Here too improvements were instituted in the mill. At several other points in Georgia, notably in Cherokee county promising prospects were opened up. The southern properties showed a general tendency to better mill operations, but the lack of engineering methods in underground work was still to be criticized.

NORTHERN MINES

The Davis mine near Charlemont, Mass., showed a restricted output on account of a rather disastrous cave-in which occurred in the early part of 1909. At the north end of the property a new shaft, No. 4, was sunk about 90 ft. but neither the main nor No. 3 shafts were in commission. The difficulties are now reported to be overcome and the normal output is looked for in 1910. The company recently experimented with motor trucks and expects in the near future to substitute these for the wagon teams which are now used to haul the output of the mine to the railroad. At Charlemont station on the Boston & Maine Railroad, the Mount Peake mine was actively operated and produced some ore. Most of the work carried on was, however, of a development character. This mine still yielded some chalcopryrite ore associated with the pyrite. The Milan Mining and Milling Company's property, situated about 12 miles from Berlin, N. H., was a regular producer throughout the year. In New York, the St. Lawrence Pyrites Company produced as usual large tonnages of low-grade ore from its Stella and Anna mines.

Conditions about the Great Lakes were practically unchanged in 1909. The Northern Pyrites Company which was expected to become an important factor in this trade, did not actively enter the field. The production in 1909 only amounted to 5000 tons or so, but the company is reported to be in a position to produce a large tonnage during 1910, and expects to compete for the American market. This property, known as the Vermilion pyrites mine, is situated on Vermilion lake, in Western Ontario, about 2½ miles by aerial tram from the branch line of the Grand Trunk-Pacific Railway from Fort William, Ont. The orebody is large and the pyrites of almost a theoretically pure composition.

The Northland mine, formerly known as the Harris or Rib Lake, shipped lump ore to the markets of eastern Canada and the United States in 1909. The main shaft on the property (situated near Rib lake in the Temagami forest reserve about one-half mile from the Temiskaming & Northern Ontario Railroad) was sunk about 300 feet.

IMPROVEMENT OF MILLING METHODS

The tendency toward improved milling methods was marked in 1909, much attention having been paid to this technical feature of the industry. At Milan picking was installed on two 24-in. Jeffrey belts. Shaking screens, a Richards classifier and Wilfley and Bartlett tables were used. No changes were introduced in the concentrating method, at Davis, jigging still being conducted in a four-compartment Harz jig. The plant, however, was somewhat enlarged. At the St. Lawrence Company's mill Hancock jigs replaced the Harz formerly used. The Cabin Branch mine at Dumfries, Va., as noted, built a new mill comprising crushers, picking tables, Sturtevant rolls and Harz jigs.

At the Mineral, Va., mine of the Sulphur Mining and Railroad Company an interesting development in pyrites concentration was instituted in the removal of iron impurities by magnetic concentration. The jiggered material is run over a Cranberry magnet which removes particles of iron oxide and pyrrhotite, thus raising the sulphur contents of the finished product 4 or 5 per cent. Balancing the increased loss of sulphur against the saving effected in freight charges, shows that the operation gives a commercial saving. This company also put in Harz jigs and made other changes at its mill at Villa Rica, Ga., during 1909. All of these improvements indicate that the producers of pyrites realized that improved methods were necessary to the success of their business.

The Corporation Tax Law

The Treasury Department at Washington has issued a circular relating to the new corporation tax law, giving the interpretation placed upon its provisions. We give below some parts of this circular which seem to be applicable to mining and smelting corporations especially.

INTENT OF THE LAW

A study of the act discloses clearly that the intent of the law is as follows:

1. That the law is a revenue measure and should be construed liberally for the purpose of producing revenue for the Government.

2. That the real intent of the law is to collect a tax of 1 per cent. on the net income, less \$5000, of the individual corporation, joint-stock company, or association liable to the tax.

In order to understand clearly the intent of the law a few primary definitions are essential:

NET INCOME

The term "net income" as used in this law means not only net profits arising from the operation of the principal business of the corporation, but all items of income received from other sources, such as investments, holdings in other companies, and businesses, etc. The expression "net income" is used because there can be no question as to its embracing amounts of income received from these outside sources, whereas there might be some question as to whether or not such items would be included in the expressions "net profits" or "net earnings."

GROSS INCOME

In the same manner the term "gross income" includes gross profits, the expression being used because there can be no question but what it embraces all items of income received by any corporation from any source, while there might be some question as to whether "gross profits" or "gross earnings" would embrace such items.

A great amount of adverse criticism of this law is due to misapprehension of the proper definitions of these terms. The opinion was advanced that because "gross income" was not "gross profits" it must be "gross receipts," and that, in the same way, because "net income" was not "net profits" it meant "net receipts." An examination of the law, however, will show that if gross income meant gross receipts the statutory deductions therefrom would not leave net receipts, but would leave merely an arbitrary sum. It also appeared from calculations that if these interpretations were given to the law from mercantile and manufacturing companies alone the amount of tax received would

be many times the sum which was estimated to be collected from all corporations, joint-stock companies and associations of whatever nature.

It is clear, therefore, that the purpose of the law was not to put a tax on receipts, but a tax on profits; and that the terms "gross income" and "net income" are used because, while they are practically identical with "gross profits" and "net profits," they are yet more embracing and consequently permit a more comprehensive administration of the law.

The law requires that the return from every corporation, joint-stock company, and association liable to the tax shall show the "gross amount of the income . . . received during the year from all sources," and authorizes certain deductions such as "ordinary and necessary expenses actually paid out of earnings in the business and property of such corporations . . . within the year; all losses sustained during the year; amount of interest actually paid within the year; amount paid by it within the year for taxes; amount received within the year as dividends upon stock of other corporations liable to this tax, etc."

Very careful consideration has been given to these expressions in order to determine what evidence shall be required in order to determine what items are to be considered as "income" in calculating "gross income," and what items should be allowed as deductions under the language of the law. An impression has obtained in some quarters that no item should be considered in making up the account of the corporation, either as income or a deduction, unless its receipt or disbursement was evidenced by an actual cash transaction. It was owing to this interpretation placed on the law that a great number of accountants throughout the country declared that the law was impossible of administration, and if their interpretation of the law had been correct, there would indeed have been the most serious difficulty.

MEANING OF "ACTUALLY PAID"

Upon first reading the law and studying the authorities relating to the language used, it would appear that the words admit of no interpretation other than that an item must have been evidenced by the actual disbursement of cash, or something of equal value, before it could be considered in making up the account of a corporation. It is interesting to note, however, that all definitions and decisions regarding the expression "actually paid," consider the matter from the standpoint of debtor and creditor, and not from the standpoint of the individual himself, or

in this case, from within a corporation concerned solely with its own accounts from which alone the law requires this return for taxation to be made, and not taking into consideration the standpoint of the debtor.

DIRECTIONS TO COMPANIES

Gross income consists of the gross revenue derived from the operation and management of the business and property of the corporation making the return, together with all amounts of income (including dividends received on stock of other corporations, joint-stock companies, and associations subject to this tax) derived from all other sources, as shown by the entries on its books from Jan. 1 to Dec. 31 of the year for which return is made.

Relating to statutory deductions, the regulation is to the effect that the deductions authorized shall include all expense items under the various heads acknowledged as liabilities by the corporation making the return and entered as such on its books from Jan. 1 to Dec. 31 of the year for which return is made. It will appear, therefore, that the return is to be made up from the ledger and not the cashbook, and that entry on the ledger from Jan. 1 to Dec. 31 of the year for which return is made is the evidence which will determine whether or not an item is to be taken account of in making the return.

It is believed that this interpretation furnishes a practical working method by which the amount of income subject to the tax can be fairly and justly determined in every case.

The regulations do not call for specific methods of keeping accounts or any particular method of bookkeeping; the requirement is simply that the transaction be so recorded that accurate returns can be made therefrom and verified when necessary.

In many corporations, mercantile and manufacturing particularly, an inventory, or its equivalent, is essential at the close of each calendar year. The law specifically states that the tax shall be collected for the calendar year and no return for any other period can be accepted. Provision is however made for preparing returns for the present year, when no inventory or equivalent was taken at close of last calendar year.

Provision is made for a method of fairly determining amount of loss and depreciation claimed; also for a fair adjustment of profit or loss in case of sale of capital assets acquired prior to Jan. 1, 1909; also for properly accounting for materials and supplies, etc.

Ottokar Hofmann

Ottokar Hofmann, the eminent metallurgist, whose death on Dec. 24 was briefly noted in our last issue, was born in 1843 at Ruskberg, a mining town in Austria Hungary. He came of a family which had been for generations engaged in mining and metallurgical work, in which some of its members had secured eminent positions. He was educated in the technical schools at Vienna and in the *Bergakademie* at Freiberg in Saxony, graduating there in 1866. In the following year he came to the United States and settled in San Francisco, where he formed a partnership with the late Guido Küstel, at first as assayers and later in operating metallurgical testing works, the first to be established on the Pacific Coast. At that time pan amalgamation and barrel amalgamation were practically the only processes used in treating the silver ores of the coast. Küstel and Hofmann commenced experiments with the Patera process, and found it well adapted for their purpose. Late in 1868 Mr. Hofmann received a commission to erect lixiviating works at La Dura in Sonora, Mexico, in which he succeeded after many difficulties. The works there attracted much attention and he was soon called on to build other plants of the same kind at La Trinidad and at San Marcial, also in Sonora, both of which were successfully operated for a number of years.

Returning from Mexico to California, he found it difficult to induce mine operators to take up the lixiviation process and for several years he filled positions as metallurgist in amalgamating mills and chlorination works in Nevada and California. In 1878 he was engaged to work the rich concentrates of the Advance and the Colorado No. 2 mines at Monitor, Cal. He was very successful in this work, roasting the ore with salt, using the Plattner chlorination process for the gold and leaching for the silver contents. His success at Monitor led to his engagement to erect works at the Silver King mine at Pinal, Arizona, and thereafter his services were much in demand for the erection and management of lixiviation plants. These included experimental works at St. Louis for the Mary Murphy Mining Company, and several plants in Mexico. In 1888 he was engaged by an English company to experiment with the ores of the San Francisco del Oro near Parral, Mexico. The result of his work was described by him in a series of papers which appeared in the *ENGINEERING AND MINING JOURNAL* in 1889, and which constituted an extremely important contribution to metallurgical literature. In 1890 he was appointed managing director of the North Mexican Mining and Milling Company, a position which he held until 1894. In that year he was engaged by the Hidalgo Mining Com-

pany to rebuild and remodel its lixiviation works at Parral.

In 1895 Mr. Hofmann was called to Argentine, Kansas, by the Kansas City Smelting and Refining Company, which was having trouble with the Hunt & Douglas process for copper extraction. Concluding that this process was impracticable from a business standpoint, he invented a method of his own, which proved more successful and which enabled him to produce copper sulphate of unusual purity. This process was adopted by the Kansas City company and the works were enlarged from time to time. The Hofmann process was fully described



OTTOKAR HOFMANN

in Vols. VIII and X of *THE MINERAL INDUSTRY*. In 1899 he was appointed chemical director for the United Zinc and Chemical Company, and built for that company a large plant at Argentine where he remained until 1905. He then resigned, intending to devote his time to experimental work and writing. He was engaged in this work for two years, during which time he discovered a new method of making red oxide pigments of unusual brilliancy. He also wrote a number of articles and completed his well-known treatise on "The Hydrometallurgy of Silver."

A sedentary life, however, did not suit his active temperament, and in 1907 he decided to go back to Mexico, accepting an offer from the Topia Mining Company of New York. Topia is a small mining camp in the precipitous mountains of Durango, more than 100 miles from a railroad. The place is remote, being reached only by difficult trails, and it was almost impossible to secure proper food and accommodations. Though he accomplished what he undertook to do—to remodel a rundown lixiviation plant and

make it pay—he was too old a man at that time to undergo such hardships and his health gave way. He returned to his home in Kansas City, but last summer his health broke down completely.

Besides the articles mentioned above, Mr. Hofmann wrote many papers for scientific publication and societies. His articles were never compiled; they were all descriptive of his own experiences, investigations and discoveries. His last article was "Notes on the Hydro-metallurgy of Copper" which appeared in *THE MINERAL INDUSTRY* for 1908. He has the distinction of having introduced in the United States a branch of metallurgy and a number of processes which were practically entirely new in this country. Much of his early work was done in the face of strong opposition—partly ignorant and partly interested—but his persistence and energy and his thorough mastery of his work made him successful in the end.

Misrepresentation by Curb Market Promoters

Our attention has been called to the circulars of two "brokerage" firms doing business on the New York curb, who in their "market letters" refer to J. Parke Channing in connection with the Ray Central and the Tularosa copper companies. One of these concerns says that J. Parke Channing estimates that every month's development work now being done upon the Ray Central property blocks out and exposes over 1,000,000 tons of copper ore. The other concern says that J. Parke Channing has nailed his flag on Tularosa, thus implying an indorsement of that concern.

Mr. Channing authorizes us to inform the public that he has never made any statement as to tonnage on Ray Central and has steadfastly refused to make any estimates on this property until such time as work is sufficiently advanced to enable him to do so intelligently. His original statement was that probably the whole of the Globe-Isabella group was entirely underlain by ore.

Respecting the implication that Mr. Channing indorses the Tularosa Copper Company, he states that he has never seen the property and does not even know where it is.

The *JOURNAL* takes this opportunity to reiterate to the public its warning against these so-called "market letters." Their references to prominent engineers are generally unqualifiedly untrue. Their statements as to other matters are apt also to be untrue.

The stock of the Amalgamated Copper Company is held by 15,000 shareholders, which means an average holding of a little less than 100 shares.

Personal

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

Frank H. Probert, of Los Angeles, Cal., is visiting New York.

J. V. N. Dorr, of Denver, Colorado, is now located in larger offices at 728 Equitable building.

P. Chester Thompson has resigned his position as president of the Calaveras Copper Company.

Carl F. Dietz has returned from North Carolina where he has been engaged on professional work.

Frederick G. Clapp, of Pittsburg, has recently been examining petroleum and natural-gas territory in Indiana.

Dyke V. Keedy, who has been in New York for some time, is on the way to Utah and Nevada, on professional business.

B. L. Farrar has resigned his position as mine manager for the Chihuahua and El Potosi companies, of Santa Eulalia, Mexico.

J. B. Tyrrell, of Toronto, Ont., has been spending some time looking over the new gold finds near Porcupine lake in northern Ontario.

R. J. Howard, of Spokane, Wash., has been appointed general manager of the New Republic Mining Company in Ferry county, Washington.

Patrick J. Lavelle, general manager of the Johnstown plant, of the Lorain Steel Company, for the past nine years, has tendered his resignation.

P. R. Alsdorf, of the Aurora Gold and Copper Company operating in Gilpin county, Colo., is making a visit to Pittsburg, on mining business.

J. E. Spurr left New York Jan. 17 for Mapimi, Durango, Mexico, where the Spurr & Cox staff are conducting an extensive geological survey.

E. E. Ellis, of Birmingham, Ala., geologist in the Land Department of the Tennessee Coal, Iron and Railroad Company has been promoted to the position of assistant manager of the department.

