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The Anthracite Decision

The decision of the Supreme Court in the case against the anthracite companies under the Sherman law was given on Dec. 16. It was on an appeal from the Circuit Court decision and was of a mixed character, in part sustaining and in part reversing the lower court. It holds that the organization of the Temple Iron Co. and the use of that concern to control the independent operators and to prevent the building of an independent outlet for the anthracite mines was an illegal combination in restraint of trade and that the injunction against the management and control of that company by the large anthracite companies must be enforced. The well known fact that the directorate of that company formed a convenient means of consultation among the heads of the large companies did not appear in the case.

The contracts with the independent operators, whereby their coal was bought at 65% of the tidewater price, are also pronounced illegal as in restraint of competition and are to be enjoyed in the future. These contracts gave the large companies the entire control of the selling and marketing of anthracite.

With regard to the general question of combination, the court finds that the government has produced no evidence sufficient to prove the existence of any trust or agreement to control the trade. The court, therefore, takes no action and makes no decision on this point, except so far as it sets aside the decision of the lower court on this point. The questions as to the existence of partial and minor pools and their effect in restraint of trade is left open for further investigation.

This decision again shows the uncertainty of the law. Probably no great trade in this country is so closely controlled and unified as that in anthracite. There is, however, nominally no trust, and there is no tangible agreement or

combination among the companies. The control is through stock ownership and common interest, and is exercised in ways the law does not reach and which it cannot be brought to touch without the greatest difficulty under existing conditions.

An Episode in the History of Copper

A prominent feature of discussion last week was the testimony given by Tobias Wolfson, of the United Metals Selling Co., in response to the interrogatories of Samuel Untermyer, before the Pujo Committee, which for the enlightenment of the House of Representatives is engaged in hunting the "money trust." Mr. Untermyer extracted from Mr. Wolfson the testimony that we quote on another page. The story thus developed was incomplete, the most interesting aspects of the case were missed, and inasmuch as Mr. Untermyer is a well informed man, there is naturally a supposition that he had some particular axes to grind. If the Pujo Committee is going to be taught history in this way, it will need to be careful. There are plenty of authoritative, contemporary records to which it may refer if it chooses.

The "runaway" market of 1906 had carried the price of copper to 25½c. per lb., from which it had settled to 25c., in the early part of 1907. As early as March in that year the signs of coming financial trouble had become unmistakable, and following disturbances in the stock markets of both Europe and America, the price for copper had begun to waver. Several important copper producers made sales at the market right along, although several large interests continued to hold out for their pegged price of 25c., but in the main buyers were conspicuous by their absence. Those who needed copper were always able to obtain it. In fact it was urged upon them. As early as May unsold stocks began to accumulate in outside hands, as well as in the hands of

the United Metals Selling Co. By the end of June some more of the big interests had broken away and were slashing the price in the effort to place all the copper they could. The price for the metal had, by that time, receded to about 22c. The United Metals Selling Co., and at least one other large interest, did not realize the situation and continued to stand for the old price of 25c. Of course they had made no sales worth mentioning for months previous, just as Mr. Wolfson testified. This was the situation when Mr. Rogers returned from Europe and delivered his famous remarks (in which he was unquestionably sincere, but fearfully ignorant).

In July the United Metals Selling Co. cut its price to 22c., but its competitors immediately undercut and continued to take the business just as they had been doing previously. For several months then the policy of the United Metals Selling Co. was vacillating. Loaded with a large and increasing accumulation of copper, it was hoped at every halt in the downward course of the metal that the bottom had been reached, but almost immediately the crumbling away would begin again through the efforts of the competing selling agencies and producers to find customers, and there was no way for the big fellow to take the market except by a boldness that it was unable to work up to. Even if it had cut the price to 11¾c. in one fell swoop there is no certainty that it would have stayed there. The course of the copper market of 1907 was entirely normal under the circumstances, and neither the United Metals Selling Co., nor anybody else, was carrying copper because they wanted to, but simply because they had to. If the United Metals Selling Co. had acted differently, it might perhaps have sold more copper on the decline, but the decline would have been even more precipitous than it was, and perhaps more cataclysmic.

If Mr. Untermeyer had been fair in his interrogatories, he would have developed for the information of the Pujo Committee that the abstention of the United Metals Selling Co. from the market did not deprive any consumer from obtaining all the copper he wanted, and at substantially his own price. In the latter part of 1907 there was no producers' "hold-up." On the contrary, the shoe was on the other foot. If the United Metals Sell-

ing Co. saw fit to prefer copper to money, and to accumulate a large, unsold stock at the expense of its own and borrowed money, it certainly did not commit any economic or social crime, although it may have done bad business for itself.

The Hollinger Mill

In the fourth of his series of articles on American cyanide practice, in this issue, Mr. Megraw describes and discusses the Hollinger mill at Porcupine, Ont., which is one of the newest cyaniding constructions. In treating of such new constructions the critic and commentator is always at a disadvantage because he observes and studies a practice that seldom has become settled, but is likely to be modified as experience is gained.

Thus in the case of the Hollinger mill, which has given an excellent extraction of the gold of the ore treated, and probably is not radically wrong in any of its departments, there are nevertheless advantageous changes which can, and no doubt will, be made, that will lead to a higher extraction and lower working costs. For example, the method of treating the concentrates will have to be changed. We understand also that Dorr thickeners will be substituted for the Trent agitators, this involving merely the substitution of one type of revolving arms for another. With this change the milling practice will become continuous decantation, which it is thought will reduce the metallurgical loss.

Such modifications in the metallurgical scheme of a new mill are, of course, the common thing. The establishment of a well settled line of practice is always a matter of study and of experimentation, and especially of time.

Metal Tariff Hearings

As reported by our Washington correspondent, the Ways and Means Committee of the House of Representatives has appointed Friday, Jan. 10, as the date for hearings on the metal schedules of the tariff. We are not going to urge one thing or another about the tariff in principle, but we do hope that some intelligent, unbiased person will step forward to point out, and secure the abolition of, certain absurdities, which become pieces of rank injustice. We refer especially to the collection of duties upon

the metal contents of ores that the smelter does not save. Many copper ores contain zinc, but the smelter does not get any zinc out of such ore. It goes into his slag and thence to the dump, and from beginning to end is a bother to him. Similar is the case of the zinc smelter who buys zinc ore containing lead. Either he does not recover any of that lead, or obtains but a small modicum of it, and that at heavy expense. The new tariff law should be drawn so as to relieve importers from paying duty on metal that they do not and cannot deliver for consumption.

The importance of operating data for comparison is recognized by every operator and engineer who has occasion to estimate the cost of new work. The article by Robert E. Hanley, on page 1182 of this issue of the JOURNAL, gives some highly interesting operating details regarding the driving of the No. 5 tunnel at the Mammoth copper mine in Shasta County, Calif. Articles of this character are most helpful by giving operators details that will enable them to estimate closely the funds that must be provided when similar work is to be undertaken. Both General Manager Metcalfe and the company are to be complimented on their generosity in offering such valuable technical data to the profession and industry. It is in line with the more enlightened attitude of reciprocity now being adopted by the large operating companies. Articles of this character, we are glad to note, are being more frequently offered.

The copper producers who are hanging to the pegged price for copper, point with one hand to the certainty (supposition, surmise, hope) that the buyers must be nearly bare of supplies, and consequently must soon enter the market and pay the demanded price; but with the other hand they point with pride to the enormous deliveries during the last month as evidence that the aforesaid buyers are still taking in great quantities of copper. The two things do not seem to jibe. The consumers are, no doubt, eating up supplies steadily, but so long as large supplies are going to them right along, they may, perhaps, be in no such desperate a state as is fancied. It might be imagined that an exhaustion of supplies would be foreshadowed by a marked diminution in the current shipments.

By the Way

A "scrap" expert is the latest addition to the naval personnel, according to the annual report of Rear Admiral T. J. Comie, paymaster-general of the Navy. His duty is to reclaim materials thrown aside as waste. By the new system large quantities of scrap metals have been collected and classified and either sold to dealers or sent to foundries to be reworked and returned to the government for further use. Some industrial concerns might advantageously imitate this practice of the government.

The latest achievement in high-speed tool steels is recorded by the Becker Steel Works, of Crefeld-Willich, Germany, in a full-page advertisement in the *Kölnische Zeitung*. It refers to the use of iridium for high-speed steel and high claims are made for it. The use of iridium is certainly novel, remarks *Metalurgical and Chemical Engineering*. We will add "improbable" to "novel." So long as iridium fetches \$68 per oz. and the world's annual production is but a few ounces, we do not think that much is going to be used in steel-making. To get 0.01% iridium, 3.2 oz. would be necessary for each ton of steel, costing \$217.60. We have heard of a steel containing 2% iridium being offered to miners in this country, but we have not taken any stock in it.

The Royal Society of Edinburgh is forming a provisional committee to consider how the tercentenary of the discovery of logarithms may best be celebrated. The year for this celebration will be 1914, as it was in 1614 that John Napier's "De Mirifici Logarithmorum Canonis Descriptio" appeared, although, according to Kepler, Napier had indicated his acquaintance with the properties of logarithms as early as 1594, in a letter to Tycho Brahe. Napier's logarithms were, of course, based on the sum of the series

$$1 + \frac{1}{1} + \frac{1}{1.2} + \frac{1}{1.2.3} + \dots + \frac{1}{1.2.3 \dots \infty}$$

approximately equal to 2.718281828. It was not until 1624 that Briggs published his "Arithmetica Logarithmica," using the base 10. The appearance of Napier's "De Descriptio," supplemented by his posthumous, "De Mirifici Canonis Constructio" (1617), may be considered as an event but little less important than Newton's "Principia." John Napier was born in Merchiston, near Edinburgh, in 1550, and died there Apr. 4, 1617.

Archie L. Wisner, head of the stock brokerage concern of A. L. Wisner & Co., and John J. Meyers were placed on trial in New York City, Dec. 9, before Judge Julian W. Mack, of the Federal District Court, on indictments charging them with using the mails to defraud investors in mining stocks. The postal authorities charge that more than \$2,000,000 was ob-

tained fraudulently by the men under indictment and their associates. Inspector Mayhew says that a list containing 120,000 names was found in the Wisner office. One of the indictments contains eight counts and recites 73 overt acts between Feb. 1, 1905, and Dec. 29, 1910. Stocks specified in the complaint are those of the United Tonopah and the Goldfield Mines, Limited, but in addition, it is charged, A. L. Wisner & Co. had for a long time invited investment in such enterprises as the Empire Gold Mines, Ltd.; Murchie Gold Mines Consolidated; California & New York Oil Co., and the California Monarch Oil Co. This trial, like that of Scheftels & Co., and Freeman, Hawthorne and associates, now pending, promises to be a long drawn out affair.

The New York *Evening Post* tells this story of August Heckscher, capitalist, who was for many years the general manager of the New Jersey Zinc Co., and is still largely interested in mining. Mr. Heckscher is a self-disciplinarian, according to his Long Island neighbors. In summer months he makes the daily trip from Huntington to New York in his steam yacht "Anahma," which flies the flag of the Seawanhaka-Corinthian Yacht Club, of which he is commodore. Taking one's own boat is easy in comparison with train-catching—also one is apt to land late at the office. The skipper, therefore, has strict orders to sail at 7:30 a.m., owner aboard or not. So up comes the anchor at seven bells, and away she goes, while the commodore scrambles aboard as best he may. Occasionally, inhabitants of Huntington have the pleasure of seeing the owner, hat in hand, rush madly down the landing just as the tender is leaving the pier, stamp angrily and say to himself words to this effect: "Worse luck! Worse luck! I've missed her again."

An example of the pathetic cases in the selling of wildcat mining stocks to poor, helpless persons was brought out a few days ago in the trial of A. L. Wisner & Co. Urbano Derby, of Concord, Mass., and his wife were purchasers of stock. He was an old man with snow-white hair and beard; she looked almost as aged. Together they sat in the court room from the minute the trial started. Their eyes never left the defendants. "How much money did you give A. L. Wisner & Co.?" asked Mr. Arnold, the U. S. attorney. "More than \$10,000 in all," said Mr. Derby, in a quavering voice. This was his entire fortune. Sometimes he got small dividends, he said, but as soon as he did he received an offer to sell him more stock. Sarah Derby, his wife, then took the stand. The questions had to be repeated to her several times, and when she answered, even the judge found it hard to hear. The state-

ments of A. A. Butterfield, the Concord agent, had caused her and her husband to invest in the mining stocks, she said, with a sob in her voice. "We told him we couldn't afford to invest all our money unless it was safe, as we had to have something for our old age. When we had given the firm all we had, we tried to borrow from them on their stock. But they wouldn't let us have any money." Another witness who told much the same tale was Peter J. Bollinger, of Buffalo, a deaf and dumb man, who lost \$1000. His testimony was interpreted by Dr. George Saven, of Buffalo. There are thousands of such cases along the trails of the mining sharks and swindlers, whose operations are as mean as the stealing of candy from a baby. The government has done no better work than its campaign for their extermination, which already has been crowned with brilliant success.

Readers of Julian Hawthorne's mining literature will recollect his brochure on "The Secret of Solomon." This was read in court a few days ago and commanded interested attention. The jury in this case is becoming so surfeited with interesting things that it will probably shun the vaudevilles during the remainder of the season. The New York *Sun's* version is the following: The story which appeared to impress the audience most favorably was "The Secret of Solomon," in which Mr. Hawthorne tells how the great king made millions in mining. King Solomon, so the story runs, was worth \$330,000,000, most of it acquired in the operation of the mines of Ophir. To be sure, he had to wait seven years for a single shipment of ore, owing to the lack of up-to-date transportation facilities, but the result was worth the trouble, according to Mr. Hawthorne. "How did Solomon make himself the richest of men?" asks the author of the tale. "By gambling," was the answer from the same source. The explanation followed that Solomon was not the kind of gambler who after having "deluded himself by the belief that something can be gotten for nothing in this world," goes out and puts a bullet through his brains; rather, the king was an intellectual gambler who took the wildest risks, yet with the full realization that he had a good chance of losing. The writer cited Columbus, Julius Cæsar, Alexander the Great and Cecil Rhodes as shining examples of successful gamblers. Rhodes, he said, realized that Africa had possibilities other than that of a game preserve, the ideas of "some big men" on the subject to the contrary notwithstanding. "The firm of Cæsar, Columbus, Rhodes & Co. will never lack living representatives," declared Mr. Hawthorne, and then mentioned the names of Morse, Edison, Vanderbilt, Harriman, Carnegie and Rockefeller.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Melting Point of Sulphur Trioxide

The statement made by Mr. Hawley, in his paper on the determination of sulphur trioxide in flue gas in the *JOURNAL* of Nov. 23, 1912, that at ordinary temperatures sulphur trioxide is a solid, calls attention to some of the peculiarities of this substance. There are two forms of this compound, the α -form, with a definite melting point, and the β , the latter probably not melting at atmospheric pressure, but subliming, the fumes on condensation giving the α -modification, which may later go over into the β .

According to D. M. Lichty (*Journ. Am. Chem. Soc.*, Nov., 1912), the melting point of the α -form is 62.2° F., and the boiling point 112.8° F. For the α -trioxide, Mr. Hawley's statement would often prove untrue. The α -trioxide goes over into the β , apparently merely from long standing or from small amounts of moisture. However it seems that both have the same molecular weight (80), so there can be no hypothesis that one is only the polymerization of the other.

New York, Nov. 25, 1912.

A. A. NASON.

Is Mining Languishing

Whatever be the cause, the languishing of the mining industry is certainly a fact inasmuch as it pertains to precious-metal mining. The success attained in the promotion and development of the low-grade porphyry coppers has placed this branch upon a firmer basis than ever before with no diminution apparent in the near future. With gold and silver mining it is different. The greater part of the production today is from so called low-grade ores and tailings, not new discoveries, but ores that could not be handled at a profit in former years. No new bonanza camps have been discovered in the past 10 years and prospectors have been exceedingly busy, especially in the United States and Canada. All the waste and remote places have been invaded and carefully prospected. As several writers have recently said: "The day of the new mine with a prominent rich outcrop has passed. The protruding veins, dikes and rocks have been examined, some carefully, some casually, but in general enough to determine their value."

As a rule, the prospector of the past and even of the present day has never been much of a digger and it is only by

new methods of prospecting and by digging that the new mines will be found. In some respects a mining boom such as the one Nevada experienced several years ago is a good thing. It causes much developing and prospecting work to be done that would not be done at any other time or under any other conditions and in opening this ground in a mineral territory, ore is found that otherwise would remain undiscovered.

Now with the surface of the earth fairly well known, explored and prospected, the chances of discovering new mines of merit are gradually becoming less. With the hopes of great reward gradually diminishing, the number of prospectors in the field is becoming smaller and smaller. Under the modern methods of mining and milling the present mines are rapidly becoming exhausted, much more so than formerly, so that instead of having more new mines to take their place, with the harder conditions of discovery we have less. We have reached the pinnacle and are now on the down grade.

Another item that has an influence, is the fact that the public in general is out of the market. Money formerly spent for the development of the country, and mining is included in this, is now used for other purposes, largely purchasing automobiles and accessories. Millions of dollars of surplus, with which the people outside of those directly in the mining business, formerly used to take an honest chance in the development of promising prospects, is now switched into the channels of the automobile industry, with the result that it is nearly impossible for owners of these prospects to secure funds for their development. About the only persons directly interested in the purchase of mines today are those in the large mining and developing companies, who never take a chance, and as a general rule want at least \$4 in sight for every \$1 invested. Personally I know of a promising prospect, adjoining a producing mine and containing the same veins, with good surface indications, and high-grade ore within a few feet of the line, yet the owners have been unable to dispose of enough stock at a small figure, to develop. It is not developed enough for the large operator to take hold of and the general public is not spending its money along these lines.

Agreeing with G. L. Sheldon in his article in the *JOURNAL* of Nov. 23, 1912, I know numbers of mining engineers and mining men that are quitting and taking up other lines of business. They are

good men, too, with plenty of experience. And still the mining schools are turning out hundreds of new engineers every year. I suppose though the supply and demand will adjust itself in the future.

Referring again to Mr. Sheldon's article, I think he overestimates the influence of the conservation movement in killing the mining industry. It is a hindrance in a number of instances in a small way but not enough to deter prospectors from entering forest reserves to prospect if there is even a hint of mineral there. A forest reserve in Nevada, however, is rather a laughable matter. Acres and acres of ground are reserved without a stick of timber in sight and with no hopes of any ever growing. Bound up with red tape, they do create annoyances at times, but not serious enough to blame them entirely for the decadence of mining.

According to my idea the whole matter is caused by the lack of new discoveries caused by the lack of new territory to be explored and the more difficult methods necessary to prospect the present territory; by the diverting of money formerly used in the mining industry to other channels of industry; to the apathy of the investing public, due to causes too numerous to mention.

H. C. CUTLER.

Reno, Nev., Dec. 6, 1912.

Mechanical Efficiency in Crushing

While Mr. Del Mar's article in the *JOURNAL* of Dec. 14, 1912, seems to throw a certain amount of light on Mr. Stadler's work, I confess I do not yet see the derivation of the formula (p. 1133, col. 3),

$$N = -10 \log S.$$

Although Mr. Del Mar says he will explain this, I cannot find anything concerning it, until I fetch up against the solution of the equation, which is not a difficult one for a certain specific case.

I am willing to assert that I remember enough elementary algebra to solve linear equations all day, but how and where is this mystery $N = -10 \log S$. derived? Perhaps in asking this I am laying myself open to a reproof I heard in my college days: "Professor, I see everything except the last step." "Yes, you see all except the whole thing," but I hope Mr. Del Mar will make a short attempt to show this.

R. S. LEACH.

New York, Dec. 16, 1912.

Electric Power Testing Set

By James C. Bennett*

A modification in the design of a Blake-type crusher, which appeared to increase the capacity of the machine, made it desirable to make test runs for the purpose of comparing the modified design with the original. This was of particular importance in view of the fact that there were a number of other similar machines in service that should be changed if it were definitely known that the change meant an increased tonnage without a disproportionate increase in power consumption and decrease in the life of the wearing parts.

For the purpose of making this particular test run, representatives of one of the electrical manufacturing companies were engaged to make observations of the power consumption with measuring instruments furnished by themselves. While this arrangement gave the desired information in this particular instance, it would not cover the additional needs in the same direction, as it was intended to determine over considerable periods the power consumption of the different machines in the plants. The instruments used in the first tests were of the indicating type only, so that it was necessary to have someone constantly at the instruments, and someone at the machine on which measurements were being made in order that the exact conditions prevailing at the time readings were taken might be known.

INSTRUMENTS FOR POWER CONSUMPTION TESTS

It was decided, therefore, to secure a set of instruments that would more nearly cover the individual needs of the plants and machines concerned. In arranging such a set, the principal points to be borne in mind were: (1) The observations might extend over considerable periods of time, ranging from one day to one or two weeks; (2) the records should show not only the total power consumption during the period of observation, but the range and duration of the fluctuations; (3) two voltages are in use, so the set must be adapted to secure readings on circuits of either 440 volts or 2200 volts, with a range in horsepower from five to 200. Further, as there are three plants somewhat widely separated, the set must be of at least a semi-portable nature.

The set finally decided upon and purchased consisted of the following General Electric Co. instruments: Two potential transformers, 330-360-440 volts, primary 110 volts, secondary type P, form A, 50 watts, 25 to 60 cycles; two potential transformers, 1100-2200 volts, primary 110-112 volts, secondary type

To determine the mechanical efficiency of certain crushing machines the amount of power consumed under various conditions was needed. The requirements were met by a portable electrical measuring set by which records of total consumption and the range and duration of fluctuations over a given period could be obtained with sufficient accuracy.

*Mechanical engineer, Natomas Consolidated of California, Sacramento, Calif.

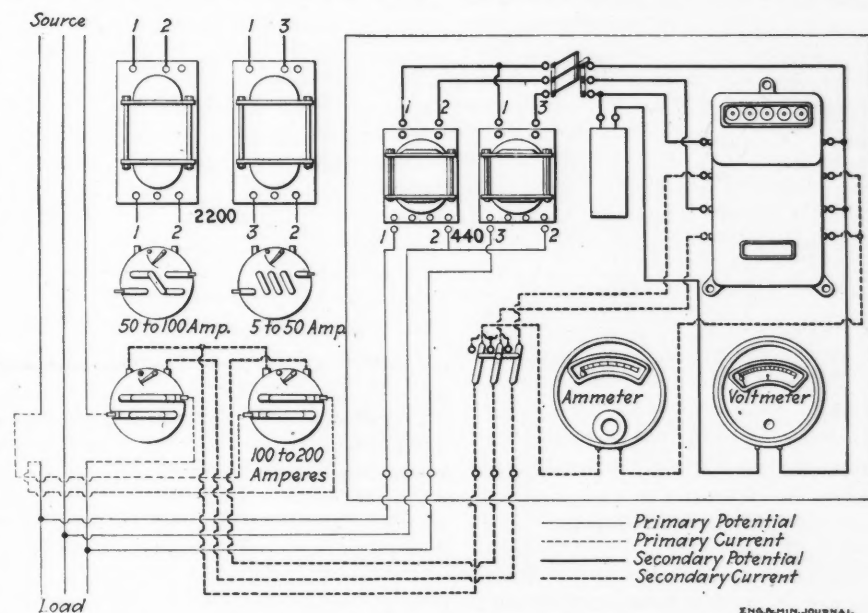
P, form B, 50 watts, 60 to 125 cycles; two current transformers, primary current 50-100-200 amperes, ratio, 10-20-40 to 1, type S, form P, 40 watts, 25 to

data on the 2200-volt circuit. As rated by the manufacturers, the range of power for which this set is suited ranges from 10 to 150 h.p. in a 440-volt circuit, and from 50 to 750 h.p. in a 2200-volt circuit.

SIMPLE WIRING DIAGRAM

The set was laid out on a board 2 ft. 7 in. by 3 ft., the accompanying diagram showing the arrangement and wiring connections.

It may be mentioned that this diagram is of a somewhat more elementary nature than is commonly used in electrical work. It was prepared for the use of the electricians with a view to enabling them to install the set in connection with any desired motor, and to select the ratio for the current transformers that best suited the needs of the motor in question. It serves the same purpose in relation to the selec-



CONNECTIONS FOR POWER-CONSUMPTION TESTS

125 cycles; one watt-hour meter, Thomson recording, 100-110 volts, 60 cycles, type D3, 3 wire, three phase, 5 amperes; one ammeter, type CR, curve drawing, 60 cycles, 5 amperes, chart CR-110; one voltmeter, type CR, curve drawing, 60 cycles, 90-130 volts, chart CR-109; one resistance coil, included as a part of the voltmeter equipment.

As will be seen by the foregoing list, the watt-hour meter and voltmeter are designed for 110 volts. It would have been possible to get both of these instruments for 440 volts, thus eliminating the potential transformers for use in the 440-volt circuit. To do this, however, would have introduced complications in making provision for securing

tion of the right potential transformers.

It is desirable to secure as large ammeter readings as the meter will afford, in order that the fluctuations in current consumption may be the more pronounced and more easily read. Thus, on a motor of 2200 volts, with a normal current consumption of say 24 amp., the ammeter will register only 2.4 amp. with the current transformers set on the 10:1 ratio. Another motor of the same power, but of 440 volts, would mark a current consumption of 12 amp. with the same ratio on the current transformers. This is, of course, beyond the range of the ammeter, so it becomes necessary to use the 40:1 ratio, giving a reading of three amperes for the motor

of 440 volts, but of the same capacity as that of 2200 volts.

STURDY CONSTRUCTION ADVISABLE

The board on which the instruments are mounted is made of a good grade of white pine, thoroughly seasoned and painted. All of the wiring is on the back of the board and is protected from injury by a frame $1\frac{1}{2}$ in. deep, extending entirely around the edge. A back of $\frac{1}{2}$ -in. boards is then nailed to this strip, thus entirely inclosing the wiring. When it is desired to ship the set from one plant to another, it is only necessary to disconnect and dismount the instruments, for each of which a substantial shipping case is provided.

The front of the board is so arranged that all of the instruments can be mounted and connected after the board is hung to studding or post as the case may be. The only projections on the front of the board are the terminal wires for the various connections, and as these are all made of flexible wire sufficiently heavy to give mechanical strength, as well as current capacity, they may be lightly cleated to the board in shipping, and there is little likelihood of any mishap to them while in transit.

The two switches indicated on the board are to permit cutting out the measuring instruments momentarily, should it become necessary, without interfering with the operation of the motor. The switch in the potential circuit is used in the ordinary way, viz., opened to disconnect the instruments. The one in the current circuit, however, is closed to disconnect the instruments, the two contacts being connected, thus causing a short circuit on the secondary side of the current transformers when the switch is closed.

RESULTS NOT PRECISE

The following example will illustrate the use of the data obtained with the instruments: If the power factors under different conditions of loading are known, as they should be when tests are undertaken, the power consumption at any moment may be computed sufficiently closely for all average requirements as follows: Multiply ammeter reading by ratio to which current transformers are set, by voltmeter reading, by ratio to which potential transformers are set, by power factor, by 1.73. Divide the final product by 1000, and multiply the quotient by 1.34. The result will be in terms of horsepower. Should it be desired to obtain the results in terms of kilowatts, the omission of the final multiplication will give such information.

As will be inferred from the statement in the preceding paragraph, this

result is not especially accurate. The error will range from 5 to 10%. Part of the inaccuracy is due to the instruments and part to the variation of the power factor. The information commonly furnished by the electrical manufacturers gives power factors for conditions of loading equivalent to $\frac{1}{2}$ load, $\frac{3}{4}$ load, full load, and $1\frac{1}{4}$ load. Thus, if the load amounts to 60 or 65% of the full load, there will be a variation in power factor which will have an appreciable effect on the calculated result. Probably the manufacturers will supply power factor curves from the factory performance records if requested to do so.

A METHOD TO INCREASE ACCURACY

To avoid such inaccuracy as has just been pointed out, it will be necessary to take a direct reading at the moment that it is desired to know the power consumption. This may be done by observation of the speed at which the small disk in the lower part of the watt-hour meter revolves. Through the small glass in the lower part of the case, the speed may be easily observed, as the disk is marked for that purpose. Having observed the time required for the disk to make one, two, or more revolutions, depending on its speed at the time of observation and on the frequency and duration of fluctuations of the load, the power consumption may be calculated as follows:

Multiply the number of disk revolutions observed by the constant K , which is marked on the disk, by 3600 and divide the product by the number of seconds required to make the observed number of revolutions. Multiply this quotient by the product of the ratios of the current and potential transformers, divide by 1000 and multiply by 1.34. The result will be in terms of horsepower. As stated in connection with the computations based on ammeter and voltmeter readings, the omission of the final multiplication will give results in terms of kilowatts. A stop watch should be used in timing the disk in the watt-hour meter, as it is difficult to read an ordinary watch to within one or two seconds, and an error of this extent will have a marked effect when the consumption is rapid, and the observed number of revolutions but one or two.

While the second method should be a close check on the first, it will be the exception when such a check can be made, owing largely to the variation in power factor already mentioned. In the second method, the power factor is accounted for in the watt-hour meter, whatever the loading may be. It is advisable to make occasional calculations by the second method, as a means of

securing a rough check on the data secured during the progress of the observations.

By reading the recording dials of the watt-hour meter at the beginning and completion of the observations and multiplying the difference by the combined ratios of the current and potential transformers, the total consumption in kilowatt hours over the entire time observed may be obtained. From this the average hourly consumption, or the consumption per ton may be determined by calculations which are obvious. An attempt, however, to check the total power consumption as recorded by the watt-hour meter with the momentary readings, either from voltmeter and ammeter, or from the disk of the watt-hour meter, will only lead to disappointment as the element of time, which is accurately accounted for in the watt-hour meter, is wholly neglected by the other meters and can only be approximated by eye in a study of the charts of these two meters.

CERTAIN PRECAUTIONS NECESSARY

A few words of caution regarding the care and use of such a set of instruments as has been described. It is not necessary that the set be installed by a graduate electrical engineer, though the electrician to whom the work is intrusted should be one who is painstaking and thoroughly reliable in his work. That the connections be made exactly as diagrammed is highly important, since a slight change in one of them will probably result in readings that are worse than useless for the reason that they will be misleading. The connections on the primary circuits should be substantial even though they are temporary, since those circuits are of such tension that defective work may possibly lead to fatal results. While this set was selected with a view to the sturdiness of the several instruments, and is probably as substantial as can be secured, in their very nature they are of delicate construction and it is important that they be handled with the utmost care.

Although the meters are understood to have been properly adjusted before leaving the factory, there is always the possibility of some derangement in shipping, so that a careful check should be made when first installed. The watt-hour meter in particular should be checked from time to time after being placed in service. Where a known motor load is available and is a steady one, so the power factor may be definitely determined, the watt-hour meter may be checked by means of the ammeter and voltmeter of the set. The preferred way, however, is by comparison with a stand-

ard meter. Where the power is purchased from a central power station, the distributing company will be fairly certain to have a standard meter so that the watt-hour meter may be checked by the regular meter tester.

The delivered cost of this particular set was \$252. In many instances where a similar set may be desired, it will be possible to reduce the cost by reason of the fact that there will be but one voltage to deal with. This will permit the elimination of one set of potential transformers and should the service current be at 440 volts or less, both sets may be omitted as it is possible to secure meters designed to work on such voltages without the necessity of stepping down.

Hearing Concerning Metal Tariff Revision

WASHINGTON CORRESPONDENCE

The Ways and Means Committee has appointed Friday, Jan. 10, 1913, as the date for considering schedule C of the tariff bill which deals with metals and manufactures thereof. It is understood that the hearings on this subject will extend throughout January 10 and 11. The plan is to hear all those who may choose to present themselves, provided the number is not too great to cover the time set apart for that purpose. In the event that too many persons present themselves, the committee will probably find it necessary to designate representative persons to speak for the trade and in so doing to grant to those who are not heard the power to file with the committee briefs representing their views.

The following statement has been issued to those who are likely to ask to be heard:

The hearings will be conducted in the hearings room of the committee, 321 House of Representatives Office Building. Sessions will begin at 10 a.m. and 2 p.m. unless otherwise ordered.

Persons desiring to be heard should apply to the clerk of the committee previous to the date set for the hearing, to be assigned time on the program for that day. In making such application the following information should be given:

Name; permanent address; temporary address in Washington; person, firm, or corporation represented; paragraphs of the Act concerning which testimony will be given; brief mention of attitude to revision of the tariff; and the amount of time desired.

In addition to this the person intending to give testimony should forward in advance to the clerk a copy of his brief and of any documents he desires to file with the committee. In preparing this brief it is desired that the following outline be observed:

(1) State by items and paragraphs the changes in duties recommended, assigning in each instance reasons for recommendations. (2) Estimate the in-

crease or decrease in imports by paragraphs and items, which would result from suggested modification of duties. (3) Explain methods or experience relied upon in making estimate. (4) Suggestions as to changes in phraseology of present tariff law. (5) Suggestions as to the betterment of the administrative features of the present law.

All briefs and other papers filed with the committee should have indorsed on them the name and address of the person submitting them and the numbers of the paragraphs of the present tariff law to which they relate.

California Miners Association

SAN FRANCISCO CORRESPONDENCE

The sixteenth annual convention of the California Miners Association was held at San Francisco on Dec. 9, 10, and 11. It was the first convention of the association since 1906. President W. C. Ralston presided.

M. H. de Young, vice-president of the Panama-Pacific Exposition, invited aid in the preparation of the mineral display. Upon his suggestion, the convention in 1915 will be held in San Francisco, and the mining men of the world will be invited to meet in a great mining congress.

Secretary of the Interior Fisher delegated Charles G. Yale, statistician of the U. S. Geological Survey at San Francisco, to represent him by the delivery of a paper prepared by W. C. Mendenhall, chief of the land classification board, defending the policy of the department regarding public-land administration. The paper stated that the Department of the Interior is an administrative organization and not a law-making body, but acts purely by the mandates of Congress; and that only in the administration of those statutes which grant discretionary powers or permit of various constructions, is there opportunity to develop and express a policy. So that whatever the officers of the department have done in matters relating to the land and water affecting the rights of the miners has been done under the provisions of the statutes or in the discretion of the Secretary of the Interior in the public interest. The withdrawal power, it was admitted, has been widely exercised by the President. The oil-land legislation in the last Congress, the Secretary holds, would have applied to California had there not been strong protest by some of the oil men of the state. The view of the Secretary, as expressed in the paper, respecting the withdrawal of lands valuable for water power, is that, like the oil and phosphate withdrawals, legislation is needed, as the statutes at present contain no law which provides adequately for the acquisition and use of these lands.

A. H. Ricketts, mining attorney of San Francisco, said that conservation as practiced by the government bureaus is op-

posed to the theory that the government holds the public land in trust for the people, to be disposed of so as to promote the settlement and ultimate prosperity of the states in which they are situated, and that the federal departments persistently exceed their limited lawful power over the public domain. Russell L. Dunn and Frank H. Short supported the position of Mr. Ricketts, while James F. Farrar supported the Secretary of the Interior.

Whitman Symmes submitted a resolution that the association is not in favor of the policy recently developed of maintaining the public lands to be leased or rented on such terms as Congress and departments may prescribe, but that the government should hold such lands in trust for the purposes originally agreed upon between the federal government and the separate states, and that eventually the mines, forests and un-navigable streams of the nation may be administered by the states in which they are situated. This was substituted by a resolution, which was adopted unanimously and without discussion, calling attention of Congress to the persistent and harmful interference of federal bureau officials with the operation of prospectors and miners who go on the public land. That the association believes the remaining public lands in all the states should be disposed of consistent with the policy of the rule embodied in the early acts of Congress and in many decisions of the Supreme Court, and calling upon the governors and legislatures of the several states interested to see to it that the rights and interests of such states and people shall be properly guarded and fully protected. A similar resolution was adopted relating directly to the use of water by miners.

The conservation of flood waters by the operation of hydraulic mines was discussed by W. W. Waggoner. He presented a plan that induced the adoption of a resolution that a committee be appointed to consult and cooperate with the debris commission relative to the resumption of hydraulic mining.

The employers' liability act and industrial accident insurance were discussed by A. J. Pillsbury, chairman of the State Industrial Accident Board, and T. J. Nilon, the former supporting and the latter opposing the present law. The convention adopted a resolution expressing the belief that the present law imposes on mine owners and all other employers of labor an unjust burden of liability, and suggesting amendment providing for equal sharing by the employer, the employee, and the state of the cost of accident insurance. The convention also adopted a resolution suggesting legislative remedy of the hardship imposed on mine owners by the corporation tax law.