Dr. William Berryman Scott, professor of geology at Princeton University, has been awarded the Wollaston medal by the Geological Society of London, in recognition of his research work in geology.

J. L. McClelland has resigned his professorship at Leland Stanford University in California, and has been appointed professor of mining engineering at the Sheffield Scientific School of Yale University.

The Governor of Iowa has appointed J. J. Jeffrys, of Albia, Edward Sweeny, of Des Moines, and R. T. Rhys, of Ottumwa, State mine inspectors. Mr. Jeffrys is the only new inspector; the others are reappointed.

M. F. Godfrey, who has been in charge of the Canisteo district of the Oliver Iron Mining Company for a short time, has returned to Chisholm, Minn., and will remain in charge of the Chisholm district as general superintendent.

The firm of Grady & Shorkley, consulting engineers and mining geologists, has been formed, with offices in the Empire building, Knoxville, Tenn. The members are William H. Grady, recently mechanical engineer for the Lehigh Coal and Navigation Company at Lansford, Penn., and Charles C. Shorkley, lately with the Bethlehem Steel Company at the iron mines, in Cuba.

Philip Argall announces that in order to give prompt attention to his rapidly increasing business, he entered on Jan. 1 into partnership with Philip Henry Argall, late of the Selby Smelter, and George Oates Argall, general manager Iron Silver Mining Company, Leadville, Colo., with the object of conducting a general business as consulting, mining and metallurgical engineers, under the name of Philip Argall & Sons. The offices are in the Majestic building, Denver.

G. H. Dowell, who for a number of years has been employed by the Phelps-Dodge interests at the smeltery at Douglas, Ariz., has been appointed general superintendent of the Old Dominion. George Kingdon, who has been acting superintendent since the resignation of R. B. Hegardt a few weeks ago, will henceforth be superintendent of mines and also general superintendent of the United Globe property controlled by the Old Dominion Copper Mining and Smelting Company.

Frederic H. Keyes, formerly general manager of the Robb-Mumford Boiler Company, has associated himself with Timothy W. Sprague, Henry Docker Jackson, and others, to carry on a general consulting engineering business under the name of Timothy W. Sprague, Frederic H. Keyes, Henry D. Jackson and Associates, 88 Broad street, Boston, Mass. They propose to make complete reports, investigations, and furnish designs and supervision for all sorts of power plants; also mining reports, investigations and power plants.

Obituary

Stephen Warner Baldwin died at Brookline, Mass., Jan. 4, aged 76 years. He was for many years connected with the Pennsylvania Steel Company and was thoroughly acquainted with steel manufacture and trade. He was an active member of the American Society of Mechanical Engineers, having served as a manager and as vice-president. He took a strong interest in industrial education and trade schools.

N. E. Whitaker, former member and

president of the West Virginia State Senate, president of the West Virginia Commission to the Louisiana Purchase Exposition, president of the Whitaker-Glessner Company, the second largest independent iron and steel company in the Wheeling district, and largely interested in other corporations, died at Wheeling, W. Va., on Dec. 28. He was a native of Maryland and was 71 years old.

John H. Lidgerwood, vice-president and treasurer of the Lidgerwood Manufacturing Company, died at his home in Morristown, N. J., on Jan. 1. Mr. Lidgerwood's connection with the firm dates back to its inception. He entered the employ of the historic Speedwell Iron Works, Morristown, N. J., in 1858, and later, upon the organization of the Lidgerwood Manufacturing Company, he became associated in its management, and so continued until the time of his death. Mr. Lidgerwood was 80 years old.

Societs and Technical Schools

National Association of Cement Users—The sixth annual convention will be held at Chicago, Feb. 21-25, headquarters at the Auditorium hotel. A large attendance is expected. A number of important committee reports will be made, and some valuable papers on cement and concrete construction are expected.

Montana Society of Engineers—This society held its annual meeting in Butte last week and elected the following officers: President, Frank M. Smith, manager of the American Smelting and Refining Company, East Helena plant; first vice-president, F. W. C. Whyte, general superintendent of the Amalgamated coal mines; second vice-president, Robert A. McArthur, chief engineer Parrot Mining Company; secretary, Clinton H. Moore. Several papers on engineering and mining features in the State were read.

American Institute of Chemical Engineers—At the recent annual meeting in Philadelphia the following officers were elected for the coming year: President, Dr. Charles F. McKenna, New York; first vice-president, Dr. F. W. Frerichs, St. Louis; second vice-president, Dr. Edward G. Acheson, Niagara Falls, N. Y.; third vice-president, Dr. Eugene Haanel, Ottawa, Can.; secretary, Dr. John C. Olsen, Brooklyn, N. Y.; treasurer, William M. Booth, Syracuse, N. Y.; auditor, Henry S. Renaud, New York; directors, George E. Adamson, Easton, Penn.; David Wasson, Montclair, N. J.; Dr. Edward Gudeman, Chicago; Ludwig Reuter, Berkeley, Cal.; Thorn Smith, Portland, Mich.; H. F. Brown, Wilmington, Del.; Dr. William M. Grosvenor, New York; Richard K. Meade, Nazareth, Penn., and Dr. S. P. Sadtler, Philadelphia.

EDITORIAL CORRESPONDENCE

REPORTS FROM OUR OWN REPRESENTATIVES ON
IMPORTANT EVENTS FROM MANY IMPORTANT
MINING CENTERS OF THE WORLD

San Francisco

Jan. 16—Under the California corporation laws, the president of a mining company is required to give any stockholder if he so requests, an order on the superintendent to allow the stockholder to inspect any mine owned by the corporation. An expert may accompany the stockholder in this inspection. For refusing to permit a stockholder of the Socrates Consolidated Mining Company to inspect the Socrates (quicksilver) mine, the court has ordered the president to pay to the stockholder \$1000 and to pay costs of the suit. This is perhaps the first time that this State law has been appealed to in the courts.

The eight-hour law passed by the last legislature has been declared valid and constitutional by the Supreme Court of California. The law was attacked in the present case on the ground that it was class legislation directed solely against mine owners. Fred J. Martin, superintendent of the Utica mine at Angels, agreed to have a test case made in behalf of the mine owners of the State, and, in June last, was placed under arrest on three charges of violating the eight-hour law. One charge was that of forcing a man to work in a mine for a longer period than eight hours; another was that of working a man in a quartz mill longer than the specified time; and the third was that of compelling a man to work eight hours in a mine and making him take the trip to and from his place underground on his own time, instead of that of the company. On the two counts which charged that Martin kept men at work in both mine and mill over eight hours, the writ of habeas corpus was denied by the court. On the third charge where the miner was forced to go to the face of the drift on his own time, he was discharged from custody. Thus, while upholding the law, the court construed the act to mean eight hours' actual work, the miner to go to and from the place of work on his own time. The court in rendering its decision maintained that the matter came under the police power of the State, holding that there are a number of operations detrimental to health of employees, such occupations demanding special precautions for the well being and protection of employees. While this reasoning may apply to underground miners, the mine operators do not think it applies to surface men or men employed in quartz mills or reduction works,

though the decision covers all these as well as underground miners. If the operators feel now as they did when the law was passed, and before it had been declared unconstitutional, some of them may close down their properties in which low-grade ore is being mined, or will at least curtail operations materially and mine only the better class of ore with fewer men. The decision will also make quite a difference in the running of quartz mills, for another shift will now have to be added, thus making more cost for ore reduction.

The Western Steel Corporation, with a capitalization of \$20,000,000, has been organized under the leadership of J. A. Moore, of Seattle, and H. E. Law, of San Francisco, to make iron and steel on the Pacific coast. The company own the plant at Irondale, Wash., where charcoal iron was formerly made from ore from Texada island. The company is said to have extensive deposits of bog ore on Vancouver island and other important deposits along the coast. They also are reported to own valuable coalfields on Graham island, one of the Queen Charlotte group, and at Ashford, in Pierce county, Wash. The present assets of the company are estimated to have a value of \$42,000,000.

Denver

Jan. 15—The Cleveland shaft, in Big Evans gulch, Leadville, has developed a fissure vein well into the granite, and is making a highly profitable production of gold ore. There are other instances on Breece hill of ore-bearing fissures.

Prospecting work in the South Evans section, however, is active, and promises much in the way of discoveries of new orebodies in the gold belt, and the tonnage going out from the above section is larger than at any former time. The names of properties working are the Valley, Cleveland, Ollie Reed, Silent Friend, Gold Basin, Louise, Little Bob, Little Ella, Blanche, Alps-Aztec, St. Louis, Boulder, etc., and nearly all shipping.

The history of the Little Jonny is in keeping with that of nearly all mines, inasmuch as they are free of litigation and counterclaims and work along comfortably, often for many years, until rich ore is discovered, when suddenly up jump a dozen, more or less, litigious adventurers, who seek through the courts to establish a claim to a portion of the

prize. The Van Cise suit, involving a \$500,000 interest in the above mine of the Ibex company, has just been dismissed by the Supreme Court of the United States, and is the last of 12 suits filed against the company as soon as the rich gold ore was discovered in 1892, and all of which have been dismissed from time to time during the past 15 years, not a single plaintiff having secured final judgment. The Little Jonny is the biggest gold mine in Leadville. It is owned by John F. Campion, of Denver.

Cripple Creek, whose mines are at elevations of from 9400 to 11,200 ft., has suffered severely from the long protracted cold weather experienced lately. All surface and dump work has to be stopped, pipe lines are out of commission, and little team work is being done, except in hauling fuel.

The Mine Owners' and Operators' association held its annual meeting in Colorado Springs on Jan. 10., and re-elected the executive board, all Cripple Creek men. Most of the leading mine managers of the district were present, but nothing was made public as to the policy for this year. However, it is said that one of the principal subjects of discussion was as to ways and means of putting a stop to what is politely termed "high grading." Why on earth it is not called "ore stealing," and why the perpetrators are not called "thieves," passeth all understanding. Is it prompted by a sense of delicacy about hurting the feelings of these predatory rascals that their operations have been in this way almost classed as a trade by the press, rather than as a crime, and a remarkably sneaking one at that? The burglar who breaks into a house takes the chances which need a considerable amount of ill-directed courage, and if caught, he alone suffers; but the ore thief steals from his employer what he is paid good wages to produce, and not only without risk to his person, but casts suspicion probably on a hundred honest miners working in the same mine. According to reports it was stated that 20 to 30 "high-grade fences" (meaning receivers of stolen ore, and practically partners of the thieves) are in operation in the district, and that upward of \$250,000 had been stolen during the year. If true, it would seem to be incredibly silly, as one-fifth of that amount paid to a good detective agency would probably

stamp it out. Only four men have been convicted during the year and are now serving terms in the penitentiary.

In 1909 the mines of Leadville, Colo., produced 29,811 tons of carbonate ore, 81,360 tons of argentiferous iron ore, 308,604 tons of sulphide ore, 32,192 tons of silicious ore, and 88,545 tons of zinc ore. The metallic contents of these ores were 66,652 oz. of gold, 3,593,108 oz. of silver, 6,693,625 lb. of copper, 9050 tons of lead, and 18,500 tons of zinc. These statistics are reported by the Leadville *Herald Democrat*.

Butte

Jan. 15—The Boston & Montana smeltery at Great Falls, started up Monday after a shutdown lasting from the beginning of the switchman's strike. The Great Northern railway has imported strike-breaking switchmen for use at Great Falls and freight is being handled as usual. At the smeltery yard and about the plant 100 special deputy sheriffs are on guard and 40 more are in the railway yards. At the smeltery 600 men have been put to work and more will be taken in as the plant resumes its full capacity. A recent large shipment of coal from the Sand Coulee mines has relieved the fuel famine in Great Falls. The mines of the Boston & Montana company started shipping to the Great Falls smeltery on Saturday. The threatened shutdown of all the Amalgamated properties has thus been averted.

At the annual meeting of stockholders of the Idaho Smelting and Refining Company, the following were elected directors: J. Herbert Anderson, Arthur B. Lee, E. K. Erwin, Thomas L. Greenough, W. J. C. Wakefield, W. W. Hidman and J. L. Drumheller. Mr. Anderson was re-elected president and his policy was approved. President Anderson has issued a statement in which he says that a \$500,000 operating fund has been arranged for and also an additional fund of from \$50,000 to \$100,000 for improvements. Those furnishing the \$500,000 for the operating fund will be secured by a lien on all ores treated at the plant, while the fund for improvements will be secured by a lien on the improvements themselves. From the foregoing it would appear that the differences existing among stockholders had been fixed up and that complete harmony now prevailed. The resumption of operations at the smeltery will mean much to many of the small producers in Idaho and Montana and it is to be hoped that work will be renewed soon.

The annual report of the assay office at Helena shows that its total receipts for 1909 were \$2,037,436 against \$1,754,265 for 1908. The receipts from Montana alone amounted to \$1,992,276 and Fergus county leads with \$664,173, ChoctEAU second with \$658,961.

There has been doubt as to who were the interests behind the Gilmore & Pittsburg railway now being built from Armstead, Mont., to Salmon City, Idaho, and the latest theory advanced is that the road is being built jointly by the Great Northern, Northern Pacific and Chicago, Burlington & Quincy. Such backing would indicate that the road may be extended much farther than its present terminals.

In the case of St. Louis Mining and Milling Company vs. Montana Mining Company a writ of error has been granted the defendant by Federal Judge Hunt. Notice was also given by the defendant that it would move the court for an order directing the United States marshal and William Mayger of the St. Louis Company to return to defendant certain cipher codes, assay sheets and other papers which came into their hands at the recent sale of defendant's personal property under execution. It is contended that the articles mentioned are not properly within the meaning of the statute and thus not the subject of levy under execution. These moves disprove the rumors that the Montana Company has abandoned the fight.

Indianapolis

Jan. 17—A large number of delegates to the annual convention of the United Mine Workers of America, which will be opened in this city, Jan. 19, have arrived.

Leaders of the delegates believe that a general increase of 20 per cent. in the wage scale applicable throughout the country will certainly be asked at the coming conference. The miners point to the fact that there has been no general increase since 1902. This point will be decided by the scales committee.

On the same day the Indiana Bituminous Operators' Association will have a meeting to form a union between the bituminous operators' associations of America. A National constitution will be considered. It is pointed out that the operators are not banded together in one organization as the mine workers are, but such amalgamation is now deemed advisable.

Scranton, Penn.

Jan. 17—Since the new child-labor act went into force in this State at the beginning of the year, the attendance of boys at the public schools in the anthracite regions of Pennsylvania has largely increased. In fact, in some of the schools the influx has been so great that there is no room for the numbers who have applied for admission. It is admitted on all sides, and by none more readily than by the operators, that if the law had no other effect than to bring the children of foreign miners to the public schools, it will be a great blessing. The children of foreign parent-

age are bilingual; the majority of them can read and write two or more Slavonic languages, say Polish and Russian, Lithuanian and Magyar, according to the part of Europe from which they came. They learn English rapidly.