W. H. Storms, state mineralogist, delivered a paper on the disposal of quartz-mill tailings for filling underground

stopes. Mr. Storms discussed the same subject in the JOURNAL of Sept. 23, 1911. Mr. Storms also presented a paper setting forth the history and work of the State Mining Bureau. The convention adopted resolutions asking for state appropriation of \$25,000 for the investigation by the state mineralogist of fake mining companies, and also for an increased appropriation for the general and special work to be done by the bureau.

Walter W. Bradley, librarian of the State Mining Bureau, read a paper on "Federal Law and the Miner." Whitman Symmes, of Nevada, delivered a short address on the construction and operation of pumps on the Comstock.

Secretary Fisher on the Mineral Land Law

WASHINGTON CORRESPONDENCE

Secretary of the Interior Fisher, in a report to the President made public on Dec. 16, 1912, includes a discussion of the need of revising the mining legislation of the United States, and expresses interesting opinions with reference to the situation existing under recent court and administrative decisions. In part Mr. Fisher says:

It is becoming increasingly evident that the lode-mining law needs change in one respect, at least. The law at present does not provide for the creation of any rights in supposedly mineral land, except by the issuance of patents, and in that regard Congress has provided that a patent can follow only on a legal location and has said "but no location of a mining claim shall be made until the discovery of the vein or lode within the limits of the claim located." . . . The law tends fairly well to the development of mineral properties where ore can be discovered at or near the surface, but it seems to be ill calculated where, as is the case notably in some of the copper-mining districts, the ore lies at depths of hundreds and sometimes thousands of feet. Discovery of the vein within the limits of any particular claim in such cases involves deep exploration, either by drilling or by the sinking a shaft, or the extension of a tunnel into the claim. Either of these operations may involve great expense, and it has been repeatedly urged on the Department that investors are reluctant to spend the money required without further assurance than the law at present can give them.

On this ground the Department has been strenuously pressed so to construe the law as not to require an actual discovery of the lode which is supposed to exist within each claim, but to patent the claims upon evidence of the existence of mineral at or near the surface wholly disconnected with the supposed lodes below and of no value in itself, it having been further urged that in these cases it was a matter of geological inference that orebodies did exist far below the surface. It is obviously the duty of the Department to carry into effect the intention of Congress expressed in statutory form. Congress having said that no lode claim should be patented without discovery of the vein or lode, within the

limits of the claim, it would be an evident usurpation of power for this Department to patent lode-mining claims without proof of actual discovery. The frequently repeated assertions that the recent rulings of the Department have overturned interpretations placed upon the law for 30 years seem without foundation. On the contrary, had the Department decided that it could dispense with actual discovery it would have overturned the practically unanimous holdings both of courts and of the Department ever since the enactment of the lode-mining law. Doubtless in some cases claims have been patented where there was little or no proof of actual discovery, but the patenting of such claims is evidently to be laid to a misapprehension of the facts by employees of the Land Office, and not to a misconstruction of law by the Department.

It seems, however, possible by a change in the law to keep in force the policy of the Government expressed in the mining law of rewarding the actual discoverer of valuable veins, while at the same time giving such protection during the work preliminary to actual discovery as would make it possible for capital to invest. I suggest that the law should be amended so as to give a prospector, for a term of years, an exclusive right of possession and of prospecting within a limited area of land. In case actual discovery were made within the time given, patent would issue. The prospector should be obliged to perform a reasonable amount of work during the existence of the permit in order to make evident his good faith. He should, however, be given the right, by proper proceedings, to settle disputed questions of intervening claims, both in case of conflict with other mineral claims and also cases of conflict with agricultural claimants, so that he might at the earliest possible moment know whether or not his title would be absolutely clear upon his making discovery.

The only alternative suggested to this plan, apart from the evidently impossible one of accepting as evidence of discovery something which is clearly not such evidence, would be for Congress to amend the law so as to permit the issuance of patents to mining claims upon proof of the existence of valuable mineral within the claims by geological inference. The objections to this are many. In the first place, it is evident that no geological inference can be absolutely sure. This is particularly clear in the case of copper deposits at great depth, for it was admitted in a case where a large number of claims were applied for, that it was impossible for the claimants to state that there was in fact any copper ore under the surface of any particular claim; all that they asserted that they could be sure of was that somewhere beneath the surface of the large number of claims there was a large amount of such ore. Another objection of perhaps much greater weight is that to substitute geological inference for the actual discovery of the vein or lode as required by the present law is to give to the geologist, or the man financially able to employ skillful geologists, the reward which it has been the policy of the law up to now to extend to the prospector or actual discoverer. It would also follow that a wealthy man could, without any actual development of the mineral resources of the country, obtain patents for and thus monopolize large districts of valuable mineral land.

Humors of the Hawthorne Trial

The testimony in a case like that of the Government against Freeman, Quincy, Morton and Hawthorne is in the main prosaic and dreary, but now and then becomes amusing an even humorous, as, for example, on Dec. 10, when two young women stenographers in the offices of the Temagami-Cobalt Mining Co. testified that they had been elected directors "of something or other," but were not quite certain just what. Of course, they had never attended a meeting, they said, and were surprised that such a question should be asked.

Helen Rogers, private secretary and stenographer for Albert Freeman, testified:

"I was a director of—I forget just what. I think it was the Elk Lake Co. Oh, no; I never attended any meetings, but I was notified that I had been chosen director of something or other."

Rose Greeley, another stenographer, when asked if she, too, was a director of the Elk Lake Co., replied:

"I don't know just what the companies were that I was a director of, but I remember that I was told one day that I was a director of two of the companies."

"Did you ever attend a meeting?"

"Oh, no," she replied.

Herbert D. Sayre, professor of mathematics in the University of Alabama, testified that he never bought any shares of the Hawthorne Silver and Iron Mines Co., but that he was a member of the "advisory committee."

"Mr. Hawthorne asked me to serve," he explained, "and he sent me a certificate for 10,000 shares of stock in the Hawthorne Silver and Iron Mines Co. and a certificate for a \$5 dividend on Temagami-Cobalt stock. I sent back the certificate of stock in November, 1911, after having had it since early in 1910. I never attended a meeting of the company and never was notified to attend any."

John McKinnon, of New York, formerly secretary and treasurer of the four mining companies named in the government indictment, testified regarding the connection of the Continental Syndicate, an underwriting concern of which he was also an officer, with the mining companies. He said that at the end of May, 1909, there remained approximately 200,000 shares of Montreal-James Mines, Ltd., stock unsold. A letter from Hawthorne to a prospective subscriber, written some time in May, 1909, which was read to the jury by Assistant United States Attorney Dorr, stated that there remained only about 1500 shares unsold.

The witness, refreshing his memory from the books of the mining companies, stated that by the terms of the agreement between the Continental Syndicate and the companies, the Elk Lake-Cobalt

Mines, Ltd., was entitled to hold back \$10,000 from the sale of its stock, and the Montreal-James Mines, Ltd., \$50,000 from the sale of its stock; the remainder was to be turned over to the syndicate.

The witness testified further that when he retired from the secretaryship on Dec. 9, 1910, there was on the books of the Temagami-Cobalt Mines, Ltd., a balance of \$472; on the books of Elk Lake-Cobalt Mines, Ltd., a balance of \$35.85, and on the books of Montreal-James Mines, Ltd., a balance of \$26.81, all being on deposit with the Knickerbocker Trust Co.

The indebtedness of the Elk Lake Co. to the holding company, Temagami-Cobalt Mines, Ltd., at this time was \$29,700; of the Montreal-James Co. to the Temagami-Cobalt Mines, Ltd., \$1230, and of the Temagami company to the Hawthorne Silver and Iron Mines, Ltd., \$24,500.

Mr. McKinnon also testified that as secretary and treasurer he had received no money from the sale or shipment of ore from the mines of any of the companies.

"How much money did the public subscribe to Temagami-Cobalt?" asked Assistant District Attorney Dorr.

"Upward of \$400,000," said Mr. McKinnon.

"How much went to the Continental Syndicate?"

"Everything in excess of \$190,000."

"Did Temagami-Cobalt get all this \$190,000?"

"No, \$100,000 went back to the Continental Syndicate, leaving \$90,000 for Temagami-Cobalt."

Earlier in the day Mr. McKinnon had testified that Mr. Freeman was the sole stockholder and president of the Continental Syndicate. In explaining the reason why the Syndicate should get everything but \$90,000 of the \$400,000, Mr. McKinnon went into a long argument, the involution of which took the Court a considerable time to understand and digest.

"Did the entire \$90,000 remain in the Temagami-Cobalt treasury?" went on Mr. Dorr.

"No, \$14,000 was paid to Dr. Morton. The remaining \$76,000 went, technically, for exploration and development."

On a following day, letters in Mr. Hawthorne's own handwriting, giving a rollicking account of his efforts to induce folks to "separate themselves from their money," in exchange for mining stock, were read. The defendants themselves, Mr. Hawthorne in particular, appeared to enjoy the reading, although Mr. Hawthorne at times looked embarrassed.

Under date of Feb. 27, 1909, Mr. Hawthorne wrote from New York to Mr. Freeman in Canada, as follows:

Speaking of that individual whom you fired off the directorate and then allowed to crawl back (I have forgotten his name) . . . he told me that

he was in touch with certain English capitalists whom he did not name, who would be disposed to invest in our companies to any extent up to all the stock issued, provided they could be satisfied that it was a sound business risk. He suggested that I supply him with data, local color, etc.—the promulgation whereof to said Britishers might tend to open these fathomless pocketbooks of theirs in our direction.

Hereupon I endeavored to imagine myself to be a combination of the qualities of both you and Morton; your fire and resourcefulness, and his conservatism, together with my own innocence and virtue; and in this guise I conducted him into your room, set him down with his nose over the samples and the maps, and administered a lecture to him. He went off, at last, full; and I expect him back in a few days conveying a line of wagons loaded with British gold to exchange for our certificates.

Further on Mr. Hawthorne said:

Faithful little Pignet paid his final installment of \$100 for Temagami and another \$50 on his Elk Lake. Pat McCabe, from the auld sod, engineer on North River ferries, separated himself from \$75.

For all I know we may be getting rich. I wish you would wire McKinnon (treasurer) to pay me \$1000 or so for my lunches and carfares. I am stone broke, and in a mood to rob the till. You had better come back anyway. Why should you two fellows (speaking of Dr. Morton and Mr. Freeman) be off playing while I stick here with my nose to the grindstone, starving to death?

At another time, in January of 1909, Mr. Hawthorne wrote that "Brother Brown turned up on the fifth and paid his 5000 like a little man," but that "Colby's bank-book still lies unclaimed on the desk. However, I wrote Colby a love letter and expect him back tomorrow or on Monday. A certain "Hubbard, of Plainfield," was also mentioned. "Hubbard, of Plainfield, who looks rich," Mr. Hawthorne wrote, "talked for a space and seemed so well satisfied that he arranged to come again to see you, and I expect will swallow 5000 or 10,000." Professor Amen, of Phillips Exeter Academy, according to Mr. Hawthorne, "would buy Temagami about Jan. 25, when his salary is paid."

Bureau of Mines

WASHINGTON CORRESPONDENCE

Congress has been asked to allow \$250,000 for an investigation of the methods by which low-grade ores in the West which cannot possibly be worked under present conditions may be developed and made to pay by the use of more scientific methods of mining. The work would be done by the Bureau of Mines through an extension of its present scientific investigations. The Bureau also desires to enlarge the study of health conditions in lead, zinc, copper and other metal mines, and it reports that the percentage of deaths from tuberculosis

among workers in such mines is higher than that among those employed in coal mines and other occupations.

It is also desired to have the Bureau investigate carefully the causes of accidents in the metal mines and to do it much more thoroughly next year than it has been heretofore done. The work already accomplished in investigating the cause of accidents in coal mines is said to be good evidence that the use of the funds asked for in these investigations will be well warranted. It is likely that some allowance will be made for the extension of this kind of inquiry.

The Copper Revelations

We were aware that the Pujo Committee, with the assistance of Samuel Untermyer, was investigating the "Money Trust," but we were unaware that this had anything to do with the copper market. Also we thought that we were well informed respecting copper corners, umbrellas, etc. Consequently we rubbed our eyes in amazement when we read in the papers of Dec. 12, headlines like these:

COPPER CORNERED

PUJO COMMITTEE HEARS HOW UNITED METALS COMPANY HELD BACK 93,000,000 POUNDS IN 1907,

Then Smashed the Market.

When our eyes caught the figure 1907, however, we began to suspect what was up. It appeared that the Pujo Committee had had Tobias Wolfson, assistant general manager of the United Metals Selling Co. on the stand. Mr. Wolfson testified that in his opinion his company never controlled more than 50 to 60% of the copper product of the country and the proportion was very much less now. Mr. Untermyer insisted that the company had controlled between 70 and 80%. In questioning about the alleged corner in copper in 1907, counsel for the committee drew from Mr. Wolfson an acknowledgment that for April, May and June, 1907, the total sales for the company had been only 70,000 lb., 409,964 lb. and 454,909 lb., respectively. The sales for the month of April were only 70,000 lb., as compared with 11,000,000 lb. in March, 21,000,000 in February and 7,000,000 in January, and the average sales were normally from 30,000,000 to 40,000,000 lb. a month.

The witness acknowledged that the company had accumulated copper for four or five months in 1907 and that it had advanced money to the producers amounting to between 80 and 90% of the value of the copper, which was being withheld from the market.

Mr. Untermyer wanted to know if the United Metals Selling Co. had not been obliged to borrow from the banks as much as \$50,000,000 to make the advances and hold copper from the market. The witness replied that it had borrowed

only \$10,000,000 from the banks and had used its own resources for the balance. In four months it advanced over \$42,000,000 on copper, in which time it put on the market only about 5,000,000 lb.

"They kept piling copper on you?" said Mr. Untermeyer.

"Yes," replied the witness.

"And Amalgamated stock was being unloaded in those four months?" added counsel for the committee.

"I can't say as to that," said the witness.

"But soon after you began to sell, the price dropped from 25 to 13c. a pound?"

"Yes."

"You couldn't hold the market any longer, you had to let it go?"

"No, that is not accurate."

The witness went on to contend that the consumers of copper metal had been loading up for months at the high price; that they had laid by much more than they needed in the hope of making money on a further rise and that after the preliminary panic early in 1907 the entire market for copper had disappeared. He added that the United Metals Selling Co. regarded it as the company's duty to support the market and hold it up until the surplus stock that had been obtained by the consumers had been exhausted. Mr. Wolfson contended that if his company had not done this, many of his customers and the United Metals Selling Co. itself would have been forced into bankruptcy. He maintained stubbornly, however, that the company had not held up the price of copper by refusing demands for a supply. As he remembered the situation there was no demand.

"Then how was it," asked Mr. Untermeyer, "that the price dropped from 25 to 13c. a pound when you began to sell if it is true, as you say, that the market was cleaned up when you stopped selling?"

Mr. Wolfson contended that the drop had been gradual. He acknowledged that the United Metals Selling Co. had accumulated 119,000,000 lb. of copper by Sept. 1, 1907. This was after all orders had been filled and represented a three months' supply. The figures submitted in evidence showed that while only trifling amounts had been sold for five months preceding October, 1907, about 93,000,000 lb. was taken as soon as the United Metals Selling Co. loosened its hold on the product.

Q. And, although you say you were not able to interest buyers during those five months, they were suddenly interested to the extent of 5,637,000 lb. in September, 93,000,000 in October and 46,000,000 lb. in November and continued to show an interest for many million pounds every month after that? A. Yes.

Mr. Untermeyer wanted to know how it had happened that when the United Metals Selling Co. released copper in October and sold 93,000,000 lb. that the

Amalgamated stock had dropped from 121 $\frac{7}{8}$ to 56 $\frac{1}{4}$.

"How can I answer that?" asked the witness impatiently.

In a subsequent interview, John D. Ryan, president of the United Metals Selling Co., said:

The criticism I have to make as to some of the reports appearing in the morning papers is that the reporters seem to have taken Mr. Untermeyer's questions as comprising the entire evidence, without any reference to the answers made by the witness. It is assumed in many of the questions that the company had accumulated an exceptional amount of copper which it was carrying for the purpose of sustaining high prices that prevailed in the early months of 1907. As a matter of fact the company had never in its history sold copper so freely nor so heavily as it did in the months preceding the March panic in 1907, it having sold copper several months in advance of production, owing to the unusual demand on the part of consumers and stocks of unsold copper had not for years been so low as they were at that time.

So far from there being any unusual accumulation, the only copper accumulated in that year was during the summer months when the demand for it absolutely ceased and the total accumulation at any time in the hands of the United Metals Selling Co. did not exceed three months' output of the mining companies which it represented.

Mr. Untermeyer questioned Mr. Wolfson as to whether a large sum of money, naming \$50,000,000, was not borrowed by the United Metals Selling Co. in order to meet the advances which it was under contract to make to the mining companies to carry the copper which was accumulating.

The testimony shows that the total amount of money borrowed by the United Metals Selling Co. in the year 1907 was about \$10,000,000 and, based upon the prices ruling at that time, the output handled by the United Metals Selling Co. was worth over \$100,000,000 annually, so that the total amount of money borrowed to finance its copper business was about what was used to carry one month's production, and nearly all of this money was borrowed on copper bills negotiated abroad, so that the use of New York banking institutions by the United Metals Selling Co. was very slight.

The Anthracite Decision

The United States Supreme Court on Dec. 16 announced its decision on the appeal from the Circuit Court in the suits brought by the United States against the anthracite coal-carrying companies under the Sherman law. The decision of the lower court is set aside so far as the general charge of combination is concerned, but it is sustained so far as certain specific acts are pronounced illegal, such as the organization and management of the Temple Iron Co. as an agent of the anthracite companies, and the purchase of the coal mined by the independent operators. The question of the owner-

ship of stock in certain carriers by other companies as an element of combination is not touched in the opinion.

In brief, the decision is given in substance in the following summary of the opinion read by Associate Justice Lawton:

THE QUESTION OF COMBINATION

(1)—That the general combination alleged by the government to exist between the defendant roads for an apportionment for total tonnage to the seaboard by an agreement in the nature of a pooling arrangement, has not been established, and, therefore, the relief sought by the government upon the assumption of such combination is denied.

(2)—The court finds, however, that the principal defendants did combine, for the purpose of shutting out from the anthracite coal field a projected independent line of railroad, the New York, Wyoming & Western R.R., and to accomplish that purpose it is found that the stock of the Temple Iron Co. and of the Simpson & Watkins collieries was acquired for the purpose of and with the intent, not of normally and lawfully developing trade, but of restraining interstate commerce and competition in transportation which would have presumably come about through the construction and operation of the proposed competing line of railroad, between the mines and tidewater.

THE CONTRACT WITH THE INDEPENDENTS

(3)—The court holds that certain contracts made with producers covering between 20 and 25% of the total annual supply of coal, known as the 65% contracts, by which such independent producers bound themselves to deliver the output of their mines or any other mine which they might acquire, to the railroad companies for 65% of the average market price at tidewater, were also void, because in violation of the anti-trust act as abnormal and illegal restraints upon interstate commerce.

REASONABLE AND ABNORMAL CONTRACTS

(4)—The court reiterates the declaration in the Standard Oil case, that an act of Congress does not forbid or restrain the power to make normal and usual contracts to further trade by resorting to all normal methods, whether by agreement or otherwise, to accomplish such purpose. Nevertheless, it holds that the acts which it finds in this case to be illegal, the Temple Iron and 65% contracts were not within such class, but, on the contrary, were abnormal in their character and directly tended to, and were intended to restrain trade and commerce illegally, and therefore came within the statute as illustrated by the rulings in *St. Louis Terminal Association and Swift & Co. vs. United States*.

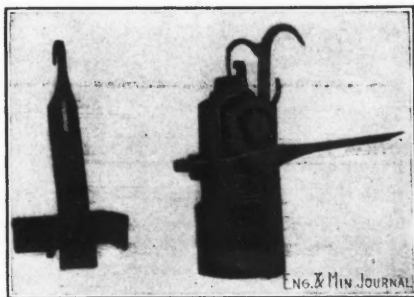
Details of Practical Mining

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

The Acetylene Lamp Underground

By L. O. KELLOGG*

Engineers are finding that the acetylene lamp has become almost indispensable for technical work such as sampling, surveying and general examination; and this in spite of some defects. It can be carried in the hand, worn in the hat, or better in the second button-hole of the shirt, or hung from the shoulder. In any of the above positions it is out of the way, leaves both hands free and casts a brilliant light where it is needed. It can be improved by a small cross piece of wire or flat iron, fastened to the back to prevent side swing. A flat reflector or none at all is better in most cases, making the lamp more manageable and giving the more



HOLDER FOR ACETYLENE LAMP

useful diffused-light. But a bell reflector with the finish dulled gives a better fore or back sight for the transit than the conventional tracing cloth and candle.

The lamp, however, offers one real disadvantage for work around a transit. The intensely hot jet of flame, accidentally flicked across the plumb bob cord cuts it instantly. This helps neither the plumb bob nor the transit.

The accompanying illustration shows two holders designed by L. K. Terry for the Germany Mining & Development Co., of Kelly, N. M. They served the purpose admirably, making it possible to hang a lamp anywhere a miners' candlestick would hang. Another kink devised here consisted of a 6-in. length of cleaning wire tied in a buttonhole to give two free ends, instead of a short piece fastened to a tin disk and hung from the lamp. A sharper point was obtained by cutting the wire with the flame rather than with shears or by breaking.

*Engineer, 3302 North 27th St., Tacoma, Wash.

The direct cost per ton of underground illumination is no criterion of its importance. It runs between one and two cents. Its indirect effect on costs is tremendous. The normal state of semi-darkness in which underground mining is conducted is the feature most sharply distinguishing it from other industrial operations. It decreases speed and increases accidents and delays. It is a safe guess that the improvement of illumination would first receive the attention of an underground efficiency engineer.

Drill for Cutting Samples

Cutting samples in a mine where the ore is hard, tough, compact quartzite such as is the "banket" ore on the Rand, or similar material, is a laborious task, often requiring half an hour per foot of sample. Noel Griffen has described in the *Journal of the Chemical, Metallurgical and Mining Society of South Africa*, a method by which a small chipping hammer, not unlike a pneumatic riveter adapted for carrying a cutting bit, can be used, greatly facilitating the cutting of mine samples.

The chipping hammer recommended is an Imperial, Size B, No. 1, weighing 10½ lb. A rose bit 2 in. in diameter has been found preferable to any other shape. The clippings and dust are caught in a canvas bag, supported in an open position by a stiff-wire or round-iron frame, and measuring about 24x18 in., so arranged that the drill bit can be passed through a hole in the bottom of the bag, the opening being reinforced by two washers to prevent tearing at the edge. The bag is held against the face and the bit directed by the left hand while the handle of the drill is grasped by the right hand so that the controlling trigger can be operated by the right forefinger. The drill requires ½-in. air hose.

It is stated that at first the drill is difficult to control, but after a few days' practice the operator becomes proficient enough to cut a channel 2 in. wide and ½ in. deep across the face of a drift at the rate of 2 ft. in 10 min. in the hardest rock. The work requires much muscular exertion, but in tough ground far less exertion is required to cut a sample by machine than by hammer and moil.

The rock cut out by the rose bit ranges in size from powder to chips half the size of a pea, so that if any larger pieces flake off beyond the edges of the desired channel, they may be readily removed by

screening. It is said that if the drill is held well up against the face the chips do not fly as much as when sampling is done by hammer and moil. It is the usual practice to turn the bag inside out after cutting a sample so as to avoid salting.

Improvised Aerial Tramway

A. L. SCOTT*

The problem of transporting six tons of lead ore from a hillside dump to a gulch road, about 325 ft. distant and 100 ft. below, is responsible for the design of an improvised aerial tram. Boulders and slide rock on the hillside made sledding impracticable. One end of a ½-in. rope was fastened to the bottom of a tree about 20 ft. up on the opposite side of the gulch from the dump. It was then



ATTACHING SLING TO SACK OF ORE ON IMPROVISED AERIAL TRAMWAY

run through a fork of a cedar just back of the dump, around the bottom of a pine just behind that, back through the fork and to the tree on the opposite side of the gulch. A ¼-in. rope was fastened to the ring of an iron double block which had been put upside down on the ½-in. rope and the small rope was run through an iron single block back of the dump. A hook was inserted in the ring of the double block, with the open side pointing uphill. The small piece of ½-in. rope used for a sling was fastened on the hook by one of its strands, twisted once around the double rope about a foot back of the block, then to the hook again. In that way, the weight and friction was just sufficient to hold the block in an upright position when it was drawn to the top of the hill with the ¼-in. rope. After the larger rope had been tightened as much as possible, the sling was put around one sack at a time (the heaviest

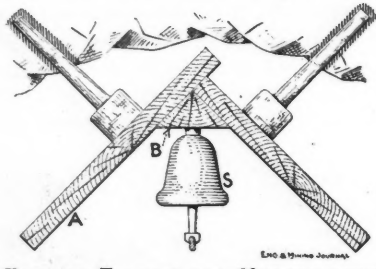
*Ploche, Nev.

ones first while the rope was tight), and the block drawn down and hooked into the sling. The speed of the sack was then checked with the 1/4-in. rope. Ninety sacks, weighing 12,567 lb., were transferred from the dump to the road in one day by two men; the heaviest sack weighed 186 lb. The cost of the labor was \$6, of the 55 lb. of 1/2-in. rope required \$7.50 and of the 10 lb. of 1/4-in. rope \$1. The rope was only slightly worn and was sold for \$5, making the net cost of the operation \$9.50, as the borrowed blocks were returned in good condition.

Hanging Troughs for Protecting Trolley Wires

BY ALLEN H. FOSTER*

Supplementary to the article of this title, by Claude T. Rice, in the JOURNAL of Nov. 2, the accompanying illustration shows a trough which is useful where



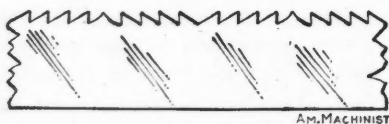
TROLLEY TROUGH FOR UNDERGROUND SERVICE

there is little headroom available. The stringer boards A are one- or two-inch planks, depending on the span between supporting plugs. Blocks B are placed at the points where trolley ears are located, and wherever it is thought desirable for the purposes of stiffening the trough. Under comparatively dry conditions the petticoat insulator S can be omitted and the ear attached directly to the block B. In this case the blocks should be treated with an insulating compound.

Double Acting Hacksaw Blade

The engraving shows the tooth arrangement of a new hacksaw which is being placed on the market by Alexander Reitlinger, 201 William St., New York.—(American Machinist, Nov. 21, 1912.)

The claims made by the manufacturer



A DOUBLE-ACTING HACKSAW

for these saws are that they will cut faster and cleaner than when made with the teeth all in one direction, and that

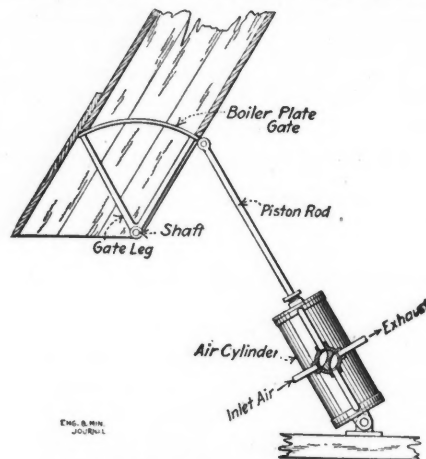
*5612 Linwood Ave., Cleveland, Ohio

they will cut iron pipe without breaking the teeth. When used in a power-driven frame, the machine must be one which does not lift on the back stroke, as with this saw both strokes are cutting strokes.

Pneumatic Ore Chute Gate

By J. R. MCFARLAND

At the Cactus mine of South Utah Mines and Smelters, Beaver County, Utah, a pneumatically operated ore-chute door is used. The door is operated by moving a lever controlling a four-way valve. The advantage of this gate is that the weight of the ore bears directly on the shaft so that the power required in opening and closing is less than in the



PNEUMATIC ORE-CHUTE GATE

old style of drop gate. The closing is positive and ore is not spilled on account of rock getting under the gate and preventing its total closure.

To the bottom corner of the chute is attached the supporting shaft. The door is constructed of a square sheet of boiler plate the width of the chute, bent in an arc with the face up, and supported on the shaft by two legs, so as to revolve about the shaft as an axis.

To the side of the door which is on the underside of the chute, is attached a piston working in a cylinder. The piston rod is hinged at top and the cylinder at bottom so as to allow the necessary play. The air pipe parts at a four-way valve and the air enters the cylinder from top and bottom.

Handling Lubricants

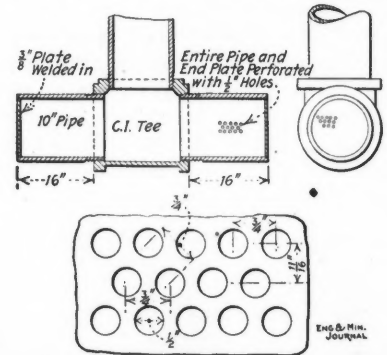
Receiving, storing and distributing lubricants are important factors in economical operation. If the plant is a large one, where several thousand gallons of oil are used per year, it will pay to provide storage capacity so that oils can be bought in tank-car lots, said W. W. Davis, in part, before the Lake Superior Mining Institute. If only a few barrels of each kind of oil are used per month, the oil should be kept in tanks so arranged that the barrels can be emptied

into them by gravity. Care should be taken to see that the barrels drain out thoroughly. As the empty barrels are worth from 75c. to \$1 apiece, they are worth saving and should be kept in a cool place to prevent shrinking, until enough have accumulated to make a carload.

Suction for Underground Station Pump

BY H. L. BOTSFORD*

The sketch shows a suction for a 24-40-7x36-in. pumping engine. The area of the 1/2-in. holes is five times the area of the pipe. The capacity of the pump is 1200 gal. per min., or 600 gal. for each side. This requires a velocity of 150 ft. per min. in the section pipe, and of 30 ft. per min. through the 1/2-in. holes. It is good practice in the design of pump suc-

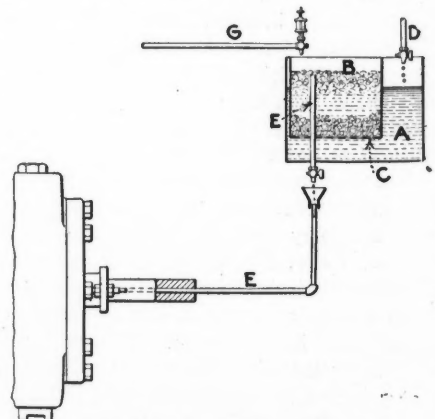


SUCTION INLET FOR UNDERGROUND PUMP

tion to limit the velocity to 200 ft. per min., and to make it less than that if the pipe is longer than 25 ft., or has many elbows.

Soapsuds Lubricator for Air Compressor

When compressing air to 90 or 100 lb. gage pressure in one stage, the temperature after compression is frequently



SOAPSUDS LUBRICATOR FOR AIR COMPRESSOR

high. This results in carbon being deposited on the discharge valves and passages, and trouble is therefore experienced

*Mining engineer, Creighton Mine, Ont.

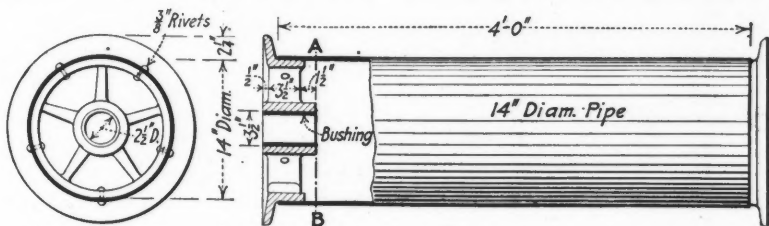
in properly lubricating the air cylinder, especially where compressors are run at high speeds and the temperature of the intake air exceeds 80° or where an inferior grade of oil is used. To overcome this trouble, soapsuds have been used as a lubricant with good results.

The lubricator shown in the accompanying illustration consists of a small galvanized-iron water tank A, about 7x6x12 in. Inside of it a smaller tank B is soldered to the large one with its bottom 2 in. above the bottom of the large tank. In the bottom of the small tank are a number of 1/8-in. holes at C. Soft brown soap, cut into small pieces, is put into tank B. Water is then fed into the large tank through a 1/4-in. pipe D, and passing through the small holes at C dissolves the soap and rises to the top of the 1/4-in. pipe E, through which it passes down into the inlet of the compressor, says Martin McGerry (*Power*, Nov. 26, 1912). The water is regulated by the valve in pipe D, the small cock under the tank being left wide open.

Just before shutting down the compressor the water is turned off at D, and oil is fed into the small tank B from a cup G, and the compressor is run with oil for a half hour to prevent rust formation. Soap is used that will sink in the water; otherwise small chips will float and pass down through the pipe E. This lubricator is used on a 14x18-in. compressor, and when running at 150 r.p.m. with an air pressure of 90 lb., the water is fed at about 45 drops per minute.

Improved Rollers

Skip- and tram-car wheels discarded because of flange or tread wear may be utilized for rollers by driving the tread



Section A-B

GUIDE ROLLER MADE OF PIPE AND OLD SKIP WHEELS

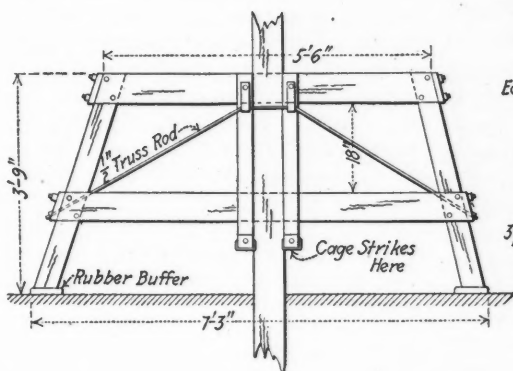
of the wheels into the ends of wrought-iron pipe of proper diameter and length. The pipe is then riveted to the tread of the wheels. This type of roller is particularly suited for rope carriers on inclined hoistways where the rope has some lateral travel, for knuckles and again for side rollers to guide the rope and skip around horizontal curves.

The adherence of paint to cement surfaces, and the duration of the film are said by *Revue des Produits Chimiques* to be greatly improved by treating the surface with zinc-chloride solution.

Guarding the Top of Shafts

In the lead district of southeastern Missouri, the ore lies directly on top of a water-bearing standstone in which deep sumps are not desirable owing to the difficulty in handling the water.

Due to the shallow sumps it is not possible to use cages having more than one deck. Thus in order to handle the production of the mine, relatively high hoisting speed must be used and all unnecessary delays in putting the cars on and off at the surface avoided. This fact is made clear when it is known as much as 400 to 500 tons are regularly hoisted in eight hours from a depth of approximately 450 ft. on a one-deck cage using one-ton cars, and that often as much as 800 tons are handled at some shafts using 1 1/2-ton cars.



GUARD FRAME FOR SHAFT

This necessity for cutting down delays has developed several types of automatic guards for shaft collars which are operated by the cage itself. Such a guard, whether it be a railing or a platform, must be made as light as consistent with

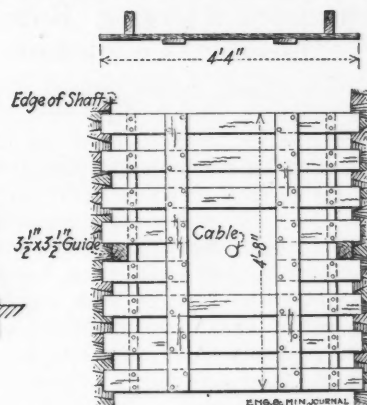
strength in order to diminish the shock when it is picked up by the cage.

A common form of platform consists of 1x4-in. planks, made up as shown in the accompanying sketch. At the Desloge Consolidated shafts, a lifting guard railing or frame is used; it is no heavier than the platform and is regarded as much safer. The construction of the frame is shown in the accompanying sketch. The lower braces are notched clear into the corner posts, while the upper ones are notched in only about half way. A 1/2-in. steel truss rod is used to distribute properly the stress due to the

sudden lifting of the frame. This rod passes through loops in the straps by which it is fastened to the top cross pieces of the framework. The corner posts are placed at an angle to give added strength as well as to decrease the weight of the top of the structure. Rubber bumpers are used to take up the jar of the frame when it drops back upon the landing floor.

An Unusual Mining Accident

An unusual accident in a Tennessee copper mine illustrates the importance of extreme care in using explosives. In prospecting at these mines, it is customary to put in diamond-drill holes often to a distance of 200 or 300 ft.; in the level in which this accident occurred, there were about 25 of them showing.



PLATFORM SHAFT COVER

Upon examination of a particular face it was found that an old prospecting hole passed close to the place chosen for the blast, and the man in charge of the operation directed the miner to make use of this prospecting hole instead of drilling a new one, says the *November Travelers' Standard*. The miner, in preparing to fire the shot, put a ladder rung into the hole first, and thought that this would make a sufficient backing. It did not drive up tight, however, so he next put in a piece of pine, about six inches long and 1 1/4 in. in diameter. This he drove up solidly in the hole, until there was a clear space of perhaps three feet between it and the face of the rock. On top of this he put two "dooleys," or bags of tamping, after which he introduced two sticks of dynamite, and tamped the whole with two more dooleys.

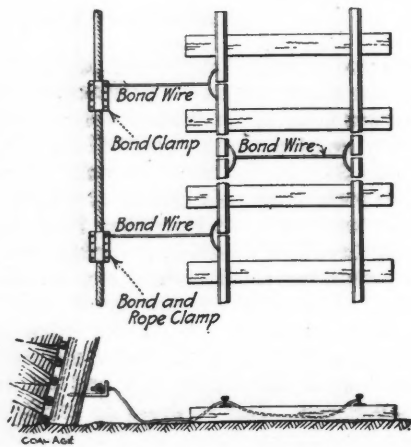
Having made his preparations as described, he lighted the fuse and hastened to what he thought was a place of safety, going to a distance of perhaps 125 ft., and passing around one corner and through an S-shaped passageway. It happened, however, that he stopped exactly in front of the distant end of the very prospecting hole in which the charge was set, and when the explosion occurred, he was badly injured. The backing blew out underneath the dynamite, and a consid-

erable part of the force of the shot was transmitted through the hole, as through a long gun barrel. It is thought that he was not struck by either of the pieces of wood that were placed under the charge, but small fragments of copper and a considerable quantity of dirt and pulverized rock were discharged against his back.

It is common to explode charges of dynamite in these prospecting holes, and accidents seldom happen from doing so, providing the backing underneath the explosive is put in properly. In some mines these prospecting holes are numerous and it is hard to remember where all of them lead. The hole that was shot in this case was drilled about 15 or 20 years ago, and was first noticed by the miners about a year before the accident.

Discarded Hoisting Rope as Electrical Conductors

Underground electric haulage systems are subject to great power losses, due to poor electrical connections in the return track. Where favorable conditions exist, as on the surface, or where tracks are new and the rails in first-class condition, a bond of high efficiency may be obtained and kept in good condition at a reasonable expense. In mine work, conditions are not in many cases so favorable and it is generally more difficult to do good bonding. Contacts must be smooth, clean



SKETCH SHOWING METHOD OF BONDING

and dry, and, even if the bonding is done right, it is hard to keep up the efficiency, since rails are frequently changed or bonds cut by cars getting off the track. For these reasons the results obtained are not what should be expected for the money invested, says Albert Leonarz (*Coal Age*, Nov. 16, 1912).

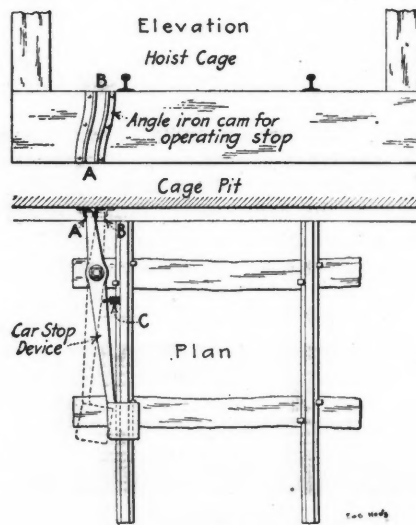
The only way to overcome this unsatisfactory condition and to reduce the bad effects to a minimum is to put in ground wires along the track and to tap these, at suitable distances, to the rails; this insures the bonding and provides an uninterrupted metallic circuit. The high price of copper practically prohibits its

use for this purpose in mining installations.

Wornout wire hoisting ropes, in lengths of 500 ft. and over, which makes few joints necessary, having a scrap value of approximately \$8 per ton and a specific resistance of 8 to 1 as compared with copper, may be utilized for this purpose. It is a better conductor than rails and a rope of, say, 1 1/2 in. diameter has about the same current-carrying capacity as a No. 000 B. & S. gage, or about a 3/8-in. copper wire. Smaller ropes may also be used, the size required depending upon the conditions.

Automatic Car Stop

The removal of excavated material from one section of the Catskill Aqueduct tunnel is accomplished by means of dump cars which are loaded with the broken rock at the face and then hauled by means of a storage-battery locomotive, to the shaft where they are run, one at a time, on the cage. (*Eng. News*, Nov. 21, 1912). Some difficulty was experienced by the cars running off the end of the track into the sump when the cage was not in position. To prevent this nuisance the simple car-stop device, shown in the accompanying drawing, was designed and installed at the shaft station.

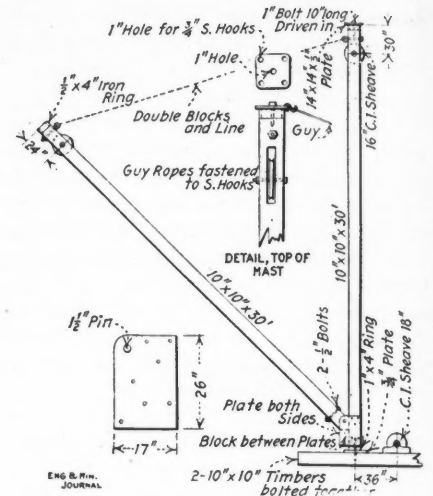


AUTOMATIC CAR STOP

When the cage is out of the pit, the stopping device is held in position A by the spring at C and cars cannot run off the track into the pit. When the cage descends and is about to enter the pit, the lower end A of the angle-iron cam engages the stop lever at A and, as the cage continues to descend, the stop lever is forced over by the cam until the cage is at the bottom, when the stop is in the position B and cars can pass from the cage to the track or vice versa, as may be desired. When the cage rises again, the spring C pulls the stop from position B back to position A, as fast as the cam will allow.

A Simple Guyed Derrick

The derrick shown in the accompanying drawing is suggested by H. L. Botsford, Creighton Mine, Ont., as being readily constructed by a mine carpenter and blacksmith. It is useful for handling

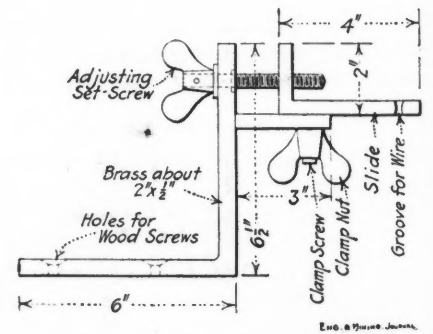


DETAILS OF SIMPLE GUYED DERRICK

buckets at the beginning of shaft sinking operations, as well as for many other purposes about a mine.

Bracket for Shaft Plumbing

For the support of plumb lines used for carrying a survey down a vertical shaft, special brackets will be found useful, says R. J. Donaldson (*Min. and Eng. Review*, Oct. 5, 1912).



BRACKET FOR SHAFT PLUMBING

The brackets when in use are screwed to a heavy piece of timber thrown across the shaft. One of them is fitted with a screw adjustment, by means of which the wires can be brought in line with a transit set up over or under a permanent station, either on the surface or underground. The brackets are best made of brass. The clamp screw works in a slot in the bottom plate.

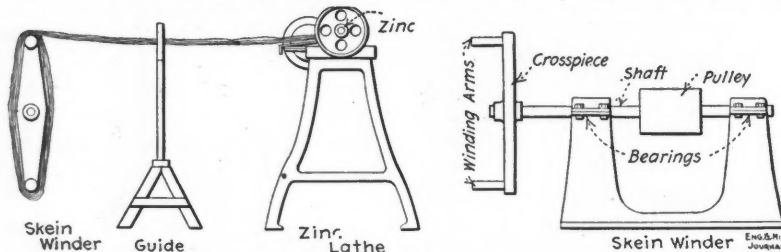
After Jan. 1, 1913, the standard topographical maps of the U. S. Geological Survey will be increased in price to 10c. per copy retail, or 6c. per copy wholesale, an order of \$3 or more entitles the purchaser to the reduced rate.

data secured are practically constant. While the buckets are discharging, a part of their content is caught in a bottle, this serving as a sample of the precipitated solution.

Device for Handling Zinc Shavings

The handling of zinc shavings used in precipitating gold and silver from cyanide solutions is a problem which has involved a great deal of annoyance and expense. The zinc thread, when cut, is usually piled away in a more or less tangled mass, and when it is desired for use, an appreciable expense is entailed in straightening it out and getting it ready. The great amount of handling causes a breakage of a goodly proportion of the thread, making a product that is not of much use in the boxes and which is usually wasted.

A method has been devised whereby this secondary handling may be entirely avoided, obviating both the annoyance and expense of the operation. This device consists, as is shown in the sketch, of a



DEVICE FOR HANDLING ZINC SHAVINGS

horizontal shaft carrying at its end a light cross piece of wood. From the ends of the latter two short pieces, which may be of small pipe or wood, are fastened. The whole virtue of the idea depends on the fact that the distance between these two projecting arms is equal to the width of the compartment into which the zinc has to be packed.

The shaft is moved by a pulley, the speed of travel of the arms being made to equal exactly the velocity of the zinc thread as it comes from the lathe. The result is that when one end of the zinc thread is fastened to one of the traveling arms, the shaving is wound continuously into a skein which will fit into the compartment of the zinc box without further handling. When the skein is sufficiently thick it is slipped off the arms, the thread cut and another skein started.

The skeins of zinc are stored away and are ready for instant use when required without further trouble or expense. A movable guide directs the thread to the skein from any point on the lathe.

The device is installed at the Liberty Bell mill, near Telluride, Colo., where its use has been attended by economy

and satisfaction. W. H. Staver, general superintendent of the Liberty Bell, is responsible for the idea and he suggests that the scheme might be adapted for winding skeins of various sizes by replacing the cross piece with a wooden disk having holes at various intervals into which wooden pins might be placed upon which the various lengths of skein might be wound.

Rand Tube Mill Practice

The most effective work in all crushing of hard grains is done by impact, and the falling pebbles in a tube mill are in this respect like the falling stamp in a stamp mill, says W. R. Dowling in "Rand Metallurgical Practice," Vol. I. The greater the number and the greater the height of drops the more crushing is done. Similarly the greater the diameter of the tube mill the greater will be the height of drop, and the higher the speed within certain limits the more drops per minute.

The style of liner is of importance in determining the speed necessary to ob-

tain the maximum height of drop. Should the liner be smooth, as is the case when steel or iron plates are used, then the mass of pebbles tends to slip, especially with a light load, and the revolutions per minute must be increased as compared with the more irregular flint liners. The rapid wear of cast-iron or steel liners appears to be due to the slipping load of pebbles, mixed with sharp-edged sand grains, which grinds away the liner. The life of tube-mill liners on the Rand appears to be far shorter than is the case in other mining districts, such as Kalgoolie, and the fact may be attributed to the hard abrasive nature of basket ore and to the high pressure at which tube mills are worked in these fields.

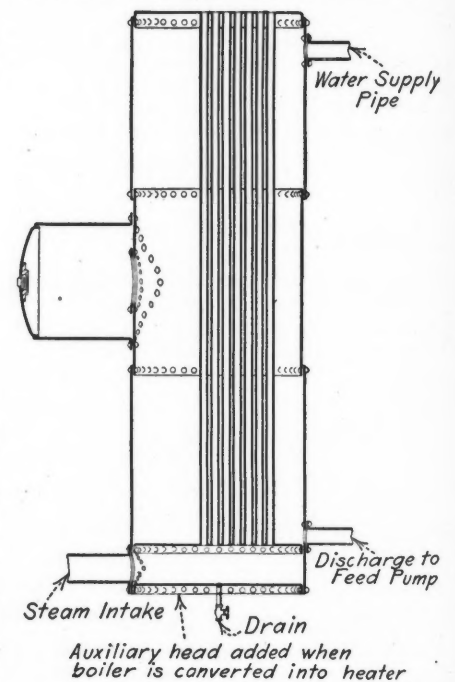
It is of utmost importance that tonnage and moisture of feed be maintained at correct standard. With a large dry feed of sand the mill appears to become overloaded at the feed end. The ideal pulp feed appears to be of that consistency which permits of the sand particles adhering to both pebbles and liner, so that whenever a pebble strikes other pebbles or the liner there are grains of sand to receive the impact and be crushed.

A series of tests by G. O. Smart led to the conclusion that, for Rand condi-

tions with a 22x5½-ft. tube mill, 400 tons of sand containing 39% moisture by weight should be fed per 24 hr. With a small feed, 200 tons of solids per day, 27% moisture in the pulp was found to give the best crushing. The reason for this is believed to be that with a large tonnage of exceedingly thick pulp the mill cannot discharge at an adequate rate and becomes over-full, so that large masses of sand and pebbles are projected at once instead of the pebbles individually, as would be the case with a more dilute pulp feed. With a small thick feed, however, overcrowding in the mill does not take place, and more efficient crushing is obtained than with a small feed of solids as a diluted pulp.

Home Made Feed Water Heater

The proverbial "killing of two birds with one stone" is frequently a somewhat elusive problem around mines. The



HOME-MADE HEATER

conversion of scrap material at small expense into useful and efficient cost-saving appliances may, however, be justly regarded as one of its successful solutions.

An improvised feed-water heater made from an old boiler is shown in the accompanying drawing. The operation of this device is so self-evident that it needs scarcely any explanation, says *Coal Age*, Nov. 23, 1912. It will be observed, however, that the exhaust steam flows upward through the boiler flues while the feed water moves downward outside of them. The direction of travel of the two being thus opposed, the transfer of heat from the one to the other will be the most efficient.

The Cost of Doing Things

Data from Mining and Metallurgical Practice

Tons per Man

The data in this article have been taken mostly from annual reports and have appeared in separate articles in the "Cost of Doing Things." No attempt has been made to give full details of working conditions or to group mines of similar working conditions. Tons per man, or in other words, labor efficiency, is the ruling factor in cost records; therefore a careful study of the following may prove interesting to the reader; it must be borne in mind, however, that these records are subject to various working conditions and intelligence of labor employed.

Gold Mines—At the Cinderella Consolidated Gold Mines, Transvaal, during 1911, an average of 324 tons of unsorted ore per annum was obtained per underground employee. The Robinson Gold Mining Co., South Africa, employed 3463 men during 1911, consisting of 423 whites, 66 Cape boys and Indians and 2974 natives; about 205 tons of unsorted ore or 171 tons of ore were mined and milled per man per year. At the West Rand Consolidated during the same year 2820.5 men were employed, of whom 2475 were natives and 345.5 Europeans. The tonnage mined and milled was equal to 115 tons of unsorted ore per man per annum; 11.01% of the ore was sorted out before milling.

In India the Nundydroog mines in 1911 employed 4294 men and mined and treated by milling and cyanidation about 36.2 tons per man per year. Of the employees only 143 were white men, and of the natives 2544 were employed underground. At the Ooregum Gold Mining Co. of India, during the same period, 4600 men were employed, all except 96 were coolies and about 66% of them worked underground. At this property 44.5 tons of unsorted ore were mined a year per underground employee and 29.4 tons of unsorted ore or 26.2 tons of ore were mined and treated during the year per man employed at the mine and mill. The Mount Boppy Gold Mining Co., New South Wales, secured 435 tons per annum for each man employed underground and mined and milled 151.3 tons per man per year. The milling operations consisted of stamping, amalgamation, concentration, cyanidation and retreatment of residue by roasting.

In Brazil, at the Ouro Preto Gold Mines, where the labor is practically all native, during 1910-1911, 105 tons were mined and treated per man per year. The month-

ly average per man stoping for three years has been 10.2 tons, 10.4 tons and 11.3 tons per month. At the Alaska-Treadwell during 1911, as indicated by figures reported, 1040 tons were mined and treated per man per annum. A record of one of the mines of Goldfield, Nev., indicated about 16 tons per day per man in stopes and 3.5 to 4 tons per day per man at the mines. The Erie Consolidated, Gaston, Calif., mining about 75% of its ore by the caving system and the remainder by stull stoping secures 5.59 tons of rock or 3.85 tons of ore per day per man employed underground. In stopes 6.18 tons of rock or 4.7 tons of ore are mined per day per man stoping.

COAL PRODUCED PER MAN PER DAY IN UNITED STATES IN 1909

	Tons per day per man	Per cent. by Machines
Alabama.....	2.72	15.57
Arkansas.....	2.69	none
Colorado.....	3.14	17.3
Georgia.....	1.51	none
Illinois.....	3.78	31
Indiana.....	3.85	45
Iowa.....	2.09	small
Kansas.....	2.46	1
Kentucky.....	3.23	51
Missouri.....	2.19	14.47
Ohio.....	3.44	75
Tennessee.....	2.51	12.7
Pennsylvania anthracite...	2.31	?
Pennsylvania bituminous...	3.53	41.48

The Pittsburgh-Silver Peak mine, Blair, Nev., operates through a tunnel. This mine secures about 7.5 tons of ore and waste or 6.22 tons of ore per day per man employed at the mines and 13.5 tons of ore and waste in stopes per man stoping. The ratio of waste to ore is about 1:37.5. H. C. Hoover, in his "Principles of Mining," selected a group of mines working under the same conditions with modern machinery and gives the following figures: Three mines in India, mostly colored labor, 69.3 tons per man per annum; three South African mines, mostly colored labor, 195.5 tons per annum; six Australian mines, white labor, 669.9 tons per annum; and five American mines, white labor, 713 tons per man per annum.

Copper Mines—The Copper Queen Consolidated in 1911 employed one man for every 330 tons mined per annum or one underground man for every 400 tons. The Calumet & Arizona at its Superior & Pittsburg mine secured 596 dry tons of ore per year per man and at the Calumet & Arizona mine 435 tons, an aver-

age of 496 for the two. The Cananea Consolidated hoisting about 30% of its ore and hauling the remainder through tunnels to the surface secured 88.5 tons of ore and waste or 61.5 tons of ore per month per man employed underground, and 163 tons of ore and waste or 145 tons of ore per month per man in stopes. The labor consisted of about 93% Mexicans and 60% of the ore was mined by top slicing.

The British Columbia Copper Co., at its Mother Lode mine, including no development and hoisting from 375 ft., secures 11 tons per day per man at the mines, 15 tons per man underground, 19.5 tons per man working in stopes and 30.9 tons per man breaking ore. All ore is mined by chamber and hollow-pillar system. The Mammoth Copper Mining Co., Shasta County, Calif., operating through tunnels, secures 998 tons of ore and waste or 895 tons of ore per annum for each man employed at the mines, 1220 tons of ore and waste or 1140 tons of ore per man underground and 1655 tons of ore per annum per man stoping. The Tennessee Copper Co. from 1905-1910, inclusive, has secured 910 tons, 936 tons, 959 tons, 870 tons, 834 tons and 830 tons, respectively, per annum per man employed at the mines. The average of this period is 882 tons. The North Butte mine secured 1.46 tons per day in 1910 and 1911 per man employed. The Mass Consolidated in Michigan in 1907 and 1908 secured 935 and 1147 tons, respectively, per man employed.

Iron Mines—The Republic Iron & Steel Co. has secured during the period 1907-1912, in the order named: 611 tons, 850 tons, 999 tons, 999 tons, 1049 tons and 1250 tons per annum per man employed in its iron mines. The United States Steel Corporation iron mines produced an average of 1435 tons per annum per man employed during 1910 and 1911. Figures for 1908 show production per man per year for some of the Michigan iron mines as follows: Hartford mine 1160 tons, Lake Shaft mine 1255 tons, Austin mine 1045 tons, Chapin mine 1250 tons, and the Norrie mine on the Gogebic range 868 tons per man per annum.

The Broken Hill Proprietary, Block 10, a zinc mine in Australia, secured about 442 tons per annum per man employed underground and mined and milled about 224 tons per man employed. At the Grace Zinc Co., Joplin, Mo., approximately 3.17 tons were secured per day

for each man employed at the mine. The Broken Hill South Silver Mine, Australia, during the half-year ended June 30, 1912, mined 432 tons per annum per man underground and mined and treated about 229 tons per man employed..

In the accompanying table are given data concerning coal mining in the United States in 1909, taken from Government reports.

Summary of Iron Mining Costs in Michigan

A general summary of all districts of Michigan where iron is mined, viz., Gogebic Range, Iron River, Crystal Falls, Old Menominee Range, Western Marquette Range, Marquette hard ores and Marquette soft ores has been published separately in the "Cost of Doing Things."

The table given herewith was compiled to give these data in condensed form. It will be noticed in the table that a group of low-grade mines has been classified separately; these mines, as a whole, have lost on an average of 5% of the average value of the ore produced by them. The figures given in this table represent a five-year average of all the iron mines of Michigan and were obtained from data given in the report of J. R. Finlay

per ton, but since 1904 it has been 32c. per ton. Ores shipped from Marquette ranges by Escanaba have a charge of 40c. per ton for rail freight; the same rate applies to ores shipped from the Menominee Range and the Gogebic Range ores shipped to Ashland. The lake freights to lower lake ports have been as follows, from 1906 to 1911, respectively: From Marquette 70c., 70c., 60c., 60c., 65c. and 55c.; from Escanaba 60c., 60c., 50c., 50c., 55c. and 45c.; and from Ashland 76c., 76c., 65c., 65c., 70c. and 60c. per ton. According to the general average, as shown in the table, including low-grade mines, the average cost of Michigan iron ore at Cleveland is equal to 80.5% of its value, indicating an average profit of 19.5% to the mine operators; adding royalties, which have averaged 6.7%, the average profit to mine operators and fee owners has been 26.2% of the average value of the ore.

Elkton Consolidated

The annual report for 1911 of the Elkton Consolidated Mining & Milling Co., Cripple Creek, Colo., gives some of its costs as follows: Trimming 53,136 mine cars of ore and waste, 14.6c. per car, a car being equal to about 0.7 ton;

company's account 2684 ft. of drifting were done at a cost of \$4.02 for labor and powder against a cost of \$5.97 per ft. for 474 ft. let to contractors. The average cost of sharpening hand and machine steel was 2.7c. each. The average wage for men employed underground, including shift boss, was \$3.51 per shift; entire mine, exclusive of management and office, \$3.436 and including management and office \$3.69 per shift.

Unloading Coal on Bonus

In some plants the chief engineer finds it rather expensive to unload coal from cars by hand and transport it by wheelbarrows to the coal pile or pit. To those having charge of such work, says W. L. Myles, in *Power*, the following should prove interesting:

The laborers unloading coal from cars usually work slowly and the cost per ton of unloading is often great. The cost per ton generally can be reduced by unloading the coal on a bonus system by which the men are amply compensated for the extra effort which they may exert in their work.

In some places the car is simply opened at the bottom and the coal dropped into the coal pit, in others the coal has to

RATIO OF COSTS AND PROFITS TO VALUE OF ORE PER TON F.O.B. CLEVELAND, O., FOR IRON ORE MINED IN MICHIGAN

A Summary of Records from 1906-1910 inclusive	Gogebic Range	Iron River District	Crystal Falls District	Old Menominee Range	Western Marquette Range	Marquette Hard Ores	Marquette Soft Ores	Swanzy District	Sundry Low-Grade Mines in Various Districts	Gen. Avg of All Iron Ore Mines of Michigan
Mining.....	32.3%	39.0%	31.0%	33.0%	52.5%	39.5%	36.4%	49.4%	34.1%	34.9%
Exploration and development.....	2.3	19.0	1.1	2.64	8.2	2.4	2.1	2.2	3.8	3.4
Construction, shafts, machinery, etc.....	3.92	7.5	6.6	2.97	0.3	4.4	3.2	2.5	7.4	4.2
General expense, including administration, etc.....	2.36	2.6	2.6	2.83	2.5	3.3	3.3	2.5	2.4	2.7
Royalties.....	9.1	6.3	7.6	7.0	7.1	1.5	4.5	8.0	6.3	6.7
Taxes.....	1.51	0.55	0.5	2.34	0.3	2.8	2.1	1.5	0.8	1.7
Rail freights.....	9.15	11.5	11.5	11.0	12.5	8.9	8.3	10.0	19.0	9.9
Lake freights.....	16.0	15.3	16.5	15.40	23.2	13.4	16.8	16.2	28.4	16.1
Commissions.....	1.06	2.0	2.6	0.02	2.4	0.3	0.3	.....	2.8	0.9
Total cost per ton.....	77.7	103.75	80.00	77.2	109.0	76.5	77.0	92.3	105.0	80.5
Average loss per ton.....		3.75%			9.0%				5.0%	
Average profit per ton.....	22.3%		20.0%	22.8%		23.5%	23.0%	7.7%		19.5
Total value of ore f.o.b. Cleveland.....	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

to the State of Michigan for taxation-purposes. They probably represent as elaborate a compilation of general costs on iron mining as has ever been compiled in the state, if not elsewhere. The tonnage shipped and accounted for in these data amounts to 52,895,459 tons, as follows: Gogebic Range, 15,393,642 tons; Iron River district, 3,820,308 tons; Crystal Falls district, 6,119,177 tons; Old Menominee Range, 9,335,812; Western Marquette, 657,370 tons; Marquette hard ore, 3,888,557 tons; Marquette soft ore, 10,830,611 tons; Swanzy district, 1,670,263 tons; sundry low-grade mines, 1,179,719 tons.

Rail freight from mines in the Marquette Range was as high as \$3 per ton in 1855; in 1856 it was lowered to \$1.27 per ton and to 87c. in 1858; from 1860 to 1870 it ranged from \$1.09 to \$1.10, and since 1870 the rate was as low as 25c.

of the ore hoisted about 42% was discarded as waste. Labor for breaking ore costs 78.5c. per ton; waste \$1.143 total cost of breaking for these two items or 81.4c. per ton for ore and waste; including a cost of 23.6c. for powder the was \$1.05 per ton. Other partial costs were: For underground labor and powder, \$1.36 per ton hoisted or \$2.32 per ton shipped; sorting and sampling, 23.6c. per mine car of ore or 33.7c. per ton hoisted; based upon the tons of ore shipped, the cost of sorting, sampling and loading was 67c. per ton. The average cost of sinking a winze for 82 ft. was \$12.51 per ft., consisting of \$10.655 for labor and \$1.845 for powder. The average cost of a raise for 82 ft. for labor was \$3 and powder \$1.62, a total of \$4.62 per ft. Sinking 55 ft. of shaft averaged \$12.46 for labor and \$2.92 for powder, a total of \$15.38 per ft. On the

be shoveled into wheelbarrows, and wheeled to the coal pit. It was in one of the latter places, where the coal had to be wheeled 20 ft. from the car to the pit, that the bonus system was tried very successfully.

Before the men were put to work on a bonus it took three laborers from 1½ to two days to unload a 50-ton car. The cost to the company was about \$10, or 20c. per ton, the men receiving 18c. per hour. Under the bonus system two men were given the job of unloading a 50-ton car. They shoveled out the coal and wheeled it 20 ft. to the coal pit in a total time of 19 hr., or about 26 min. per ton. The cost of unloading the coal was reduced to 14c. per ton and the men averaged about 30c. per hr. This speaks well for the bonus system when laborers can increase their pay from 18c. to 30c. per hour.

Hollinger Cyanide Mill, Porcupine

By Herbert A. Megraw

CLASSIFIERS AND TUBE MILLS IN CLOSED CIRCUIT

The plant of the Hollinger Gold Mines, Ltd., is situated east of Miller Lake, near the town of Timmins in the Porcupine district of Ontario, Canada. The mill occupies a site on the side of a hill in proximity to the main shaft from which the ore is hoisted from the mine. The ore is broken to a size appropriate for stamp milling at the shaft head and is then conveyed by means of an inclined belt conveyor to the mill bins, where it begins the process of reduction. The accompanying engraving of an east view of the mill shows the conveyor which carries the broken ore to the mill bins.

ORE SOFT AND EASILY CRUSHED

The ore, in which gold is the valuable content, is comparatively soft and is easily crushed, the crushing and grinding machinery having a high rate of efficiency, as will be shown. The mill run consists of about two-thirds sericitic schist and about one-third quartz, all the rock being highly schistose and for this reason easily crushed and ground. While a good proportion of slime is formed, there is also a large proportion of fine sand in the product which passes a 200-mesh screen. Thus a product for treatment is formed which is largely granular in character and which presents the difficulties usually encountered in a pulp of this character. The mineral is heavy, the dry slime having a specific gravity of about 2.85. A pulp of this character always is troublesome to handle on account of its tendency to settle at every opportunity, and the machinery for handling it has to be designed particularly with the idea of obviating, as far as possible, every chance for the heavy, granular solids to settle and give trouble in treatment.

The ore from the mine is first passed through a No. 7 Kennedy gyratory crusher, after which it goes through a trommel having 2½-in. openings, the undersize going directly to the 20-in. inclined belt conveyor, which carries it to the mill, while the oversize is passed through a 20x10-in. Allis-Chalmers Blake crusher, which reduces all the rock to 2½ in. The crushed ore joins the undersize from the trommel on the conveyor belt.

The incline conveyor delivers the ore to a cross conveyor which reaches over the top of the mill bin and, by means of a Robbins tripper, the ore can be delivered at any desired point in the bin. The bin is of wooden construction with flat bottom and has a capacity of 1000 tons of rock.

Suspended Challenge feeders deliver the ore to the stamps, of which there

A new 400-ton cyanide mill in northern Ontario. The ore is easily crushed, but a large portion of it forms a heavy, granular product which is difficult to agitate and gives rise to filter troubles. The gold is easily dissolved and presents no metallurgical problems. Stamps and tube mills are used for crushing and grinding and a Moore vacuum filter separates the residues from solution. Concentration is practiced and the concentrate is amalgamated in pans. The Merrill system of zinc-dust precipitation is used. Good results are obtained and the mill is in steady operation.

Note—This is the fourth of a series of articles on American cyanide practice by Mr. Megraw. The first article appeared Nov. 23 and Dec. 7, 1912.

are 40 of 1500 lb. each, dropping in a narrow mortar of the type used for speed crushing. The height of drop is 6¼ in.



EAST VIEW OF HOLLINGER MILL, PORCUPINE, ONT.

and the frequency is 100 drops per minute.

The screens used in the battery are of the slot form of wire cloth, the size used being about six mesh in width and about ¼ in. long.

Experiments made on crushing capacity show that through a 14-mesh screen of this type a capacity of eight tons per stamp per 24 hr. is obtained; with 6-mesh, 9½ tons and with 4-mesh, 12½ tons. The screen normally used at the present time is the 6-mesh and a regular crushing of 9½ tons, possibly a little in excess of this figure, is obtained.

Crushing is done in cyanide solution of 1½ lb. KCN per ton, the ratio being five of solution to one of ore. The mortars are arranged so that the height of discharge is two inches.

From the stamps the ore is carried by gravity to four Dorr duplex classifiers of the Belmont type. This type of machine is fitted with a crank arrangement with which the rakes may be lifted above the bed of sand and the machine started. This is of great service when a large amount of sand has settled in the classifier after a shutdown, the rakes being gradually lowered into the settled sand and raking it out by degrees.

The sand from the classifiers is re-ground in four Allis-Chalmers tube mills each 5x20 ft. They are lined with silex brick, the brick being set on edge in the mill, thus giving thickness which aids in giving long life of the lining. At present no idea of the life of these linings can be obtained because the original linings are at work and do not show any great indications of wear.

The tube mills are fitted with special spiral scoop feeders, 22 in. in diameter. Through these feeders the daily addition of pebbles is also put into the mill. The pebble charge is about six tons to each mill and the consumption is approxi-

mately two pounds per ton of ore ground. The consumption of pebbles was higher at first, reaching four pounds per ton at one time, but is gradually becoming less and it is expected that the normal consumption will remain at about two pounds per ton.

The consistency of the pulp fed to the tube mills varies somewhat from that usually considered most efficient and is the result of experiments undertaken to determine the most efficient dilution. The weight of the solids in this case makes it most efficient to use a thick pulp, 33% moisture having proved to give the best results. The mills make 28 r.p.m., use No. 1 Danish pebbles and grind 90 tons per 24 hr. to a point such that 90% passes a 200-mesh screen. The illustration shows the arrangement of the stamps, classifiers and tube mills.

ORIGINAL DRIVING DEVICE FOR STAMPS AND TUBE MILLS

At this mill an original device, by means of which a unit of 10 stamps and one tube mill is driven from one motor, is installed. The motor, of 100 h.p., is connected with a $3\frac{1}{8}$ -in. line shaft by means of a Reynolds silent-chain drive, and this shaft passes to stamp-mill line shaft, of $2\frac{1}{8}$ in., at right angles, moving it by means of a miter gear. The motor shaft continues to the front of the batteries and is directly geared to the tube mill. The advantage claimed for this arrangement is that the full power of the motor may be utilized for starting the tube mill after a shutdown; the power is sufficient to overcome the inertia of the loaded mill, the stamps being hung up while this is done. The cam shaft for the 10 stamps, six inches in diameter, is in two parts and is driven by a pulley on each end. The arrangement of the driving motor and shafts is shown in the accompanying plan of the mill. This arrangement, while having the advantage claimed for it, has also the apparent disadvantage of being subject to breakage due to the crystallization of the metal of the gears from the constant vibration caused by the stamps. As a matter of fact some of these gears have already broken, but it is considered that the advantages of the system outweigh the disadvantages.

REMOVAL OF COARSE GOLD BY CONCENTRATION

The slime product from the classifiers is led to a series of wooden dewatering boxes, 20 in number, each 6x6x6 ft., having pointed bottom and goose-neck discharge. This dewatering plant is really two 10-compartment spitzkasten, and is used to obtain a pulp thick enough for efficient concentration. The underflow from the spitzkasten, at a dilution of three of solution to one of solids, is led to 40 No. 3 Deister slime concentrators. The concentrators are installed for the sole purpose of removing from the pulp the comparatively coarse particles of gold which would require a long time to dissolve in the cyanide solutions used. There is not a great deal of this gold that ever appears on the tables, most of it being retained in the tube mill and ground until it is dissolved in the solution.

Gold, even in fine state, does not show on the tables unless there has been an unusual quantity of extremely high-grade ore milled, which is exceptional. The expectation, when the mill was designed, was that there would be a large quantity of comparatively coarse gold, which would come out of the tube mill and would take such a long time to dissolve in cyanide solution that there would be

danger of its being incompletely dissolved and discharged in the tailing. This idea has proved to be generally incorrect, the coarser particles of gold being ground up and dissolved to a great extent in the tube mill. The concentrate recovered, however, is high in gold and is treated separately on the ground.

AMALGAMATION OF CONCENTRATE

The concentrate from the tables drops directly into conduits in the floor, which are equipped with spiral steel conveyors by means of which it is conveyed to the end of the concentrator room, where it is received by a cross conveyor of the same type and delivered into the boot of a belt-and-bucket elevator. This spiral conveying system would seem to be a rather expensive way of conveying concentrate on account of the large amount of power usually consumed by machinery of that class. Screw conveyors are usually not considered altogether satisfactory on that account.

The concentrate is elevated to a launder which delivers it into four wooden, flat-bottom bins, each 4x7x5 ft., where it is stored and shoveled out as required in the amalgamation treatment.

There are installed four Chalmers & Williams standard Wheeler pans, five feet in diameter, and into each of these is charged 1.5 tons of concentrate, 100 lb. of mercury and some lye for keeping the mercury clean, the pan being filled up with solution. The mullers of the pan are let down and grinding is continued for one hour, after which three hours are devoted to amalgamation. The pulp is then passed to two 8-ft. settlers, where settling is completed in four hours, the amalgam being drawn off and cleaned up in a small cleanup pan. In this way about 97½% of the gold contained in the concentrate is recovered, the amalgam being sent to the refinery, where it is retorted and the resultant sponge added to the bullion obtained from the regular cyanide treatment.

As already mentioned, the original scheme of treatment included this concentration and amalgamation for the purpose of taking care of the expected quantity of coarse gold, but that has not been encountered in practice and it is altogether probable, according to the management, that this step in the process can be left out, the straight cyanide treatment being able to recover as much gold without it. Experiments toward this end are being undertaken and a decision will be made within a few months as to the course which will be pursued. The illustration shows the present installation of bins, pans and settlers, together with the elevator which brings the concentrate from the level of the concentrator room.

DORR THICKENERS USED BEFORE TREATMENT

The tailing from the concentrators is joined by the solution which was taken from it by the spitzkasten and goes to two Aldrich triplex slime pumps, each 10x12 in., which deliver to four Dorr thickeners. These thickener tanks are 30x12 ft. and the scraper arms make ¼ revolutions per minute.

Each triplex pump is operated by a 10-hp. motor and lifts the slime in an 8-in. spiral-ribbed pipe through 30 ft. to deliver into the thickeners. The pulp from the amalgamation treatment joins the concentrator tailing and goes through the regular cyanide treatment in the mill. The Dorr thickeners deliver an underflow containing 48% moisture which is elevated in two belt-and-bucket elevators with 10-in. buckets into the treatment tanks.