Toronto

Jan. 15—Directors' meetings of the Dominion Iron and Steel Company and the Dominion Coal Company were held at Montreal, Dec. 12, at which concurrent action as regards organization was taken. Matthew J. Butler, Canadian deputy minister of railways and chairman of the Intercolonial Railway Commission, was appointed second vice-president and general manager of both companies, with headquarters at Sydney, N. S. It is understood that he is to receive \$25,000, his salary in the government service being \$8000. Mr. Butler has been prominently connected with several railway and industrial enterprises, including the Rathbun company, of Deseronto, and the Montreal Locomotive Works, joining the government railway staff in 1902. The production of the company in 1909, with the figures for 1908 in parentheses, follows: Coke, 401,182 tons (411,086); Pig iron, 256,496 (262,839); steel ingots, 296,950 (279,513); blooms, 262,052 (248,621); rails, 140,738 (152,440); wire rods, 73,004 (40,420).

Ore from Wabana was received during 1909 to the amount of 530,682 tons and 14,765 tons from other sources, as against 556,255 tons from Wabana and 44,212 tons from elsewhere in 1908. The new coke ovens are well under way and contracts have been let for the new blast furnace, the additions to the open-hearth and other extensions.

The Amalgamated Asbestos Corporation is making extensive preparations to greatly increase the output from some of the principal properties.

Cobalt

Jan. 15—Cobalt in 1909 surpassed all previous records, both in regard to tonnages shipped, value of the output and dividends paid. It is interesting to note that the total dividends paid by Cobalt companies up to the end of 1909 represent a total of \$15,777,257. Included in this total are the profits of the privately owned companies, the La Rose properties before they went into the consolidation, the O'Brien and the Drummond, while the profits paid by these companies amounting to \$3,304,826 were not actually distributed as dividends, they form part of the profits won.

During 1909 the total dividends paid by 16 companies, amounts to \$6,301,316. It is estimated that the total silver production for that period will approximate 24,000,000 oz., representing about 10 per cent. of the world's silver production. It will be seen from this that the divi-

dends paid represent about 50 per cent. of the value of the year's production. When it is considered that the Right-of-Way and O'Brien pay 25 per cent. the Hudson Bay 15 per cent. and the Crown Reserve 10 per cent. of the gross value of their outputs, in royalties to the Ontario Government, these figures take on a deeper significance. Until within the past few months the dividends for 1909 promised to be even greater than they are, but unexpected reverses among some of the dividend payers led to the cutting or suspension of the regular dividends. In almost every case, however, the prospects are good for their being resumed later.

During 1909 work was started on several new concentrators and additions have also been made to four of the existing mills and it is estimated that when these and the others in the course of construction are running to their full capacity, the tonnage of the mills will be over 1000 tons a day. One new smeltery for the treatment of the high-grade ores, the Coniagas Reduction Company's plant, has also been completed. So far this plant has been treating mainly Coniagas ore but when the improvements now being made are finished it will be in a position to handle outside ores as well.

The prospects for the coming year are bright and the production should show a substantial increase over the present year. This will be partly accomplished by the greater tonnage that will be handled in the concentrating mills and partly on account of the fact that when the power companies are in a position to distribute cheap air and electricity, many of the mining companies will carry on operations on a much larger scale and many claims now lying idle for lack of power will be developed.

The outlying districts, South Lorraine, Elk Lake and Gowganda, are also commanding more attention and 1910 should show a big improvement. The rush into the Porcupine goldfields should be productive of encouraging results, and judging from the reports that are coming from that section it is possible that at last Ontario is to have a profitable gold camp. Many large interests have already taken up claims.

Victoria, Tamaulipas, Mexico

Jan. 12—Owing to the general stagnation of business throughout this section of the Republic, brought about by the financial crisis, one or two years of drought and finally the unprecedented storm of September, 1909, mining was very seriously set back in this state.

Active work, however, has continued in the Dulces Nombres, Rampahuala and Llera districts. In the former, Rafael Salinas Cantre has been shipping zinc ores steadily, and under the impulses of better prices is now erecting at his mines

a large calcining plant for the purpose of utilizing a large quantity of 30 to 40 per cent. ore which, owing to the long mule pack, has been unavailable for transport to the railway. The Guadalupe & Virginia lead-silver mine in the same district, under the management of F. E. Sandys Simpson, has been pushing development steadily, and is asking bids for an 11-km. cableway. The mine has a large amount of ore blocked out now. South of the Guadalupe & Virginia property is the Tamaulipeca group, 165 pert. with seven workings. These properties have been idle for three years, the company having been in financial difficulties. L. Vogelstein & Co., of New York, through their Monterey representative, have recently taken over the Tamaulipeca group upon a two-year lease for extracting the zinc and lead-silver ores, and a large force is at work. The San Antonio lead-silver mine owned by the Conductors' company, and under the administration of Joseph Van Stone, is working and has developed a large tonnage of lead-carbonate and sulphide. This company has completed arrangements for the installing of a Patridge hot-blast furnace of 10 tons capacity, and expects to have it in operation in April. La Lolita mine, owned by the Alta Rampahuala Mining Company, largely owned in San Antonio, Tex., with H. C. Dennin manager, has been doing development work for the last two years, and has a large tonnage of lead-carbonate and sulphide ore blocked out. Development will be pushed to a point where sufficient ore will be in sight to warrant the erecting of a cableway to the railway at Santa Engracia station. R. S. Willey, who owns a large number of claims in the Chinge cañon, south of the La Lolita, has completed the organization of a company in Texas. If development is successful, another cableway will follow.

In the vicinity of Victoria, the only property being actively exploited is the Barnita, a locally owned copper mine. Work upon this property lagged considerably during the past year. Shipments of copper ore are made at rate of one car of 31 tons each two months. The ore contains 10 per cent. copper and from 500 to 800 grams silver. While there are a number of mining claims held in the territory surrounding Victoria and to the south of it in the Llera district, the Guadalupe de Tamaulipas near Llera is the only property being developed. This property is owned by La Gloria Copper Mining Company, of Terre Haute, Ind., and is in charge of Manuel Ruiz. The property yields lead and silver, and has much low-grade carbonate ore developed. Owing to the distance, 30 miles, from the railway, the company has decided to treat its ore on the ground, and is now investigating suitable processes.

Interest is being shown in the coal-

fields west of Cruz station on the Monterey & Gulf division of the National Railways. A French company is prospecting with drills a property near Ascencion, across the Tamaulipas and Nuevo Leon line. So far results have been satisfactory. There is reported to be a large area in that section, showing many indications of coal. At one small mine known as La Caballda several carloads of semi-anthracite have been taken out, which were high in carbon and low in ash.

In the southern part of the State, at Tampico, the boring for petroleum is being pushed with vigor and a number of "pumpers" have been brought in within six months.

London

Jan. 9—American mines have been very prominent this week. The flotation of the Santa Gertrudis Mining Company by the Camp Bird has been accomplished. The debenture stock and new shares of the Camp Bird offered for subscription appear to have been well applied for by the shareholders and the underwriters will not, it is believed, be called on to any large extent. The purchase of the Santa Gertrudis mine involved the finding of a million sterling in round figures.

From these reports it appears that the Camp Bird Company has made a promising purchase. It is one of the largest mining deals that has been carried through in London for some time, and it is to be hoped that the valuations so conscientiously undertaken will be borne out by results.

At an extraordinary meeting of the Boston Consolidated Copper and Gold Mining Company held during the week the shareholders agreed to ratify a provisional agreement for the sale of the company's property to the Utah Copper Company. The scheme of amalgamation is approved of by Sydney Jennings, the company's consulting engineer, who estimated that the two properties could be worked more advantageously together than separately. The cost of producing copper on the enlarged Utah ought not, he thought, to exceed 8.5c. per lb. It was announced that the property of the Nevada Consolidated might later also be included, at a rate not more favorable to the Nevada company than $2\frac{1}{4}$ Nevada shares for one Utah. The terms of purchase of the Boston property are 310,000 shares in the Utah, the capital of which is to be increased from 734,500 shares of \$10 each to 2,500,000 shares.

The proposals met with some opposition, but were eventually carried. The chairman informed the meeting that a large majority of the shares were held in America and that he held proxies representing 327,438 shares in favor of the sale.



Alaska

Chicagoff—The company has been sold to a Seattle syndicate. Judge deGroff retains his interest in the property and will act as manager. Mining operations will be increased in the near future.

Bear's Nest—An air compressor is to be installed on the property, at Juneau, and it is planned to carry on active operations. W. Jewett is in charge of the work.

Arizona

The Development Company of America has taken over the Henderson concessions for the railroad in Sonora to a port on the Gulf of California and proposes to connect with a line from the Imperial smeltery at Sasco. The railroad will be important, affording an outlet for a richly mineralized section of Arizona and for a copper district in Sonora which is said to have great possibilities. Also the road will serve as a port of entry for coal from Australia for the use of the Imperial and other smelteries in Arizona.

COCHISE COUNTY

Arizona United—The company controlled by Philadelphia capital is operating a smeltery at Johnson, making a carload of matte per week, worth about \$5000. The mines are down to a depth of 750 ft., with ore in the bottom. I. Wayne Von Leer is in charge.

GILA COUNTY

Miami—Churn drilling is to be inaugurated to explore the ground toward the Inspiration property in which direction the mineralized schist is known by a geological survey to trend. The Miami orebody undoubtedly extends in this direction, the underground developments not yet having reached its limit, but how far it goes remains to be proved. The drilling, which will shortly be commenced, will throw light upon this. Recent developments by drifting in the mine have shown ore of materially higher copper content than the average of the orebody. Good progress is being made in the mill construction.

GRAHAM COUNTY

Arizona Copper Company—Production in December was 1300 tons.

Shannon—The December output was 1,498,000 lb. of copper.

Red River Copper Company—The new shaft has reached 235 ft. and sinking

continues. On the 200 level a drift has been driven 180 ft. in ore.

Donald—On the property in the Cave Creek mining district a 175-ft. shaft has been sunk. A crosscut of 110 ft. in ore fails to disclose either wall. The ore contains copper, gold and silver and is self fluxing. W. F. Donald is manager.

MARICOPA COUNTY

Arizona—The double compartment shaft at the Minneapolis, one of the 10 claims owned by the company in the Winnifred district, has reached 200 ft. and is in good average ore. L. L. Plank, Phoenix, is manager.

Rogers-Arizona—Thirty miles north of Phoenix is the property of this company. Development is being pushed on a vein of copper glance. J. D. Marljar, of Phoenix, superintendent, says a 100-ton hydrocarbon smelting plant is to be erected during 1910.

PIMA COUNTY

Twin Buttes—E. T. Davis has resigned as president. The annual meeting was held Jan. 18 at Tucson.

YUMA COUNTY

Clara—Representatives of the French stockholders have been visiting the properties near Bouse. Work on the smelting plant is being pushed and the railroad will soon be completed. Oscar Fanyan, representing the foreign stockholders, has been elected vice-president.

California

PLUMAS COUNTY

Plumas - Eureka—Turner Brothers, who have been operating a lease on this mine near Johnsville, have done well during the season.

SHASTA COUNTY

The chromite mine between Castella and Dunsmuir, owned by L. H. Brown, of Dunsmuir, is shipping chrome ore for furnace lining to smelteries at Kennett, Coram, Martinez, as well as Salt Lake City. The crude ore brings between \$12 and \$15 per ton.

Silver Falls—This company, near Igo, formerly the South fork, is being rapidly opened under management of Harold Rogers. They have started a new ore-shipment station at Girvan to send the ore to Kennett.

SIERRA COUNTY

Irelan—The three old claims owned by ex-State Mineralogist William Irelan and

his sister have been bonded to Fred Clark, of San Francisco. The claims are in a very favorable location at Alleghany and will now be fully developed. Over 30 years ago they were profitably worked. George Hegarty is superintendent.

Queen Radigunde—This property at Alleghany has been placed under a five-year lease to Tonopah men. Frank B. Smith is the representative. The mine has not been bonded, but only leased.

Eldorado—The latest strike at Alleghany is in this mine where ore of phenomenal richness is being taken out. This is a very old mine and is under management of H. L. Johnson of the Tightner.

SISKIYOU COUNTY

Clarence Smith and John Haley have found a small vein of free gold ore in this district, the first vein discovered, though there is plenty of auriferous gravel.

Machinery is being installed on the new dredge on McAdams creek and it will soon be started up.

Elk Creek—This company, operating the Coburn mine, has been making profitable clean-ups.

Forest—This mining property, on Nigger creek, adjoining the Osgood & Co. claims, will be operated this winter by W. S. Duprey.

Bennett & Co.—This firm has started work on the four hydraulic claims at Forks of Salmon with an abundance of water.

Black Bear—Ben Daggett has returned from Mexico, bringing men with him who expect to purchase and work the mine.

TRINITY COUNTY

Headlight—This property, near Carrville, will be developed extensively. Three miles of flume are to be put in and a 40-stamp mill built.

TUOLUMNE COUNTY

Moffitt—This mine on the Tuolumne river, formerly a producer, is about to be worked again.

Banner—This mine at Big Oak Flat has been started up by George C. Richards, owner.

Little Gap—This gravel mine on the Big Channel, seven miles from Groveland, has been bonded to Holtsburg & Lane of Modesto.

Horseshoe Bend—This company is about to resume operations on its property at Tuttle town.

Surprise—Very good ore is being taken from a wide shoot in this mine at Saw Mill flat.

App—Ore of high grade is being taken from this mine near Jamestown, owned by W. A. Nevills. The shoot is a continuation of that found before water stopped operations in that part of the mine.

May—This mine, formerly the Tulloch Pocket claim, is being opened by a tunnel to strike the shoot some distance below the old workings.

Yrma—The new hoisting machinery of this mine has been placed in position and sinking will be resumed.

Colorado

BOULDER COUNTY

Primos—This company will shortly arrange for the building of a power plant on North Boulder creek to generate 2500 h.p., about 500 h.p. of which will be used in the operation of the company's mines, mills and tramway, the balance to be sold to operators in the Nederland and surrounding districts.

Rip Van Dow—W. Brown and associates are sacking rich tellurium ores from this property near Jamestown.

CLEAR CREEK AND GILPIN COUNTIES

Several carloads of machinery for the Malm plant at Georgetown have been received, and it is expected that the mill will be running inside of 60 days.

S. Sternberger, of Philadelphia, Penn., and L. Sternberger, of Denver, are installing a power plant which will cost at least \$75,000 for furnishing electricity for their own and neighboring property in the Fall River section. Fred G. Wood, Russell Gulch, is in charge.

German—A strike of high-grade uranium ore has been made. A compressor plant will be installed. R. W. Miller, Bald Mountain, is superintendent.

Alice—Work has been resumed at the holdings of this company, and plans are underway for a 300-ton mill to handle the low-grade deposits. A. H. Roller, Idaho Springs, is manager.

Continental—Arrangements are being made to install a large compressor plant at the Seemann tunnel and additional capacity at the power plant.

Gold Collar—A new orebody has been found in the third west level. Heavier machinery has been installed. A. Skeels, Central City, is manager.

Ramsdell—Arrangements are made for the financing of this property and the completing of the mill near Georgetown. G. Teagarden is manager.

Kennedy—This Georgetown company is figuring on the installation of a 50-ton milling plant.

Klein-German—Wisconsin people have taken a lease and bond on this and ad-

joining property in Gregory district and are installing machinery and compressor. J. W. Stoughton, Black Hawk, is manager.

Hurricane—Denver people have purchased this mine, close to the War Dance, Russell gulch, and will install machinery. J. H. Le Shar, of Denver, is manager.