The pulp going into the Dorr thickeners receives the lime which is required for treatment. The dry lime in a fine state is put into a small pan and an emulsion is made, which is fed continuously into the pulp as it enters the thickeners. A portion of the lime is so coarse that it does not dissolve or float out of the emulsifying pan, and this portion is recovered and put into the mortars of the battery, where it is soon ground up and dissolved. The total quantity of lime added is at the rate of five pounds per ton of dry ore.

HEAVY SOLIDS MAKE AGITATION DIFFICULT

There are four agitating tanks each 30x15 ft. with flat bottoms which are equipped with Trent agitators operated by 6-in. Morris centrifugal pumps. The pulp is treated continuously through three of these tanks, the length of time of this passage being about 48 hr., experience having shown that this is sufficient time for treatment; the fourth tank is reserved as a spare. Due to the high specific gravity of the solids these agitators have been unsuccessful in handling the pulp in the agitation tanks. The pulp cannot be successfully agitated if this is thicker than 3:1, the power for moving the arms running as high as 18 hp. per tank.

At the 3:1 dilution the sand and granular slime settle in the tanks, stopping the agitator arms and giving an endless amount of trouble. This trouble extends to the filtration department where, on account of having to filter a dilute pulp, the operation cannot be performed in an efficient manner. On account of the difficulty experienced with these agitators it has been decided to remove them and install an agitator of a different type, which will be described. With the Trent agitators, in addition to the difficulty inside the tank, there is the difficulty experi-

enced with the use of centrifugal pumps. With the pumps used this consists principally in the difficulty and time required to take them apart and examine the interior.

The agitators to be installed are the Dorr type, which is simply a mechanism with four revolving arms equipped with rakes exactly as in the Dorr thickener but revolving at a higher speed. The slime is raked down to the center of the tank and is then lifted by means of an air lift

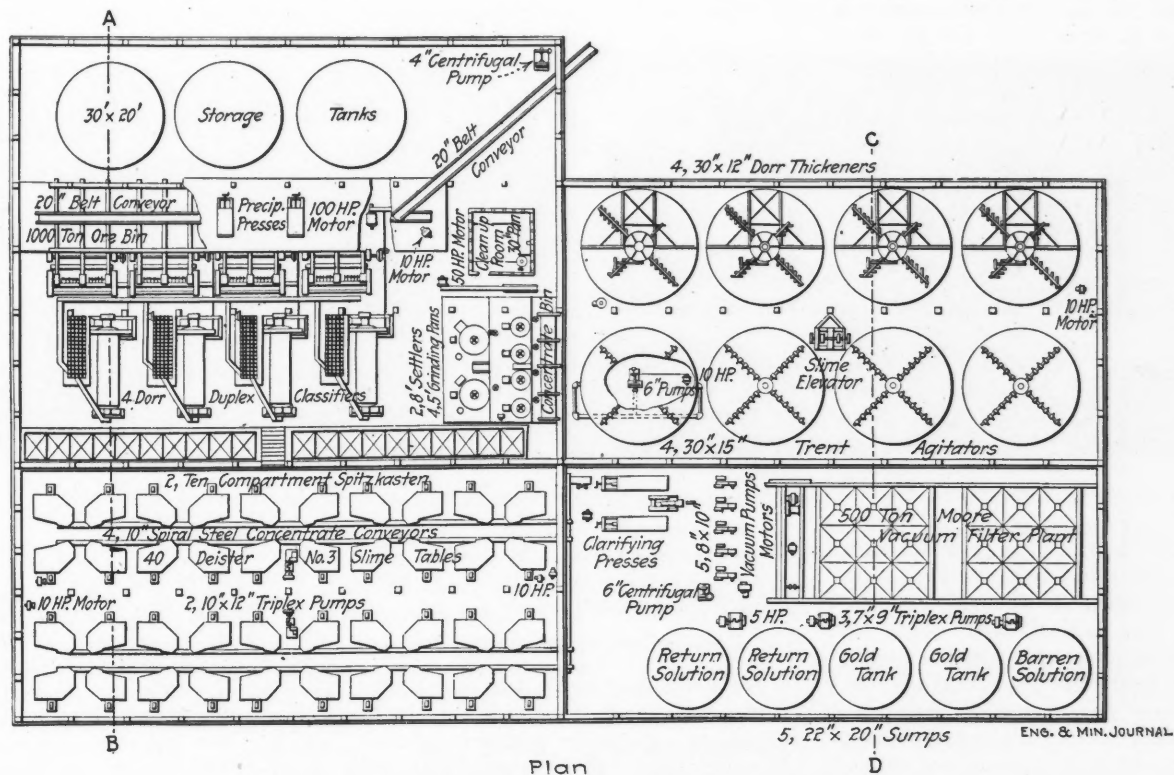
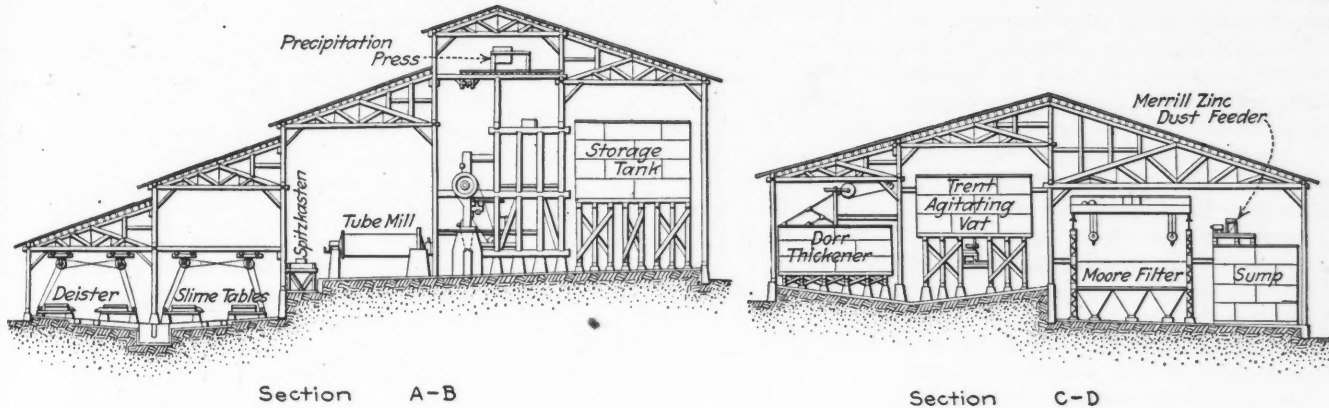
KCN per ton, as is all the solution used in the mill.

MOORE VACUUM FILTER USED

The pulp from the treatment tanks is sent to the filter plant by gravity. The filter plant consists of a Moore installation of four baskets of 60 leaves each, the leaves being 6x8 ft. each. There are six tanks in two units, each tank measuring 28 ft. 4 in. wide and 9 ft. 6 in. long, and having sides nine feet deep for the

perienched with the crane, it apparently having been designed somewhat light for the work it has to perform.

The cycle of operations is longer than should be necessary, one hour being allowed for loading, during which time a cake 1 1/4 in. thick is formed. One hour is allowed for solution wash and five minutes for the water wash. Transferring the basket takes about two minutes and discharging the cake, which is done in the water washing tank, about 15 min. The



PLAN AND SECTIONS OF HOLLINGER MILL, PORCUPINE, ONT.

situated in the center of the tank, circulation being down through the tank and up through the air lift in the center. The system has been tried in an experimental way at this mill and there is now under way the equipment of the spare agitation tank, with the agitation mechanism which will be given a through trial on a working scale. The arms will make 12 r.p.m. The solution used in treatment is 1.5 lb.

vertical part, beside hopper bottoms which have 7 ft. 6 in. additional depth. There are five 10x7-in. Buffalo vacuum pumps, one for each basket and one for the acid washing of the leaves. One crane handles the four baskets, having a capacity of 35 tons total load. The crane has two motors, one of 40 hp. for the lift and one of 15 hp. for the lateral travel. Some trouble has been ex-

perienced with the crane, it apparently having been designed somewhat light for the work it has to perform.

perienched with the crane, it apparently having been designed somewhat light for the work it has to perform. The cycle of operations is longer than should be necessary, one hour being allowed for loading, during which time a cake 1 1/4 in. thick is formed. One hour is allowed for solution wash and five minutes for the water wash. Transferring the basket takes about two minutes and discharging the cake, which is done in the water washing tank, about 15 min. The

further down it is more and more mixed with granular product until the bottom of the leaf contains a porous, granulated material which is to all intents sand, and through which the wash solution will pass, leaving the upper part of the leaf, which contains the true slime, practically unwashed. The filter tanks are supplied with air lifts to assist in keeping the solids suspended, but they are not altogether efficient and are rather troublesome to take care of.

The major part of this filter difficulty is traceable to the inefficiency of the Trent agitators. With a properly thickened slime, as has been proven in this case, less trouble will be experienced in keeping the solids in suspension and the homogeneous cake thus formed can be washed with a 97½% efficiency. It is expected that with the installation of the new system of agitation a thick pulp, 1:1, will be maintained throughout the agitation and filtration system with beneficial results to both.

The loading solution from the filter plant, together with a part of the solution from the Dorr thickeners, is passed through two 20-leaf 36-in. Merrill clari-

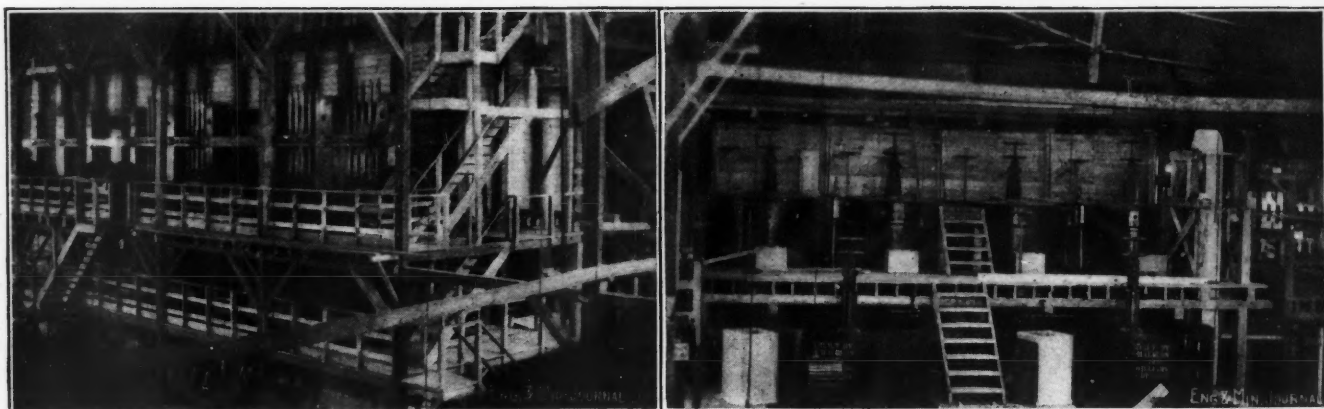
proportions: Precipitate, 100; borax, 20; soda, 7; and silica, 3. It is melted in a Monarch tilting furnace using oil fuel, in a No. 275 graphite crucible, the bullion being remelted in a No. 60 crucible. The resulting bullion is about 760 fine in gold. It is contemplated that later a lead stack will be installed for the purpose of melting down the precipitate with litharge and then cupelling it in an appropriate test. By this means a finer bullion will be produced.

A plant for sampling the ore going to the mill will be erected at some time in the near future. At present every car of ore is weighed and a sample of it taken so that some idea of the work done may be obtained. The new plant will contain Snyder and Vezin samplers and a proportion of the entire ore will be cut out, reduced in small rolls and crushers and the ensuing sample reserved for assay.

The total power required to operate the mill is about 500 hp., electrical current being used for all purposes. The mill is of wood construction, well built, and is covered with corrugated iron. It is sheathed inside with wood over a layer

obtained even under the present circumstances of mechanical imperfection. Of the gold recovered, about 85% is dissolved in the grinding operations, which are intended to include stamping, classifying and tube milling, and 15% in the agitation department. The high percentage of gold dissolved in grinding is worthy of note. It is usually true that a large proportion of metals is dissolved in the grinding department, but not much attention has been given to a study of the fact and utilization of the opportunity presented.

The dissolving rate is largely due to the efficiency of the tube mill as an agitating machine, the grinding action of pebbles liberating and cleaning the gold and getting it in contact with solution in a condition most conducive to prompt dissolution. For this reason it is good practice to make the most of the tube-mill action and do everything to assist the extraction of metal at this point. I believe it is a good thing to freshen up the solution just before going into the tube mill either by adding fresh cyanide, part or all of the addition that is regularly made, or by using a solution which



STAMPS, TUBE MILLS AND CLASSIFIERS; AMALGAMATING PANS AND SETTLERS AT HOLLINGER MILL

fying filters and to the pregnant-solution sumps, of which there are two, each 22 x 20 ft. This solution is pumped out by means of a 7x9-in. Aldrich triplex solution pump, into which zinc dust is fed through a Merrill feeder at the rate of 0.2 lb. per ton of solution, into two 20-leaf 52-in. Merrill triangular precipitate presses, where the precipitate is recovered. The regular addition of cyanide is made to the gold solution before precipitation, the cyanide being ground up and dissolved in the flow of solution. No cyanide is added in any other way in this mill. The solution precipitated is about four tons to every ton of ore treated, the consumption of zinc being 0.8 lb. per ton of ore milled. The precipitated solution is sampled for tonnage and assay purposes by a tilting-bucket device.

The resulting precipitate from the cyanide treatment is fluxed in the following

of tarred paper and is amply heated with steam, making a comfortable mill to work in during the winter season.

METALLURGICAL DIFFICULTIES FEW

There are no great metallurgical difficulties, those that were expected before operations were commenced having failed to materialize. The ore is clean and contains no rebellious elements and the gold dissolves easily in the weak cyanide solutions used. The ore does not develop much acid as is shown by the small quantity of lime used during the treatment. It might be safely said that the only problems which have been encountered are the mechanical ones already mentioned as due to the high specific gravity and granular character of the solids in the pulp.

The recovery of gold is thoroughly satisfactory, a total extraction of 93% being

has been freshly rejuvenated by means of some one of the accepted methods.

The general run of ore milled has a value of about \$20 per ton, of which about 98% is recovered in the mill. The mill started operations in June of this year and the greater part of the elapsed time has been taken up in systematizing the operation, making necessary minor changes and in general tuning up the mill so that a normal basis of cost could be obtained. The mill is now running well and the cost is not excessive, but the management desire to establish the costs firmly before publishing any data.

The mill is well built, compact and convenient, and reflects credit on its constructing engineer, A. G. Kirby. The operations of the Hollinger Gold Mines, Ltd., are under the direction of P. A. Robbins, manager, and the mill is superintended by Noel Cunningham.

Mine Slope Economizing Hand Labor

By John J. Smith

I described in the *ENGINEERING AND MINING JOURNAL* of Apr. 13, 1912, a design of self-acting plane, the central idea of which was the elimination of hand shifting and the introduction of safety features to prevent the escape of wild cars down the incline.

This brought to mind a slope built several years ago, the central idea of which was the same. Slopes, like inclines, are of several types, but the commonest and the only one considered here is that in which the mine cars are hitched to a cable and pulled up the slope, from the top of which they run to a bin or tippie.

The remarks, which were made in the previous article as to the necessity of a complication of tracks in ordinary designs to take care of alternating loads and empties, the switches necessary to put these tracks alternately in connection with the incline track or tracks, and the level space necessary for the installation of these tracks, apply with about the same force to slopes as they do to gravity inclines, consequently they need not be repeated in detail here.

In the design of the incline it was desired also to have the trip under the continuous observation of the operator, the advantages of which were explained in the preceding article.

Considerations of safety are much more urgent in the case of a slope than they are in the case of an incline for the reason that there is open ground all about the lower end of the latter, and all parts of it are in broad daylight, so that if a wild car comes down the incline it is easy for workmen at the bottom to see it and to avoid it. But with the slope there is virtually no opportunity whatever to see a runaway car until a fraction of a second before it reaches the bottom, and even if seen, the amount of space available in which to escape from its destructive energy is limited. In spite of the greatest precaution, during the sinking of the slope in question, we have had the car break loose several times, and that no one was hurt was a matter of extreme good fortune and nothing else. Hence, the urgency of safety requirements in our mines.

SINGLE TRACK SLOPE

The slope to be described was sunk parallel with the strike of an orebody having a dip of about 30°. The lower end of the slope was situated about 120 ft. from the orebody in the hanging wall, for the reason that in the particular ore deposits concerned the hanging wall is perfectly rigid and has never been known to give away to any extent, but

A single-track mine slope designed to minimize hand shifting of cars; the operator has unobstructed view of the entire trip and as the rope runs in a straight line no guide sheaves are necessary. Provision is made for blocking all runaway cars.

the settlement due to the caving system employed in mining, takes place on the foot-wall side. The crosscut from the foot of the slope to the orebody was at right angles to both and was made wide enough for double track, the two tracks uniting at the entrance to the orebody, as the mine track proper, and also uniting just above the foot of the slope as the slope track proper.

The slope in this case was a single-track one. This is not as good practice as the double-track slope, but is much less indefensible than the single-compartment vertical shaft, especially in the practice to be described, because the mine cars were light in proportion to the load they carried; only about 1000 lb., as I remember it, to carry a load of two gross tons. Hence the proportion of dead to useful load is vastly less than with the car-carrying cage and the loss of power proportionately less.

One reason for making a single-track slope instead of a double was the saving in expense. The other was the fact that it was not then deemed possible to design a double-track slope, which would have the advantageous features for the elimination of shifting and for safety possessed by the present single-track design to be described.

The angle of the slope was chosen as that which would be possible for men and mules to mount readily, and this slope was determined to be one in three, or about 20 degrees.

DOUBLE-TRACK SLOPE POSSIBLE

Since the successful operation of the inclines which were described in the article above mentioned, I am inclined to believe that some of the features used in the design of the incline could be combined with the features of the present slope and so make a double-track slope with the same advantages as the single track. The belief in this possibility is one of the reasons for this article.

The slope was of the two-compartment type, the one next the orebody being for the track exclusively, the

opposite one a pipe-way, man-way and air-way. Because the second compartment was used as an air-way and in order to strengthen the caps or collars of the timbering, a center row of posts was used, but this would not be the case if a double-track slope were used.

Owing to the position of the railroad tracks in relation with the top of the slope there was about 400 ft. of travel for the cars from the top of the slope to the bin, where they were dumped. It was desired to have the cars run freely by gravity to this bin loaded, and back from it empty. The grade necessary for this was 1½% in each case.

As the track ran with this grade from the top of the slope down to the bin, and from the bin down at the same grade to its intersection with the slope again, the latter was about 12 ft. lower than the top knuckle proper, and a switch was arranged in the slope track at a point about 36 ft. below the top knuckle to receive the empty cars.

The general arrangement of the head works of the slope is shown in Fig. 2, which shows a plan and elevation and also an inclined plan of a portion of the top of the slope. The entrance to the slope was situated near the bottom of a ravine, of which the slope of the hillside was a little less than that of the slope proper; therefore, to preserve the feature of having the rope run in an unbroken line down the slope and to have the operator's vision of the trip uninterrupted, it was necessary to put the hoisting engine on a rather high foundation, and the last few feet of the slope proper and the first few feet of the loaded track to the bin were set on low trestles, as shown. The engine house was supported on high posts running from the level of the ground, as shown. The situation on the hillside was such that the ground rose sharply on the left-hand side facing down the slope, and the boiler house was placed on solid ground just beyond the engine house in this direction at a level slightly lower than that of the engine house. The operation was a small one and one man was able to attend to both boiler and engine. It will be seen that a man standing in the operator's position just in the rear of the engine cylinders would have an absolutely uninterrupted view down the slope.

LOADED CARS PASS UNDER ENGINE

There was another reason for setting the engine quite high in the air. In order for the car to reach the bin it was necessary for it to preserve virtually the direction of the vertical plane of the

slope. Therefore, it must get past the engine house and foundation. This was accomplished by building the foundation in the form of two parallel walls entirely separated, as shown in the plan view, connected at the top by two stout girders anchored rigidly to the two piers.

The bottoms of these girders and of the floor beams were a trifle over six feet above the level of the loaded track. The loaded track was continued straight through between these two piers and the car, after reaching the top of the slope, ran directly under the engine, there being room enough for a man to pass under freely. There was a floor laid under the rails from the top of the knuckle back to solid ground behind the engine house; it was of sufficient extent to make a convenient working platform for the top men. Ugly curves at the top of the slope were thus entirely avoided.

Leaving out of account details the operation was as follows: The trip of one or two cars was hoisted over the knuckle, the top man then set the car brakes and unshackled the cars from the rope. It will be explained presently how the rope was kept taut and above his head, except for the piece of chain permanently fixed to the end of the rope to which the cars were shackled, as shown in Fig. 2. The lower end of this chain was thrown aside, the car brakes released and the top man then rode them to the bin. There he took two empty cars awaiting on the empty track and rode them back to a point near the intersection of this track with the incline, where they were again shackled to the rope and allowed to run on to the incline proper, then lowered to the bottom.

At the bottom, it may be well to state, the two tracks in the crosscut above described, sloped opposite ways from the switch near the orebody. The slope track proper curved into the first of these, which ran from this bottom point on a down grade of $1\frac{1}{2}\%$ to the switch, and from this point the loaded track ran back parallel to the empty, but sloping in the opposite direction so that at a point in the central plane of the slope it was about two feet lower than the empty track. This track then made a curve parallel to and outside that of the empty track and came into the slope track proper at a point a short distance above the bottom through a spring switch, all as roughly illustrated in Fig. 1 of the accompanying drawings.

LOADED CARS FED TO FOOT OF SLOPE BY GRAVITY

When the trip reached the bottom the cars were unshackled and allowed to run down on the empty track toward the orebody. Loaded cars on the out-

side curve were shackled on and hoisted to the top. A vertical pulley was situated so as to guide the rope in swinging out to the cars on the loaded track.

It will be seen, therefore, that the loaded cars were fed to the foot of the slope, the empty cars returned toward the mine, the loads run to and the empties returned from the bin at the top all by the means of gravity.

Those who have had to do with rope-operated means for handling cars will, I think, agree that one of the features easiest to overlook in making a design, and the hardest to escape in operation, is shifting the end of the empty rope from the point where the loads are unhooked to the point where the empties are shackled on, and *vice versa*.

In slopes this is not quite so serious as in inclines, because if properly designed the power of the engine is avail-

familiar with such operations that the cars, after landing on the loaded track with its grade away from the top of the slope, might from time to time, by one means or another, be pushed back over the slope after unshackling and that empties might escape from the bin and return by the empty track to the line of the slope and plunge down it, causing death or injury to those at the bottom.

It may be stated here that a spring derail was introduced between the point where the empty was stopped for shackling to the rope, and the incline, and that this derail had to be held closed by hand in order to take the car on to the incline, but this was not considered a sufficient precaution. It was thought that if a whole section of the slope could be raised up so as to reverse the direction of its inclination and put it at a high angle with the proper line of the track, that this would act as a gate or barricade and that wild cars from either the loaded or empty tracks would strike it and be stopped before they had acquired sufficient energy to do serious harm, certainly before they could cause the loss of life or injury to those below.

In order to bring the end of the rope from the unshackling position of the loaded trip to the shackling position of the empty, it was thought that a gravity pull-back could be arranged of sufficient power to unwind the slack of the rope as soon as the drum brake was released. It seemed obvious to let the heavy weight of the elevating section of track serve to actuate such pull-back, and on the basis of these ideas the present design was made.

It may be said here that it was perfectly successful in operation for the entire life of the mine, and that no defects developed in the course of several years of operation, the features of safety and convenience both being secured in a high degree.

The elevating or "gate" section of the track is shown at A in Fig. 2, in its elevated position. This structure is shown in full detail in Fig. 3. Few comments are necessary except to call attention to the fact that the center of the hinge must be at or above the top face of the rails, so that the instant the structure starts to move from its normal position the rails will clear. For the same reason the bearing surface of the lower end is sloped so that there is no possibility of its jamming at either end in leaving or approaching the operating position. The hinge, or bearing, was made of a piece of 5x1-in. bar-iron, running completely under the bottom gate and up both its sides, the bar being twisted at right angles to the bottom section and again bent at right

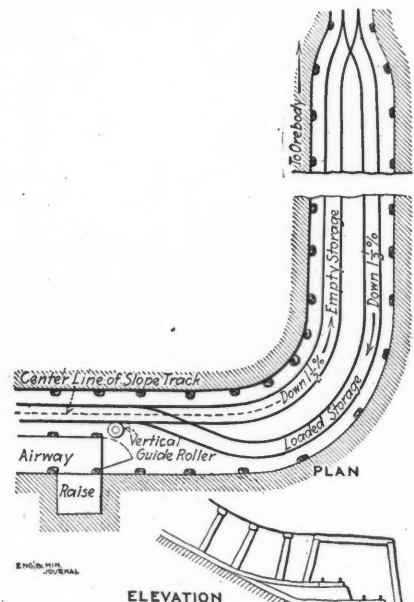


FIG. 1. FOOT OF MINE SLOPE, SHOWING GRAVITY SWITCHING ARRANGEMENTS

able for throwing slack in the rope and unwinding it from the drum, which is not the case with inclines, but even under these conditions it is frequently noticeable that it is heavy work to transfer the end of the rope from the loaded to the empty cars. It was desired in this design to eliminate this work as much as possible.

It is obvious that it is necessary to unwind about 35 ft. of rope from its position at the end of the hoisting trip in order to restore the empty to the slope track, after which the weight of the car is sufficient to overcome the rope and drum resistance. This would make such a design as that shown intolerable if some means were not taken to facilitate this transfer.

SAFETY DEVICE FOR RUNAWAY CARS

It will also be obvious to those

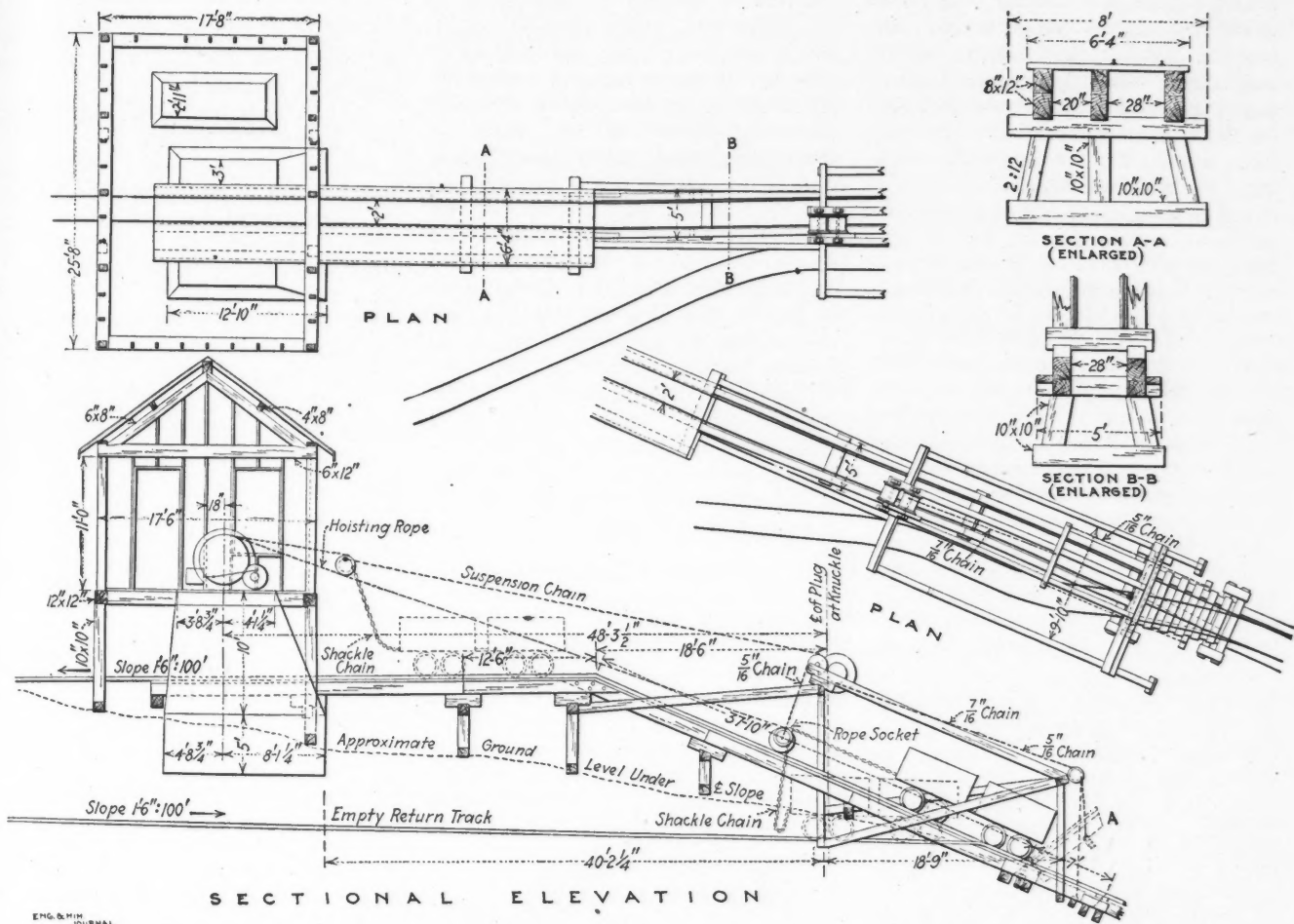


FIG. 2. GENERAL ARRANGEMENT OF SLOPE, SHOWING ENGINE HOUSE, PULL BACK AND LOADED AND EMPTY TRACKS

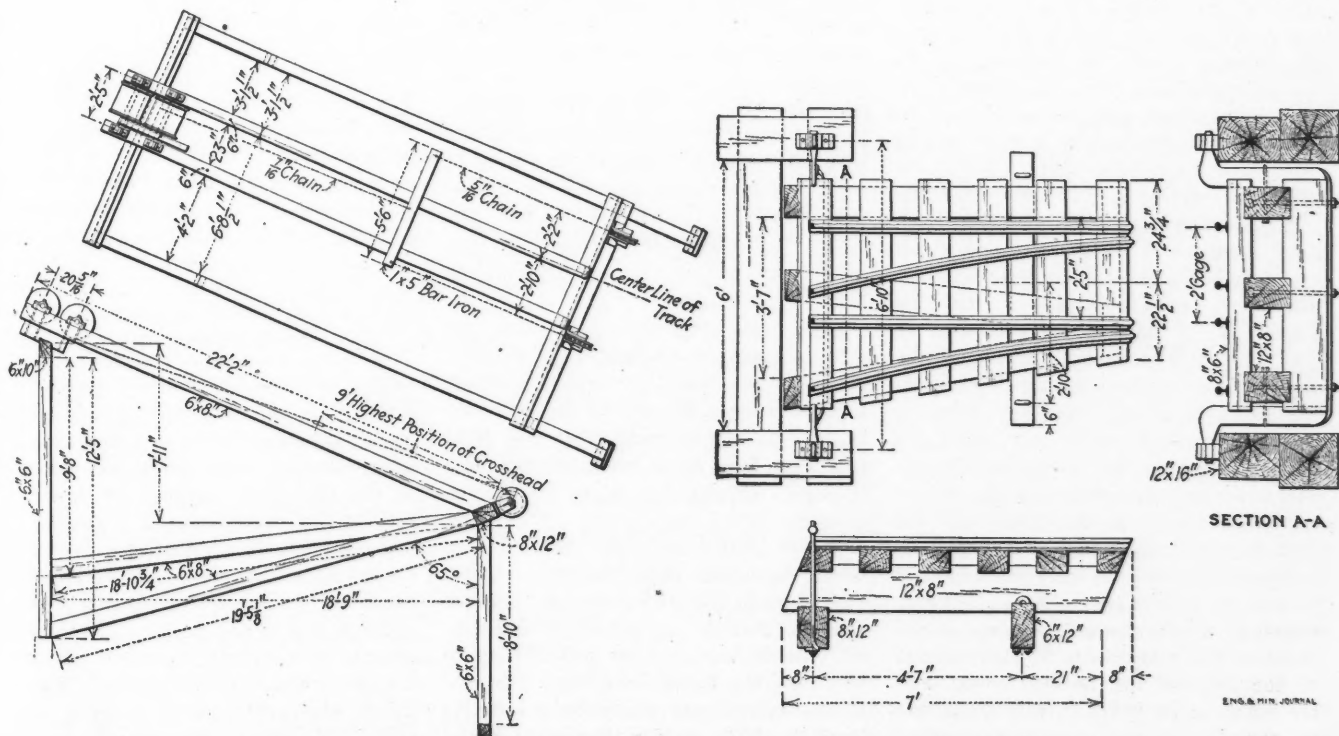


FIG. 3. DETAILS OF PULL BACK AND LIFTING TRACK FOR MINE SLOPE

angles edgewise at the top and forged down into journals for the hinge. This supplied the necessary rigidity for the overhanging bearing and made a thoroughly satisfactory hinge from stock material at a minimum expense. The cross piece carrying the U-bolts for the attachment of the lifting chains, was made of 6 x 12-in. cast iron in order to supply the necessary weight for the pull-back to bring the gate down on its bed properly and secure a good alignment of the rails.

GEARS USED IN PULL-BACK

It will be seen that the total elevation of the point of attachment of the suspension chains is only three or four feet, whereas, the distance through which the end of the hoisting rope required to be pulled back was, as above stated, about 35 ft., so that direct connection would not answer, but the motion of the pull-back had to be geared up about nine times. This was accomplished as follows:

The suspension chains from the gate passed up over sheaves mounted on the end of a timber framework to a sort of crosshead equalizing bar. These suspension chains were, of course, set far enough apart to clear the cars on either track. From the center of this equalizing bar (which was nothing more than a bar of 5 x 1-in. iron) ran a larger $\frac{1}{2}$ -in. chain to the lower one of a pair of drums, shown quite plainly at the left of Fig. 3. This drum was geared to the upper one of the pair, as shown, in such a way that the motion of the latter was about nine times as great as that of the former. The $\frac{1}{2}$ -in. chain was virtually all unwound from the lower drum when the gate was in its working position. On the other drum in this position were wound about 40 ft. of $\frac{1}{2}$ -in. chain, the end of which hung down over the center of the incline and carried a frame in which ran a guide sheave for the hoisting rope. This sheave was made light and about one foot in diameter. The shackle chain which ran from the socket on the rope proper to the car coupling was eight or 10 ft. long. During the running of the rope on any portion of the trip below the gate, the swinging sheave acted as a most excellent guide and roller for the hoisting rope, but when the trip was past the gate, the socket on the end of the rope struck in the frame of the swinging sheave, which held it rigidly.

Thereafter the swinging sheave was pulled up the incline with the hoisting rope and as the normal position of the chain which held it was at right angles to the line of the hoisting rope, and therefore, at its shortest, this chain had to pay out as the rope socket pulled the swinging sheave up the incline. It will be noticed, however, that no shock

occurred in starting the unwinding of the suspension chain, because in its normal position a given degree of movement up the incline required a minimum of unwinding at first, but a gradually increasing amount as the suspension chain was pulled further and further from a line normal to the hoisting rope and approaching the direction of the latter. The rotation of its drum caused by the unwinding of this chain operated the companion drum at a slower speed so that by the time the trip was over the knuckle the gate was raised to the position shown. It will be seen that the pull of the suspension chain against the end of the rope tended to bring these two into a straight line, with the shackle chain running therefrom down to the car standing on the track, as indicated in dotted lines.

WEIGHT OF LIFTING TRACK SLACKS OFF THE HOISTING ROPE

Of course, as soon as the trip cleared the knuckle the engine was stopped and the downward grade toward the engine caused the trip to slack up on the shackle chain so that unshackling was easy. After unshackling the loads were run to the bin, as above described and empties returned. When the empties reached a position with their upper end about at the upper end of the overhead drum frame and were brought to rest, the engineer slacked off the drum brake and the weight of the heavy gate then caused the winding up of the suspension chain and the restoration of the swinging sheave to its normal position. The length of the shackle chain was then easily sufficient to reach the draw bar of the cars and was shackled on. The track was restored to its operating position simultaneously with the slacking off of the hoisting rope, and after releasing the car brakes and throwing the spring switch, the empty trip was free to return to the slope track and so to the bottom of the slope.

After several years of operation one car managed to escape on the slope when the gate was in its safety position. It jumped over the end of the gate and lit on the slope track below the gate and went from there to the bottom, fortunately without injury to person or property other than itself. Thereafter a heavy framework was erected just down the slope from the drum frame and immediately above the end of the gate, so that cars could clear when on the incline, but any car which tried to emulate this flying leap over the end of the safety gate would be absolutely blocked. This feature is not shown on the drawings, but will be readily understood.

OBJECTS OF THE DESIGN

I think it will now be evident that the objects of the design as set forth have been attained:

(1) The operator has the trip in plain view from top to bottom.

(2) The rope runs in a straight line from the trip to the hoisting drum without going around the innumerable guide sheaves between the engine and the shaft, or slope, so much in evidence at some mines.

(3) The slope is absolutely blocked for runaway cars, either from the loaded or empty tracks.

(4) The shackle chain is easily unhitched, without any pulling and hauling to get slack enough to permit its release, and is automatically carried back to a position where it can be shackled to the empty trip with equal ease.

It may be frankly stated now that no design, or attempt at one, has ever been made for a double-track slope embodying these features. But, as before stated, the successful design of a double track-gravity plane embodying them indicates that it might be done.

The first consideration would be that of taking care of all the horizontal traverse of the rope as it winds on the drum. This is done admirably in the present instance by the swinging sheave, but where the rope is wound and unwound from both top and bottom of the drum, as is the custom with the double-track slope, this could not be worked out so well, particularly in conjunction with an apparatus for reversing the ropes in order to keep the loads always on one track and the empties always on the other.

One reason for the difficulty is that if a reversing sheave or a pair of them were introduced as in the design of the gravity plane, the angle at which the rope ran from the drum to the reversing sheave would vary greatly in different portions of its travel, owing to the traverse along the drum.

"FIGURE 8" DRUM RECOMMENDED FOR DOUBLE-TRACK SLOPE

The "figure 8" type of drums described in the previous article lends itself admirably to this condition, because there is no horizontal traverse of the ropes and because the plane of rotation of the drums is virtually the same as that of the incline. Therefore, the alteration in the angle of approach made by the reversing sheave accordingly as it is in one position or the other, affects nothing but the point at which the ropes make or leave contact with the drum, which, of course, is quite immaterial. No other style of drum seems to meet this condition quite so well, and if I were to attempt the design of the

type of double-track slope above mentioned, I would be inclined to adopt the figure-8 type of drums set in the plane of the slope and gear them to the engine shaft with a single pair of bevel gears. A reversing sheave, either automatic or power driven, could then be used exactly as with the incline.

It is obvious, however, that the automatic pull-back as shown in the present design could not be made to work without being changed by hand from one rope to the other, which would be quite out of the question. Therefore, some other scheme for a pull-back of the empty rope would have to be devised, and with it, some means of operating a safety gate. These should present no insuperable obstacle.

My principal object in making these comments concerning the possibilities of such a design is to start mining superintendents and engineers to thinking along lines outside of the beaten tracks. No one wishes to make a new design so revolutionary that if it fails the whole apparatus must be scrapped. At the same time, if we do not occasionally take the chance of failure when we see the opportunity to make a considerable improvement over existing methods, the science of mining is not advanced and we miss the opportunity to make savings more considerable than any loss which can result from the failure of the scheme. For this reason too much conservatism and too close adherence to the known and tried is as fatal to success as is too much unsuccessful experimenting.

Fertilizer Supplies

WASHINGTON CORRESPONDENCE

Secretary of Agriculture Wilson refers to the subject of potash investigations in two places in his annual report, just made public. In connection with a description of the work of the Bureau of Soils, he says, in part:

It has been shown that the United States has ample supplies of the raw materials which experience has proved to be most useful as fertilizers.

There is in this country enough high-grade phosphate rock to supply the present demands for 36 centuries or more. The giant kelps of the Pacific coast and Alaska, if cropped on scientific principles, can probably surpass in yield of potash salts the famous Stassfurt mines, and there is reason to expect that commercial production of potash from feldspar will soon be a reality.

In the meantime, an unremitting search has been maintained for potash salts in some of the desert basins. Theoretically, it seems probable that areas may be discovered where segregation of these salts has occurred, and one such deposit is now being exploited commercially. Examinations of our salt brines seem to show that there is little prospect of success here.

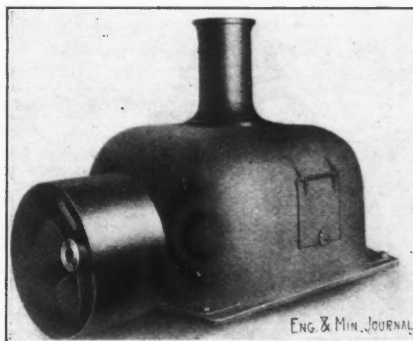
With many sources of nitrogen yet to be utilized to their fullest extent and with practicable methods of "fixing" atmospheric nitrogen, the future may be faced with equanimity so far as problems of fertilizer supply are concerned.

Power Winch for Car Spotting

A power winch for car spotting has been placed on the market by the Stephens-Adamson Co., and, we are advised, has been adopted by one of the large copper companies for hauling small cars on and off scales, and in other places where short shifts have hitherto been made by hand, with excellent results.

As shown in the illustration, the winch externally usually shows only a pulley, the iron gear case, and the winding drum, but the machinery can be sunk in a pit and direct-connected with a motor, so that only the winding drum appears above the cover plate.

A train of planetary gears connects the driving shaft with the winding drum. The gearing is designed to give a large reduction between the winch and the



WINCH FOR CAR SPOTTING

driving shaft, so that a slow, powerful movement is obtained without the use of a large motor or large belt. In use, the rope attached to the car to be started is given two or three turns around the drum. Then by pulling on the free end of the rope, the operator can cause enough friction between the drum and rope to move the car. The release of the rope end instantly releases the pull of the winch.

Although the illustration shows a machine with the winch on top and drive at right angles, it is also made with drive and winding drum in the same plane, for platform use in freight terminals.

Mineral Production of Tonkin

The exportation of ores from Tonkin for the first half of 1912 is given by *Echo des Mines*. Nov. 15, 1912, as follows: Zinc, 12,366 metric tons; antimony, 328; tin, 63; wolfram, 37 metric tons. The zinc ore, which forms the greater and most important part of this tonnage, is sent partly to the Auby works, at Dunkirk, and partly to Antwerp. Expensive

exploration work is now being done both for zinc and tin by the Société de Recherches Minières en Indo-Chine.

In 1911 Tonkin produced 434,046 metric tons of coal, 28,241 metric tons of zinc ore, and 212 metric tons of tin and wolfram ores.

Louisiana Mineral Output

The value of the mineral production of Louisiana in 1911 was \$12,710,958, according to the U. S. Geological Survey, which calls attention to the growing mineral output of that state. The principal products are petroleum, sulphur and rock salt.

After the sensational strike of oil at Beaumont, Tex., in 1901, prospecting for petroleum was actively carried on east of the Sabine River in Louisiana, resulting in the discovery and development of several pools in the vicinity of Jennings. Since that time productive areas have been developed in many parts of the state, and Louisiana now ranks eighth among the states in the production of petroleum. The Caddo district, opened in 1906, is stated to be the principal producer at present, and of greatest promise for the future. The petroleum production of Louisiana last year was 10,720,420 bbl., an increase of nearly 4,000,000 bbl. over the production of the previous year.

Louisiana stands preëminent among the states in the production of sulphur. In 1904 the Frasch process for the recovery of sulphur from beds lying under a heavy cover of quicksand was put into successful operation by the Union Sulphur Co., at Sulphur, La., 12 miles west of Lake Charles. Since that time approximately 2,000,000 tons of refined sulphur have been recovered. Previously nearly all the sulphur used in the United States was imported from Sicily.

Louisiana also ranks first as a producer of rock salt; in the total production of salt, including that evaporated from brine, Louisiana ranks sixth among the states.

Borax as a Fertilizer

What might serve as a use for crude borax is suggested by the paper of Henri Agulhon, before the International Congress of Applied Chemistry, who found small amounts of boric acid acted as what he termed a "catalytic fertilizer," producing a remarkable stimulation of plant growth, from 34 to 54%. The smallness of the dose is insisted upon; for instance, with grains fine results were apparently obtained with less than 2½ lb. per acre. Twenty to 36 lb. per acre proved too much for oats. About eight pounds per acre gave sensible increases of crop with almost every crop. The results persist into the second year on the same ground.

No. 5 Tunnel, Mammoth Mine, Calif.

The No. 5 tunnel, started Apr. 1, 1911, at the Mammoth mine, in Shasta County, Calif., was driven to afford an outlet for the ore known to be below the former lowest level of the mine, to provide drainage, and to cheapen the cost of transporting the entire mine output to the bins. The tunnel is about 170 ft. below the 300-ft. level, and was driven of large cross-section, to permit the use of the standard 25-ton electric locomotives in use on surface and 25-ton 3-ft. gage bogie-truck cars. These cars are to be run in six-car trains beneath the Main and Clark orebodies, where they will receive the ore from large loading stations fed from raises to the main tramming levels above. These raises will give from 800 to 1600 tons storage capacity to balance variations of output and haulage. By the use of this tunnel, over one mile of surface haul on heavy gradients will be avoided, and it will enable the surface railway to handle the mine output of 800 tons daily on one shift, where before two shifts were necessary. There are other economies in haulage in the mine effected at the same time.

GRADE OF TUNNEL 0.6%

The main tunnel and two branches have a total length of 3267 ft., and were finished Dec. 21, 1911. The cross-section

By Robert E. Hanley *

The No. 5 tunnel at the Mammoth copper mine was driven below the existing workings to facilitate ore transportation and to provide drainage. The cross-section averaged 10 ft. wide by nine feet high, and a 0.6% grade favoring the load was maintained. The main tunnel has a total length of 3008½ ft., the average daily advance being 10.52 ft. at an average cost of \$22.23 per foot.

*Superintendent, Mammoth mine, Mammoth, Calif.

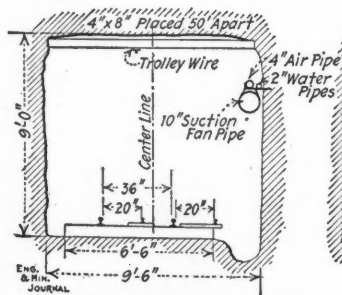


FIG. 1. CROSS-SECTION MAMMOTH No. 5 TUNNEL

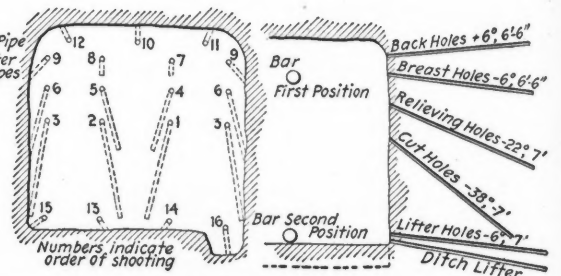


FIG. 2. ARRANGEMENT OF HOLES; DRIFT ROUND, No. 5 TUNNEL

COST OF NO. 5 TUNNEL, MAMMOTH MINE, CALIF.—LENGTH 3008½ FT.

Operation	Labor	Material	Air	Power	Total	Cost per foot
Drilling.....	\$14,355.99	\$394.25	\$3629.18	.....	\$18,379.42	\$6.109
Mucking.....	10,451.82	1,172.92	.....	.....	11,624.74	3.864
Timbering.....	206.91	300.96	.....	.....	507.87	0.169
Piping.....	812.54	2,511.63	.....	.....	3,324.17	1.105
Explosives.....	.....	12,034.07	.....	.....	12,034.07	4.000
Making drill tools.....	49.57	1,075.18	.....	.....	1,124.75	0.374
Repair burleighs.....	131.31	1,002.69	.....	.....	1,134.00	0.377
Sharpening steel.....	814.92	.....	.....	.....	814.92	0.271
Track and wiring.....	516.33	3,811.25	.....	.....	4,327.58	1.438
Electric lights.....	78.25	114.68	.....	.....	192.93	0.064
Electric tramming.....	2,448.54	401.19	.....	156.08	3,004.81	0.999
Repair cars and locomotive.....	153.40	627.36	.....	.....	780.76	0.260
Foreman.....	3,506.30	.....	.....	.....	3,506.30	1.165
Superintendence, engineering and office.....	1,594.55	.....	.....	.....	1,594.55	0.530
Widening tunnel.....	133.50	.....	.....	.....	133.50	0.044
Total actual work.....	\$35,253.93	\$23,446.18	\$3629.18	\$156.08	62,485.37	20.769
Pipeline to portal.....	.....	.....	.....	.....	556.80	0.118
Extension of tramroad.....	.....	.....	.....	.....	675.19	0.224
Grading for yards.....	.....	.....	.....	.....	1,573.11	0.523
Miscellaneous preliminary work.....	.....	.....	.....	.....	1,803.51	0.599
Total of all costs.....	.....	.....	.....	.....	\$67,093.98	\$22.23

of the tunnel is shown by Fig. 1, and is 9 ft. 6 in. wide and 8 ft. 6 in. high above the rails; this being the minimum dimension allowed. The actual ground broken averaged 10x9 ft., or 90 cu.ft. per foot of advance. The grade is 0.6%, and a ditch 18 in. wide and 12 in. deep was carried to the right of the ties.

Permanent 50-lb. rails were laid on 6x8-in. ties, spaced 2½ ft. centers, forming the 36-in. gage haulage line. Two 16-lb. rails were laid temporarily, forming, with the 50-lb. rails, two 20-in. gage

tracks used for the narrow-gage 14-cu.ft. dump cars while driving the tunnel. Later it was found that by using the cross-over switch and "slick-sheet" device, as shown in Figs. 4 and 5, it was only necessary to lay one temporary 16-lb. rail between the permanent 36-in. gage, 50-lb. rail track, to handle the material as broken in the face, with the exception of the stretch between movable slick sheet and face, and near portal, where the four tracks were laid to facilitate switching the dump cars.

NO SPECIAL EQUIPMENT USED IN DRIVING TUNNEL

The tunnel was driven as an adjunct to the mine operation, and had no special equipment. The equipment used was:

Five 3-in. Ingersoll-Sergeant rock drills.

Twenty 14-cu.ft. side- or end-dump mine cars, 20-in. gage.

One 6-ton electric locomotive for 36-in. gage track.

One 10-in. exhaust fan driven by one 5-hp. three-phase 220-volt motor.

One 4x10-ft. air receiver.

Four 4x10-ft. slick sheets, ¾ in. thick.

One 6x10-ft. movable slick sheet for switching cars.

One short movable cross-over 16-lb. track for switching.

Four sets of temporary 16-lb. track, 30 ft. long, used ahead of permanent track to face.

Air at 85-lb. pressure was furnished by the mine through a 4-in. pipe line about 700 ft. long. A 10-in. suction pipe, made of No. 18 iron, a 4-in. air line and a 1-in. water line were carried in the tunnel. The dump was of the usual type, one car at a time being dumped over the end.

During the earlier months of the work various plans of working were tried with different crews, but the one with which most of the tunnel was driven and which gave the cheapest results is given below:

7 A.M.-3 P.M.

1 Foreman	@ \$6.00
3 Machine men	@ 3.50
2 Chuck tenders	@ 3.25
3 Muckers	@ 3.00
1 Trammer	@ 3.00
1 Motorman	@ 3.00
1 Pipeman	@ 3.25
1 Single-hand miner	@ 3.00

3 P.M.-11 P.M.

1 Shift boss	@ \$4.00
3 Machine men	@ 3.50
2 Chuck tenders	@ 3.25
3 Muckers	@ 3.00
1 Trammer	@ 3.00
1 Motorman	@ 3.00

11 P.M.-7 A.M.

1 Shift boss	@ \$4.00
3 Machine men	@ 3.50
2 Chuck tenders	@ 3.25
3 Muckers	@ 3.00
1 Trammer	@ 3.00
1 Motorman	@ 3.00

Total, 35 men, costing \$116.25 per day.

This force could drive and finish from 11 to 13 ft. daily in ordinary ground, the labor in the tunnel costing from \$9 to \$12 per ft. In the main heading, however, there were encountered many hard

SUBDIVIDED COSTS PER FOOT, MAMMOTH TUNNEL

Labor.....	\$11.718
Materials.....	7.793
Air.....	1.206
Electric power.....	0.052
Total average cost per foot.....	\$20.769

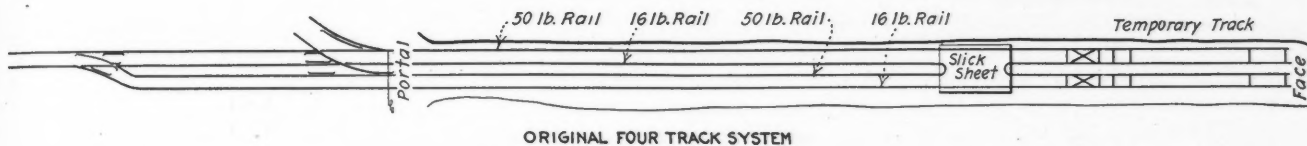
bars from 50 to 150 ft. thick, which necessitated a readjustment of the working force and retarded the progress greatly. These bars were difficult to drill. A machine which ordinarily could drill 11 ft. per hour in the usual porphyry could only drill from 2½ to 3½ ft. per hour in these stretches of silicified porphyries.

10-in. exhaust line for about 500 ft. back from portal and constructing in its place a wooden box, which was fitted over the new end of the 10-in. line and extended down into the tunnel drain, where it was covered tightly with plank and dirt packed over the plank. As the gas and smoke were forced out through the pipe to the wooden box, a spray shower attached to the 1-in. water line came in contact with the gas and smoke, causing instant absorption. The arrangement is shown in Fig. 8. By this means we could probably have taken up all of the 10-in. exhaust pipe by merely placing the box ahead in the tunnel as it progressed.

REMOVING THE LAST OF THE FUMES

The fan was operated alone until five minutes before the men were to return,

Three men mucked while one man trammed the loaded cars to a point about 100 ft. back from the face to a slick sheet laid over the rails, as shown in Fig. 5. This slick sheet was movable, and was pushed ahead as the tunnel progressed. The train was made up here, the one man tramping back and forth from the face with the empty and filled cars. A train consisted of about eight cars, and was handled and dumped by the motorman on each shift. There was at all times at least one empty car at the face into which the muckers could shovel. The first 10 to 12 ft. of the muck heap was shoveled from off the tunnel bottom and was slower work than when the slick sheets were reached. These slick sheets were four in number, and were laid about 25 ft. back from the face. When mucking from the sheets an output of from



ORIGINAL FOUR TRACK SYSTEM

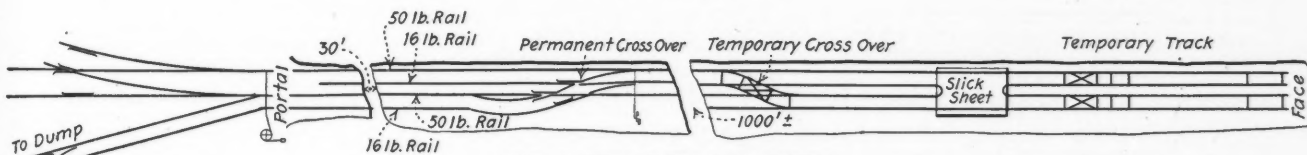


FIG. 3 FINAL THREE TRACK SYSTEM

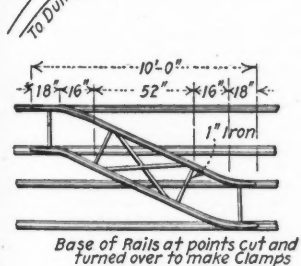


FIG. 4 CROSS OVER

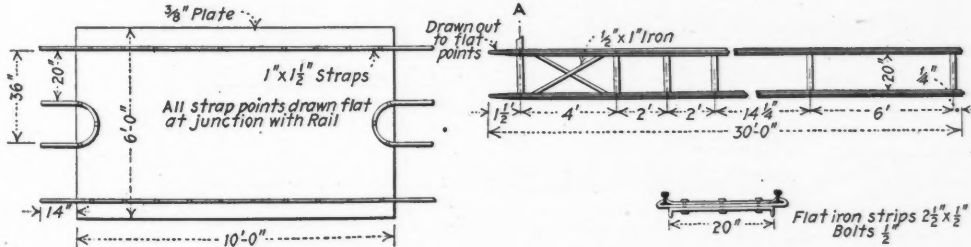


FIG. 5 SLICK SHEET

FIG. 6 TEMPORARY TRACK

TRACK ARRANGEMENTS, MAMMOTH NO. 5 TUNNEL

After the blast the crew waited from 12 to 45 min. for the greater part of the gas to be drawn out; the variation in time being due to the grade of powder used; the 40% powder used in good breaking ground permitting a much speedier return than the combination containing 60% powder and 100% strength blasting gelatin used in tough ground. As the tunnel progressed and the suction pipe of the fan grew to be over 1000 ft. long, the fan's efficiency was noticeably decreased.

VENTILATING FAN MOVED TOWARD FACE

To overcome this defect somewhat, the fan was moved in 1063 ft. from the portal to a point in the main heading where a crosscut began, and was then operated as a suction machine from face to fan, and as a blower from fan to portal.

A further change was also made, as the tunnel progressed, by taking out the

when compressed air was blown against the face in quantity, all that a 1-in. outlet could deliver, thus driving the gas back from the face. When the men return, one man connects the water hose and sprays the muck, roof and walls of the tunnel, to absorb the remainder of the gas, while the other three miners, with the boss, carry up the machines and blocking, and commence to set up the bar.

A 5½-in. horizontal bar, nine feet long, was used and was set usually about four feet back from the face and 2 ft. 8 in. below the back. The time used in setting up the bar, placing the three machines and connecting air hose varied from 25 to 55 minutes.

Meanwhile, the muckers cleared the track of debris, put temporary tracks in place and commenced mucking. This usually took from 20 to 30 minutes.

16 to 20 cars per hour was obtained. Removing the last portion of the pile was slow work as there were, of course, no sheets under the space occupied by the round just broken, and the muckers worked beneath a light scaffolding carrying the machine men. The time required for removing the muck varied from 4½ to 8½ hours, averaging about 6½ hours.

AIR HOSE SUPPORTED BY EXTENSION RODS

The air hose for the drills was held above the head of the muckers by two extension rods placed in hitches in the sides, and shown in Fig. 7. The cars used were ordinary mine cars of 14-cu.ft. capacity, much too small for effectiveness in this class of work. As the muckers removed the rock on which the machine men were standing, they set two ladders against the walls, and two or three planks set in these ladders formed the scaffold

for the machine men to stand on while the muckers removed the last of the rock from beneath them.

DAILY AND MONTHLY PROGRESS, MAMMOTH TUNNEL

Month	Days worked	Feet per month	Feet per day
April, 1911.....	18	217	12.06
May.....	31	309	9.97
June.....	30	310	10.33
July.....	30	274	9.13
August.....	31	327	10.55
September.....	30	347	11.57
October.....	31	395	12.74
November.....	30	347	11.57
December.....	29	260.5	8.98
January, 1912.....	26	222	8.54
Totals.....	286	3008.5	
Average feet-per day.....			10.52

looking down 21°, and four cut holes looking down 38°, as shown in Fig. 2. This took from 4½ to 12½ hr., averaging about 6½ hr. The bar was then taken down and set about 24 in. above the bottom, and four lifters drilled. It took from 12 to 25 min. to reset the bar and place the three machines on it. Drilling the lifters took from 1½ to 4½ hr., averaging about 1¾ hr. It took about 10 min. to remove the bar and machines.

The holes were the following lengths: Back, 6 ft. to 6½ ft.; breast, 6½ ft.; relievers, 7 to 7½ ft.; and lifters 7 ft. Two sticks of high-grade explosive (60%-100%) were placed in the bottom of the holes, followed by the primer also in high-grade powder. Then from three to

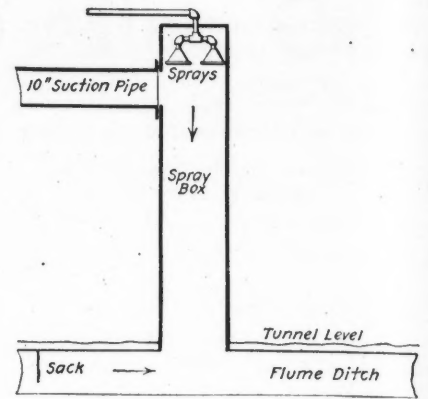


FIG. 8. ARRANGEMENT FOR SPRAYING POWDER SMOKE

		1st Hour	2nd Hour	3rd Hour	4th Hour	5th Hour	6th Hour	7th Hour	8th Hour	Total Hours	REMARKS	Working Place No. 179 DRILLING RECORD				
TUNNEL EFFICIENCY RECORD	PICKING DOWN									3		Back Holes	3	7	21	27
	SETTING UP									3		Breast Holes	4	7	28	36
	DRILLING									30		Rel'v. Holes	4	7	28	36
	MOVING BAR									3		Cut Holes	3	7	21	30
	LOADING									1½		Lifters	4	7	28	40
	SMOKE									4½		Total	7	126	169	40%
	TIMBERING									6		Mach. No. 2 56 ft. 3 hrs.				
	Track Laying									6		Mach. No. 2 42 ft. 5 hrs.				40%
	CLEARING TRACK									2		Mach. No. 3 49 ft. 5 hrs.				100%
	MUCKING									12½		Cars Loaded 1st Round			49	
TRAMMING									3½		Cars Loaded 2nd Round					
TRACK LAYING									13		Mistakes					
LABORING									1		Re-Shot Holes					
SMOKE									2		Powder Used Re-Shooting					
												Powder Used Spraying				5½ ft.
												Approximate Advance				
												Working Place No. DRILLING RECORD				
												Back Holes				
												Breast Holes				
												Rel'v. Holes				
												Cut Holes				
												Lifters				
												Total				40%
												Mach. No. 1				50%
												Mach. No. 2				50%
												Mach. No. 3				100%
												Cars Loaded 1st Round				
												Cars Loaded 2nd Round				
												Mistakes				
												Re-Shot Holes				
												Powder Used Re-Shooting				
												Powder Used Spraying				
												Approximate Advance				
												Shift No. 1..... Date 1-10-12 Foreman Ma S 071-				
												Total No. Muckers 32				
												Total No. Mover 8				
												Total No. Miners 16				
												Grand Total 13 men 104				

FORM OF RECORDING LABOR DISTRIBUTION, MAMMOTH No. 5 TUNNEL

In easy ground the machine men could finish the holes above the bar before the muckers had completely cleared the face; in this case the machine men shoveled the muck back on the slick sheets, where the muckers loaded it into cars. The muck cleared, except a few cars for covering the sheets, the muckers pulled the sheets ahead, covered them with loose dirt, and then carried back the temporary track and steel, etc., preparatory to blasting.

VARIOUS GRADES OF EXPLOSIVES USED

The machine men drilled 15 holes above the bar; three back holes looking up about six degrees, four breast holes looking down six degrees, four relievers

seven sticks of 40% finished the charge. In no case was it found advisable, in point of cheapness or efficiency, to load a hole for more than three-quarters of its length.

ADVANCE PER ROUND ABOUT FIVE FEET

During several months clay tamping was used with beneficial results in tough ground. The primers were made up by the foreman using fuse cut to lengths varying from 6 ft. 3 in. to 10 ft. 3 in. by 3-in. graduations. The prepared primers were carried to the face in a pigeon-hole box, corresponding to the holes as drilled in the face, and were handed to the loaders by the boss as needed.

Pacific fuse and 6-X caps were found most effective. The fuse was doubled only on the lifters, and the water-hole caps were "doped" with an armature compound. The fuse ends were split, gathered into four bunches, and spit by

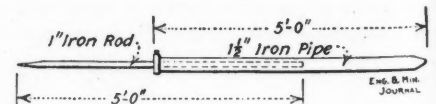


FIG. 7. TELESCOPIC BAR FOR SUPPORTING AIR HOSE

four miners simultaneously. Loading, including blowing out the holes, took about 40 min. In tough ground it proved ad-

visible to shoot the cuts and lifters first, then to re-shoot these with the whole round. The advance per round obtained varied from 3½ to 6½ ft., averaging a little under 5 ft. The powder used per foot advanced varied from 16½ to 35 lb., averaging about 24 lb. The most effective combination of powder was found to be one-third 100% blasting gelatin and the balance 40% dynamite.

MOVABLE TRACK USED NEAR FACE

Permanent track laying was done two to three times per week on the day shift by the entire force, exclusive of the miners. It was commenced as soon as the face was cleared of muck and was nearly always completed while the miners were drilling the lifters. Two rails, weighing 50 lb. per yd. and 33 ft. long, together with the same length of 16-lb. temporary rails, were laid at one time; the 50-lb. rail being laid permanently, to grade and line given by the mine surveyor. Ahead of these rails, as the tunnel progressed, were laid the two sets of 16-lb. movable track 30 ft. long, as

Impurities in Tough Pitch Copper

At the September meeting of the Institute of Metals, Frederick Johnson, of the metallurgical department of Swansea Technical College, read a paper dealing with the influence of impurities in tough-pitch copper; chiefly with reference to antimony (*Engineering*, Oct. 25, 1912).

He concludes that with antimony present up to 0.3%, the copper has good hot-working properties, either when under or up to pitch. With more than 0.3% antimony the removal of oxygen by poling is synchronous with inferior hot-working properties. According to his experiments, although the influence of antimony is to render the copper red-short after the removal of oxygen, and thus "overpoled," according to one interpretation of the term, yet its effect is really to prevent overpoling, when the latter term is used to describe the physical phenomenon, the rising exhibited by an ingot during solidification.

The rising of the surface, or the ejection

short before other signs of overpoling or going over the pitch have become apparent.

Another side of the question is that antimony hardens copper for rolling; and this becomes serious if it prolongs the breaking-down operation. For a normal, soft, tough, arsenical copper, however, the author considers that 0.1% of antimony would be a beneficial addition. The presence of other impurities, however, would modify this proportion, but such copper could not be used for making malleable alloys for brass. For high-conductivity copper, also, antimony must be rigidly excluded. Up to 0.5%, antimony has no detrimental effect on the hot-forging qualities of tough-pitch copper free from other impurities, and it is even possible to forge copper containing 1% of antimony, if sufficient oxygen be present in the metal.

The addition of lead to pure copper or arsenical copper causes the surface of a tough-pitch ingot to sink during solidification. Further poling, with the object of obtaining a level surface, is attended by the risk of rendering the metal red-short. Like antimony and arsenic, lead tends to check rising in the mold. The mechanical properties of arsenical copper (0.4% arsenic) at normal temperature are little affected by the addition of 0.2% of lead.

The addition of 0.2% of tin to tough-pitch arsenical copper is attended by an increase in hardness during hot- and cold-rolling, and an increase in tensile strength. The elongation is correspondingly lowered, but the toughness is unimpaired.

Of interest to American metallurgists working with electrolytic copper is the following rather emphatic statement by Mr. Johnson: "Incidentally, the author would like to dispose, once and for all time, of the fallacy that pure electrolytic copper is immune from overpoling. The statement has been made by well known metallurgists so often that it demands immediate refutation. Such copper has possibly a greater solvent power for gases than most less pure brands, and in addition to meeting with overpoled electrolytic copper in the refinery, it has been the author's experience that tough-pitch ingots of electrolytic copper are the most difficult of all to produce on an experimental scale. Such copper, although never becoming red-short, is just as liable to become porous or to 'spew' after overpoling, as any other kind, and more liable than many kinds."

Although previously considered insoluble in sulphuric acid, even when boiling, it has been shown that platinum is actually soluble in it to a slight degree (*Brass World*, November, 1912) and that boiling sulphuric acid will dissolve appreciable amounts from the vessels in which it is heated.

COMPARISONS OF COST PER FOOT, MAMMOTH TUNNEL—BIWEEKLY PERIODS

Operation	One Heading		Two Headings		Average cost per foot
	Lowest June 11 to June 24	Highest June 25 to July 8	Lowest Oct. 1 to Oct. 14	Highest Nov. 26 to Dec. 9	
Drilling.....	\$4.780	\$13.765	\$5.519	\$6.409	\$6.109
Mucking.....	2.918	4.216	3.455	3.728	3.864
Timbering.....	0.121	0.257	.....	0.217	0.169
Piping.....	1.076	0.800	0.206	0.778	1.105
Explosives.....	4.047	8.276	3.614	3.841	4.000
Making drill tools.....	0.381	0.697	0.038	0.021	0.374
Repairing burleighs.....	0.392	0.862	0.281	0.403	0.377
Sharpening steel.....	0.164	0.513	0.162	0.165	0.271
Track and wiring.....	1.123	2.662	0.840	3.027	1.438
Electric lights.....	0.025	0.002	.....	0.020	0.064
Electric tramming.....	1.638	3.097	0.847	0.927	0.999
Repair cars and locomotive.....	.....	.....	0.115	0.153	0.260
Foreman.....	1.178	1.532	1.094	1.206	1.165
Superintendence, engineering and office.....	0.472	0.974	0.469	0.511	0.530
Widening tunnel.....	.....	.....	.....	.....	0.044
Total.....	\$18.315	\$37.653	\$16.640	\$21.406	\$20.769
Feet of advance.....	163	79	164	151	3008.5

shown in Fig. 6. The laying of track took from 2½ to 3 hr., and usually delayed the machine men from ¾ to 1¼ hr. Had the track been of a lighter weight, faster progress could have been made in the tunnel.

From Aug. 18 to Dec. 21 two headings were driven, but there was no increase in the working force. Two headings enabled the delay caused by waiting for smoke, and that due to setting up the bar, to be eliminated, and shortened the time per round from 1¼ to 1¾ hr. The rate of progress and the costs varied markedly, due to the extremely variable ground encountered.

A table of costs covering the entire period, as well as high and low periods, is given herewith. These include all labor and supplies used in the tunnel, together with cost of powder, repairs to equipment, first cost of equipment, and cost of supervision. A table is also given showing the average progress throughout, as well as by months.

tion of molten copper through the top crust of the ingot, is due to the escape of gases which excessive poling has introduced into the copper; either the action of these gases is neutralized, or their action into the molten copper opposed by antimony. The author rather prefers the latter explanation. This latter property is of value in the refining of tough copper, since there is nothing so trying in a refinery as a charge which has gone over pitch. Any impurity in the copper will check this tendency to go over pitch, is therefore welcome.

Arsenic is such an impurity, and the author has shown that antimony is another. A little antimony even in arsenical copper should be beneficial. Lead has been also recognized as having a similar influence, but lead is wholly undesirable in wrought copper. Of course, the addition of antimony is not without its danger. This lies in having too much present, and so masking the true pitch of the copper. That is, the copper is hot-

NEW PUBLICATIONS

OFFICIAL YEAR BOOK OF THE COMMONWEALTH OF AUSTRALIA, 1901-1911. G. H. Knibbs. 6½x9½, pp. 1275, illus., paper. Commonwealth Bureau of Census and Statistics, Melbourne, Australia.

MODERN MINE VALUATION. By M. Howard Burnham. 6¼x9, pp. 160; cloth, \$3.75. J. B. Lippincott Co., Philadelphia.

This book is dull and uninteresting, and does not add anything valuable to the literature of its subject. It is written in a laborious style, and is largely a reiteration of petty advice and trite commonplaces, supported by much arithmetic.

MODERN COPPER SMELTING. By Donald M. Levy. 6½x9; pp. 259, illus.; cloth, \$3.50. Charles Griffin & Co., Ltd., London; J. B. Lippincott Co., Philadelphia.

This book is based upon a series of lectures delivered at the University of Birmingham, and presents in a compact volume the various processes involved in the treatment of copper ore. The volume is excellent for its presentation of a comprehensive subject in such concise form, and it is most satisfactorily illustrated. The illustrations include the author's polychrome plates of the converter flame in its various stages; while these would not enable a student to "call" a copper charge, they nevertheless give him a more vivid conception of the converter-flame changes than he ordinarily gets. Some criticism may be made of the title selected for the book, both in its duplication of Doctor Peters' well known work and in its essentially ephemeral character. There are also some errors that might have been easily avoided, such as reference to the American Institution of Mining Engineers, Pierce-Smith (for Peirce-Smith) converters, and like most other British publications, it refers to Huntingdon-Heberlein and to Huntingdon mills. We do not understand the British objection to "t" in the name of Huntingdon.

MINERALOGY. By Alexander Hamilton Phillips. 5¾x9, pp. 639, illus.; \$3.75. The MacMillan Co.

DANA'S MANUAL OF MINERALOGY. Thirteenth Edition, Revised. By William E. Ford. 5x7½, pp. 479, illus.; \$2. John Wiley & Sons, New York.

Two new treatises on mineralogy have lately been published which may be reviewed in conjunction. Professor Phillips states the purpose of his book as follows:

The object of this book is to bring together for the beginner, in concise form and under one cover, the facts and basic principles of the several branches of mineralogy, unadulterated by an excess of data. It is, therefore, not a book of reference, but it takes the student along the various branches of the subject to a point from which, if he wishes to continue, he will be in a position to appreciate and to use the advanced literature and books on the subject.