Newhouse Tunnel—Work on the heading has been discontinued for the present as it is reported that the ventilation was inadequate. It is expected that work will be resumed inside of 60 days and during the interval several laterals are being run to cut veins under Quartz hill, which have been partially explored through the big tunnel. During 1909 the tunnel was extended 3332 ft., making its total length 20,978 feet.

Cumberland—High-grade gold ore has been found in this property near Yankee hill. Denver people have recently purchased the property and they will install machinery including compressor. J. D. Montgomery, Yankee, is manager.

Gilpin Independence—This company has recently opened up large orebodies in its Golden Flint mine, Perigo, and intends to install an additional 10 stamps and other machinery at its mill. The company has an office at 202 Exchange building, Denver.

Princess Alice—Developments are being carried on at the holdings in the Alice district and it is reported that a mill is to be built near the property. J. F. Kaminky, Alice, Colo., is superintendent.

LAKE COUNTY—LEADVILLE

Cleveland—This mine is installing a 1200-h.p. hoist and will sink another 200 ft. During the sinking, the company will ship about 2000 tons of ore per month, as usual. The New Monarch shaft is to be unwatered preparatory to sinking deeper and exploiting orebodies.

Gold Basin—The lessees on this mine are shipping seven carloads of high-grade ore per month.

Robert E. Lee—W. T. Jones and associates, leasers, are shipping high-grade zinc ore.

Ibex—From the lease on No. 2 shaft, high-grade ore has been produced for over a year, and a carload of exceptionally rich stuff has just been sacked and sent to the local smeltery.

TELLER COUNTY—CRIPPLE CREEK

News comes from Cripple Creek that four old-time shippers that have not been producing for a considerable period, have again begun to ship, sending out a carload each this week. They are the Peggy, under lease to Seaver & Henry, this mine being on Gold hill, and worked through the Ophelia mining and transportation tunnel; the John A. Logan, on Bull hill, under lease to Charles Ridpath; the Jennie Sample, on Beacon hill, under

lease to W. L. Shockey; and the Mitchell shaft of the Pinnacle claim, on Bull hill, which is said now to have ore yielding from 1 to 3 oz. gold per ton.

Golden Cycle—It is reported that the mine and mill have been sold to an English syndicate for \$7,000,000 or \$4.50 a share. Verner Z. Reed, who sold Stratton's Independence, is said to have negotiated the deal. It is admitted that the mine has been examined but the completion of the deal is not admitted by the company officials at Colorado Springs.

Gold Sovereign—This mine, which was closed down for 10 months on account of the destruction by fire of the mine plant and buildings, is shipping steadily, and is credited with a total production of 2964 tons of a gold value of \$23,294. O. H. Hinds is president.

W. P. H.—This mine on Ironclad hill is shipping about 600 tons per month from 450 ft. deep, the ore running about 2 oz. gold to the ton.

Idaho

CŒUR D'ALENE DISTRICT

Bunker Hill & Sullivan—A new milling plant has been installed with a capacity of 700 tons daily. The old mill will be remodeled and when this is done it is expected that the mine will produce between 1500 and 2000 tons daily.

Copper King—The continued heavy flow of water from the face of the tunnel has necessitated the closing of the mine and it will in all probability remain closed for three months.

Nipsic—It is thought that the property may change hands in the near future and that only the issuance of patents is being awaited before the transfer.

Snowstorm—Ore rates have been reduced \$1 and \$2 per ton on shipments from Larson. This was done after the directors threatened to shut down the property unless rates were reduced. This will enable the mine to ship low-grade ore which it was formerly unable to do.

Surprise—A fine body of lead-silver ore has been opened up, creating interest in Pine Creek district.

Josephine—This mine will ship ore which lies on dump and will continue monthly shipments.

Ambergris—The raise 300 ft. long has made connections between levels after months of work.

Hercules—The Tiger mill is treating 200 tons daily on one shift.

Kentucky

The mine of the Interstate Coal Company at Barbourville caught fire two weeks ago. At first it was thought that the fire could be handled easily, but it spread rapidly and the mine is now completely closed. As a last resort the main entry has been sealed and water is being

pumped into the mine. The mine is the largest in eastern Kentucky, and was recently equipped with electric haulage and other machinery.

Michigan COPPER

The Lake Superior copper properties produced in December 19,920,458 lb. of refined copper, or 279,230 lb. less than November.

Winona—This property continues opening up reserve ground and at the present time has enough blocked out to maintain regular shipments to the mill for a number of years. The ground is of a consistent nature and will in all probability yield about 15 lb. copper to the ton.

South Lake—The mine has its drill in the lode after passing through 240 ft. of overburden.

Tamarack—The rock from the conglomerate lode of this property is being shipped to the Calumet & Hecla mills, while the rock from the Osceola amygdaloid lode of the Calumet & Hecla is going to the Tamarack mill. This arrangement went into effect Jan. 1 and to the benefit of both companies as the respective mills are more economical on these different kinds of rock.

Franklin—The company is about to start drill operations upon the approximated strike of the No. 3 lode which is showing such good results at the Hancock property. Operations are centered on the Pewabic lode with most encouraging results.

Oneco—This company has encountered a copper-bearing amygdaloid formation in its No. 5 drill hole at 350 ft. The core taken out shows the formation 12 ft. wide and charged with copper throughout. This unidentified lode is 1200 ft. west of the lode exposed in the shaft. No. 5 hole is sinking to cut the Oneco lode at depth and also the hypothetical Tomahawk conglomerate lode, which Edwin J. Hulbert, discoverer of the Calumet conglomerate, maintained traversed this tract. A second drilling outfit is working in proximity to this strike and will expose this lode at another point in a short time.

Lake—A diamond drill operating from the face of the crosscut at the sixth level has cut the Lake lode at 120 ft. from the shaft. This work was done to determine the distance necessary to drive before striking the lode, and crosscutting will not be resumed. The crosscut has been extended 70 ft. from the shaft. Drifting on the new formation cut by the shaft at the sixth level continues showing good copper ground.

Indiana—This property has disclosed in its diamond-drill operations a conglomerate lode of exceptional richness.

The core shows the lode to be 41 ft. thick and impregnated with heavy copper throughout and as rich as any sample ever taken from the district. The drill is operating at the northeast corner of section 28 and cut the lode at 1400 ft., but in all probability the outcropping will be found on these lands.

Ojibway—The north drift from the 500-ft. level of No. 1 shaft is encountering a good run of copper ground, as is also the south drift from the 650-ft. level of No. 2 shaft. A diamond drill operating at the 800-ft. level drift of No. 1 shaft has cut the formation and shows 10 ft. of it carrying commercial copper. This drift passed out of the copper-bearing portion of the lode some time ago, owing to a fault in the formation and this drill was recently started to relocate the lode.

Missouri

Frank T. Creller has purchased 320 acres in Newton county near the Mattes brothers mine from Victor L. Young and others and is opening the tract.

Continental—This company has taken over the Temagami mine and mill, Joplin tract, and is operating in sheet ground.

John Jackson—This tract of land consisting of 400 acres near Joplin has been sold to the St. Louis-Joplin Lead and Zinc Company for \$250,000. T. J. Franks, of St. Louis, is president and R. F. Campbell Joplin, manager.

Montana

BUTTE DISTRICT

Amalgamated—The Mountain View mine has kept in operation throughout the recent troubles, but with a reduced number of men. Its normal output is between 1500 and 1700 tons but during the railway strike it has been shipping about 1000 tons daily, for a while to Anaconda, but since Jan. 9 to Great Falls. The Pennsylvania was closed for some time, but opened again with about two-thirds its full force, and is shipping about 500 tons daily to Great Falls. The Leonard and East and West Colusa are producing at a much reduced rate. A crosscut driven north from the Badger State shaft has recently connected with a drift on the 1200-ft. level of the Speculator.

Butte & Superior—The first shipment of zinc ore to the Basin concentrator has been made. Work has been begun in the Black Rock shaft.

Davis-Daly—A new vein varying in width from 18 to 30 in. has been cut on the 1800-ft. level, 50 ft. from the shaft. The main vein has not been cut, on this level, and is in about 600 ft. further. The company's petition to build a tramway from the Colorado to the Hesperus shaft in the city has not as yet been acted upon by

the council and shipments are being held, pending such action.

Butte-Ballaklava—P. H. Nelson, of Duluth, president, is in Butte, and will remain in this city several months to direct operations. The third compartment of the shaft has been raised to the surface and the new steel headframe is up. The new hoisting engine has not yet arrived.

North Butte—A wreck in the shaft was caused by the engine escaping control and one cage went to the sump while the other was pulled into the sheaves.

Nevada

Unprecedented floods have destroyed nearly 100 miles of the Salt Lake railroad in Nevada. The road will rebuild the line through Meadow Valley wash in a new location to avoid the recurrence of such disasters.

ELKO COUNTY

The new Contact camp on the Twin Falls-Cobre line is attracting attention. The Ivy Wilson group has been bonded and other negotiations are underway. The ore is copper and low grade but the deposits are extensive.

ESMERALDA COUNTY

Goldfield Consolidated—The annual meeting of the company was at Evanston, Wyo., Jan. 10., and the following board of directors was elected: George Wingfield, J. B. Hubbard, J. H. MacKenzie, J. H. Carstairs, W. C. Ralston, A. H. Howe and W. G. Roelker. The officers for the ensuing year are: George Wingfield, president; J. B. Hubbard, vice-president; J. R. Finlay, general manager; A. H. Howe, secretary and treasurer.

HUMBOLDT COUNTY

Laurel—This gold property eight miles west of Winnemucca is now shipping. G. F. Siebert is manager.

LINCOLN COUNTY

At Goodsprings, the Ninety Nine and the Sultana are developing satisfactorily. J. B. Jensen is manager.

STOREY COUNTY

C. & C.—The water stands at 151½ ft. below the 2350 station.

Ward—This shaft is working on the 2100 pump station and retimbering of the shaft below the 2300 level.

Comstock Tunnel—The wood stave pipe to carry hot water from the Ward and C. & C. shafts has been completed to the mouth of the tunnel.

Butters—The mill has discontinued working tailings for the winter, and is running on ore from the Ophir and upper levels of the Chollar and Potosi.

Mexican—The two-compartment winze is down 72 ft. below the 2300 level.

Hale & Norcross—The station at the top of the incline raise, from the tunnel

level, has been completed. The reopening of the No. 2 east crosscut from the north lateral drift is in progress.

Yellow Jacket—The incline shaft has been reopened and repaired for a distance of 325 ft. below the 1100 level.

WHITE PINE COUNTY

Steptoe Lead and Copper Company—Work has been started on this lead property in the Duck Creek district.

New Mexico

The Orogrande Smelting Company has had engineers in the field for the past six months searching throughout the Southwest for available properties producing copper-sulphide ores. The company is now negotiating for two properties, one in the Globe district, Ariz., the other in New Mexico. This company has a smeltery at Orogrande, on the main line of the El Paso & Southwestern railroad, 50 miles north of El Paso. The daily capacity is 500 tons. The company owns, near the smeltery, large amounts of oxide and silicious ores, but owing to the lack of sulphides the plant has been idle for about two years. J. J. Murray, formerly of the Mountain Copper Company, California, and the Iron King, Arizona, is manager.

Polar Star—This group, in the northern part of the Black Range district, worked under lease and bond by Park Commissioner Harris, of El Paso and associates, has just been sold to the Black Range Reduction Company, formed by Colorado men. The company is planning the construction of a 50-ton milling plant to treat the Polar Star ore and also to do custom work.

Stephenson-Bennett—The company with properties at Organ, at the present time in receiver's hands, is having its financial troubles adjusted and will soon resume. This lead-silver mine has ore blocked out, and a concentrating plant on the property.

Pennsylvania

ANTHRACITE COAL

Delaware & Hudson—Five brothers named Hull have sued this company in the Lackawanna county court to recover royalties on a tract of coal land in Blakeley township, near Scranton, containing some 400 acres, which, it is estimated, originally contained over 25,000,000 tons of coal, of which about 5,000,000 tons have been mined. The Hulls, according to their complaint; made contracts in 1860, which reduced the annual minimum quantity to be mined to 120,000 tons. As a result of this contract, the company, it is claimed by the defendants, has been enabled to conserve the coal in the Hull tract, while it has mined out coal from other tracts, where the minimum was greater. The plaintiffs claim that the company fails to pay its royalties to

them; they also claim that the coal has been mined negligently and that no proper accounting has been made of the output during the past 50 years.

Monongahela Consolidated—An order has been placed for 400 steel mine cars with the Ohio Ceramic Engineering Company, Cleveland, the equipment being for the Monongahela company's large mine at California.

South Dakota

With the declaration that they intend to establish permanently in the Black Hills non-union labor conditions and to install the card system, the managements of 13 large mining properties in the Black Hills district have issued notice to their employees that they could sign under the new conditions before any outsiders were imported. More than 800 men are affected, exclusive of the 2500 at the Homestake, now closed. The Homestake employees opposed to the policy of the union have formed the Homestake Loyal Legion unaffiliated with any union and are in negotiation with Superintendent Grier looking to a resumption of operations.

Homestake—The company has started part of plant using non-union men only and expects soon to be in full operation. Over 1000 men are ready to work and it is not expected that any outside labor will be needed.

Utah

A company headed by George F. Timmons, of Washington, D. C., is making investigations of special process for treating the copper ore from the deposits in Green river section. The ore is expected to run 5 per cent. and can be steam shoveled.

BEAVER COUNTY

Nevada Ready Pay—Development will be resumed on the Santa Anna and Mollie Reed claims. H. A. Moore succeeds W. L. Bachtell as superintendent.

JUAB COUNTY

Tintic Central—Conditions in the property are reported improved by manager O. U. Holdaway. The limestone formation has not been cut. Electric power will be installed.

Scranton—This mine, Tintic district, has opened new ore in the Magazine tunnel, the deepest working. The product is zinc and lead. Henry Jones is superintendent.

SALT LAKE COUNTY

Utah Copper Company—The meeting of the stockholders of the company which was to have been held at Jersey City, Jan. 18, was adjourned until Jan. 25 next by an injunction granted by Judge Scott of the United States Circuit Court at Trenton, on the application of E. A. Wall. The injunction is to be argued at Trenton

on Jan. 24. The meeting was called for the purpose of ratifying the merger with the Boston Consolidated and Nevada Consolidated Copper companies, for the stock of which Utah shares have been offered in exchange at the rate of 1 for 2½ and 1 for 2¼, respectively, and to vote an increase in Utah stock from 750,000 to 2,500,000 shares for the purposes of exchange.

Utah Consolidated—The local management has received no information concerning the probability of a shutdown of the mine until International smeltery is finished. The new smeltery is getting more material now, and the improvement in weather conditions is permitting increased activity in completing the plant. The exact date for blowing cannot be given, but the plant, it is said, cannot possibly be commissioned by April 1, the time set for receiving the Utah Consolidated ores.

SUMMIT COUNTY

California—This old property, Thaynes cañon, Park City, has been leased to George Morse and M. H. Wynn. Other work is planned for the adjoining Comstock property owned by the same interests.

Washington

Capt. John McA. Webster, superintendent of the Spokane Indian reservation in eastern Washington, announces in a statement that no mining claims can be located on the reserve until President Taft issues a proclamation opening the mineral lands to location and entry. This order is looked for early next spring.

KLICKITAT COUNTY

Lucky Five—The owners of this property are making extensive preparations for early spring work. The ore is free-milling gold. P. G. Peterson, White Salmon, has charge.

WHITMAN COUNTY

Commonwealth—This coal mine at Wilkeson has been sold. The mine outputs 250 tons daily, which the new management will double. Robert L. McCormick, of Tacoma, is president.

Canada

ONTARIO

The Cobalt shipments for the week ended Jan. 7, are as follows: Drummond 170,000, Kerr Lake 120,213, Cobalt-Central 40,000, Coniagas 59,597, McKinley-Darragh 48,041, La Rose 65,000, Nipissing 62,301, total 565,152 pounds.

City of Cobalt—This company has arranged with the Northern Customs Concentrator to mill the dump, estimated at 10,000 tons.

Union Pacific—This property, Cobalt, has suspended mining operations pending the arrival of the hydraulic air.

Silver Alliance—A diamond drill has been installed to test the underlying diabase at this property, Elk Lake.

Lucky Godfrey—It is expected that the first car of high-grade ore from this mine, Elk Lake, will be shipped Feb. 15.

Mexico

BAJA CALIFORNIA

Boleo—Production in December was 1378 metric tons, the average yield of the ore having been 3.784 per cent. copper.

CHIHUAHUA

Negotiations are reported for the Chihuahua Mining Company property and the Potosi mine in Santa Eulalia district for 7,000,000 pesos to an American company. The London Exploration Company also has some pending deals in this district.

Dolores—Fire at Madera, Jan. 8, destroyed the storehouse of the company. Loss \$100,000.

Inauguration—This property near Ojo Caliente is being operated by a company in which G. W. Vanderslice, G. L. Williams, M. D. Murphy and G. L. Vaughan are interested. The ore contains silver and lead.

Parral Consolidated—This Parral company's new concentrating plant is to be in operation in January. D. H. Bradley, Jr., is in charge.

Cordero—The company is making regular shipments of silver ore which nets about \$1500 to the car. It is announced that dividends will be distributed shortly.

American Zinc Extraction Company—At Parral the experimental Elmore oil-process plant lately installed at Parral is proving sufficiently satisfactory to warrant the early erection of a large working plant.

Minas Veta Grande—Heavy shipments of silicious ores are in progress from this Mines Nuevas property.

Lluvia de Oro—Milling operations have been suspended until early spring when the new hydroelectric power plant will be in readiness. Mine work is being continued under the direction of H. R. Conklin.

GUERRERO

Maine & Nebraska—The smeltery of this company at Rio Balsas is at present shut down, awaiting repairs necessitated by an explosion. The plant has a capacity of 160 tons per 24 hours.

JALISCO

San Vincente—At this mine, owned by the Philadelphia Gold Mining, Milling and Smelting Company, an experimental cyanide plant, using Pachuca tanks, is being installed. The company is having trouble with the treatment of the ore, due

to some undetermined element in it. M. J. Slattery is manager.

Mataraña—A tunnel 950 ft. long has cut 21 ft. of ore in the old Mataraña mine near Mascota. The tunnel is several hundred feet below the old workings. The mine is owned by the Mataraña Mining Company, of Spokane, Wash.

Magistral—A wagon road has been completed from Ameca, the railroad terminus, to the copper mines, a distance of 8 miles. Machinery for the 100-ton concentrating plant is being brought in.

Santa Maria—The old workings of this copper mine in southwestern Jalisco, near the Colima line, are being cleaned out preparatory to sampling by the De Lamar interests. The mine is owned by S. S. Gates, of Guadalajara.

Virginia & Mexico—Fuel difficulties have been overcome, and the new 150-ton plant is now handling from 75 to 90 tons daily. Electric power will be used soon.

El Favor—It is estimated that the ore now in sight is sufficient to keep the recently completed 100-ton mill in steady operation for 10 years. The mill will not be placed in commission until electric power reaches the district.

MEXICO

El Oro—Returns for December are as follows: mill No. 1 ran 16 days; mill No. 2 ran 30 days; crushed 25,383 tons; yielding bullion, \$224,980; working expenses, \$119,230; expenditure on developments, \$31,000; total expenditure, \$150,230; profit, \$74,750; profit on railway, \$4000; total profit, \$78,750; expenditure on permanent improvements, \$7000.

Mexico Mines—Returns for December are as follows: mill ran 31 days, crushed 11,500 tons; yielding bullion, \$115,410; working expenses, \$42,270; expenditure on developments, \$12,300; total expenditure, \$54,570; profit, \$60,840. net value of 23 tons shipped during month not included in the above profit, \$3000. Expenditure on permanent improvements, \$1000.

Cucharra—The new mill is now running and the separation of the lead and zinc is satisfactory.

Santa Ana-Esperanza—The mine is shipping regularly and exploration work is being carried on. A crosscut has been started in order to get under the old workings.

San Fernando—Development is being pushed. Sr. Francisco Conejos is in charge.

Imparcial—This company, L. N. Shaw in charge, is doing development and a 5-ft. vein of milling ore has been discovered.

OAXACA

San Juan—The American company contesting the title of this property has

won in a suit in the Federal Court of Mexico City.

SONORA

Santa Rosalia—One thousand pounds of first-grade ore was brought to Cananea from this mine last week as an experimental shipment.

Greene-Cananea—The Sierra de Cobre mine was put on the producing list in December and is yielding regularly. The ore does not require concentration.

Mexican Northern Mines Company—This concern has recently added to its working force and is in good shape. Its properties are situated near Tucabe.

Black Mountain—This is a Cole-Ryan holding near Magdalena. A retrenchment and reduction in number of employees are reported.

ZACATECAS

Santa Rosa—This property, in the Concepcion del Oro district, owned by V. D. Williamson and the estate of V. M. Clement, is under negotiation to the exploration Company of London.

Zaragoza—This mine has been shipping to Aguascalientes for three months. One shaft yields copper, silver and lead ore. The other iron sulphide containing gold and silver. The company is refitting the mill. The main shaft is down 130 m. and is being sunk to the 225-meter level.

Asia

INDIA—MYSORE

Kolar Goldfield—Gold production in December was 53,099 oz. bullion. For the year ended Dec. 31 the total was 534,415 oz. bullion in 1908, and 544,007 oz. in 1909; an increase of 9592 oz. The bullion reported in 1909 was equal to \$10,120,032, or 489,600 oz. fine gold.

South America

BRITISH GUIANA

Exports of gold from the colony, 11 months ended Dec. 1, were 66,471 oz. bullion in 1908, and 60,390 oz. in 1909; a decrease of 6081 oz. The bullion reported in 1909 was equal to \$1,050,162, or 50,806 oz. fine gold.

Exports of diamonds in 1909 were 5583 carats, valued at \$35,589; a decrease of \$3746 in value from the previous year.

VENEZUELA

The Venezuelan government has notified the Pan-American Company, in which Charles M. Schwab is believed to be interested, that it will not recognize the transfer of the Imataca iron mine to that company, on the ground that the title to the property is questioned. The protocol expressly prohibited any person taking possession of the mine until the title was cleared. It was the intention of the company to begin work at an early date.

\$ · THE MARKETS · \$
CURRENT PRICES OF METAL · MINERALS · COAL AND
STOCKS · CONDITIONS AND COMMERCIAL STATISTICS

Coal Trade Review

New York, Jan. 19—The coal trade in the West is in a generally confused state. The demand for coal at all the distributing centers is strong and mines are working hard to fill orders. The distribution of coal, however, has been badly disarranged by stormy weather and at many points coal has been scarce and premium prices have been paid. It is quite probable, however, that this condition will pass over in a short time and matters will work down to a normal basis. A good demand seems to be assured for some time to come.

The Eastern bituminous trade has its own troubles, some of them similar to those of the Western trade, though demand does not seem to be generally as strong. Transportation here too has considerable effect on the trade.

In the anthracite trade there is nothing specially new beyond the usual winter demand.

Preparations are already being made for the Lake trade of next season. The Northwest is reported short of coal and early shipments will be needed. No charters have been made for next season, but it is generally expected that coal rates from Lake Erie ports will be at least 5c. above the past season. Some coal has already been loaded, so local papers report, on vessels tied up for the winter; the boats charging 10c. per ton for the storage.

Car Distribution to Mines—The United States Supreme Court, on Jan. 10, rendered an important decision sustaining the order of the Interstate Commerce Commission in the case of the Illinois Central and other roads in Illinois. That order directed that no discrimination should be made in the case of companies owning their cars, but that all private cars should be counted in the general stock and distribution made to mines on an equitable basis. The court fully sustains the right of the commission to make the order, and to direct the allotment of cars.

COAL TRAFFIC NOTES

Corrected report of coal passing through Sault Ste. Marie canals for the full season of navigation, short tons:

| | 1908. | 1909. | Changes. |
|-----------------|-----------|-----------|-----------|
| Anthracite..... | 1,384,743 | 1,412,387 | I. 27,644 |
| Bituminous.... | 8,517,717 | 8,527,639 | I. 9,922 |
| Total..... | 9,902,460 | 9,940,026 | I. 37,566 |

Increase in anthracite, 2 per cent.; in

bituminous, 0.1; total increase, 0.4 per cent.

Coal and coke tonnage, Chesapeake & Ohio railway, five months of fiscal year July 1-Nov. 30, short tons:

| | Coal. | Coke. | Total. |
|-----------------------|-----------|---------|-----------|
| New River | 3,395,134 | 151,375 | 3,546,509 |
| Kanawha..... | 2,622,974 | 17,182 | 2,640,156 |
| Kentucky..... | 178,955 | 228 | 179,183 |
| Connecting lines..... | 31,950 | 21,635 | 53,585 |
| Total..... | 6,229,013 | 190,420 | 6,419,433 |
| Total, 1908..... | 5,143,022 | 128,334 | 5,271,356 |

Total increase in 1909 was 1,148,077 tons, or 21.8 per cent. Deliveries in 1909 were, to points west of mines, 3,289,044 tons coal and 85,299 coke; points east, 745,457 tons coal and 105,121 coke; tidewater, 2,191,491 tons coal; anthracite to line points, 3021 tons.

Coal receipts at Boston for the full year, reported by Chamber of Commerce:

| | 1908. | 1909. | Changes. |
|--------------------|-----------|-----------|------------|
| Anthracite..... | 1,776,401 | 1,706,659 | D. 69,742 |
| Bituminous..... | 3,302,929 | 3,495,011 | I. 192,082 |
| Total domestic.... | 5,079,330 | 5,201,670 | I. 122,340 |
| Foreign..... | 370,709 | 228,297 | D. 142,412 |
| Total..... | 5,450,039 | 5,429,967 | D. 20,072 |

The foreign coal received is mainly from Nova Scotia.

Coal and coke tonnage originating on Pennsylvania Railroad lines east of Pittsburg and Erie, year ended Dec. 31, short tons:

| | 1908. | 1909. | Changes. |
|-----------------|------------|------------|--------------|
| Anthracite..... | 11,294,598 | 11,190,176 | D. 104,422 |
| Bituminous..... | 35,797,171 | 38,882,058 | I. 3,084,887 |
| Coke..... | 7,463,498 | 12,028,791 | I. 4,565,293 |
| Total..... | 54,555,267 | 62,101,025 | I. 7,545,758 |

The total increase in 1909 over 1908 was 13.8 per cent. Nearly 60 per cent. of this gain was in coke.

New York

ANTHRACITE

Jan. 19—Local demand is good. The railroads are doing fairly well in handling coal, but local dealers have a great deal of trouble in making deliveries to customers, while ice in the harbor and rivers is delaying barge deliveries to city yards from the different harbor points.

Schedule prices for large sizes are \$4.75 for lump and \$5 for egg, stove and chestnut, f.o.b. New York harbor. For steam sizes quotations are f.o.b. New York harbor points: Pea, \$3.10@3.25; buckwheat, \$2.35@2.50; No. 2 buckwheat or rice, \$1.75@2; barley, \$1.35@1.50. Some coal is reported sold higher where quick delivery is wanted.

BITUMINOUS

The bituminous trade is in bad shape.

There is a demand for coal and yet buying is slow and is confined almost entirely to the cheaper grades. Higher-grade coals have few customers, and their deliveries are almost entirely on contract. Fair grades of steam coal bring \$2.55@2.60 per ton, f.o.b. New York harbor. For the better grades there is no sale and no quotations can be given.

Transportation is about as bad as it can be. The Baltimore & Ohio is practically out of business, and many mines are almost shut down because they can get no cars. Motive power as well as cars is short. The Pennsylvania is doing somewhat better but has had a good deal of trouble from snow and stormy weather. How long this will continue it is impossible to say.

The coastwise trade is also in bad shape as a result of the weather. Many vessel owners are reluctant to take charters and are frightened by the number of vessels which have been lost in recent storms. Rates are higher and shippers have to pay 80@85c. for medium-sized vessels to points around Cape Cod. The loading and discharging clause is being insisted on in charters in view of the possibilities of demurrage at the delivery ports. Locally barges are charging as high as 25c. per ton for city and near-by deliveries, and are not always easy to get at that.

Birmingham

Jan. 17—Coal production in Alabama shows some improvement and still there is need for more. The output is back to the active state that prevailed two years ago. Coal prices are hardening a little. All classes of coal, steam and otherwise, are actively in demand. The coke demand is also most interesting, the entire make being easily sold right along.

There is quite an amount of coal being shipped from this State into the South and Southeast. A trade is being worked up that promises to be permanent.

Chicago

Jan. 17—Shortness of coal continues to maintain high prices, and despite milder weather there seems bound to be a continuance of this condition for several weeks. Receipts from western and eastern mines are hardly up to contract requirements and railroads are confiscating coal to such an extent as to keep down the open-market supply. Screenings from Illinois

mines continue to bring \$2.25@2.50, with lump selling at \$2.75@3.50, most of it bringing over \$3. Run-of-mine is nominally at \$2.40@2.65—in fact, hardly any prices can be called other than nominal, properly, for individual conditions of consignments to the market and of the user's needs determine the price. But in any case the coal brings a high price, if it can be delivered.

Smokeless West Virginia coals continue strong and run-of-mine is hard to get at \$3.40@3.50, with lump and egg in comparatively less demand at \$3.75@4. Hocking likewise is in short supply but does not command any general premium over the list price of \$3.15. Youghiogheny is also selling at list prices of \$3.25 for steam and \$3.30 for gas lump, and minor coals show no great advances. Anthracite is in good supply for the local market, but country dealers are having much difficulty in getting enough for their needs.

The local terminal situation has been greatly improved within the last two or three days, but railroads are very slow in getting forward delayed and inadequate shipments.

Cleveland

Jan. 17—While the demand continues active the deliveries are restricted. The railroads are in bad shape; cars are scarce and motive power is insufficient, owing to bad weather and the condition of tracks. Moreover, the snow and stormy weather have interfered with operations at mines.

Prices are nominally about the same, but premiums are being paid where deliveries are urgently needed, so that it is hard to give any real quotations.