This book is different from some other mineralogies in that it comprises all branches of the science, including crys-

tallography, descriptive mineralogy and determinative mineralogy. The section on crystallography is particularly full, amounting to 218 pp. It is a good exposition of its subject, but for the purposes of general treatise it might well have been condensed, we think. In the section on descriptive mineralogy such matters as the relation of minerals to the elements and the origin of minerals are taken up before the actual description of the species is begun. The section on determinative mineralogy is particularly good, comprising tables for the determination of the more common minerals by their physical properties and by their chemical tests; also a table for the determination of the principal rock-forming minerals in sections. Professor Phillips' book impresses us as being rather unbalanced, being too light on the side of descriptive mineralogy, and moreover conveys imperfect pictures in many cases. Thus, the pages devoted to sphalerite are distinctly unsatisfactory. We wish that the professors in colleges, when writing a scientific treatise, would carefully avoid references to commercial phases of their subject, which would not only save them much trouble and space, but also from falling into error. Thus, when Professor Phillips speaks of molybdenite ore as being valued at \$1.50 per lb. in the market he provokes a smile and similarly by other remarks elsewhere in his book.

Professor Ford's book is a rewriting of Dana's Manual, the fourth and last revision of which was published in 1887. With a desire of keeping the book up-to-date, Prof. Edward S. Dana asked Professor Ford to prepare a new and revised edition. Professor Ford found that it was desirable to rewrite the book, but he preserved the original scope and character as much as possible, except that the chapter on petrography was omitted. The book has been primarily designed to fill the ordinary needs of the elementary student of mineralogy, the mining engineer, the geologist, and anybody who may be interested in the subject.

Professor Ford, like Professor Phillips, gives a complete treatment of his subject, i.e., covering crystallography and both descriptive and determinative mineralogy. On the whole he made a better-balanced presentation. The section on crystallography is relatively brief and not too tiresome. The section on determinative mineralogy is fairly satisfactory, and that on descriptive mineralogy is better than in Professor Phillips' book. Professor Ford has the usual pedagogic tendency to make commercial references without a clear understanding of conditions, and occasionally is amusing in consequence thereof; for example, when he remarks that gold "ores are mined at a profit sometimes which contain only 0.001% of gold and yield but \$6 to the ton."

It is a pity that Professor Ford considered it advisable to encumber his pages by a chapter on mineral statistics, an abstract from the "Mineral Resources of the United States." On the whole, his work does not interest us any more than the manual that we used to use in our youth, even if it be 25 years old.

We wish that Professor Phillips and Professor Ford and all other mineralogists would adopt a new name for the hydro-silicate of zinc, and cease to perpetuate confusion by the adoption of a name that had a different commercial signification long before mineralogy became an exact science.

THE DESIGN OF MINE STRUCTURES. By Milo S. Ketchum. 5x8 in., cloth; 459 pp. and 250 illus. \$4. McGraw-Hill Book Co., New York.

This volume explains the application of scientific methods to the solution of a class of problems which have, until recently, often been solved by rule of thumb, or by copying some other company's structures. Of course, designing engineers have long employed the principles of graphic statics in the several branches of their profession, but this book is the first that has come to our notice dealing in that manner with the special types of structures employed at mines, headframes and tipples, mill buildings and coal breakers, ore bins and rock houses. It is a particularly valuable book for mining students, containing as it does a wide variety of the kind of instruction that is usually given by lectures and wall diagrams. The illustrations and diagrams are excellent, and bear evidence of much painstaking labor.

The first two chapters describe in a general way the structures and appliances required for hoisting. Chapter III shows the graphic method for computing stresses due to live, dead and wind loads in a simple headframe of the A-pattern, in which the stresses in all members are determinate. Chapters IV and V apply the same method to the four-post frame, in which, owing to redundant members, not all stresses are determinate; here the theory of least work has to be invoked. Chapter VI applies the knowledge of stresses gained in the preceding chapters to the actual design of a headframe, in all its parts; it then proceeds to display numerous examples, illustrated by working drawings, of headframes and rock houses in all parts of the country. It is to be regretted that in this connection only one specimen of a wooden frame is exhibited. Chapter VII gives working drawings of a number of coal tipples.

Chapters VIII and IX discuss first the stresses and then the design of steel-framed and truss-roofed buildings. Much of this is similar to the same author's earlier book on steel mill buildings. Chapter X applies the principles of the

retaining-wall to the determination of stresses in bins and works out a clear solution of this difficult problem. The selection of types of actual bin designs, however, is neither complete nor widely representative. Chapters XI and XII deal with coal washeries and breakers, and XIII with a few selected types of structures for other purposes.

Chapter XIV gives information concerning details of construction practice, dimensions and weights of steel, rivet data, etc., without, however, wasting space to reproduce tables which are easily available in the handbooks issued by the steel companies. Chapter XV is devoted to the cost of steel, of its fabrication, erection and painting, and is a valuable fund of information not usually easy to get; this chapter will be welcomed especially by students. Of course, prices are subject to change without notice, but the costs are stated in such a way as to be of great assistance. Appendix I contains specifications for the erection of steel buildings and mine structures, while appendix II relates in the same way to reinforced concrete.

HANDBOOK OF MINING DETAILS. Compiled from the Engineering and Mining Journal by the editorial staff. 6x9, pp. 372, illus.; \$4. McGraw-Hill Book Co., New York.

It is recorded that when Oliver Goldsmith started in Bohemian fashion to travel afoot through Europe, Doctor Johnson said of him that he was capable of traversing the entire continent and bringing home only the description of a wheelbarrow. Taking a wheelbarrow as the representative of those homely details of apparatus or practice which scientists and historians regard as beneath their notice, we can safely say that the dogmatic old doctor was clearly wrong in his depreciation of its importance. In that sense, "descriptions of wheelbarrows," past or present, are often the very things we seek most ardently and find it hardest to discover. This is true, not only in historical research, but also in technical practice. Our professional treatises often necessarily omit the details which we need to know, in order to apply their general instructions; and hints of practice, innumerable and invaluable, are lost in the confusion of periodical publications or professional "transactions." One great improvement has come since Doctor Johnson's dictum ruled the literary world: there is now an abundance of Oliver Goldsmiths, who note and describe particulars; and one may be almost certain, concerning a given bit of such information, that it exists somewhere in print. Indeed, one sometimes remembers having seen it "somewhere." But the need of it is usually immediate and imperative, while the search for it would be long and desperate.

To meet this situation, almost anything is better than nothing. Indexes, summaries, etc., abound and increase; and their number is proof of the demand which they aim to satisfy. Some books of this class are nothing more than indexed scrap-books, containing a mass of indiscriminate and unclassified material. Even these have often an unexpected value. But a greater boon is conferred upon the modern student when some competent critic sifts and arranges such a crude mass, and gives to him the trustworthy and useful part of it in such form as will not only serve his convenience, but also assist his judgment.

The editorial office of the ENGINEERING AND MINING JOURNAL has issued, from time to time, volumes of this character, containing the articles upon given subjects which have appeared in its columns. The present work belongs in that class, and I think it possesses some elements of peculiar excellence.

In the first place, Mr. Ingalls, since he became the editor of the JOURNAL, has realized a dream of my own, which remained a dream during my editorial régime, because, in those days, there was no means to make it more. He has sought, as I did, not merely to make the JOURNAL a scientific and professional organ, but also to render it useful to the great multitude of practitioners, educated or uneducated, who could derive benefit from practical suggestions of any kind. My great difficulty was, that I had to depend, in this field, upon voluntary contributions, which were not always either entirely accurate or entirely disinterested. Mr. Ingalls, pursuing the same ideal with ampler means, has employed expert observers to collect such items of practice as were really worth collecting, and therefore his material passed one critical sifting before he had to deal with it at all.

The book is arranged under the general headings: Explosions; Rock Drills; Shaft Work; Driving Adits and Drifts; Stopping; Headframes, Chutes, Pockets, etc.; Hoisting and Transportation; Skips, Cages, Cars and Buckets; Safety Appliances for Hoisting and Trimming; Pumping and Drainage; Ventilation and Compressed Air. Some of these chapters are almost complete pictures of modern practice; but the book as a whole does not profess to be that. Mr. Ingalls himself describes it as "a more or less modern collection of useful information, being just what passes through the pages of the ENGINEERING AND MINING JOURNAL in the course of a few years." The reader, in turning its pages, feels as if he were chatting with some well informed expert, who has traveled recently all over the country, and who remarks as to this or that problem of mining practice, "Speaking of so-and-so, let me tell you what I saw the other day, which struck me as a good thing in that line."

There is a preliminary chapter, entitled General Notes, and comprising miscellaneous items which do not belong in either of the others. This has proved to me the most fascinating of all. To take as a sample the passage which is apparently (though not really) the most remote from mining—I was delighted to find in it the description, by my old friend and field companion, W. H. Storms, of the "diamond hitch," that wonder of human ingenuity and skill, whereby Man establishes his supremacy over Horse and Mule. The diamond hitch was to primitive desert and mountain transportation what couplings and brakes are to railroading. Thirty-odd years ago, I knew all about it, and practiced it with success upon the most tricky and refractory pack animals; and I have casually mentioned it with a knowing air, ever since. Yet, the other day, I awoke with a start to realize that I had forgotten how to do it, and that my easy assumption of knowledge was a bluff that any tenderfoot might safely call. Now, thanks to Messrs. Ingalls and Storms, my self-respect is again invulnerable on that point! I have traversed more than once in a Pullman car the scenes where once I corded my baggage with the diamond hitch; and I shall probably never again make use of it; but I am sure it will be, for another generation, one of the things essential to explorers—and every mining engineer is likely to be at some time or other, an explorer. I heartily applaud, therefore, this "description of a wheelbarrow."

It would be unfair, however, to give the impression that this book contains chiefly accounts of such picturesque collateral things. On the contrary, it describes many machines and operations directly connected with mining. But I must confess that I have here given its effect upon me personally, rather than a cold and impartial judgment of it, as a contribution to technical literature. To me, it has been remarkably fascinating. I have found in it, not what I expected, but what I did not expect, yet consciously or unconsciously needed and desired; and I am inclined to think that any mining engineer who turns over its pages will be entertained and stimulated as he reads, and will be likely, at some point, to come upon an enlightening and helpful suggestion, "worth the whole price of admission." In smaller degree, one derives similar benefit from glancing over the weekly numbers of a good technical periodical. But this is a condensed ENGINEERING AND MINING JOURNAL, from which the things to be skipped have been kindly removed, and the interesting things have been so grouped as to become still more interesting. A mining engineer could doubtless do without it; but he could do much more with it—and have a good time besides!

R. W. RAYMOND.

PERSONALS

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

There is a vacancy in a junior position on the editorial staff of the JOURNAL. Applicants are requested to call in person.

L. Vogelstein has returned from Europe.

C. R. Corning sailed for Europe on Dec. 14.

Kirby Thomas was in Canada last week on professional business.

Harley A. Sill, of Los Angeles, is at Tumco, Calif., examining mines.

J. Parke Channing returned this week from Europe on the "Lusitania."

Baron von der Ropp has returned to New York after having been in California several weeks.

M. C. H. Little has been appointed superintendent of the Calumet Metals Co., at Larawls, Quebec.

M. S. Griffiths is underground mine foreman of the Ojuela mine, Mapimi, Durango, Mexico.

Sydney H. Ball left New York Dec. 12 for Belgium, and expects to remain abroad until March.

P. J. Kennedy, assistant superintendent of the Treadwell mine, Alaska, has been visiting San Francisco.

Frank M. Estes has returned to the City of Mexico, where his headquarters are at 525 Mutual Building.

B. F. Noehl has returned to Los Angeles, Calif., after completing examinations in Arizona and Nevada.

H. C. Hoover left New York for San Francisco on Dec. 12. He expects to be back in New York by the end of December.

T. Allison, of Galt, Ont., has accepted the position of manager of the Black Lake Consolidated Asbestos Co., at Black Lake, Quebec.

Harold C. E. Spence has returned to Montreal from an extended tour of Newfoundland, where he examined large mineral areas.

W. B. Buckminster, of Boston, principal owner of the Harvard mine, in Tuolumne County, Calif., visited Jamestown in November.

W. L. Cumings, of Bethlehem, Penn., has returned from a five months' trip along the west coast of Mexico and the west coast of South America.

John G. Berquist, works manager of the Universal Portland Cement Co., has resigned that position. He will hereafter act in the capacity of consulting engineer.

J. B. Goodhue, of Quebec, vice-president of the Craig and the Globe Consolidated Mining companies, in Trinity

County, Calif., has been in San Francisco.

H. C. Hurd has resigned from the employ of the Nevada-California Power Co. and will go to Spain as engineer for an irrigation plant, operated by an English corporation.

E. S. Sheffield has resigned as superintendent of the Empire and Pennsylvania mines, in Nevada County, Calif. The position will be filled by George W. Starr, of Grass Valley.

James V. Peterka has been appointed chief mechanical engineer of the Indiana Harbor works of the Inland Steel Co., Indiana Harbor, Ind. He will be assisted by Ole Stenbakken, construction engineer; Benjamin Burrell, master mechanic; Frank Warner, assistant master mechanic.

Earl D. Blowers, formerly with the Natomas Consolidated and other W. P. Hammon interests, left San Francisco, on Dec. 4, for Siberia, as superintendent of drilling operations on placer lands to be prospected by Scott & Wiltsee. A Keystone drill will be employed. The drillers will be outfitted in London.

Dr. Alfred L. Thompson, member of the Canadian Parliament, Yukon district, stopped at San Francisco on his way from Dawson to Ottawa, and visited the Panama-Pacific Exposition site. He stated that the Yukon exhibit of the exposition will embrace specimens of all the minerals of the Canadian-Yukon, with a collection of prehistoric relics.

OBITUARY

Frederick S. Bagley died at Denver, Colo., Dec. 7, aged 60 years. He had been in Colorado since 1870 and a resident of Denver for 30 years. He was largely interested in mines in Colorado, Idaho and Mexico.

E. F. Daly died at Tulsa, Okla., Dec. 9, aged 50 years. He was born in Washington County, Penn., and for nearly 25 years was an oil operator and oil-well contractor in western Pennsylvania. He went to Oklahoma in 1909 and engaged in the oil business there.

Capt. W. C. Rose, of San Francisco, died in New York, Dec. 11, aged 49 years. He was a mining engineer and had lived in California for a number of years. He was connected with several different mines in California and Nevada.

Humphreys Miller died at Warren, Penn., Dec. 11, aged 52 years. He was born in Pittsburgh, and at early age entered the iron trade. He was connected with the Keystone Rolling Mill Co., and later with the Pittsburgh Forge & Iron Co. In 1897 he went into business for himself as an iron broker, and was one of the best known men in the trade.

J. M. Bruck died at Houston, Tex., Dec. 11, aged 56 years. He was born at

Kingston, N. Y., and for a number of years was connected with various oil and gas companies. About five years ago he went to Texas and had since been engaged in experimental and practical work in the manufacture of various products from petroleum. He was president of the Bruck Solidified Oil Co., of Houston.

D. D. Demarest, founder of the D. D. Demarest Co., manufacturers of mining machinery, with shops at Altaville, Calif., and offices at San Francisco, died at Berkeley, Nov. 22. He was 88 years old, and was born in Bergen, N. J. He went to California in 1849, and mined for 10 years, when he engaged in supplying water to the mines in Angels Camp and other mining sections in Calaveras County. In 1861 he established the Angels Iron Works, at Altaville, and conducted the business personally for nearly 40 years, when he was succeeded by his son Clarence D. Demarest. He resided in Calaveras County about 60 years.

Societies and Technical Schools

University of Wisconsin—This institution is now giving instruction by correspondence in many engineering studies; also in a number of other subjects of importance to engineers, such as mathematics, chemistry, geology and mineralogy. These courses include subjects which are usually given chiefly by lectures and recitations and others which are largely laboratory work. Recently a course has been added in microscopic petrography, given by Professor Winchell. In connection with work in mineralogy and economic geology as previously given, this should be of special value to mining engineers and others interested in rocks, minerals and ores. University credit may be obtained for many of these courses by properly qualified students. Full information may be obtained by addressing the Extension Division of the University of Wisconsin, Madison, Wisconsin.

American Society of Mechanical Engineers—The officers elected at the recent annual meeting were: President, W. F. M. Goss; vice-presidents, James Hartness, I. E. Moulthrop, H. G. Stott; managers, W. B. Jackson, H. M. Leland, Alfred Noble; treasurer, William H. Wiley. Dr. Goss, the new president, was born in Massachusetts and studied at the Massachusetts Institute of Technology, Wabash University and the University of Illinois. He organized the department of practical mechanics at Purdue University in 1879, and was professor of experimental engineering, dean of the school of engineering and director of the experimental laboratory of that institution from 1890 to 1907, giving special attention to the testing of locomotives. Since 1907 he has been dean of the College of Engineering of the University of Illinois.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Dec. 12—The attitude of the sixteenth annual convention of the California Miners Association respecting the policy of the Department of the Interior in the withdrawal of mineral lands and the use of the waters of unnavigable streams will no doubt be accepted by the Prospectors Alliance of America, recently organized at Bishop, Inyo County. There is no doubt that the members of the alliance have been greatly hampered by the methods of the agents of the department, but they are not greater sufferers than other mining men who are less radical in their demands for restoration of sane conditions. The warning recently issued by the alliance recommending to its members that they decline to give information to federal bureau officials, and to exclude physically such officials from entry into shafts and tunnels, will only work a hardship upon themselves, and render the conservative and wiser effort toward the desired end more difficult. Miners and prospectors, whether of the alliance or members of the miners' association, will find their remedy, if at all, through legitimate and legislative channels and by sane and conservative methods indorsed by the entire community of mining men. It is the purpose of the California Miners Association, to ask the governor and the legislature to assist in guarding the interests of the miners and it makes no untoward attack upon the officials or the department, and its members will not in any way seek to prevent the officials of the department from carrying out the instructions of their chiefs, who are acting under the law, even if they may be exceeding their discretionary powers. The violent policy of the Prospectors Alliance will gain nothing but the ill will of the officials of the government and retard the progress of the California Miners Association. A representative of the alliance had his say in the convention, and to the credit of the better element in the alliance he presented the case of the prospectors without the least show of animosity which is apparent in the literature of the alliance.

Denver

Dec. 13—The fact that the supreme court of the state has ordered the Colorado & Southern Ry. to reopen and operate its line between Denver and Leadville, may be regarded as important to the mining industry. The South Park

division, or that portion of the line between Como and Breckenridge has been closed for three years, the company claiming that the business was not great enough to justify its operation. In the opinion of the court, the duty of the railroads is to give the public service and they have no right to pick out a single branch of the system and refuse to operate it at a loss, when the system as a whole is paying handsome dividends, as the Colorado & Southern has for years. The case probably will be taken to the United States Supreme Court if a rehearing is not granted. The officials of the road believe that a federal question is involved inasmuch as the Interstate Commerce Commission holds that any line carrying interstate business even if its cars do not cross the state line is an interstate carrier. In the opinion written by Justice Gabbert, the power of the state railroad commission to control and regulate the railroads of the state is affirmed and all question of the constitutionality of that body is dispelled.

Governor-elect E. M. Ammons promises to be active in his efforts in behalf of the mining industry of the state, and will, it is expected, in his first message to the legislature recommend laws to be enacted for its benefit. He has named some prominent mining engineers to act as a commission to make suggestions for his guidance.

Butte

Dec. 11—As improvements demanding a greater supply of water are added to the Washoe smeltery at Anaconda the supply from Warm Springs Creek is being found inadequate during certain seasons of the year. Recently one section of the concentrator building was remodeled and the new system, which requires the use of much more water than formerly, has been found so effective that it is probable that the remainder of the plant will soon be transformed in like manner. Several years ago borings to bedrock were made to determine underground water conditions in Warm Springs Cañon. It was ascertained that the largest part of the water supply escaped under the surface, the greatest flow being found at a depth of about 50 ft. For the purpose of adding to the supply for the smeltery the management has decided to make use of this information, and a force of 24 men is now engaged in sinking an 8x16-ft. shaft to intercept the subterranean flow. A depth of 20 ft. has already been

reached, and when 50 ft., or whatever necessary depth, has been attained, a 7000-gal. electrically operated centrifugal pump will be installed, and the flow will be pumped into the flume now conveying the water from Warm Springs Creek to the smeltery. During the high-water period the supply will be sufficient without additional pumping, but during low water, particularly in March and April, the pumps will be operated steadily.

A short time ago the Anaconda company installed what is known as the "rustling-card" system. It is required that all laborers about to enter the employ of the company be provided with a card containing the history in writing of the individual; name, time, nature and place of previous employment, etc. The object of this is to more thoroughly familiarize the company with its employees, and to provide a more efficient method of keeping the time books. With the system in use it will be necessary for a prospective employee to provide himself with one of these cards in order to obtain work from the foreman of the mine where he may be looking for work, or "rustling" as it is called. In the case of miners newly arrived in the city, cards can be obtained at the clerical office. As was anticipated the innovation at once met with some opposition, and for the purpose of deciding the matter, a meeting of the local miners' union was held, Dec. 10. After a stormy session between the radical and conservative elements, the latter achieved a partial victory in causing the settlement of the question to be left to the future decision of the executive board of the Western Federation of Miners, the parent body of the Butte union. The matter is now resting pending this decision.

Salt Lake City

Dec. 12—The American Ozokerite Co. is developing claims covering ozokerite deposits about 100 miles southeast of Salt Lake City, partly in Wasatch and partly in Utah County. The deposits are found along the southern and western slope of the Wasatch range, over an area up to two miles wide and about 12 miles long, from west to southeast in a general direction, beginning one mile west of Media, and extending to within two miles of Colton on the southeast. The claims, patented and unpatented, comprise an area of about 1500 acres, practically paralleling the Denver & Rio Grande R.R. The mineral wax occurs in fissures cross

ing a large fault extending throughout the entire length of the ozokerite zone, and the veins range from two to 30 ft. in width, carrying, with high-grade and low-grade material, an average of 3% wax. The deposits open up more extensively with deeper mining. So far, the claims have not been sufficiently developed to make possible an estimate of their probable productivity. The total area is, however, greatly in excess of that of the only other known field, the Austrian field, which has a production valued at \$80,000,000. The geological conditions here and on the Austrian properties are practically identical. The company has a new 100-ton mill capable of treating ore carrying as little as ½% wax.

Negaunee, Mich.

Dec. 12—The last of an ambitious, but unsuccessful scheme to strip iron-ore lands was marked by the recent sale of the apparatus for scrap iron. The so called "grab" system was given a try-out several years ago by the Jones & Laughlin Ore Co. at its Grant mine on the Mesaba range. Two large steel towers, moved on tracks, were used, one on each side of the pit. They were connected by steel cables on which a grab-bucket was hung. The bucket when lowered to the ground was expected to grab up a load of earth and convey it to the sides of the pit where it was to drop the load into cars. The system did not work out well in practice, as breakdowns occurred at frequent intervals.

The Verona Mining Co., a subsidiary of Pickands, Mather & Co., operating the Caspian, Baltic, Fogarty and Bengal mines, in the Iron River district, has established a commendable practice of encouraging flower and vegetable gardens and well kept lawns at its mines. On Thanksgiving Day, there was a gathering in the company's club house for the distribution of prizes. In each of the table gardens and lawns, there were three table gardens and lawns there were three prizes. \$15, \$10 and \$5. It was announced that in the Baltic location vegetables were grown last summer aggregating \$1100 in value, or \$30 per yard on an average; in the Caspian location the value was \$1550, or \$25 per yard.

Cobalt

Dec. 14—Sir Henry Pellatt, president of the Cobalt Lake Mining Co., has notified the shareholders that he has entered into an agreement with an English syndicate whereby he has granted them an option on his 1,000,000 shares of stock. He stated that the shareholders will be given an opportunity to join in the agreement and advises them to follow his example and accept the offer. The details of the offer have not been made public, but the purchasing syndicate will pay 20% of the purchase price

in cash, the balance to be paid in certain fixed percentages and at fixed prices from time to time, spread over a period of a little more than one year. The intention of the syndicate is to incorporate a company in England and market the shares in London.

Sir Henry stated that he had estimated with care the position of the Cobalt Lake in comparison with other properties and had come to the conclusion that the offer was not only fair as to price and terms, but that it was highly advantageous to the shareholders. A meeting will be held, Dec. 20, when the shareholders will have the opportunity of considering this matter. Those who are satisfied with the prices and terms can hand over their shares to be dealt with under the agreement. Those who prefer that matters should remain as they are, can retain their shares and hold them as shareholders of the Canadian Cobalt Lake Mining Co.

Porcupine

Dec. 14—The strike situation remains practically unchanged, with the Dome and the Hollinger working at nearly full force, while practically all the other mines are closed down. While the union has not succeeded in stopping work at the two largest properties, it has been fairly successful in keeping good miners away from the camp. Although the mills are being kept in operation, the shortage of experienced miners is proving a serious handicap. It is likely that the situation will remain unchanged for some time.

Chihuahua

Dec. 6—Operations throughout the State of Chihuahua for the last three weeks have been and are just now hampered by shortage of fuel and ore-cars. The fuel shortage is affecting not only the mines and metallurgical works, but the railroads as well.

During the latter part of November the Chihuahua smeltery of the American Smelting & Refining Co. shut down all of its furnaces two days, and at this writing is on the verge of another and longer shutdown. Local industries, such as the foundry and electric-light plant are also in a precarious condition and the Northwestern Ry. Co., operating west, is running trains only irregularly on account of no coal. Wood is largely being used in the locomotives. The Rio Tinto smeltery at Terrazas has a fuel supply sufficient for about 30 days, as have the mines of Santa Eulalia, while the smelteries at Torreón, Velardeña and Mapimí have ample fuel for from 30 to 60 days, the absence of a reserve stock is causing some uneasiness. This fuel shortage is readily explained. The railroad lines north have been, until quite recently, out of commission for several

months and hence no supply could be obtained from the United States. The output of the Mexican coal fields in the State of Coahuila has been greatly decreased during the last few months on account of revolutionary activities. Some of the large mines have been shut down and are now unable to reopen on account of scarcity of miners.

The shortage of ore cars is most serious on the line of the Mexico Northwestern Ry. and unless relief is shortly afforded, it is probable that a number of important shippers, notably in the Cusi-huiriacic camp may be compelled to close down. This shortage is due partly to the destructive work of the revolutionary and robber bands and to the inability to move cars south from the Juarez division of the line.

No reports have come in recently of further molestation of foreign interests by the roving rebel bands, although it is the general belief that American mining companies in particular may as well as be prepared to pay forced contributions. This belief is based upon the frank statement of the leaders of these bands which are, that inasmuch as American hostility (such as preventing importation of arms and ammunition) occasioned the failure of the recent revolutionary movement, the Americans in Mexico must pay. Whether or not this is an unanimous concerted action on the part of the revolutionists it is impossible now to state definitely. In any event American interests of all kinds have been less respected since the downfall of the Orozcista revolutionists.

Jena, Germany

Dec. 2—The draft of the bill proposing to create a monopoly of the sale of illuminating oil in the German Empire has at last been made public by the official organ of the government. The bill has been approved by the federal council and will be laid before the Reichstag to decide whether it will become a law or not. It is hard to predict the outcome of the decision. In the meantime the newspaper war between the Standard Oil Co. and the Deutsche Erdöl A.-G. (Deutsche Bank) is going on with unabated vehemence.

The suit of the Standard Oil Co. against the German Petroleum Selling Association (Deutsche Bank) for breach of contract, has been decided in favor of the former by the appellate court at Hamburg, as far as the validity of the contract between the two companies is concerned. The decision does not enter into the question of whether or not the Deutsche Bank was justified in breaking the contract on account of the obnoxious clauses which the court declares invalid as contrary to existing laws. The case is going now on appeal to the supreme tribunal at Leipzig for final adjudication.

The Mining News

The Current History of Mining

Alaska

Alaska Gold Mines Co.—The Perseverance stamp mill, four miles up the Silver Bow Basin, was destroyed by fire, Dec. 3. The mine force of 150 men was able to save the powder house and adjoining buildings. The mill, which was an experimental one, will not be rebuilt.

Rhoads-Hall—This mine, on Bedrock Creek, is producing steadily. About 30 men are employed in mine and mill. Ore to supply the mill is being taken from the stopes above the working adit. The winze has been sunk 115 ft. below the adit, giving it a depth from the surface of about 290 ft. At the 100-ft. level of the winze a station has been cut and driving is in progress. A good shoot of ore has been found in the west drift.

Chatham Mining Co.—This company, composed of Fairbanks men, has enough ore of a good grade developed to keep the four-stamp mill busy for a year. At present the ore is hauled from the mine to the mill by horses, but it is probable that an aerial tram will be installed before long. At the mine, stoping and driving are in progress.

Homestake—Owing to bad air at the face, the work of driving the main adit was suspended during the summer. A gasoline-driven suction fan has been installed and driving has been resumed. The adit is now in a distance of 650 ft. and is expected soon to cut the vein shown on the surface. During the summer some work was done on the rich stringer cut by the adit about a year ago. At a distance of 100 ft. from the adit, the stringer has widened to 10 in. of good ore.

Teddy R.—This claim, adjoining the Helen S., on which Cutes & Feldman are developing a rich vein, has been bonded to George Wheeler, of Ester, for \$100,000. A shaft will be sunk to develop the same vein shown in the Helen S., which has been traced across the Teddy R. for 500 feet.

Reliance Mining Co.—A two-stamp Joshua Hedy mill is being erected by Spalding & Letterman, who have the Soo claim of the Reliance Mining Co. under lease. The lessees have been operating the Fairbanks-built mill of three 250-lb. stamps during the summer when there was water. The ore crushed has averaged about \$400 per ton. The new mill will be on Dome Creek, below the mine,

and it is planned to run it continuously on low-grade ore. Martin Hanais has taken a lease on 500 ft. of the Waterbury claim, which adjoins the Soo. A 100-ft. shaft on the ground is said to show three feet of \$25 ore.

Pioneer Mining Co.—The five-stamp mill on this property was started Nov. 3. The first ore to be crushed was taken from the Gladstone vein of the Jupiter-Mars claim, which is under lease to Willis, Giske, Larson & Rodsett. A 100-ft. shaft has been sunk and 150 ft. of tunnels driven. Five stopes have been opened, from which the lessees expect to keep the mill busy.

Arizona

MARICOPA COUNTY

Ghost—Quartz containing much free gold has recently been found on this claim in the Picacho district. The quartz containing the gold is 5 or 6 in. wide. The property is owned by Harry J. Bennett.

Red Rover—Shipments of high-grade silver and copper ore continue to be made from this mine, near Phoenix. The mine is nearly 60 miles from the railroad and only the high-grade ore can be shipped at present.

Vulture—The mill at this mine, near Wickenburg, is now running full time since an abundant supply of water has been obtained from wells which were drilled near the mine. Regular shipments of concentrates are made from Wickenburg. The underground workings are being surveyed and development work continues. A large shoot of sulphide ore has recently been discovered below the old workings.

MOHAVE COUNTY

Pinkham—A bond on this property has been given to Charles Qualey and L. A. Dockery. It is expected that the shaft will be sunk to greater depth and that the 250-ft. level will be opened.

Rainbow—It is reported that the railroad extension to the Rainbow and Tennessee mines at Chloride is nearly completed.

Telluride Mining Co.—The property held by this company is an extension of the Tom Reed and has recently been equipped with a 40-hp. double electric hoist, a blower, blacksmith and machine shops and several houses for the employees. The sinking of the shaft, which was discontinued at a depth of 90 ft.

pending the installation of the hoist, was resumed a few days ago. J. E. Rose is president.

Oro Plata—At a recent meeting of the stockholders a deal was made with O. B. Stanton whereby the latter is to assume the management of the property and raise funds for its development and initial operation.

Distaff—Harry Blackwell and associates have a lease on this old mine at Chloride. The winze from the tunnel level has reached a depth of 200 ft. and drifts are being driven on the vein. There is about a carload of ore on the dump ready for shipment. Several tons of the ore recovered during the sinking of the winze was jigged and the concentrates assayed about \$200 per ton in gold and silver.

C. O. D.—This property has been bonded to Salt Lake City men and it is expected that work will be started on the property this month.

Alexander—An examination of this group of claims, near Mineral Park, held by James Dundon was recently made by R. P. Wheelock.

Union Pass—A promising discovery of a large gold-bearing vein was recently made near the summit of the Blue Ridge range, south of Union Pass, by Mike Coleman.

Ruth—It is reported that the drift near the bottom of the shaft has broken into ore, the position of which is indicative that it is the lower extension of the shoot encountered in the upper workings of the mine.

San Francisco—A rich strike was recently made on the 700-ft. level of this property. The ore streak encountered varies in width from 2 or 3 to 14 in. and some samples assay over \$2000 per ton in gold. The ore also carries silver, lead, copper and some zinc. The drift has been driven along the vein for 30 ft. A compressor is *en route* to the property and as soon as it is installed the development work will be expedited. J. C. Goulding is in charge.

SANTA CRUZ COUNTY

Switzerland Group—This property is not under bond to Woodworth & Lane, as has been inferred from an item in the JOURNAL of Nov. 30. James Partridge, Dr. Noon and associates, sold the Austerlitz property to those men, but the adjoining Switzerland claims have not yet been sold or optioned.

California

AMADOR COUNTY

Hardenburg—The concrete foundations and the frame of the building for the new 20-stamp mill are completed; N. S. Kelsey, of Jackson, superintendent.

Bunker Hill—The new steel headframe is completed and in operation. The cleanup at the mill for November was greater than for the preceding month; E. Hampton, of Amador City, superintendent.

Plymouth Consolidated—At the Pacific shaft, 30 men are employed. Only two shifts are worked at present, while the work of continued exploration of the lower levels is in progress; J. F. Parks, of Plymouth, superintendent.

Fremont—A new steel headframe is being built at the mine near Drytown. There are two wooden hoists in operation, one of which will be dismantled when the new one is ready for operation; W. Palmer, of Drytown, superintendent.

CALAVERAS COUNTY

Calaveras Copper Co.—Twelve teams of 14 animals are hauling ore from the mine at Copperopolis to the railroad at Milton. Ground is being prepared for grain growing and vegetable garden on company lands for supplying the stables and the boarding house. The use of auto trucks for hauling ore, it is understood, will be resumed in the summer when the roads are in condition; J. H. Trerise, manager.

Reiner—The surface equipment of this gravel mine at Altaville was destroyed by fire on Dec. 7. The loss included the mill and pump house, and the damage is estimated at \$75,000; John C. Benson, of Stockton, president.

HUMBOLDT COUNTY

W. H. Holcomb has been employed by N. C. Halliday, of Eureka, to make surveys for pipe line and mill site at or near Bonnaville, for the development of the recently located gold-mining claims on Willow Creek.

Red Cap Mining Co.—This mine, 80 miles northeast of Eureka, is developed by two tunnels, 275 and 75 ft. long; 75 tons of ore is in the bins ready for reduction. The surface equipment includes a crusher and concentrator. The ore is high grade; C. W. Hayden, of Eureka, president.

Horse Mountain Copper Mining Co.—A statement has been issued by the president, David Wilson, regarding the underground development and surface equipment. Six tunnels, aggregating 1500 ft., have been driven, the longer being 450 ft. and 500 ft. The surface equipment includes a 50-ton concentrating mill, costing \$12,000; a wagon road 10 miles long, costing \$10,000; necessary buildings, horses, wagons, sawmill, the cost of which is not stated. The money has all

been secured by the sale of stock. The concentrating mill has not been started, but it is expected to be ready for operation during the winter. The concentrates will be shipped to the Tacoma smeltery.

Delhi Mining Co.—About one-fifth of the five-mile flume to carry water from Bloody Run to the mine has been completed under contract. The company will complete the flume. The flume and ditch will be completed in the spring of 1913. Sufficient water will be obtained for the generation of electric power. The mine is near Columbia.

Golden Gate—W. P. Martin has resigned, and E. R. Henick, of San Francisco, has been appointed superintendent. A large amount of money has been spent in development, and it is the purpose of the owners to continue development work.

INYO COUNTY

Railroad engineers are reported to be surveying a line between Searles and Borax Lake. The distance is 20 miles across desert land. Searles is on the Southern Pacific R.R., 15 miles north of Bakersfield. The Borax Lake lands are said to contain potash deposits, also borax and other like minerals. The ownership and operation have been in dispute and litigation for some time. It is reported that a settlement is about to be reached; Foreign Mines Development Co., owner.

KERN COUNTY

Potash is reported to have been shown at China Borax Lake by investigations made by Edward Teagle and Charles Churchill who have extensive holdings in the lands north of Randsburg.

A discovery of wolframite is reported about 25 miles west of Randsburg, in Jawbone Cañon. The vein is said to be small, and it is considered an unusual find, as the tungsten in the vicinity of Randsburg and Atolia is found as scheelite.