Indianapolis

Jan. 17—There has been no abatement in the demand for Indiana coal for four weeks and Brazil block has gone to a premium. The Block coal operators have been besieged with telegrams offering to buy block coal in cars at the mines for \$2.25 and screenings for \$1. This is the highest price screenings have ever been known to bring and even at this figure the operators are unable to supply the demand. Operators have let the jobbers do the boosting in prices, and have not raised the price at mines where it is still selling for \$2@2.25. The trouble is to get enough men.

Pittsburg

Jan. 18—The national convention of the United Mine Workers opened this morning in Indianapolis. It is generally understood the men will formulate a scale based on a \$1 mining rate which would be the highest ever paid and involve about 10 per cent. increase over the present scale. The conference with the operators will probably open in Toledo a week from today. The local coal mar-

ket is strong, and slack shows an advance of 5 or 10c. a ton. The car supply is poorer than it was, but the movement is somewhat improved. Due to holidays, car shortage, poor movement, etc., coal production the past three weeks has been 15 to 25 per cent. below the former rate. We quote the market firm at \$1.15 for mine-run and nut, \$1.25 for ¾-in. and 90@95c. for slack.

Connellsville Coke—The market has been very quiet, and disappointingly so to both parties. There is no doubt that when business is done it will be at concessions from the recent nominal price of \$2.75 for furnace coke on contract. Probably \$2.60 or \$2.65 could be done without much difficulty today on contract, but this does not interest consumers. Spot is quotable at the same range. Foundry-coke quotations are a shade easier at \$3@3.15 for prompt and \$3.15@3.25 on contract.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ended Jan. 8 at 454,007 tons, a gain of 5000 tons and the highest production ever reported. Shipments, 5145 cars to Pittsburg, 7690 cars to points west of Pittsburg and 911 cars to points east of Connellsville, a total of 13,746 cars.

St. Louis

Jan. 17—The local market is a trifle slower today than it has been for the past two weeks and prices are a little off. This is due to the weather which has been warm all week. The railroads are in much better shape locally for moving coal as all the ice and snow is off by this time. The car supply, however, shows no sign of improving, and it looks very much as if there would be no improvement this winter. The Illinois Central is in terrible shape, and two days a week run is about the average. The Iron Mountain is also only running about two days a week, and is taking practically all the coal for its owners. It is very hard on the operators to be forced to run railroad coal when the market is so high. The depression in coal is only local, as anything that will go out of town is being eagerly snatched up. Screenings and fine coal of all descriptions and even mine-run are being shipped to Chicago, Omaha and the Northwest are taking all the lump coal, consequently prices are high on any kind of coal that will move out of St. Louis. There is a difference of about 40c. per ton in price between coal that will go out of town and coal that will not.

Standard 2-in. lump is worth \$1.50 mine, or \$2.02 St. Louis; 6-in. lump is bringing \$1.80 per ton mine, or \$2.32 St. Louis. However, very little 6-in. lump is being made as 2-in. is moving so readily and cars are so scarce that operators prefer not to load 6-in. Mine-run is

bringing \$1.30 at mines, or \$1.82 St. Louis; 3-in. nut is \$1.25 at mines, or \$1.77 St. Louis; 2-in. nut is worth \$1 at mines, or \$1.52 St. Louis. A premium of 30 or 40c. per ton is being offered above these prices for coal that will go out of town.

The market for hard coal is strong. Even egg and grate, which a short time ago were a drug on the market, are in strong demand now. It seems nearly impossible to get chestnut, and stove coal is being substituted. The circular price of \$6.95 per ton for small egg and chestnut and \$6.70 for grate is being rigidly maintained.

Foreign Coal Trade

Austrian Coal Production—Coal production in Austria-Hungary, 11 months ended Nov. 30, metric tons:

| | 1908. | 1909. | Changes |
|------------------|------------|------------|--------------|
| Coal | 13,035,023 | 12,702,374 | D. 332,649 |
| Brown coal..... | 24,580,506 | 23,650,512 | D. 929,994 |
| Total mined... | 37,615,529 | 36,352,886 | D. 1,262,643 |
| Coke made..... | 1,735,791 | 1,838,747 | I. 102,956 |
| Briquets made... | 134,032 | 166,497 | I. 32,465 |

The greater part of the briquets reported are made from brown coal, or lignite.

Welsh Coal Market—Messrs. Hull, Blyth & Co., Cardiff, report prices of coal as follows, on Jan. 8: Best Welsh steam, \$4.08; seconds, \$3.96; thirds, \$3.84; dry coals, \$3.96; best Monmouthshire, \$3.60; seconds, \$3.48; best small steam, \$2.28; seconds, \$2.04. All prices are per long ton, f.o.b. shipping port, less 2½ per cent. discount. Prices have hardened since the first of the year.

Iron Trade Review

New York, Jan. 19—The iron and steel markets continue rather quiet, although there is some revival in business shown principally in inquiries for second-quarter and third-quarter delivery of materials. Sellers, however, are inclined to be rather conservative and are holding back on any business beyond June.

In pig iron Southern companies report a good many inquiries of this sort, but are not anxious to take business. There is still some speculative iron on the market which is rather holding down prices for early deliveries; but the larger companies are declining offers of lower prices than they have been naming all along. There is more inquiry for basic and forge iron just at the moment than for foundry. On these classes of iron prices are generally pretty well held.

In finished material inquiries are coming forward for bars and plates. Structural steel is in somewhat better demand, and some large contracts are reported to be under negotiation. Small orders make up a fair aggregate of business. The small trade in nails and building material is reported very good.

The *Railway Age Gazette* has made up figures showing that the railroads placed orders in 1909 for 3362 locomotives, for 189,596 freight cars, and 4514 passenger cars. Of the freight cars 74,920 were all steel and 77,667 were steel-frame cars. Equipment orders were much better than rail orders last year.

Baltimore

Jan. 18—Exports from the port of Baltimore during the week included 4501 tons steel rails and 264 tons rail fastenings to Vera Cruz, Mexico. Imports included 5514 tons cupreous pyrites and 14,725 tons iron ore from Spain; 17,200 tons iron ore from Cuba.

Birmingham

Jan. 17—Some selling of pig iron is going on in the Southern territory and this is giving much encouragement, though the furnacemen do not claim that the buying movement has started in yet. There has been a little stiffening of quotations, the prices being \$14@14.50 per ton, No. 2 foundry. The furnace companies hold their iron at \$14.50. There are some sales, early delivery, being made at \$14, much of this still resale iron. Some inquiries are coming in covering a period of three-fourths of the present year, but none of the manufacturers here are willing to quote figures beyond the first half of the year. The make continues a little slow as compared to the output in November and December. There is no accumulation worthy of mention.

Chicago

Jan. 17—Recovery from the inactivity of the holidays begins to be evident in the iron market. There is more activity in buying pig iron and the market for iron and steel products is decidedly better. The bottom of the market would seem to have been reached, so far as pig iron is concerned, in some sales of Southern No. 2 at \$13.25@13.50 Birmingham, or \$17.60@17.85 Chicago, with most sales in the neighborhood of the \$13.50 mark and \$14 asked on small lots. The advance, however, is likely to be slow, in the opinion of those most familiar with the market. Northern iron remains firm at \$19@19.50, with the requirements of melters gradually expanding and the furnaces well sold up into the second quarter.

Sales of railroad materials, bars, plates and other forms of finished materials are good. Coke—more in demand and irregular in deliveries because of transportation difficulties—brings \$5.50 as heretofore.

Cleveland

Jan. 17—Placing of contracts for iron ore continues, especially of nonbessemer ores. It looks as if the business would be practically completed this month.

Pig Iron—More inquiries are reported, most of them for second quarter, but some for third quarter. Bessemer is quoted \$18.75@19; No. 2 foundry, \$17.75@18; forge, \$17.25@17.50; Lake Superior charcoal, \$19.50@20; all Cleveland delivery.

Finished Material—Buyers are showing a lively interest, but mills are rather holding back on second-quarter and third-quarter contracts. Some heavy business is pending for bars; 1.50c., Pittsburg base, is quoted.

Philadelphia

Jan. 19—The pig-iron market has fallen into a quiet condition. Basic pig is strong and would be active if there were available supplies. A reason for the present quiet is that most of the larger consumers in this territory bought heavily some time ago. Forge ironmakers have their output sold far ahead but they enjoy the vantage ground of being sought for. Pipe iron has been in good request and furnaces have been asked to name prices on large lots to be delivered later on: No. 2X foundry is selling at \$19; gray forge at \$18; for basic \$18.75 was asked.

Steel Billets—There are a few inquiries in the market. The customers have a fair supply on hand but would be glad to increase their engagements at suitable prices.

Bars—The mills are well sold up but demand has fallen off within a week at mills while the distribution through the stores has improved.

Sheets—Some large consumers who ordinarily place their orders in March, are now asking prices for iron to be delivered over the first half of the year. There has been less sold at the stores during the past week than for a long time, owing probably to the clogging of vehicular traffic.

Pipes and Tubes—This branch is slumbering so far as orders are concerned.

Structural Material—The market is quiet and there have been no sales of importance.

Scrap—The market is as dull as it well could be. Deliveries locally have been next to impossible. The scrap dealers are at a standstill but assure their regular customers that they will be taken care of.

Pittsburg

Jan. 18—Signs are multiplying that the market is just a trifle more quiet than is requisite for the maintenance of the full production rate recently attained. It is too early in the year to judge whether a definite trend has set in, but the indications begin to point in that direction. The year promises to be one of tonnage

far beyond all previous records, but it is likely to show minor ups and downs.

Pig Iron—Considerable production of steel was lost by stoppages during the holidays while furnace production went on, so that mills are in an easy position and there is no pressure for deliveries of pig iron, which are being held up to a certain extent. Basic pig iron has shown weakness again, and can be had without difficulty at \$17, Valley furnace, for first-quarter delivery, while \$17.25 would probably be asked for second quarter. Bessemer remains firm at \$19, Valley, but is very quiet. Foundry iron is dull and it is not improbable that concessions could be obtained on desirable orders, the asking range remaining at \$17@17.25, Valley. Indications are that pig iron will sell off a trifle from present asking prices.

Steel—Steel is in still better supply and there is no difficulty in buying at formerly quoted prices, \$27@27.50 for bessemer billets, \$27.50@28 for open-hearth billets and \$28.50@29 for sheet-bars, all f.o.b. Pittsburg or Youngstown mill. It is reported from the East that one or two rail mills will turn in and make billets, on account of slack demand for rails, as the Maryland Steel Company did last month, on orders for 45,000 tons of billets for western shipment.

Ferromanganese—The market is dull. A carload sale is noted at \$44, Baltimore, and two others at \$44.50, all being for prompt shipment, and the market is quotable at this range. For delivery to July 1 next, \$45 is the quotable market, although this might be shaded 10 or 15c. The rate, Baltimore to Pittsburg, is \$2.30 per ton.

Sheets—Mills are well sold up and do not care to accept much more business at the present range. Prices are firmly maintained at 2.40c. for black, 3.50c. for galvanized, \$1.70 per square for painted and \$3 for galvanized corrugated roofing and 1.75@80c. for blue annealed, 10-gage, the higher price for early delivery.

St. Louis

Jan. 17—The market for pig iron was slightly better this week and sales seem to be opening up a good deal. Inquiries are coming in at a good rate and some business is being closed. All the business transacted is confined practically to second quarter, while a few are filling in small shorts for the first quarter. A few inquiries have been received for shipments in the second half, though the average buyer is not venturing that far ahead. Prices remain unchanged at \$15 Birmingham, or \$18.72 St. Louis.

Iron Ore—Missouri ore is bringing \$3.75 per ton St. Louis and the demand is considerably more than the supply, owing to the fact that the weather conditions have been so bad that the tonnage has been practically cut in two.

Metal Markets

New York, Jan. 19—The metal markets continue rather quiet on the whole, though consumptive demand is reported good in most lines.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

| Metal. | Exports. | Imports. | Excess. |
|----------------|--------------|--------------|-------------------|
| Gold: | | | |
| Nov. 1909.. | \$15,649,281 | \$ 3,863,637 | Exp. \$11,785,644 |
| " 1908.. | 2,967,795 | 2,909,883 | " 57,912 |
| Year 1909.. | 122,301,517 | 42,003,194 | " 80,298,323 |
| " 1908.. | 73,857,749 | 45,123,561 | " 28,732,188 |
| Silver: | | | |
| Nov. 1909.. | 4,951,483 | 4,691,807 | Exp. 259,676 |
| " 1908.. | 3,951,987 | 3,275,609 | " 676,378 |
| Year 1909.. | 52,294,344 | 41,981,006 | " 10,313,338 |
| " 1908.. | 47,111,382 | 37,814,676 | " 9,296,706 |

Exports from the port of New York, week ended Jan. 15: Gold, \$806,500, chiefly to Argentina; silver, \$727,711, chiefly to London. Imports: Gold, \$100,441; silver, \$211,293, both chiefly from Mexico and South America.

The preliminary figures of the director of the Mint, as made public today, show a total output of gold in the United States in 1909 of \$99,232,200, an increase of \$4,672,200 over 1908. The silver production for the year was 53,849,000 oz., an increase of 1,408,200 ounces.

Platinum—Business is quiet but dealers report prices unchanged at \$29 per oz. for refined platinum and \$34.50 per oz. for hard metal.

Our special correspondent writes from St. Petersburg, under date of Dec. 23, that there has been some decline in prices contrary to expectation. In Ekaterinburg business has been done at 5.50 rubles per zolotnik for crude metal, 83 per cent. platinum—equal to \$20.68 per oz. In St. Petersburg 23,000@23,500 rubles per pood is asked—equal to an average of \$22.79 per oz.

Silver—The market has been very steady. The demand keeps pace with output. There does not seem to be any congested spot where the metal appears to be a menace to the present situation.

SILVER AND STERLING EXCHANGE

| Jan. | 13 | 14 | 15 | 17 | 18 | 19 |
|---------------|--------|--------|--------|--------|--------|--------|
| New York.... | 52½ | 52½ | 52½ | 52½ | 52½ | 52½ |
| London..... | 24½ | 24½ | 24½ | 24½ | 24½ | 24½ |
| Sterling Ex.. | 4.8685 | 4.8690 | 4.8700 | 4.8695 | 4.8675 | 4.8650 |

New York quotations, cents per ounce Troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Jan. 6, as reported by Messrs. Pixley & Abell:

| | 1909. | 1910. | Changes. |
|--------------|----------|----------|-------------|
| India..... | £ 66,110 | ..... | D. £ 66,110 |
| China..... | ..... | £ 57,000 | I. 57,000 |
| Straits..... | ..... | ..... | ..... |
| Total..... | £ 66,110 | £ 57,000 | D. £ 9,110 |

India Council bills in London averaged 16.094d. per rupee.

Copper, Tin, Lead and Zinc

| Jan. | Copper. | | | Tin. | Lead. | | Zinc. |
|------|--------------------|----------------------------|--------------------|--------------|------------------------|-------------------------|-------------------------|
| | Lake, Cts. per lb. | Electrolytic, Cts. per lb. | London, £ per ton. | Cts. per lb. | New York, Cts. per lb. | St. Louis, Cts. per lb. | St. Louis, Cts. per lb. |
| 13 | 13¾ @14 | 13¾ @13¾ | 60½ | 32¾ | 4.70 | @4.62½ | @6.02½ |
| 14 | 13¾ @14 | 13¾ @13¾ | 60½ | 32½ | 4.70 | @4.62½ | @6.02½ |
| 15 | 13¾ @14 | 13¾ @13¾ | .... | 32¾ | 4.70 | 4.57½ | 5.97½ |
| 17 | 13¾ @14 | 13¾ @13¾ | 60½ | 32¾ | 4.70 | @4.62½ | @6.02½ |
| 18 | 13¾ @14 | 13¾ @13¾ | 60½ | 32¾ | 4.70 | @4.62½ | @6.00 |
| 19 | 13¾ @14 | 13¾ @13¾ | 60½ | 32¾ | 4.70 | @4.62½ | @5.97½ |

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

Copper—In consequence of the weak and unsettled condition of the stock market, there has been little demand for copper, either for domestic or European consumption. The manufacturers, both here and abroad, are very busy and in many cases are working overtime, and it is expected that when the stock market conditions here improve, a good demand for the metal will again make itself felt. Producers' books are well filled and there has been no pressure to sell, but some speculative lots have been offering at slightly lower prices. The market closes nominally at 13¾@14c. for Lake copper, and 13½@13¾c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 13¾@13½c. for the week.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire has been advanced ¼c., and is now 15½c. base, carload lots at mill. Business is very good.

The market in London for standard copper has been weak and declining, mainly due to the liquidation on the part of American holders who are influenced by the stock market conditions here. Standard copper declined on Tuesday to £60 3s. 9d. for spot and £61 2s. 6d. for three months. On Wednesday it improved and closes at £60 12s. 6d. for spot and £61 11s. 3d. for three months.

Refined and manufactured sorts we quote: English tough, £65; best selected, £65@65 10s.; strong sheets, £75@76 per ton.

A shipment of 1000 tons of copper matte and 3400 tons of ore was received from Africa last week, this being the first direct consignment to New York from that quarter so far as we are aware.

Exports of copper for the week from New York and Philadelphia were 4925 long tons. Our special correspondent gives the exports from Baltimore at 2373 tons copper.

Tin—The decline in the London market made further progress. The reasons given were the unfavorable statistical position and the decreasing consumption of the metal in the United States. A somewhat better feeling made itself manifest at the close, and quotations recovered from the low point of £146 7s. 6d. for spot and £148 for three months reached on last Tuesday, closing at £147 15s. for spot and £149 5s. for three months.

Dealers in this market were discounting the London situation by offering future shipments at concessions, without, however, finding ready buyers. Business is still confined to spot material, which at the close can be obtained at 32¾ cents.

Lead—The market is quieter and lead at St. Louis is quoted at 4.57½@4.62½c. and at New York 4.70 cents.

The London market is also somewhat easier, Spanish lead being quoted at £13 13s. 9d. and English at £13 16s. 3d. per ton.

Spelter—Consumption continues good, but there has been little demand. Prices have declined somewhat and close at 5.92½@5.97½ St. Louis, and 6.07½@6.12½ New York.

New York quotations for spelter Jan. 13 were 6.15@6.17½c.; Jan. 14 and 15, 6.12½@6.17½c.; Jan. 17 and 18, 6.10@6.15c.; Jan. 19, 6.07½@6.12½ cents.

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

The London market closes slightly lower at £23 5s. for good ordinaries and £23 10s. for specials.

Other Metals

Antimony—The market has fallen into a quiet state again, and only a retail business has been done. Prices are nominally unchanged. Cookson's may be quoted at 8½c. per lb., and U. S. 8c., with 7½@7¾c. named for outside brands.

Aluminum—The price of aluminum is unchanged at 20@23c. per lb. for ingots. The higher price is that asked by the American producer.

Quicksilver—There is little change and business continues good. New York quotations are \$52.50 per flask of 75 lb.; jobbers ask 72@75c. per lb. for small lots. The San Francisco price remains at \$50.50@51.50 for domestic orders and \$2 per flask less for export. The London

price is £9 15s. per flask, but jobbers are now quoting 2s. 6d. per flask less.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 200-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—The price of pure metal is \$1.50 per lb. for 100-lb. lots f.o.b. New York.

Cadmium—Current quotations are 65 @70c. per lb. in 100-lb. lots at Cleveland, Ohio. In Germany 450@475 marks per 100 kg., at factory in Silesia.

Zinc and Lead Ore Markets

Joplin, Mo., Jan. 15—The highest price paid for zinc-sulphide ore was \$52, the base ranging from \$47@49 per ton of 60 per cent. zinc. Zinc silicate sold as high as \$31, on a base of \$24@26 per ton of 40 per cent. zinc. Week-end prices of all grades of zinc ore were weaker. The average price was \$46.06. Lead ore sold generally on a flat bid of \$58, and the average price, all grades, was \$57.74 per ton.

Conditions for outputting were improved by moderate weather, as shown in increased sales of zinc-silicate ore, but heavy roads and light buying kept the sales well under the production, af-

ording an increase in the stock in the bins.

Platteville, Wis., Jan. 15—The highest price paid this week for zinc ore was \$50; the base price, 50 per cent. zinc, was \$48@49 per ton. The base price paid for lead ore was \$56@58 per ton. Another severe snow storm Tuesday and Wednesday closed down nearly all operating mines and cut off shipments.

SHIPMENTS, WEEK ENDED JAN. 15.

| Camps. | Zinc ore, lb. | Lead ore, lb. | Sulphur ore, lb. |
|----------------------|---------------|---------------|------------------|
| Platteville..... | 352,140 | 73,500 | 80,000 |
| Mineral Point..... | 278,000 | ..... | ..... |
| Benton..... | 168,700 | 58,200 | ..... |
| Cuba City..... | 111,890 | ..... | ..... |
| Galena..... | 81,100 | ..... | ..... |
| Highland..... | 60,600 | ..... | ..... |
| Total..... | 1,052,430 | 131,700 | 80,000 |
| Year to Jan. 15..... | 2,221,530 | 224,659 | 278,200 |

In addition to the above there was shipped to the separating plants, Platteville and Mineral Point, 360,390 lb. zinc ore.

Petroleum

Southwestern petroleum production and shipments in December, as reported by *Oil Investors' Journal*, in barrels of 42 gal. each:

| | Production. | Shipments. |
|----------------------|-------------|------------|
| Oklahoma..... | 3,643,458 | 3,654,054 |
| Southeast Texas..... | 656,884 | 894,498 |
| Louisiana..... | 253,915 | 140,499 |

Oklahoma stocks on Jan. 1 were 56,543,630 bbl. New wells completed in December: Oklahoma, 144 oil and 6 gas; southern Texas, 18 oil and 3 gas; Louisiana, 5 oil and 1 gas producer.

Exports of mineral oils from the United States, year ended Dec. 31, in gallons:

| | 1908. | 1909. |
|-------------------------------|---------------|---------------|
| Crude petroleum..... | 99,446,946 | 144,199,051 |
| Naphthas..... | 36,292,418 | 57,555,061 |
| Illuminating..... | 1,120,638,415 | 1,037,750,452 |
| Lubricating and paraffin..... | 144,612,947 | 157,087,294 |
| Residuum..... | 73,829,785 | 98,142,320 |
| Total..... | 1,474,820,511 | 1,494,734,138 |

The total increase in 1909 was 19,913,627 gal., or 1.35 per cent.

Chemicals

New York, Jan. 19—There is no special change from our last report, sales being moderate. Deliveries on contracts are fair.

Copper Sulphate—Business has been moderate but prices are unchanged at \$4.10 per 100 lb. for carload lots and \$4.35 per 100 lb. for smaller orders.

Arsenic—The market continues flat and demand is light. Prices are a little lower, white arsenic being quoted at \$2.62½@2.75 per 100 lb. for both spot and futures. From 50 to 75 tons changed hands this week at the lower figure.

Nitrate of Soda—Interest in this article continues moderate only. Spot sells at 2.10c. per lb.; futures are a shade lower and 2.07½c. is named on that class of business.

Mining Stocks

New York, Jan. 19—The general stock market has again been irregular and for the most part rather depressed. Nearly all the active stocks have declined in price and occasional rallies have not helped matters much. It has been a traders' market mainly and the close is rather weak all around.

On the Curb there has also been considerable weakness in the copper stocks, some sharp declines being noted. Miami, which held up well during the preceding week, was still active, but showed losses in quotations, closing considerably below last week's prices. Cobalt stocks were more active, but irregular in price. The Nevada gold stocks are attracting more attention, but are not showing much gain.

Boston, Jan. 18—The copper-share market has been broad and active, but the activity has been largely in the Lake Superior issues and particularly Lake Copper, North Lake and Indiana, the latter a Curb stock. The recent favorable developments at the Lake mine and the striking of rich ore by diamond-drill work at the Indiana brought a wild speculation for a spell. Although the Amalgamated, Cole-Ryan stocks have been inactive, the market has been the biggest for a long period, and reminded one of the boom of 10 years ago.

Lake stock made its high of \$93 last week, but subsequently reacted to \$83, with material recovery from the low. The stock is so held that it is easy to cause a \$5 movement in almost as many moments. The advance in North Lake was in sympathy with developments at the Indiana property, as the North Lake is between Lake and Indiana. North Lake has been the most active feature and has more than doubled in price during the week. From a close at \$8.62½ a week ago it touched \$18.75. Indiana, in the meantime, has risen on the Curb from \$9.50 a week ago to \$34 per share. Sooner or later this stock will be taken over on the Exchange as the papers for such action have been filed.

North Butte continued to be depressed the greater part of the week and broke from \$44.25 to \$41. This pressure has apparently been removed for the stock was allowed to go up to \$46.25 today on private reports that an improvement had occurred at the property. Mohawk has risen \$6 to \$73. This company has struck ore in crosscutting at No. 6 shaft. Dividend action will be taken shortly but no change is likely. St. Mary's Mineral Land has benefited to the extent of \$14 during the week and rose to \$71 today. Calumet & Arizona has been a weak feature, and is off \$9 to \$91. Other strong and active spots have been Frank-

SHIPMENTS, WEEK ENDED JAN. 15.

| | Zinc, lb. | Lead, lb. | Value. |
|---|------------|-----------|-----------|
| Webb City-Carterville | 4,465,590 | 490,730 | \$119,171 |
| Joplin..... | 1,541,450 | 287,630 | 49,535 |
| Miami..... | 538,150 | 215,940 | 17,555 |
| Duenweg..... | 688,050 | 9,380 | 15,552 |
| Galena..... | 300,290 | 62,770 | 8,876 |
| Alba-Neck..... | 251,910 | 30,770 | 7,175 |
| Auroa..... | 351,010 | ..... | 6,939 |
| Spurgeon..... | 290,630 | 36,750 | 5,735 |
| Quapaw..... | 232,120 | ..... | 5,242 |
| Granby..... | 314,470 | 10,710 | 4,870 |
| Oronogo..... | 237,490 | 1,380 | 4,135 |
| Badger..... | 146,740 | ..... | 3,595 |
| Carthage..... | 108,500 | ..... | 2,710 |
| Carl Junction..... | 84,420 | ..... | 2,210 |
| Stott City..... | 61,750 | ..... | 1,450 |
| Wentworth..... | 41,560 | ..... | 955 |
| Totals..... | 9,654,130 | 1,146,060 | \$255,705 |
| 3 weeks..... | 27,362,770 | 4,810,440 | \$766,388 |
| Zinc value, the week, \$222,397; 3 weeks, \$627,089 | | | |
| Lead value, the week, 33,308; 3 weeks, 139,299 | | | |

MONTHLY AVERAGE PRICES

| Month. | ZINC ORE. | | | | LEAD ORE. | |
|--------------|-------------|---------|-----------|---------|-----------|---------|
| | Base Price. | | All Ores. | | All Ores. | |
| | 1908. | 1909. | 1908. | 1909. | 1908. | 1909. |
| January..... | \$37.60 | \$41.25 | \$35.56 | \$38.46 | \$46.88 | \$52.17 |
| February.... | 36.63 | 36.94 | 34.92 | 34.37 | 49.72 | 50.50 |
| March..... | 36.19 | 37.40 | 34.19 | 34.71 | 49.90 | 50.82 |
| April..... | 35.40 | 38.63 | 34.06 | 37.01 | 52.47 | 55.63 |
| May..... | 34.19 | 40.06 | 33.39 | 37.42 | 56.05 | 56.69 |
| June..... | 33.06 | 44.15 | 32.07 | 40.35 | 60.48 | 57.52 |
| July..... | 34.55 | 43.06 | 31.67 | 41.11 | 59.90 | 53.74 |
| August..... | 36.53 | 48.25 | 33.42 | 44.54 | 60.34 | 67.60 |
| September.. | 37.63 | 47.70 | 34.44 | 44.87 | 54.59 | 66.11 |
| October..... | 35.95 | 49.50 | 33.28 | 45.75 | 52.63 | 55.02 |
| November... | 39.13 | 51.31 | 35.02 | 48.29 | 54.53 | 53.94 |
| December... | 42.75 | 49.45 | 39.63 | 47.57 | 49.68 | 55.26 |
| Year..... | \$36.63 | 43.98 | \$34.31 | 41.20 | \$53.93 | 54.60 |

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

lin, La Salle, Superior Copper, Winona and Wyandotte.

Curb transactions have also been on a heavy scale, largely in Chino, Oneco, Inspiration, Corbin Copper and South Lake, which are all materially higher for the week.