Colorado

CLEAR CREEK COUNTY

Pioneer—This property, at Empire, is being provided with a concentrating mill to treat low-grade ores. The structure is rapidly nearing completion; Sherman L. Work, manager.

Castle Rock—This property, in the Freeland district, is being systematically developed by R. D. Blair.

Stanley—During November the fifth-level-west heading was advanced 129 ft. to a total length of 1699 ft. from the main shaft. The vein is 2½ ft. wide.

Gem—During November, lessees Shaffer and King produced 1000 tons of \$15 ore.

West Bellman—This property has been leased to Galligan & Co., who have com-

menced sinking a shaft on the vein from the Central tunnel level.

Lamartine—The development and operation of this property will be resumed in the near future. George K. Kimball has recently been appointed manager.

LAKE COUNTY-LEADVILLE

Large shoots of iron-silver ore have been opened on Carbonate Hill, as well as zinc-carbonate ores and occasionally veins of lead ore though the bulk of the lead carbonates has been extracted. From the Stars Consolidated properties about 5000 tons per month of different classes of ore continue to be shipped, principally from the lower and middle part of the hill, while in the upper portions are the big zinc-carbonate ore-bodies of the Wolfstone Castle vein and others.

It is now stated that the Leadville district mill in lower California Gulch, which changed hands lately, has been supplied with crushers, tables, and magnetic separators and as soon as contracts have been signed with owners of low-grade sulphide ores, it will be started at 100 tons daily capacity. The new owners of the American zinc-extraction mill, better known as the Yak mill, are expected to start with their new process shortly and treat 200 tons per day.

Yankee Doodle—The drifts from the shaft having been cleaned out and repaired, the lessees are now able to get at the lead-oxide ore, from which shipments were originally made through the shaft.

Amie—It is reported that the lessees have opened a big shoot of siliceous ore at the 200 level and will start shipments at once.

Little Giant—This mine, on Carbonate Hill, is employing 14 men and producing about 25 tons per diem of iron ore. There is also zinc-carbonate ore in the mine but test shipments show under 18%, which is too low for profit.

Boston—This mine, in Mayflower Gulch, Ten Mile district, opened ore lately and development now shows it to be 40 ft. wide and about 4 ft. thick, containing gold, silver and lead; 30 men are employed.

TELLER COUNTY-CRIPPLE CREEK

On Dec. 1 the deep-drainage tunnel showed an average flow of 8650 gal. per min. The recession in the Gold Coin shaft at the east end of the district was 4 ft. 9 in. for November and in the Mary McKinney and Elkton, which are nearest the tunnel, about 8 ft. for the same period; total recession since drainage through this tunnel commenced about 200 feet.

Vindicator—The output of this Bull Hill mine for November is estimated at 100 carloads, 60 of which ran about \$35 per ton and 40 about \$25 per ton.

Ajax—It is stated that the Colburn-Clancy mill on Battle Mountain is treating 78 tons of dump ore per day, averaging \$3.25 per ton. From the mine, of which A. E. Colburn is owner, the output for November was 40 carloads of \$25 ore.

Elkton—The November production was 2500 tons, carrying about 1 oz. gold per ton. This came from the 10th and 11th levels rendered accessible by the water recession.

Idaho

IDAHO COUNTY

South Fork—A new strike of high-grade ore was made recently in a new tunnel on the upper part of the property. The vein is six feet wide.

American Eagle—The raise connecting the tunnel level with the surface has been completed and sinking has commenced on the new 500-ft. shaft.

Lawrence—All the machinery for the 50-ton plant has been installed and the mill will be started this week.

OWYHEE COUNTY

Ontario—The Ontario and Stenden groups have been purchased by Idaho operators and work has been resumed.

SHOSHONE COUNTY

Tamarack—Eight feet of ore has been encountered in driving the Custer tunnel. An aerial tramway has been built to the Rex mill, which was recently remodeled to treat the Tamarack and Custer ores.

Interstate-Callahan Consolidated Mining Co.—This company has acquired the Amazon-Manhattan group and will begin extending the tunnel through the north side-line into Amazon ground. Ores from both properties will be treated in the new Interstate mill.

Silver Cable—The vein opened on the intermediate tunnel level shows ore of quality and quantity to justify continuation of work all winter.

North Bunker Hill—An assessment has been levied for the purpose of completing the long crosscut, which will have a total length of 1800 ft., of which approximately 1500 ft. has been driven.

Snowstorm—The second unit of the plant has been placed in commission, increasing the capacity to 250 tons daily. The number of tables has been increased to thirty-eight.

Nabob—Work preliminary to the resumption of operations on a large scale has been begun in advance of the arrival of the power line being built by the Washington water-power company, to serve the property.

Idora Hill—Grading for the new concentrator which the company proposes to build this winter has already been begun. The tramway right-of-way has been

cleared and construction has been begun on the ore bins at the head end.

Black Horse—Recently 40 tons of concentrates were shipped.

Black Bear—Work has been resumed at this property and it is expected to be shipping at an early date.

Roanoke—Work has been resumed in the east drift from the shaft which will be driven 350 ft. to cut the main ore-shoot.

Stemwinder—The first shipment of ore from these abandoned workings of the Bunker Hill & Sullivan mine was made recently. The ground is under lease to Blocker & Penfield.

Liston—Work has been resumed after a suspension of several weeks and will probably continue all winter.

Hector—The Mayflower tunnel has entered Hector ground and has yet to go 600 ft. before it will cut the vein at a depth of 1300 feet.

Indiana

International Lead Refining Co.—This plant, in East Chicago, was started the last week in September with George Hulst, formerly of the Omaha plant of the American Smelting & Refining Co., as superintendent. The Parkes' process is used, not the Betts', as has been reported. A new baghouse, office building and laboratory are being erected. The output is estimated at about 300 tons per day, with 150 men employed. The plant is so situated that it will have both rail and water transportation facilities when the new canal is opened.

Michigan

COPPER

Ahmeek—The structural steel for the new rock houses at Nos. 3 and 4 shafts is being rapidly assembled and the work on the other buildings of the surface equipment is progressing satisfactorily. Underground conditions continue most favorable. Another feature that is receiving a good deal of attention and which will yield considerable revenue is the fissure-vein system tributary to No. 2 shaft at the 10th and 12th levels, which is highly mineralized. Considerable mohawkite has been developed and it will be treated at the Lake Superior smeltery at Dollar Bay.

Hancock—Further developments on the lode opened at the 1800-ft. level continue opening a formation of uniform character and as well mineralized as anything exposed in the mine. The work of extending the other openings preparatory to putting the property on a producing basis is progressing satisfactorily and shipments to the mill will in all probability be started early in the new year.

St. Louis—This company's shaft is down about 500 ft. and drifts are being

extended from the four levels above. Results are very encouraging.

La Salle—The work of moving the surface equipment from Nos. 5 and 6 shafts to the site of Nos. 1 and 2 shafts has been completed and the equipment will soon be ready to do duty in its new position, so that the property will be in shape to resume operations at an early date.

South Lake—This company's shaft is to be supplied with the hoisting equipment that was in commission at the No. 3 shaft of the Franklin company. It has a capacity of about 1500 ft. The shaft is down over 100 ft. and good progress is being made in sinking.

Wyandot—Operations at this property are centered in sinking a winze on the No. 8 lode, which was exposed in the long crosscut at the 750-ft. level of the exploratory shaft. This lode at the point of intersection showed considerable copper, so that the opening at a greater depth will be watched with interest.

IRON

Brule Mining Co.—Word has been received from Oglebay, Norton & Co. to resume work at the Berkshire mine in the Iron River district. This mine was closed a year and a half ago. The stockpile of 30,000 tons which remained at that time was purchased by the Wickwire Steel Co. and has now been cleaned up.

Wickwire—A fireproof change house has been completed.

Hilltop—At this exploration in the Crystal Falls district, recently abandoned by the Oliver Iron Mining Co., the Roberts Ore Co., to which the property reverted, is sinking a shaft. The tax commission valued the Hilltop at \$15,000 last month.

Corrigan, McKinney & Co.—At Crystal Falls, this company cleaned up the stockpiles at its Dunn and Tobin mines, but did not touch the big pile at the Great Western mine. The Armenia shipped all its No. 1 grade and nearly all its No. 2 grade.

Mansfield—This mine of the Oliver Iron Mining Co., the only one in the Crystal Falls district which has shipped bessemer ore, made no shipments of any kind in 1912.

Armenia—A new shaft has been started at this mine, about 150 ft. east of the present working shaft. It will be used for ventilation and later to remove the ore near the other shaft.

Cascade Mining Co.—This company has named its new mine at Palmer, where a shaft is being sunk, the "Isabella." The shaft has been concrete lined for 40 ft. below the collar and sinking is now progressing in eight-hour shifts. It will be over a year before the shaft is completed.

Missouri

JOPLIN DISTRICT

A three-ton auto truck will soon be put in operation by S. M. Short to haul supplies to his Pocahontas and Sitting Bull mines at Thoms Station. It will take the place of two teams.

Enochs & Co.—A 10-ft. face of ore has been developed by this company on a 40-acre lease of the Spencer land on Turkey Creek at a depth of 95 ft. Plans are being made for a concentrating plant. Former developments in this vicinity have been confined to surface diggings.

Webb City-Lehigh—Seven feet of good ore is showing in the new shaft of this company on a sublease of United Zinc Co. land at Carl Junction, and the shaft is still in ore. The shaft will be continued through the ore before drifting is started and if indications warrant a concentrating plant will be erected.

Chicago-Lehigh—Steady production is being made by this mine on the Knight land at Carl Junction. Two shifts will be worked in the near future, which will bring the output to two carloads of concentrates per week. Ore is found at 130 ft. and is being mined from two shafts.

Weaver Mining Co.—Forty-two acres of mineral land has just been purchased by this company for \$20,000. The land is 3½ miles north of Carl Junction. The company was one of the heavy new producers in the Carl Junction district, but caving ground has materially curtailed the output.

Martha Ball Mining Co.—This company, operating in West Joplin, is completing a 300-ton mill, equipped with electric power throughout. The old Maltese shaft has been opened and drifting started at 200 ft. after having prospected the ground with drill holes.

Montana

BUTTE DISTRICT

West Stewart—Fire was discovered in this mine of the Anaconda Copper Mining Co., Dec. 10, in a raise between the 1500- and 1700-ft. levels. The shift of 300 men was hoisted, 60 men were put to work to subdue the blaze. In a short time several streams of water were playing upon the fire, resulting in effectively confining it to the original area. It was believed that it would be under control within 24 hours at the most, but bulk-heading material was lowered and held in readiness to wall in the fire zone, should the flames prove more stubborn than anticipated. Since a connection was made between the West Stewart and Little Minah properties, some time ago, the shaft has been downcast, which makes fire fighting much easier than with an upcast shaft. The mine is isolated from the Anaconda fire area. While the cause

of the fire has not been ascertained, it is probable that it was started by the carelessness of a miner in leaving a lighted candle near the dry timber in the raise.

DEER LODGE COUNTY

Butte & Georgetown—Efforts are being made by the directors, who own several hundred acres of placer ground in the Georgetown district, to interest French men in the property with a view to financing the installation of a dredge. As a result, a mining engineer from France is expected to make an inspection. Shafts have established the fact that that bedrock lies about 75 ft. below the surface, and at present pay dirt is being mined for a depth of 5 ft. above bedrock and hoisted to the surface, where it is run through a sluice box.

Nevada

COMSTOCK LODGE

Mexican—The annual report of Superintendent Symmes shows that the production for the last year was 19,999 tons of ore milled, and shipped to smeltery, the gross assay value of which was \$521,495, and the gross yield to the company was \$471,786. The average extraction at the mill for the year was 92%, but during the last 5½ months of the year, it averaged 93.6%. The bullion shipped from the mill contained 13,667 oz. of gold and 229,825 oz. of silver, giving a gross assay value at the smeltery of \$426,004, for which the company received in settlement \$422,937. The cost of milling per ton was \$2.81 per ton and of mining \$8.97 per ton, not including cost of pumping. The total cost of the new mill was \$104,214.

Sierra Nevada—The north drift on the 2500-ft. level has picked up the vein.

CLARK COUNTY

Bullion—Yount & Fayle, of Goodsprings, have made the final payment of \$10,000 on this and the Accident claim, both situated about seven miles south of Goodsprings. They have held the property under lease and bond for the last year, during which time, ore taken out in development netted them over \$10,000, the ore being a lead-carbonate carrying silver. The force of men now at work will be increased, and new equipment will be added.

Frederickson—R. Munzberg, now operating this property, of which he is part owner, has opened a 4-ft. vein of zinc-carbonate ore. One car has been shipped, and further shipments will go forward regularly.

HUMBOLDT COUNTY

National Mining Co.—This company has won the apex suit which was fought so bitterly this year by the Mammoth Mining Co., which owns the adjoining ground.

NYE COUNTY

Shipments in tons from Tonopah mines to date and for the week ended Dec. 7 are as follows:

Mines	Week	Year to Date
Tonopah Mining.....	3400	164,619
Tonopah Belmont.....	3060	123,878
Montana-Tonopah.....	913	50,068
Tonopah Extension.....	1655	49,468
West End.....	1100	38,127
Midway.....	45	865
MacNamara.....	576	18,732
North Star.....	.....	401
Mizpah Extension.....	.....	40
Jim Butler.....	300	5,000
Tonopah Merger.....	205	505
Totals.....	10,654	451,703
Estimated value.....	\$201,800	

WHITE PINE COUNTY

Nevada Consolidated—Operations are being continued at about normal capacity, the weather so far not having interfered with operations. The Veteran mine is producing 750 tons of ore per day. The ore is being followed to the south and west.

Giroux—This company is shipping about 500 tons of ore per day to the Step-toe smeltery. Surface improvements, which have been made to reduce shipping costs, are nearly completed.

Smoky Development Co.—In this company's mine, just above Lane City, commercial ore is showing in several drifts driven out from the development tunnel.

New Mexico

SOCORRO COUNTY

Ernestine—During a recent week, 745 tons of ore were milled, producing 57 sacks of high-grade concentrate, in addition to the zinc-box precipitates. The last 10-day cleanup in November yielded 9350 oz. of gold and silver bullion and 8450 lb. of concentrate. December promises to be a good month and the year 1912 will record the largest production in the history of the mine.

Mogollon Gold & Copper Co.—The electric hoist recently installed at the Little Charlie mine is giving satisfaction, and this property is producing about 40 tons per day. Annual assessments are being conducted on the various claims adjacent to Mineral Creek.

Oaks Co.—Shipments to the custom mills are being made regularly from the various developments being conducted by this company.

Deadwood—Developments in the lower levels continue to open a higher-grade ore than was mined from the upper zones; 350 tons were milled during a recent week.

Socorro—The mill handled 1100 tons of ore during the week, taken principally from the lower levels.

Trilby Group—Work on the 200-ft. level continues in ore both east and west.

Apache Group—A drift is being driven north from the crosscut.

Oregon

Governor West has appointed the following delegates to attend the sixteenth annual convention of the California Miners' Association, at San Francisco, Dec. 9, 10 and 11: B. O. Kempfer, Baker; J. K. Romig, Baker; W. J. Hughes, Prairie City; H. E. Hendryx, Sumpter; Robert M. Betts, Cornucopia; R. R. McGaughey, Baker; C. B. Watson, Ashland; A. H. Gunnell, Grants Pass; O. L. Young, Ashland, and G. W. McQueen, Cottage Grove.

JOSEPHINE COUNTY

Waldo—The management of these copper mines has offered \$10 per ton for hauling ore from the mine to Grants Pass, from where it is to be shipped to the smeltery, at Kennett, Calif. About five days are required to make the trip from Grants Pass and return.

Jack's Creek—The owners of this mine are installing a gasoline engine and hoist to lift the heavy boulders out of the way of placer operations.

Sexton—The giants are at work at this placer property.

Swastika—The three large giants recently installed on this property will be in operation in a short time.

LANE COUNTY

Combination—Clark Bros., owners, state that work will be resumed on this property near Bohemia. Men will be kept busy all winter in the drifts and it is the intention of the management to install more machinery in the spring. Sherman Clark has charge of the work.

Oklahoma

OTTAWA COUNTY

Carson Dodson Mining Co.—Work on a new 400-ton mill was begun recently. The mill was moved from the Joplin district. With a few improvements, it will be one of the largest mills in the district. It will be driven by a gas engine. Two 4x5-in. shafts are being sunk. The drill holes show that the ore will be reached at a depth of 210 ft. and that the face will be about 25 ft. high. A joint power plant is being built on the Oklahoma Lead & Zinc property, by the Oklahoma, the Carson Dodson and the Thirty Acre Mining Co., each company furnishing an air compressor and a gas engine.

Oklahoma Lead & Zinc Co.—The mill shaft is being sunk to a depth of 225 ft., at which level drill cuttings show that there is a face of lead and zinc ore about 25 ft. high. This mine is now producing about 70 tons of ore per week. About 60 men are employed.

Mizpah Mining Co.—This company, one of the new developments of the Miami Royalty Co., began work recently and has just shipped the first car of ore.

The ore is of a medium grade, most of which is zinc. The ground has not been opened so that the 250-ton mill can be supplied to its full capacity.

Prairie Mining Co.—A steam plant and compressor are being installed and the mill will be ready to run within a short time. A prospecting drill has been started on the north end of the lease.

Utah

BEAVER COUNTY

Moscow—A new hoist and compressor are being installed.

Majestic—This company in November shipped the largest monthly tonnage in its history, 53 cars coming from the Hickory, and one car from the Harrington-Hickory.

Horn Silver—The monthly rate of shipment for this company is given at 2500 tons; November shipments were about 1500 tons in excess of this amount. The ore is about equally divided between lead and zinc. The dumps are yielding a considerable tonnage of low-grade ore, and the better grade comes from the 300-, 500-, 700- and 900-ft. levels. The company has added to its ore reserves by finding the extension of several faults. The shaft is to be retimbered from the 500- to the 700-ft. levels, and during the two weeks required for this work, operations will be suspended on all except the 300-ft. level.

JUAB COUNTY

Tintic shipments for the week ended Dec. 6 amounted to 215 cars.

Victoria—The concrete foundations for the new machinery, which is expected early in December, has been completed.

Swansea—It is reported that operations are to be suspended.

Gold Chain—An average daily output of about two cars is being made. The drift on the 500 level is 100 ft. long, with the face still in ore.

Grand Central—Copper ore is being mined on the 2300, and a winze is to be sunk below this level.

Michigan-Utah—Preparations are being made for sinking near the raise between the Solitude and City Rocks tunnels. Shipments are being made.

Chief Consolidated—A drift is being driven to connect this property with the Gemini, the immediate object being to prospect the ground formerly owned by the Eureka City Mining Co. It is stated that a contract has been let for carrying on this work from the Gemini side also. The connection will probably be completed within a few months.

Scranton—The contract under which zinc ores have been shipped during the last few years has expired, and the working forces at this mine have been put on development. Shipments have been temporarily suspended. The older workings

are in good condition, with promising indications on the deeper levels. Preparations are being made to install new electrical equipment.

Victor Consolidated—Lessees are working at this property near Mammoth, and a car of copper ore was mined recently.

May Day—There are two faces of silver-lead ore on the 1100, or deepest level on which ore has been opened. Shipments of zinc ore are being continued.

SALT LAKE COUNTY

Bingham-New Haven—This company has completed underground connections with the Utah Consolidated, which tramline will be used to transport Bingham-New Haven ores to the Tooele smeltery. The use of this line and the convenient ore bins recently built will, it is estimated, reduce transportation costs from 60c. to 40c. per ton.

Ohio Copper—The first and third sections of the mill are treating from 1700 to 2000 tons of ore daily. The second section is idle, and the company is said to be considering replacing the Wall rolls. Colonel Wall is suing the company for \$36,000 in payment for the rolls.

Michigan-Utah—Now that the tramway is running, and the company financed, more extensive work is planned. The company owns the City Rocks, the Grizzly, Copper Prince, Utah Mines Coalition, and other claims in Little Cottonwood, covering an area of about 1000 acres in all, the entire length of which is traversed by the Lavinia and Grizzly veins, productive of much ore in the past. The City Rocks, worked by lessees, has been making steady shipments, and high-grade ore has been opened in the neighboring Utah Mines Coalition, 500 ft. below the City Rocks workings. It is estimated, from the present showing in various parts of the property, that production for the entire group can be brought up to a steady daily output of 100 tons.

South Hecla—Arrangements are nearly completed for continuing the shaft, which will probably be sunk to the 300-ft. level, before crosscutting for the vein.

TOOELE COUNTY

The November output from the Stockton district amounted to 59 cars, divided as follows: Bullion Coalition, 17 cars on company account, and four cars from lessees; 25 cars shipped from old dumps by John Connor; Galena King, one car; Eagle & Mills lease on the Ben Harrison, nine cars, and the Cyclone, three cars. No ore was shipped from Dry Cañon, owing to snow storms, and 300 to 400 tons of ore are awaiting shipment. Shippers here are Eureka-Ophir, Mona, Hidden Treasure, Thad Stevens, etc.

Eureka-Ophir—No shipments were made in November, owing to bad weather; 60 tons of silver ore are now on the way to the market.

Washington

FERRY COUNTY

Rathfon Reduction—This plant, which has been closed down for the installation of additional machinery, is to be put in commission again in the near future. The property is near Republic.

White Elephant—A mill having a capacity of 50 tons is to be erected on this property at Orient in the spring. Frank W. Ainsley has charge of the work.

STEVENS COUNTY

Amazon—Copper ore has been found in the tunnel on this property at Chelawah, and operations will be continued.

Apache—Operations at this property, in the Kettle Falls district, are proving satisfactory, smelter returns amounting to as much as \$285 per ton. The mine is under lease to Hoyt & Miller.

Wisconsin

PLATTEVILLE DISTRICT

Wisconsin Zinc Co.—A range carrying lead and zinc ore was struck by drill on the William Field land, near Shullsburg; the Freeport Mining & Milling Co. did some prospect work by shaft on this land, but abandoned it.

Vinegar Hill Zinc Co.—This company has taken over the Lucky Hit mine on the Meloy land near Shullsburg.

Murray—The first drill hole bored on this lease showed 40 ft. of jack cuttings from 105 to 145 ft.; the land lies between the Midway and Henrietta mines at Cuba.

Indianapolis Lead & Zinc Co.—A milling plant has been completed on the Weinschenk land, three miles southwest of Galena. J. H. Billingsley, of Galena, Ill., general manager.

Optimo—This company is building a concentrating mill on the Optimo No. 2 at Linden.

Canada

ONTARIO—COBALT

Shipments of ore and concentrates, in tons, from Cobalt for November, 1912, were as follows:

Bailey.....	.....
Beaver.....	64.37
Buffalo.....	.....
Casey Cobalt.....	.....
Chambers-Ferland.....	.....
City of Cobalt.....	42.00
Cobalt Lake.....	151.43
Cobalt Townsite.....	87.65
Colonial.....	.....
Coniagas.....	215.38
Crown Reserve.....	19.61
Dominion Reduction Co.....	.....
Drummond.....	.....
Hudson Bay.....	93.26
Kerr Lake.....	92.00
La Rose.....	260.62
Lost and Found.....	.....
McKinley-Darragh.....	135.44
Nipissing.....	31.62
O'Brien.....	64.79
Penn.-Canadian.....	34.46
Provincial.....	.....
Right of Way.....	.....
Seneca Superior.....	191.63
Timiskaming.....	66.22
Trethewey.....	58.00
Wettlaufer.....	.....
Totals.....	1608.48

Claim No. 950-Gillies Limit—A vein of ruby silver has been struck at the contact between the diabase and Kee-watin formations.

Island Smelting & Refining Co.—A meeting of shareholders, held Dec. 5, ratified the agreement under which the company will take over from the Cobalt Smelter, Ltd., the smeltery at Trout Lake, near North Bay, paying therefor 300,000 shares of Island Smelting stock. The reorganized company will issue \$100,000 in bonds which bear no interest the first year, 2½% the second year, and 5% for the third and fourth years, and are redeemable after five years for 200,000 shares of Island Smelting stock. Work will shortly be begun to put the smeltery in condition to smelt high-grade ores, and a plant will also be installed for the treatment of low-grade ores by the Island process.

King Edward—This property has been reopened by a new company known as the York Ontario Silver Mines, Ltd. The property has been taken over on a five-year lease.

Nipissing—The estimated net production for November is valued at \$175,266. The high-grade mill treated 134 tons of ore and shipped bullion worth \$168,707. During the latter part of the month, the low-grade mill commenced operations, dropping from 10 to 15 stamps. The results of development at shafts 73, 80 and 83 were favorable. The production for the month was not up to the average, due to the main washing plant not being in operation until the second week in November. With the payment of the regular quarterly dividend on Jan. 20, 1913, this company will have returned 159% to its stockholders.

Cobalt Lake—A special meeting of the shareholders has been called for Dec. 20 for the purpose of considering, among other things, a by-law respecting the payment of regular dividends and a by-law authorizing the directors to delegate their powers to an executive committee to be elected by them from the board.

Peterson Lake—This company will commence diamond drilling in an attempt to find the vein recently found on the Seneca Superior.

Little Nipissing—On this property, which is being operated by the Peterson Lake company, a good body of milling ore has been encountered.

Coniagas—At the annual meeting to be held Dec. 23, the shareholders will be asked to approve a by-law authorizing the purchase of \$6305 shares of the Mines Water Supply Co., Ltd., and also a by-law authorizing the purchase of \$5000 shares in the Wabi Iron Works.

Jajola—The combined plant of this company and the Twentieth Century was burned to the ground Dec. 12, entailing a loss of \$3500.

ONTARIO—PORCUPINE

Swastika—The 10-stamp mill will be put in commission Jan. 1, 1913. Manager John Redington states that there is enough ore in sight to cover the cost of the property and pay a substantial dividend.

Lindsay-McCluskey—These properties will be drilled.

Dome Extension—It is probable that this property will be closed down for some time irrespective of conditions arising out of the strike.

Plenaureum—It has been decided to pull the pumps and let the mine fill with water until the strike is definitely settled.

Burns—This property will be drilled.

Crown Chartered—At a meeting held in Toronto, Dec. 12, a committee was appointed to raise funds necessary to extricate the company from its difficulties. Twenty thousand dollars was raised, but an additional \$40,000 is necessary. A compromise has been effected with the creditors to accept stock in the reorganized company for their claims. The cash is necessary to pay off the \$60,000 of the purchase price which is still due.

ONTARIO—SUDBURY DISTRICT

Dominion Nickel-Copper Co.—At a meeting of this company at Ottawa, Dec. 11, it was decided to begin at once the erection of a smeltery in the Sudbury district to treat the nickel-copper ore from the company's properties. The smeltery will be in Snider township, about five miles northwest of Sudbury and near the Murray mines, now owned by the company. J. A. Holmes is general manager.

Canadian Copper Co.—This company is completing extensive improvements and additions to its smeltery, at Copper Cliff, and will shortly increase the capacity, which is now about 2500 tons of nickel-copper ore daily, yielding about 125 tons of 80% nickel-copper matte.

Mond Nickel Co.—Recent developments in the Victoria mines of this company have disclosed additional ore and again prolonged the life of the mine, which has been reported about to be closed for more than two years. The company is still operating its old smeltery at Victoria Mines, but by spring will have the new smeltery at Conniston, of 1000 tons daily capacity, completed.

American Smelting & Refining Co.—This company has taken several options in the Sudbury district recently, and is now conducting drilling operations in McKim township, near the Murray mine.

Mexico

MEXICO

El Oro Mining & R.R. Co., Ltd.—During November, 20,870 tons of ore and 15,160 tons of tailings yielded bullion worth \$95,320, at a net profit of \$60,850.

The Market Report

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

COAL TRADE REVIEW

New York, Dec. 18—Continued mild weather over a large part of the country has helped the coal situation by lessening demand, and also by the absence of obstructions to transportation. Otherwise the bituminous trade, both East and West, shows little change. Scarcity of cars is still a source of trouble, but is hardly as bad as it was.

The United States Supreme Court has, in part, sustained and in part reversed the Circuit Court decision in the government suit against the anthracite companies. It holds that no general limitation has been proved. The decision is given on another page. Anthracite supplies are improving and trade is quieter.

German Coal Output—Coal production of German Empire, 10 months ended Oct. 31, metric tons:

	1911	1912	Changes
Coal.....	133,470,434	147,404,184	I. 13,933,750
Brown coal.....	60,292,946	67,659,847	I. 7,366,901
Total mined..	193,763,380	215,064,031	I. 21,300,651
Coke made.....	20,887,181	23,838,693	I. 2,951,512
Briquettes m'de	18,056,758	20,174,509	I. 2,117,751

Of the briquettes reported this year 15,748,884 tons were made of brown coal or lignite.

IRON TRADE REVIEW

New York, Dec. 18—Notwithstanding the near approach of the end of the year, the iron and steel trades continue exceedingly active and there is no material change in conditions.

The volume of contract business placed in the finished-steel trade has continued to decrease, and has now become relatively light. There has also been in the past week or two a diminution in specifications, which represents in large part the working out of old contracts at prices considerably lower than the current market prices. As the mills had fallen far behind in deliveries, buyers have been free to specify against these contracts as there was no danger of too much material being forced upon them.

The opinion is expressed in some quarters that after the first of the year business will become active again, but this is somewhat doubtful. As contracts which will be in force after Jan. 1 will be on a materially higher basis than those which are now being specified against it is likely that specifications will be of smaller volume than shipments, permitting the mills to catch up some-

what in deliveries. As an average of the entire finished-steel trade it may be estimated that the steel mills have specifications on books for fully three months of production at capacity.

Under date of Dec. 14 the American Steel Wire Co. advanced its prices on wire products \$1 per ton, the advance becoming generally effective Monday, Dec. 16, with nails at \$1.75 per keg. The advance was anticipated Oct. 10 by one independent seller, and it was thought then that it would probably become general, but the leading interest has held off until now. The wire mills are unusually well filled with specifications for this time of year, which is normally dull. A part of this business was secured by certain large jobbers being allowed to specify, up to Dec. 1, on their contracts written at \$1.60 for nails. Specifications are now expected on later contracts, written at \$1.65 and \$1.70 per keg.

The pig-iron market does not seem to have gained any strength in the past week, and such a development, after so long a period of almost constant stiffening, might be interpreted as virtually a weakness, were the end of the year not so close, the market usually growing quieter at this time. It should be noted, however, that for some weeks past prompt Southern iron in small resale lots has been available at \$13.50, Birmingham, when the open market was \$14, while some furnaces are ready to sell for first quarter, and occasionally even for second quarter, at \$14, when an effort had been made to establish \$14.50 for such delivery. Experience has shown that Southern iron, in movements either upwards or downwards, is likely to foreshadow movements in the pig-iron market of the country as a whole.

Baltimore

Jan. 16—Exports for the week included 990 lb. selenium to Hamburg; 395,750 lb. pig iron to Leith, Scotland. Imports included 5700 tons manganese ore from Brazil; 10,770 tons iron ore from Cuba.

Birmingham

Dec. 16—Southern manufacturers of pig iron are not in any position to complain at the market conditions, though sales right now are not as active as they have been. There is considerable iron to be shipped out during the first six months of the coming year and the make for several months at least will

have to be kept at a high rate. The probable make for the first three months of the year will be required to fill orders on hand. Pig iron for delivery during the first six months of 1913 is quoted at \$14.50@15 per ton. For immediate delivery, iron is selling at not less than \$14.50 per ton. Considerable iron is still moving on export orders, Italy, Austria and England having made some purchases in this country lately. This iron was sold on the same basis as in the domestic market.

Steps are being taken for the reorganization of the Southern Iron & Steel Co. The referee in bankruptcy in Birmingham has ordered a sale of the properties of the company on Jan. 31 next.

J. J. Shannon and associates are making preparations to begin deep mining for ore in the Birmingham district. A company with a capitalization of \$100,000 has been organized to take up the work.

Chicago

Dec. 17—The iron market remains quiet, but firm in every line. Sales of pig iron are light, for a few hundred tons at most, as regards the individual order, but this brings no complaint from the furnace interests. Most of them are glad of the customary December lull, since readjustment for their own as well as the smelters' interests can be made to apply to the coming year. Local furnaces are well sold up toward the end of the first half; beyond the first half no sales are yet being made and none are expected until after the first of the year. Prices hold to \$14@14.50, Birmingham, which means \$18.35@18.85 on No. 2 Southern foundry iron, and \$18@18.50 on No. 2 Northern foundry iron at furnace, which means about 50c. more delivered. Lake Superior charcoal iron sells at a minimum of \$18.75, with some lots at as much as \$2 higher. The foundrymen are preparing for inventory and holding their stocks to a minimum.

Finished products continue in slightly lessened but large demand, especially railroad supplies. For structural material, aside from railroad needs, there is still a good demand for deliveries four to six months hence. Bars are very firm and this applies to bar iron, soft and hard steel bars, with local mills out of the market for the needs of the near future because of their crowded condition. Plates, sheets and minor lines are sought beyond the capacity of the pro-

ducers and some contracts for second half are being made, prices being secondary to delivery.

Cleveland

Dec. 16—The weather has been stormy and late vessels coming down have had much trouble. Iron-ore sales continue on a large scale.

Pig Iron—Most large consumers are well supplied over first quarter, some of them over first half. Small orders are still coming in. Bessemer pig is quoted \$18.25@18.50, basic \$17@17.50, No. 2 foundry \$17.75@18, all Cleveland delivery.

Finished Materials—New orders are fewer, but the pressure for deliveries continues. Quotations from warehouse have been advanced to 2.10c. for bars and 2.25c. for plates.

Philadelphia

Dec. 18—A somewhat unexpected falling off in demand for crude and finished products has taken producers with surprise. Stocks of pig at Eastern furnaces are about a nonentity and supplies at other points are very low. A constantly hardening tendency prevails in all lines of pig iron. Bessemer is still held firmly at \$17.50 at furnace, and basic has reached a minimum of \$17, according to latest inquiries. Foundry is holding its own and forge is strong with an improving demand. The entire pig-iron industry is in an exceptionally vigorous condition. Considerable Southern iron is being negotiated for, especially for pipe foundries, and next week is expected to show large purchases. Quotations may be fairly given at \$18.50 for No. 2 foundry, \$17.75 for gray forge, \$18.25 for basic and in some cases there are higher prices asked. Southern gray forge has been offered for first-quarter delivery at \$16 per ton.

Steel Billets—The large transactions in steel billets have been reflected in firmer prices in the East without corresponding sales.

Bars—The bar mills have sold most of their products up to April, and the small buyers who are sneaking in the back way are obliged to pay prices they regarded as improbable not later than a month ago. All bar-iron makers are quoting prices materially higher for late delivery and are asking 1.75@1.90c., and from store and distributing points from 2.25@2.40 cents.

Sheets—The actual business in sheet iron, excepting for galvanized sheets has been rather light, but this is due to hesitancy of a few large Eastern consumers.

Pipes and Tubes—This branch of the industry is exceptionally strong, but purchasers for remote delivery are showing less interest.

Plates—The bulk of the business placed during the past week has been the final closing of contracts that have been

kicked backward and forward between the mills and buyers for two or three weeks.

Structural Material—Several large blocks of material for Philadelphia delivery have been placed this week, most of it being wanted at the earliest possible date. A great deal of business made up of small lots for local requirements, and in some cities within 40 miles, will also go through, but from present signs there will be no large transactions until after the holidays. Even this is not a safe prediction.

Scrap—Some large blocks of scrap have been taken up for foundry purposes and heavy melting steel as well as No. 1 yard scrap and No. 1 railroad scrap. There were several good sales of heavy cast scrap. There is very little stock on hand to choose from and there are quite a number of standing contracts calling for heavy melting, old steel rails and old steel axles.

Pittsburgh

Dec. 17—The local iron and steel market has shown no material change in the past week, outside of the diminution in specifications and the advance in wire products, which is now general. Specifications for steel products have not uniformly decreased. The leading interest in sheets and tinplates, for instance, reports an increase in specifications for both products. In sheets it has fallen farther behind in deliveries, its promises against new specifications ranging from 10 to 12 weeks in the case of ordinary black and galvanized sheets up to 22 to 24 weeks in the case of automobile stock.

The wire advance announced this week is the fifth successive advance of \$1 a ton in wire products since the general market began to stiffen toward the close of November, 1911. The dates of these advances were Dec. 11, Jan. 22, July 22, Aug. 26 and Dec. 16. While wire products have advanced a total of \$5 a ton, other finished-steel products outside of standard section rails have advanced an average of \$7 a ton. There was an advance in the extra for galvanizing plain and barb wire from 30 to 40c. per 100 lb. on Oct. 14. The new wire prices are: Plain wire, 1.55c.; galvanized, 1.95c.; wire nails, base, \$1.75; painted barb wire, 1.75c.; galvanized, 2.15c. per pound.