STATISTICS OF COPPER.

| Month. | United States Product'n. | Deliveries, Domestic. | Deliveries for Export. |
|-------------|--------------------------|-----------------------|------------------------|
| I..... | 112,135,200 | 51,862,624 | 38,499,797 |
| II..... | 103,700,817 | 43,578,118 | 30,968,496 |
| III..... | 117,058,661 | 48,871,964 | 39,191,043 |
| IV..... | 113,574,292 | 47,546,010 | 35,110,111 |
| V..... | 118,356,146 | 61,163,325 | 70,542,753 |
| VI..... | 116,567,493 | 60,591,116 | 70,966,457 |
| VII..... | 118,023,139 | 52,105,955 | 50,077,777 |
| VIII..... | 120,597,234 | 59,614,207 | 48,382,704 |
| IX..... | 124,657,709 | 66,359,617 | 56,261,238 |
| X..... | 121,618,369 | 66,857,873 | 55,266,595 |
| XI..... | 117,828,655 | 69,519,501 | 59,546,570 |
| Totals..... | 1,405,403,056 | 705,051,591 | 680,942,620 |

VISIBLE STOCKS.

| Month. | VISIBLE STOCKS. | | |
|--------------|-----------------|-------------|-------------|
| | United States. | Europe. | Total. |
| I..... | 122,357,266 | 124,716,490 | 247,073,746 |
| II..... | 144,130,045 | 118,574,400 | 262,704,445 |
| III..... | 173,284,248 | 117,140,800 | 290,425,048 |
| IV..... | 182,279,902 | 115,024,000 | 297,303,902 |
| V..... | 183,198,073 | 114,050,320 | 297,248,393 |
| VI..... | 169,848,141 | 127,352,960 | 297,201,101 |
| VII..... | 154,858,061 | 150,928,960 | 305,787,021 |
| VIII..... | 122,596,607 | 171,492,160 | 294,088,767 |
| IX..... | 135,196,930 | 197,993,600 | 333,190,530 |
| X..... | 151,472,772 | 210,224,000 | 361,696,772 |
| XI..... | 153,509,626 | 222,566,400 | 376,076,026 |
| XII..... | 153,003,527 | 236,857,600 | 389,861,127 |
| I, 1910..... | 141,766,111 | 244,204,800 | 385,970,911 |

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Monthly Average Prices of Metals SILVER

| Month. | New York. | | London. | |
|----------------|-----------|--------|---------|--------|
| | 1908. | 1909. | 1908. | 1909. |
| January..... | 55.678 | 51.750 | 25.738 | 23.834 |
| February..... | 55.000 | 51.472 | 25.855 | 23.706 |
| March..... | 55.385 | 50.468 | 25.670 | 23.227 |
| April..... | 55.505 | 51.428 | 25.133 | 23.708 |
| May..... | 52.795 | 52.905 | 24.377 | 24.343 |
| June..... | 53.663 | 52.538 | 24.760 | 24.166 |
| July..... | 53.115 | 51.043 | 24.614 | 23.519 |
| August..... | 51.683 | 51.125 | 23.858 | 23.588 |
| September..... | 51.720 | 51.440 | 23.877 | 23.743 |
| October..... | 51.431 | 50.923 | 23.725 | 23.502 |
| November..... | 49.647 | 50.703 | 22.933 | 23.351 |
| December..... | 48.766 | 52.226 | 22.493 | 24.030 |
| Total..... | 52.864 | 51.502 | 24.402 | 23.726 |

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

COPPER

| Month. | NEW YORK. | | | | LONDON. | |
|----------------|--------------|--------|--------|--------|---------|--------|
| | Electrolytic | | Lake. | | 1906. | 1909. |
| | 1908. | 1909. | 1906. | 1909. | | |
| January..... | 13.726 | 13.893 | 13.901 | 14.280 | 62.386 | 61.198 |
| February..... | 12.905 | 12.949 | 13.098 | 13.295 | 58.786 | 57.688 |
| March..... | 12.704 | 12.387 | 12.875 | 12.826 | 58.761 | 56.231 |
| April..... | 12.743 | 12.561 | 12.928 | 12.933 | 58.331 | 57.363 |
| May..... | 12.598 | 12.893 | 12.788 | 13.238 | 57.387 | 59.338 |
| June..... | 12.675 | 13.214 | 12.877 | 13.548 | 57.842 | 59.627 |
| July..... | 12.702 | 12.880 | 12.933 | 13.363 | 57.989 | 58.556 |
| August..... | 13.462 | 13.007 | 13.639 | 13.296 | 60.500 | 59.393 |
| September..... | 13.388 | 12.870 | 13.600 | 13.210 | 60.338 | 59.021 |
| October..... | 13.354 | 12.700 | 13.646 | 13.030 | 60.139 | 57.551 |
| November..... | 14.130 | 13.125 | 14.386 | 13.354 | 63.417 | 58.917 |
| December..... | 14.111 | 13.298 | 14.411 | 13.647 | 62.943 | 59.906 |
| Year..... | 13.208 | 12.982 | 13.424 | 13.335 | 59.902 | 58.732 |

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

TIN AT NEW YORK

| Month. | 1908. | | 1909. | |
|---------------|--------|--------|--------|--------|
| | 1908. | 1909. | 1908. | 1909. |
| January..... | 27.380 | 28.060 | 29.207 | 29.125 |
| February..... | 28.978 | 28.290 | 29.942 | 29.966 |
| March..... | 30.577 | 28.727 | 28.815 | 30.293 |
| April..... | 31.702 | 29.445 | 29.444 | 30.475 |
| May..... | 30.015 | 29.225 | 30.348 | 30.859 |
| June..... | 28.024 | 29.322 | 29.154 | 32.913 |
| Av. year..... | 29.465 | 29.725 | 29.465 | 29.725 |

Prices are in cents per pound.

LEAD

| Month. | New York. | | St. Louis | London. | |
|----------------|--------------|-------|-----------|---------|--------|
| | 1908. | 1909. | 1909. | 1908. | 1909. |
| | January..... | 3.691 | 4.175 | 4.025 | 14.469 | 13.113 |
| February..... | 3.725 | 4.018 | 3.868 | 14.250 | 13.313 |
| March..... | 3.838 | 3.986 | 3.835 | 13.975 | 13.438 |
| April..... | 3.993 | 4.168 | 4.051 | 13.469 | 13.297 |
| May..... | 4.253 | 4.287 | 4.214 | 12.938 | 13.225 |
| June..... | 4.466 | 4.350 | 4.291 | 12.600 | 13.031 |
| July..... | 4.744 | 4.321 | 4.188 | 13.000 | 12.563 |
| August..... | 4.580 | 4.363 | 4.227 | 13.375 | 12.475 |
| September..... | 4.515 | 4.342 | 4.215 | 13.125 | 12.781 |
| October..... | 4.351 | 4.341 | 4.215 | 13.375 | 13.175 |
| November..... | 4.330 | 4.370 | 4.252 | 13.538 | 13.047 |
| December..... | 4.213 | 4.560 | 4.459 | 13.166 | 13.125 |
| Year..... | 4.200 | 4.273 | 4.153 | 13.439 | 13.049 |

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

SPELTER

| Month. | New York. | | St. Louis. | | London. | |
|----------------|--------------|-------|------------|-------|---------|--------|
| | 1908. | 1909. | 1908. | 1909. | 1908. | 1909. |
| | January..... | 4.518 | 5.141 | 4.363 | 4.991 | 20.563 | 21.425 |
| February..... | 4.788 | 4.889 | 4.638 | 4.739 | 20.875 | 21.563 |
| March..... | 4.665 | 4.757 | 4.527 | 4.607 | 21.075 | 21.438 |
| April..... | 4.645 | 4.965 | 4.495 | 4.815 | 21.344 | 21.531 |
| May..... | 4.608 | 5.124 | 4.458 | 4.974 | 19.906 | 21.975 |
| June..... | 4.543 | 5.402 | 4.393 | 5.252 | 19.000 | 22.000 |
| July..... | 4.485 | 5.402 | 4.336 | 5.252 | 19.031 | 21.969 |
| August..... | 4.702 | 5.729 | 4.556 | 5.579 | 19.350 | 22.125 |
| September..... | 4.769 | 5.796 | 4.619 | 5.646 | 19.563 | 22.906 |
| October..... | 4.801 | 6.199 | 4.651 | 6.043 | 19.750 | 23.200 |
| November..... | 5.059 | 6.381 | 4.909 | 6.231 | 20.875 | 23.188 |
| December..... | 5.137 | 6.249 | 4.867 | 6.099 | 20.625 | 23.094 |
| Year..... | 4.726 | 5.503 | 4.578 | 5.352 | 20.163 | 22.201 |

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

STOCK QUOTATIONS

| COLO. SPRINGS Jan. 18 | | | S. LAKE CITY Jan. 18 | | |
|-----------------------|------|------|-------------------------|------|------|
| Name of Comp. | Bid. | Clg. | Name of Comp. | Clg. | Clg. |
| Acacia..... | .05% | | Carisa..... | .50 | |
| C. C. Con..... | .03 | | Colorado Mining..... | .74 | |
| Dante..... | .09 | | Columbus Con..... | .99 | |
| Doctor Jack Pot..... | .08 | | Daly Judge..... | 4.50 | |
| Elkton..... | 69% | | Grand Central..... | 2.05 | |
| El Paso..... | .64 | | Iron Blossom..... | .77 | |
| Findlay..... | .11 | | Little Bell..... | 1.60 | |
| Gold Dollar..... | .11 | | Little Chief..... | .45 | |
| Gold Sovereign..... | .04 | | Lower Mammoth..... | .50 | |
| Isabella..... | .17% | | Mason Valley..... | 2.30 | |
| Jennie Sample..... | .09 | | May Day..... | .19 | |
| Jerry Johnson..... | .09 | | Nevada Hills..... | .02 | |
| Lexington..... | .45% | | New York..... | .13 | |
| Mary McKinney..... | .03% | | Prince Con..... | .93 | |
| Old Gold..... | .03% | | Red Warrior..... | 6.00 | |
| Pharmacist..... | .88% | | Silver King Coal'n..... | 3.55 | |
| Portland..... | .09% | | Sioux Con..... | .33 | |
| U. G. M..... | .73 | | Uncle Sam..... | .44 | |
| Vindicator..... | .06 | | Victoria..... | 1.30 | |
| Work..... | .06 | | | | |

SAN FRANCISCO. Jan. 18.

| Name of Comp. | Clg. | Name of Comp. | Clg. |
|----------------------|------|------------------------|------|
| COMSTOCK STOCKS | | | |
| Atlanta..... | .11 | Belmont..... | .20 |
| Belcher..... | 1.20 | Jim Butler..... | .09 |
| Best & Belcher..... | .85 | MacNamara..... | .26 |
| Caledonia..... | .58 | Midway..... | .19 |
| Challenge Con..... | .36 | North Star..... | .01 |
| Chollar..... | .32 | West End Con..... | .21 |
| Confidence..... | 1.35 | Albata..... | .08 |
| Con. Cal. & Va..... | 1.75 | Booth..... | .09 |
| Crown Point..... | 1.17 | C.O.D. Con..... | .06 |
| Exchequer..... | .30 | Columbia Mt..... | .05 |
| Gould & Curry..... | .60 | Comb. Frac..... | .40 |
| Hale & Norcross..... | .60 | Goldfield Belmont..... | 1.90 |
| Mexican..... | 1.75 | Goldfield Daisy..... | 1.98 |
| Ophir..... | 2.12 | Jumbo Extension..... | .17 |
| Overman..... | .63 | Oro..... | 1.03 |
| Potosi..... | .60 | Red Hill..... | .03 |
| Savage..... | .50 | Sandstorm..... | .02 |
| Sierra Nevada..... | .77 | Silver Pick..... | .08 |
| Union..... | .91 | St. Ives..... | 1.07 |
| Yellow Jacket..... | 1.30 | | |

N. Y. EXCH. Jan. 18 BOSTON EX. Jan. 18

| Name of Comp. | Clg. | Name of Comp. | Clg. |
|---------------------------|------|--------------------------|------|
| Amalgamated..... | 83% | Adventure..... | 7 |
| Am. Agri. Chem..... | 45 | Allouez..... | 53 |
| Am. Sm. & Ref. com..... | 94 | Am. Zinc..... | 36% |
| Am. Sm. & Ref. pf..... | 109% | Arcadian..... | 9 |
| Anaconda..... | 49% | Arizona Com..... | 45% |
| Bethlehem Steel..... | 31 | Atlantic..... | 11% |
| Col. & Hock. I. & S..... | 87% | Boston Con..... | 20% |
| Colo. Fuel & Iron..... | 44% | Calumet & Ariz..... | 91% |
| Du Pont P'd'r, pf..... | 187 | Calumet & Hecla..... | 665 |
| Federal M. & S..... | 84% | Centennial..... | 33 |
| Great Nor., orctf..... | 73 | Con. Mercur..... | 12 |
| Nat'l Lead, com..... | 85% | Copper Range..... | 82% |
| National Lead, pf..... | 109 | Daly-West..... | 9 |
| Pittsburg Coal..... | 23 | East Butte..... | 11% |
| Republic I. & S. pf..... | 40 | Franklin..... | 19% |
| Republic I. & S. pf..... | 101 | Greene-Can..... | 10% |
| Sloss Sheffield, com..... | 82% | Hancock..... | 31% |
| Sloss Sheffield, pf..... | 118% | Isle Royal..... | 26% |
| Tennessee Copper..... | 37 | Keweenaw..... | 5% |
| Utah Copper..... | 53% | La Salle..... | 18 |
| U. S. Steel, com..... | 83% | Mass..... | 7 |
| U. S. Steel, pf..... | 123 | Michigan..... | 7 |
| Va. Car. Chem..... | 54 | Mohawk..... | 72 |
| | | Nevada..... | 25% |
| | | North Butte..... | 44% |
| | | Ojibway..... | 11% |
| | | Old Dominion..... | 50 |
| | | Osceola..... | 161 |
| | | Parrot..... | 20% |
| | | Quincy..... | 68% |
| | | Shannon..... | 16% |
| | | Superior..... | 64 |
| | | Superior & Bost..... | 16% |
| | | Superior & Pitts..... | 15 |
| | | Tamarack..... | 66 |
| | | Trinity..... | 9% |
| | | U. S. Smg. & Ref..... | 50% |
| | | U. S. Sm. & Re., pd..... | 51% |
| | | Utah Con..... | 41% |
| | | Victoria..... | 4% |
| | | Winona..... | 12% |
| | | Wolverine..... | 149 |
| | | Wyandotte..... | 3% |

N. Y. CURB Jan. 18

| Name of Comp. | Clg. |
|-----------------------|------|
| Big Vein Copper..... | 8% |
| Bonanza Creek..... | 3 |
| Boston Copper..... | 20 |
| Braden Copper..... | 4% |
| B. C. Copper..... | 7% |
| Buffalo Mines..... | 3% |
| Butte Coalition..... | 26 |
| Cobalt Central..... | 21% |
| Combination Fra..... | 40 |
| Con. Ariz. Sm..... | 3% |
| Cumberland Ely..... | 9 |
| Davis-Daly..... | 3% |
| Dominion Cop..... | 7 |
| Ely Con..... | 82 |
| Ely Central..... | 01% |
| El Rayo..... | 2% |
| Florence..... | 2% |
| Giroux..... | 11% |
| Gold Hill..... | 1% |
| Goldfield Con..... | 7% |
| Greene Cananea..... | 10% |
| Guanajuato..... | 2 |
| Guggen. Exp..... | 241% |
| Kerr Lake..... | 09% |
| La Rose..... | 4% |
| McKinley-Dar-Sa..... | 80 |
| Miami Copper..... | 23% |
| Mines Co. of Am..... | 50 |
| Montezu. of C. B..... | 4% |
| Mont. Shoshone..... | 1% |
| Mont-Tonopah..... | 70 |
| Nev. Utah M. & S..... | 1% |
| Newhouse M. & S..... | 3% |
| Nipissing Mines..... | 9% |
| Ohio Copper..... | 4% |
| Pacific Sm. & M..... | 1% |
| Silver Queen..... | 22 |
| Standard Oil..... | 648 |
| Stewart..... | 3% |
| Tintic..... | 2% |
| Tonopah..... | 6% |
| Tonopah Ex..... | .07 |
| Tri-Bullion..... | 1 |
| Utah Apex..... | 5% |
| Yukon Gold..... | 4% |

BOSTON CURB

| Name of Comp. | Clg. |
|--------------------|------|
| Ariz. Mich..... | .95 |
| Amheek..... | 218 |
| Bingham Mines..... | 3% |
| Boston Ely..... | 4% |
| Calaveras..... | 5% |
| Champion..... | 11 |
| Chemung..... | 11% |
| Chino..... | 14 |
| Corbin..... | 11% |
| Cactus..... | 6% |
| Crown Reserve..... | 15% |