Pig Iron—The pig-iron market has been generally quiet the past week and indeed for a fortnight or more, the only features being the scarcity of prompt foundry iron and the Pittsburgh Steel Co.'s purchases of basic iron. This company took 30,000 tons of basic from the Brier Hill Steel Co., delivery 5000 tons a month over the first half, at \$16.35, Valley. This was a cut of 15c. from the regularly quoted market. The seller is now reported sold up on basic to July 1 next. The same steel interest purchased

5000 tons of prompt basic from E. W. Mudge & Co., the iron to come from Steubenville, at substantially the market price, delivered. Reports widely circulated that \$17, Valley, has been secured for basic iron for prompt shipment are altogether erroneous. No such basis has been reached. Foundry iron has proved very scarce; and while no important sales have been effected, it does not seem possible to find any No. 2 foundry at less than \$18, Valley, and an equivalent price has been paid for a number of small lots from the Ironton district, at \$17, furnace, equal to \$18.90, delivered Pittsburgh. We quote: Bessemer, \$17.25; basic, \$16.50; forge, \$17.25@17.50; No. 2 foundry, \$18; malleable, \$17.25@17.50, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The ferromanganese market has been relatively quiet as to actual transactions, but the material is scarce and prices are firmly maintained. We quote: Prompt carloads, \$75@80; contracts, first half, \$70@75; second half, \$65, f.o.b. Baltimore.

Steel—The Carnegie Steel Co. has named prices for first-quarter sheet bars against its regular long-term contracts, these prices being at considerably less than what is considered the minimum of the open market. There has been a very large advance in the open market and the company is endeavoring to protect its regular customers. It is not a regular seller in the market and on account of the limited tonnage of steel it has available it is not seeking business. Its deliveries of sheet bars to its brother subsidiary in the Steel Corporation, the American Sheet & Tin Plate Co., have been below the mill requirements for many weeks. There are no regular sellers of either billets or sheet bars, and former quotations are repeated, although they have become largely nominal: Bessemer billets, \$27; sheet bars, \$27.50; openhearth billets, \$28; sheet bars, \$28.50, f.o.b. maker's mill, Pittsburgh or Youngstown. Rods have been selling at \$30, Pittsburgh, but there are few, if any, regular sellers now at this figure.

Sheets—As noted, the American Sheet & Tin Plate Co. has fallen farther behind in its promises of sheet deliveries against new specifications, as its specifications have been greatly exceeding shipments. The independents on an average have slightly less specifications than they had a fortnight ago, which arises from the fact that some of their contracts are running out and they have all been reserved about making fresh contracts of late. Some of them are not well covered on steel for first quarter. For anything like early delivery premiums are readily secured, so that the market is quotable as follows: Blue annealed, 10 gage, 1.65@1.80c.; black, 28 gage, 2.25@2.40c.; galvanized, 3.40@3.60c.;

painted corrugated, 2.45@2.50c.; galvanized corrugated, 3.45@3.50c. per pound.

St. Louis

Dec. 16—The market in pig iron is quieter. Sales agents have not been soliciting business and melters, owing to the coming season of inventory, have not been as active. This little lull in the trade is quite a relief to producers as it gives them a chance to catch up. Producers all have enough business to keep them going for the next four months full and a number of them are well sold up until after June next. Current prices remain unchanged at \$14@14.50, Birmingham, or \$17.75@18.25, St. Louis, on No. 2 Southern foundry iron. There is a light demand for Northern iron at around \$19, St. Louis, for No. 2 foundry.

The demand for finished products of all kinds is still excellent and shows no signs of slacking up.

Coke remains about the same, very high and firm, Connellsville foundry bringing \$6.80@7, St. Louis; byproduct is bringing around \$6, St. Louis. So many are turning to byproduct coke this season and becoming accustomed to using and handling it that a large tonnage of Connellsville coke will undoubtedly be permanently displaced.

Iron Ore Market

Sellers of Eastern iron ores are generally holding out for 8½c. per unit of iron, delivered. Foreign ores are quiet, high ocean freights making the prices above what furnaces are willing to pay. The consequence is that more Lake ores are being placed in the East than for several years past. Some odd lots of Wabana ore have been placed at 7¼c. per unit, at tidewater.

Lake shipments of iron ore from the Lake Superior region in November were 4,072,674 tons. In December, up to the close of navigation, they were 14,579 tons. The total water shipments for the season, by ports, were as follows:

Port	1911	1912	Changes
Escanaba.....	4,278,445	5,234,655	I. 956,210
Marquette.....	2,200,380	3,296,761	I. 1,096,381
Ashland.....	2,429,290	4,797,101	I. 2,367,811
Superior.....	9,920,490	14,240,714	I. 4,320,224
Duluth.....	6,934,269	10,495,577	I. 3,561,308
Two Harbors. ...	6,367,537	9,370,969	I. 3,003,432
Total.....	32,130,411	47,435,777	I. 15,305,366

Receipts at Lake Erie ports were 3,677,200 tons in November and 144,330 tons in December.

German Foreign Trade—Imports and exports of iron and manganese ores in the German Empire, nine months ended Sept. 30, in metric tons:

	Imports	Exports	Excess
Iron ores.....	9,149,017	1,664,687	Imp. 7,484,330
Manganese....	383,778	4,825	Imp. 378,953

The larger imports of ores are from Spain, Sweden and Russia.

METAL MARKETS

New York, Dec. 18—The metal markets have not been especially active, and have shown no important changes for the week.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess*
Gold			
Oct. 1912..	\$ 330,270	\$ 11,887,492	Imp. \$11,557,222
" 1911..	3,983,994	4,102,427	Imp. 118,433
Year 1912..	44,058,544	50,677,285	Imp. 6,618,741
" 1911..	22,247,304	49,279,533	Imp. 27,032,229
Silver			
Oct. 1912..	6,171,820	4,683,784	Exp. 1,488,036
" 1911..	5,087,087	3,404,458	Exp. 1,682,629
Year 1912..	58,519,766	40,985,536	Exp. 17,534,230
" 1911..	54,615,048	37,100,888	Exp. 17,514,160

Exports from the port of New York, week ended Dec. 14: Gold, \$24,789; silver, \$1,196,878. Imports: Gold, \$881,402, chiefly from London and Mexico; silver, \$289,985, largely from Central and South America.

Gold—Prices on the open market in London remained at the usual level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. Most of the supplies went to the Bank of England, and nothing was taken for New York account.

Iridium—The metal is scarce just now, and there has been a sharp advance, \$73 @75 per oz. being asked.

Platinum—The market is fair and unchanged, both here and abroad. Prices are unchanged, at \$45@46 per oz. for refined platinum, according to quantity; \$47.50@48.50 per oz. for hard metal, up to 10% iridium.

Silver—The market has declined the past week on completion of the heavy orders from Bombay for prompt shipment; so that the premium for spot silver has disappeared, and silver closes at 29½d. for spot and 29⅞d. for forward delivery. The position of silver, however, is considered good and likely to improve shortly on renewed buying for the Indian Mint.

SILVER AND STERLING EXCHANGE

Dec.	12	13	14	16	17	18
New York....	63½	64	63½	63½	63½	63½
London.....	29½	29½	29½	29½	29½	29½
Sterling Ex..	4.8500	4.8520	4.8525	4.8535	4.8535	4.8550

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

Shipments of silver from London to the East, Jan. 1 to Dec. 5, reported by Messrs. Pixley & Abell:

	1911	1912	Changes
India.....	£8,356,500	£10,229,000	I. £1,872,500
China.....	990,300	1,674,500	I. 684,200
Total.....	£9,346,800	£11,903,500	I. £2,556,700

Imports of gold into India for the nine months ended Sept. 30, were £26,346,314. This compares with £10,077,472 for the full year 1909; £18,028,008 in 1910; and £23,366,814 in 1911.

Copper, Tin, Lead and Zinc

NEW YORK

Dec.	Copper		Tin	Lead		Zinc	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
12	17½	17 3/5	49½	4.27½	4.12½	7.10	7.05
13	@17½	@17 4/0	49½	4.32½	4.17½	@7.20	@7.10
14	17½	17.35	49½	4.25	4.10	7.10	7.05
15	@17½	@17.40	49½	4.27½	4.12½	@7.20	@7.10
16	17½	17.35	49½	4.25	4.10	7.10	7.05
17	@17½	@17.40	49½	4.27½	4.12½	@7.20	@7.10
18	17½	17.25	49½	4.25	4.10	7.10	7.05
19	@17½	@17.35	49½	4.27½	4.12½	@7.20	@7.10

The quotations herein given are our appraisal of the market for copper, lead, spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgment, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Dec.	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
	Spot	3 Mos	Best Sel'd	Spot	3 Mos		
12	74½	75½	81	225½	225½	18½	26½
13	74½	75½	81	225½	225	18½	26½
14	.....	.....	.....	.....	.....	.....	.....
16	73½	74½	80	225½	225½	18½	26½
17	74½	75½	80	227½	227½	18½	26½
18	74½	75½	80	227½	227½	18½	26½

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; £25 = 5.44c.; £70 = 15.22c. Variations, £1 = = 21¼c.

Copper—The market has been disturbed by cheap offerings of copper by several dealers, who may have supplies put in their hands for resale, or by some of the smaller producers, or their own importations of crude material refined here on toll. Anyway, electrolytic copper from these sources has been sold as low as 17¼c., while contracts for forward delivery have been taken at materially lower figures, evidently representing arbitrage transactions against the London market. Some first hands have offered

to sell around 17.35c. The market is very irregular and nominal. The large agencies continue to stand pat for their pegged price of 17¼c., delivered, usual terms, and express the same confidence that consumers will be starved into paying it. Some small sales of Lake copper were made at about 17.55@17.60c. Casting copper was rather pressed for sale by certain hands.

The irregularities in the copper market this week are clearly due to the fact that the London standard market has declined to a point at which furnace material can be purchased on a parity that will produce electrolytic copper at low figures. It is reported that considerable shipments from the other side are being made, and as the stocks over there have been decreasing for some time past and the copper cannot well be spared, these shipments are likely to have a decided influence on the position in Europe. It is reported that considerable bear selling has been going on in the London market of late, and that a large bear account has accumulated.

We quote Lake copper at 17½@17½c., and electrolytic in cakes, wirebars or ingots, 17.25@17.35c. Casting copper is quoted at 17@17.10c. as an average for the week.

The London standard market, which closed on Dec. 12 at £74 12s. 6d. for spot and £75 12s. 6d. for three months, declined on Dec. 16 under persistent bear selling to £73 10s. for spot and £74 10s. for three months. On Dec. 17 and 18, the market was slightly better, the bears being somewhat disconcerted by the reports that considerable quantities were being taken out of warehouse and shipped to smelters. The market closes at £74 7s. 6d. spot and £75 10s., three months. The European statistics for the first half of December show a decrease in European warehouses of 169 tons, and a decrease in the visible supply of 1494 tons.

Copper sheets are 23@24c. per lb., base for large lots; full extras are charged and higher prices for large quantities. Copper wire is 19@19¼c. base, carload lots at mill.

Visible stocks of copper in Europe, Dec. 15, are reported as follows: Great Britain, 27,440; France, 4160; Rotterdam, 350; Hamburg, 2140; afloat from Chile, 2500; afloat from Australia, 5300; total, 41,890 long tons, or 93,833,000 lb. This is a decrease of 1390 tons from the Nov. 30 report.

Tin—The past week witnessed a firmer market than we have had for some time. American sellers, who had all along been meeting European competition or under-quoting prices cabled from abroad, obtained so large a business that they changed their policy completely. Consumers have been buying very freely, not only for near-by, but also for future

deliveries. The market closes firm at £227 10s. for spot and three months and about 50c. here.

Messrs. Robertson & Bense report the arrivals of tin ore and concentrates at Hamburg, Germany, in November at 2166 tons, all from Bolivia.

Lead—There has been a little more business done at somewhat lower prices, the demand being freely met by most producers. At the close lead at St. Louis is quoted 4.10@4.12½c., and New York 4.25@4.27½ cents.

The London market is slightly firmer, Spanish lead being quoted £18 2s. 6 d., and English lead 7s. 6d. higher.

The average price of lead for the week ended Dec. 11 was 4.269c., New York.

Spelter—The market is unchanged. There is some business doing from day to day at around last prices, 7.05@7.10c., St. Louis, and 7.10@7.20c., New York. Consumption, both in the galvanizing and brass trades continues excellent.

The European market is firm. Good ordinaries are unchanged at £26 10s.; specials 15s. higher.

Zinc dust is quoted at 7½c. per lb., New York.

Base price of zinc sheets is \$9 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Other Metals

Aluminum—The market has been again rather quiet, but with more inquiries, and may be quoted as rather firmer. The current price is 25½@26c. per lb. for No. 1 ingots, New York.

The latest quotations for ingots in London are £85@88 per long ton—equal to 18.46@19.12c. per pound.

Antimony—The market is rather quiet, and has been a little disturbed by sales from second hands. Cookson's is easier, at 10@10.25c. per lb. Hallett's is nominally still 9.45@9.75c. For Chinese, Hungarian and other outside brands 9@9.25c. per lb. is asked.

Quicksilver—The market is inclined to be dull and prices are easier. The New York quotation is \$40 per flask of 75 lb., with 58@59c. per pound asked for retail lots. San Francisco, \$40 for domestic and \$37.50 for export orders. London price is £7 7s. 6d. per flask, with £7 5s. named from second hands.

Zinc and Lead Ore Mareets

Platteville, Wis., Dec. 14—The report for the week ended Dec. 7, received too late for publication last week, shows base prices of \$56@59 for zinc ore and \$57 for lead ore. Shipments were 3,574,030 lb. zinc ore, 251,980 lb. lead ore and 962,780 lb. sulphur ore; deliveries to the separating plants, 1,304,570 lb. zinc ore. The report for Dec. 14 follows.

The base price paid this week for 60% zinc ore was weaker at \$56@57. The base price paid for 80% lead ore was \$50 per ton.

SHIPMENTS WEEK ENDED DEC. 14

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville.....	746,520	.....	212,000
Mineral Point.....	626,890	.....	.....
Benton.....	622,100	.....	1,053,200
Shullsburg.....	404,000	56,800	.....
Galena.....	398,700	.....	.....
Cuba City.....	302,600	.....	.....
Highland.....	228,300	.....	.....
Hazel Green.....	220,000	60,000	.....
Harker.....	188,730	.....	.....
Linden.....	132,300	.....	.....
Rewey.....	86,000	.....	.....
Montfort.....	60,000	.....	.....
Total.....	4,016,140	116,800	1,265,200
Year to date.....	192,470,060	7,859,940	38,062,430

Shipped in previous week from Benton, not then reported, 497,700 lb. zinc. Shipped during the week to separating plants, 1,864,870 lb. zinc ore.

Joplin, Mo., Dec. 14—The high price of zinc sulphide is \$60, the base price per ton of 60% zinc \$52@57. Zinc silicate sold at \$28@32 per ton of 40% zinc; the average price, all grades, of zinc ore is \$52.02. Lead sold at \$53 base per ton of 80% metal content and the average for all grades is \$51.66 per ton.

SHIPMENTS WEEK ENDED DEC. 14

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville.....	5,366,060	.....	1,293,360	\$178,039
Joplin.....	2,515,650	.....	289,300	78,524
Galena.....	793,110	.....	117,450	24,527
Miami.....	712,600	.....	265,830	23,310
Duenweg.....	587,410	.....	242,370	22,160
Oronogo.....	824,710	.....	.....	18,763
Carl Junction.....	620,730	.....	.....	18,000
Granby.....	117,900	726,650	18,350	15,220
Alba-Neck.....	385,680	.....	.....	10,798
Spurgeon.....	168,960	281,820	61,130	10,577
Cave Springs.....	861,310	.....	.....	9,936
Carthage.....	345,240	.....	.....	8,975
Jackson.....	240,570	.....	13,690	6,730
Aurora.....	153,140	.....	.....	3,980
Wentworth.....	81,290	59,970	.....	3,080
Quapaw.....	121,200	.....	.....	3,030
Lawton.....	64,550	.....	.....	1,810
Seneca.....	.....	.....	53,950	1,350
Totals.....	13,460,110	1,068,440	2,355,410	\$438,809

50 weeks...552,526,260 35,276,650 90,207,670 \$17,955,593
Blende val., the week, \$360,511; 50 weeks, \$14,831,216
Calamine, the week, 17,448; 50 weeks, 562,450
Lead value, the week, 60,850; 50 weeks, 2,561,927

MONTHLY AVERAGE PRICES

Month	ZINC ORE				LEAD ORE	
	Base Price		All Ores		All Ores	
	1911	1912	1911	1912	1911	1912
January.....	\$41.85	\$44.90	\$40.55	\$43.54	\$55.68	\$58.92
February.....	40.21	45.75	39.16	43.31	54.46	52.39
March.....	39.85	51.56	38.45	49.25	54.57	54.64
April.....	38.88	52.00	37.47	50.36	56.37	54.18
May.....	38.25	55.30	36.79	53.27	55.21	52.45
June.....	40.50	55.88	38.18	54.38	56.49	55.01
July.....	40.75	58.85	38.36	56.59	58.81	58.83
August.....	42.50	55.13	41.28	53.27	60.74	57.04
September.....	42.63	59.75	41.29	57.07	59.33	61.26
October.....	42.38	57.00	40.89	55.97	54.72	63.22
November.....	45.40	55.69	43.25	53.98	57.19	56.55
December.....	44.13	.....	40.76	.....	62.03	.....
Year.....	\$41.45	.....	\$39.90	.....	\$56.76	.....

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

Other Ore Markets

Molybdenum Ore—Recent quotations are \$25 per ton for molybdenite, carrying 25% MoS₂; \$100 per ton for wulfenite carrying 25% or over MoO₃; both delivered at railroad.

Vanadium Ore—A recent quotation for vanadinite at mine is 75c. per lb. for the V₂O₅ contained, for ore carrying 10% or over.

Chemicals

New York, Dec. 18—John C. Wiarda & Co., Brooklyn, N. Y., are erecting on the ground which was occupied by their buildings, destroyed by fire in March last, nine buildings devoted to the manufacture of hydrofluoric acid, metallic oxides and various other chemicals. At the time of the fire they were able to continue business, owing to the possession of a storage warehouse some distance from the plant, which was filled with a large stock of finished materials. The new buildings will be equipped with the best appliances, and have been planned and arranged to secure the best results.

Arsenic—Trade has fallen into a pretty dull condition, and prices are unchanged. The quotations are \$4.87½ per 100 lb. for both spot and futures.

Copper Sulphate—Trade is pretty quiet and prices are unchanged at \$5.50 per 100 lb. for carload lots, and \$5.75 per 100 lb. for smaller parcels.

Guano—The Peruvian Corporation, which has the sole right to export guano from Peru, exported 83,000 tons of guano in 1911, as against 61,000 tons in 1910. In the latter year, the latest for which detailed figures are available, the distribution of guano exports was as follows: Belgium, 28,000 tons; United States, 15,500; Germany, 8,000; Great Britain, 7,000, and France, 2,500 tons.

Nitrate of Soda—Trade is quiet. Quotations remain at 2.60c. per lb. for spot and futures up to Apr. 30. Futures are 2.57½c. for May, 2.55c. for June and 2.52½c. for July and later deliveries.

Petroleum

The buyers for the Standard Oil companies have advanced prices 5c. per bbl., making the present quotations \$2 per bbl. on standard Pennsylvania grades.

MINING STOCKS

New York, Dec. 18—On Dec. 12 the Exchange was active, but rather weak. Mining stocks on the Curb showed fair dealings at irregular prices.

Dec. 13 the Exchange tended upward but on smaller business. On the Curb there were gains in Yukon Gold, Tonopah Merger and Nipissing on good

trading. Braden Copper led a general rise in the copper stocks.

Dec. 14 the Exchange was dull and depressed, feeling the effect of high money rates and the disturbed condition of the European markets. On the Curb mining stocks were active, but generally at lower prices.

Dec. 16 the Exchange was irregular and without definite tendency. The coal decision boosted some stocks, but others were weaker. On the Curb mining stocks were active and generally stronger.

Dec. 17 and 18 there was rather more steadiness on the Exchange and some tendency to recovery. On the Curb trading in mining stocks, especially the coppers, was good and prices were firm, with fractional advances on many stocks.

It is reported that at Pittsburgh, over 400,000 shares of mining stocks were sold on account of P. V. Rovnianek & Co., bankrupts, for \$104; also 9900 of Pittsburgh Silver Peak at 61c. per share and 2000 at 63c. per share.

At auction in New York, Dec. 12, the following prices are noted: North Butte Extension Copper Co., 1000 shares, \$5 par, \$21 for the lot and 500 shares, \$6 for the lot; 2000 shares Ontario Mining & Smelting Co., \$1 par, \$54 for the lot; Consolidation Coal Co., 50 shares, \$100 par, \$100.25 per share; Alabama Mineral Land Co., 57 shares, \$100 par, \$75 per share; New York, Susquehanna & Western Coal Co., 500 shares, \$50 par, \$11 per share; United States Tungsten Co., 97,000 shares, \$1 par, \$810 for the lot; Dover White Marble Co., \$100,000 bonds, May interest unpaid, \$100; lot including 5 shares Stewart Mining Co., \$1 each; 5 shares National Monument Co., \$100 each; 50 shares Cobalt Silver Queen, Ltd., \$1 each, and 100 shares Consolidated Arizona Smelting Co., \$10 each, \$34 for the lot.

Boston, Dec. 17—As might be expected, the market for mining shares has been demoralized and many prices reached the lowest level for the year. Values were not considered, so urgent was some of the selling. There has been but little news, but what there was has been of a favorable nature. The decline in prices was caused by the weakness of Amalgamated and other Wall Street stocks, and might be said to be technical rather than from any other cause. Some \$150,000,000 has been taken off the market value of copper shares from the high of the year, and it is argued that present prices are about the equivalent of a 14-cent copper metal market.

Two more copper mining dividends have been declared during the week, these being the North Butte and Shannon. Both are at the same rates as declared three months ago, namely, 50c. each.

Pond Creek has been an active and strong feature. After going off a little, it recovered to \$26.50 tonight.

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	Sept.	October	Nov.
Alaska shipments.	1,726,715	1,435,235	.....
Anaconda.....	24,500,000	25,250,000	24,250,000
Arizona, Ltd.....	3,340,000	3,200,000	3,000,000
Copper Queen.....	9,105,851	8,184,575	8,807,940
Calumet & Ariz.....	4,462,000	4,404,000	4,918,000
Chino.....	3,217,359	3,638,500	3,911,169
Detroit.....	1,881,668	1,934,828	1,968,620
East Butte.....	1,250,000	.....	.....
Mammoth.....	1,634,937	1,883,283	.....
Giroux.....	1,045,208	.....	.....
Mason Valley.....	1,200,000	1,563,700	.....
Nevada Con.....	5,607,578	850,741	.....
Ohio.....	635,000	.....	.....
Old Dominion.....	2,204,000	2,523,000	2,758,000
Ray.....	2,975,404	.....	3,201,500
Shannon.....	1,142,000	1,210,000	1,436,000
South Utah.....	225,568	.....	.....
United Verde.....	2,750,000	2,750,000	.....
Utah Copper Co.....	6,616,887	2,022,352	.....
Lake Superior*.....	19,250,000	21,500,000	20,400,000
Non-rep. mines*.....	8,094,792	8,250,000	8,250,000
Total production.....	103,025,987	.....	.....
Imports, bars, etc.....	25,149,329	.....	.....
Total blister.....	128,175,316	.....	.....
Imp. in ore & matte.....	7,142,232	.....	.....
Total American.....	135,317,548	.....	.....
Miamit.....	2,949,150	2,577,750	2,972,000
Brit. Col. Cos.:	.....	1,022,904	.....
British Col. Copper	.....	2,018,424	.....
Granby.....	2,083,118	.....	.....
Mexican Cos.:	.....	2,612,400	2,315,040
Boleof.....	.....	3,500,000	5,064,000
Cananea.....	771,844	3,045,667	2,112,377
Mocetzuma.....	.....	.....	.....
Other Foreign:	.....	.....	.....
Cape Cop., S. Africa	678,720	757,120	907,200
Kyshtim, Russia.....	1,750,000	.....	.....
Spassky, Russia.....	981,120	974,460	.....
Tilt Cove, Now'd.....	.....	86,785	.....
Exports from:	.....	.....	.....
Chile.....	6,048,000	8,512,000	4,816,000
Australia.....	7,616,000	9,520,000	10,752,000
Arrivals in Europe†	8,518,720	13,771,520	12,976,320

†Boleof copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER

Month	U.S. Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
XI, 1911.....	111,876,601	68,039,776	67,049,279
XII.....	122,896,697	65,988,474	65,298,716
Year.....	1,431,938,338	709,611,605	754,902,233
I, 1912.....	119,337,753	62,348,901	80,167,904
II.....	116,035,809	56,228,368	63,148,066
III.....	125,694,601	67,487,466	58,779,566
IV.....	125,464,644	69,513,846	53,252,326
V.....	126,737,836	72,702,277	69,485,945
VI.....	122,315,240	66,146,229	61,449,650
VII.....	137,161,129	71,094,381	60,121,331
VIII.....	145,628,521	78,722,418	70,485,150
IX.....	140,089,819	63,460,810	60,264,796
X.....	145,405,453	84,104,734	47,621,342
XI.....	134,695,400	69,369,795	55,906,550

VISIBLE STOCKS

	United States	Europe	Total
XII, 1911.....	111,785,188	164,281,600	276,066,788
I, 1912.....	89,454,695	158,323,200	247,777,895
II.....	66,280,643	154,851,200	321,131,843
III.....	62,939,988	141,142,400	204,082,387
IV.....	62,367,557	136,819,200	199,186,757
V.....	65,066,029	134,176,000	199,242,029
VI.....	49,615,643	117,801,600	167,417,243
VII.....	44,335,004	108,186,000	152,521,004
VIII.....	50,280,421	113,299,200	163,579,621
IX.....	46,701,374	113,568,000	160,269,374
X.....	63,065,587	107,408,000	170,473,587
XI.....	76,744,964	103,801,600	180,546,564
XII.....	86,164,059	96,947,200	183,111,259

Trading on the Curb has been active and strong for specialties, notably Alaska Gold, which is selling at a record price of \$12.75, and Mexican Metals, which has been very active and is up to \$2.18 3/4. Butte Central has steadied to just under \$7 per share.

Assessments

Company	Delinq	Sale	Amt.
Butte & Anaconda, Mont.	Jan. 1	Feb. 1	\$0.01
Challenge Con., Nev.	Dec. 4	Dec. 27	0.05
Consolidated Imperial, Nev.	Jan. 8	Jan. 29	0.01
Copper Hill, Ida.	Jan. 5	Feb. 5	0.002
East Crown Point, Utah	.....	Dec. 30	0.01
East Hercules Ext., Ida.	Dec. 15	Jan. 3	0.001
Echo, Ida.	Dec. 11	Jan. 11	0.01
Hider Nevada, Utah	Dec. 20	Jan. 10	0.005
Hypothek, Ida.	Dec. 18	Jan. 10	0.005
Leroy Gold & Copper, Ida.	Nov. 28	Dec. 28	0.002
Mayflower, Ida.	Dec. 4	Jan. 4	0.002
Moon Creek, Ida.	Dec. 2	Jan. 2	0.005
Moonlight, Ida.	Dec. 2	Dec. 23	0.005
Nabob, Ida.	Nov. 30	Dec. 30	0.001
North Star, Ida.	Dec. 7	Dec. 28	0.02
N. Y. Bonanza, Utah	Dec. 5	Dec. 24	0.05
Overman, Nev.	Dec. 16	Jan. 26	0.004
Royal, Ida.	Jan. 7	Jan. 31	0.02
Seg. Belcher & Midas, Nev.	Dec. 15	Jan. 6	0.01
Seven Troughs Mont., Utah	Dec. 2	Dec. 23	0.10
Sierra Nevada, Nev.	Nov. 26	Dec. 26	0.002
Sunrise, Ida.	Jan. 4	.....	1.00
Superior & Boston, Mont.	Nov. 19	Jan. 28	0.002
Tarbox, Ida.	Jan. 8	Jan. 30	0.15
Union Consolidate 1, Nev.	Dec. 23	Jan. 23	0.004
Wibur, Ida.	.....	.....	.....

Monthly Average Prices of Metals
SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52.375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	59.043	23.794	24.081	27.190
March	51.454	52.745	58.375	23.690	24.324	26.875
April	53.221	53.325	59.207	24.483	24.595	27.284
May	53.870	53.308	60.880	24.797	24.583	28.038
June	53.462	53.043	61.290	24.651	24.486	28.215
July	54.160	52.630	60.654	25.034	24.286	27.919
August	52.912	52.171	61.606	24.428	24.082	28.375
September	53.295	52.440	63.078	24.567	24.209	29.088
October	55.490	53.340	63.471	25.596	24.594	29.299
November	55.635	55.719	62.792	25.680	25.649	29.012
December	54.428	54.905	.....	25.160	25.349	.....
Year	53.486	53.304	.....	24.670	24.592	.....

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

COPPER

Month	NEW YORK				London, Standard	
	Electrolytic		Lake		1911	1912
	1911	1912	1911	1912		
January	12.295	14.094	12.680	14.337	55.600	62.760
February	12.256	14.084	12.611	14.329	54.974	62.893
March	12.139	14.698	12.447	14.868	54.704	65.884
April	12.019	15.741	12.275	15.930	54.034	70.294
May	11.989	16.031	12.214	16.245	54.313	72.352
June	12.385	17.234	12.611	17.443	56.365	78.259
July	12.465	17.190	12.720	17.353	56.673	78.636
August	12.405	17.498	12.634	17.644	56.266	78.670
September	12.201	17.508	12.508	17.698	55.253	78.762
October	12.189	17.314	12.370	17.661	55.170	78.389
November	12.616	17.326	12.769	17.617	57.253	76.890
December	13.552	.....	13.768	.....	62.068	.....
Year	12.376	.....	12.634	.....	55.973	.....

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

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41.255	42.529	July	42.400	44.519
February	41.614	42.962	August	43.319	45.857
March	40.157	42.577	September	39.755	49.135
April	42.185	43.923	October	41.185	50.077
May	43.115	46.053	November	43.125	49.891
June	44.606	45.815	December	44.655	.....
			Av. Year	42.281	.....

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4.483	4.435	4.334	4.327	13.009	15.597
February	4.440	4.026	4.268	4.266	13.043	15.738
March	4.394	4.073	4.238	4.046	13.122	15.997
April	4.412	4.200	4.262	4.118	12.889	16.331
May	4.373	4.194	4.223	4.072	12.984	16.509
June	4.435	4.392	4.292	4.321	13.260	17.588
July	4.499	4.720	4.397	4.603	13.530	18.544
August	4.500	4.569	4.406	4.452	14.260	19.655
September	4.485	5.048	4.356	4.924	14.744	22.292
October	4.265	5.071	4.139	4.894	15.332	20.630
November	4.238	4.615	4.181	4.463	15.821	18.193
December	4.450	.....	4.332	.....	15.648	.....
Year	4.420	.....	4.286	.....	13.970	.....

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

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5.452	6.442	5.302	6.292	23.887	26.642
February	5.518	6.499	5.368	6.349	23.276	26.661
March	5.563	6.626	5.418	6.476	23.016	26.048
April	5.399	6.633	5.249	6.483	23.743	25.644
May	5.348	6.679	5.198	6.529	24.375	25.790
June	5.520	6.877	5.370	6.727	24.612	25.763
July	5.953	7.116	5.545	6.966	25.006	26.174
August	5.953	7.028	5.808	6.876	26.801	26.443
September	5.869	7.454	5.719	7.313	27.750	27.048
October	6.102	7.426	5.951	7.276	27.256	27.543
November	6.380	7.371	6.223	7.221	26.795	26.804
December	6.301	.....	6.151	.....	26.849	.....
Year	5.758	.....	5.608	.....	25.281	.....

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

PIG IRON AT PITTSBURG

Month	Bessemer		Basic		No. 2 Foundry	
	1911	1912	1911	1912	1911	1912
	January	\$15.90	\$15.12	\$14.40	\$13.32	\$14.75	$14.00
February	15.90	15.03	14.50	13.28	14.81	14.01
March	15.90	14.95	14.65	13.66	14.96	14.10
April	15.90	15.13	14.65	13.90	15.00	14.15
May	15.90	15.14	14.30	13.90	14.72	14.12
June	15.90	15.15	14.06	14.11	14.56	14.22
July	15.90	15.15	14.03	14.38	14.53	14.38
August	15.90	15.43	14.00	14.90	14.47	14.85
September	15.90	16.86	13.57	16.03	14.40	15.63
October	15.43	17.90	13.44	17.18	14.34	17.22
November	14.92	18.07	13.30	17.09	14.25	18.00
December	15.15	.....	13.10	.....	13.90	.....
Year	\$15.72	.....	\$13.94	.....	\$14.49	.....

STOCK QUOTATIONS

COLO. SPRINGS Dec. 17		SALT LAKE Dec. 17	
Name of Comp.	Bid.	Name of Comp.	Bid.
Acacia	.031	Beck Tunnel	.087
Cripple Cr'k Con.	.017	Black Jack	.10
C. K. & N.	.01	Cedar Talkman	.01
Doctor Jack Pot.	.063	Colorado Mining	.19
Elkton Con.	.62	Columbus Con.	.12
El Paso	5.80	Crown Point	.04 1/2
Findlay	.03	Daly Judge	16.15
Gold Dollar	.021	Grand Central	.75
Gold Sovereign	.153	Iron Blossom	1.25
Isabella	.05	Little Bell	1.25
Jack Pot.	.05	Lower Mammoth	.03
Jennie Sample	.005	Mason Valley	10.50
Lexington	.01	May Day	23 1/2
Moon Anchor	.01	Nevada Hills	1.30
Old Gold	.03	New York	.01 1/2
Mary McKinney	.55	Prince Con.	1.60
Pharmacist	.011	Silver King Coal'n	3.40
Portland	1.02	Sioux Con.	.03
Vindicator	.08	Uncle Sam	.11
Work	1.01	Yankee	.16

TORONTO Dec. 16

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	7.40	Foley O'Brien	.20
T. & Hudson Bay	160.00	Hollinger	14.75
Temiskaming	.41	Imperial	1.03
Wetlaufer-Lor.	.24	Pearl Lake	.21
Am. Goldfield	1.40	Porcu. Gold	.18
Apex	1.00	Preston E.D.	.03
Crown Chartered	.02	Rea	.25
Dobie	.25	Standard	1.00 1/2
Dome	119.00	Swastika	.09
Dome Exten.	.06	West Dome	.10

SAN FRANCISCO

Dec. 17

Name of Comp.	Cig.	Name of Comp.	Bid
COMSTOCK STOCKS			
Alta	.04	MISC. NEV. & CAL.	
Belcher	.23	Belmont	7.70
Best & Belcher	.06	Jim Butler	.62
Caledonia	.79	MacNamara	.17
Challenge Con.	.06	Midway	.34
Chollar	.02	Mont-Tonopah	1.62 1/2
Confidence	.31	North Star	.22
Con. Virginia	.37	West End Con.	1.27 1/2
Crown Point	.35	Atlanta	.20
Gould & Curry	.01	Booth	.05
Hale & Norcross	.11	C.O.D. Con.	.06
Mexican	1.60	Comb. Frac.	.09
Occidental	.70	Jumbo Extension	.26
Ophir	.28	Pitts-Silver Peak	.75
Overman	.40	Silver Pick	.06
Potosi	.03	St. Ives	1.30
Savage	.07	Tramp Con.	1.02
Sierra Nevada	.30	Argonaut	12.00
Union Con.	.07	Bunker Hill	14.50
Yellow Jacket	.30	Central Eureka	.30
		So. Eureka	2.50

N. Y. EXCH. Dec. 17

Name of Comp.	Cig.
Amalgamated	73 1/2
Am. Agr. Chem.	55
Am. Sm. & Ref. com	69 1/2
Am. Sm. & Ref. pf.	104 1/2
Am. Sm. Sec. pf. B	38
Anaconda	83
Batopilas Min.	1 1/2
Bethlehem Steel pf.	66
Chino	41 1/2
Federal M. & S. pf.	37 1/2
Goldfield Con.	2
Great Nor. ore. ctf.	41 1/2
Guggen. Exp.	49 1/2
Homestake	106
Inspiration Con.	17 1/2
Miami Copper	25 1/2
Nat'l Lead. com.	55 1/2
National Lead, pf.	104
Nev. Consol.	19
Phelps Dodge	210
Pittsburg Coal, pf.	87
Ray Con.	20 1/2
Republic I. & S. pf.	25 1/2
Republic I. & S. pf.	85 1/2