

Issued Weekly by the
Hill Publishing Company

JOHN A. HILL, Pres. ROBT MCKEAN, Secy.
505 Pearl St., New York.

Monadnock Bldg., Chicago.
6 Bonverle Street, London, E. C.
Unter den Linden 31—Berlin N. W. 7.

WALTER RENTON INGALLS, Editor.

Subscriptions payable in advance,
\$5.00 a year for 52 numbers, including
postage in the United States, Mexico,
Cuba, Porto Rico, Hawaii, or the Philip-
pines, \$6.50 in Canada.

To foreign countries, including post-
age, \$8.00 or its equivalent, 33 shillings:
33 marks: or 40 francs.

Notice to discontinue should be writ-
ten to the New York Office in every in-
stance.

Advertising copy should reach New
York Office by Thursday of week before
date of issue.

Entered at New York Post Office as
mail matter of the second class.

Cable Address, Enginjour, N. Y.

The Engineering and Mining Journal

Vol. 94

OCTOBER 26, 1912

No. 17

Leaching versus Total-Sliming

After many years' labor and study in devising and developing the total-slime method of cyanidation of gold and silver ores, there are still metallurgists who maintain that it is not able to return the profit that may be obtained by a separate sand and slime treatment. That this difference of opinion exists is a fairly clear indication that neither method is all that its adherents claim for it.

There are several points which must be carefully considered when weighing the merits of either of these methods for comparison with the other, and each of these points must be given due weight in a comparison of the merits of the whole. To consider one of these points without viewing it in the light of its effect upon other essential items of the treatment is to fall into expensive error, an error into which many have been led by the specious claims for a new and apparently efficient, though untried, process.

The cost of reducing an ore to an entirely slimed product is an important item and varies with the character of the ore under consideration. A soft ore might easily be ground to a point where it could be handled as a total slime, while a tough rock might require an expenditure so great to accomplish the same end, that it would be commercially impossible. It is as well to bear in mind that extremely fine grinding does not necessarily result in total slime; in fact, it is practically impossible to produce a total slime, as a true slime would be colloidal; but it is possible to grind an ore so fine that the product may be handled as if it were slime, and with about as good results, as far as extraction is concerned.

The degree of subdivision necessary to allow an ore to give up the commercial maximum of its contained metal is another point which must be considered in connection with the cost of grinding. Often it may be found that a compara-

tively coarse product will give up so large a percentage of its metal content by simple leaching that further subdivision would be a useless expense. Even if the ore has to be ground extremely fine, it does not necessarily follow that agitation of the product must follow. It is to be remembered that a clean sand is leachable even when it is so fine as to pass a 200-mesh screen. The leaching process has the advantages of cheapness of operation and the possibility of using stronger solutions than are permissible in agitation. The expensive part of leaching is in the handling of the sand, and this one item may, in some arid regions, make the process commercially impracticable.

It is not unlikely that improved mechanical methods and chemical processes may put one or the other of these systems in the lead definitely, but the question is not yet settled. It is a rather general opinion that the question has been settled in favor of the total-sliming method, but within the profession this is known to be not correct.

Iron and Coke

The remarkable expansion of the demand for iron and steel which has taken place during the present year has, apparently, not yet reached its limit; but it bids fair to be halted and circumscribed for the time being by an unexpected cause. The demand for pig iron, the basis of the industry, has come to a point where it seems difficult to satisfy it. It is not that blast-furnace capacity has been exceeded, for there are idle furnaces whose owners are willing to put them in blast under present conditions of active business, advancing prices and the general exhaustion of reserve stocks. Iron ore can be had, and there is no fear that sufficient supplies are not attainable. The trouble just at present is the scarcity of coke, which is the fuel with which nine-tenths of our iron

CIRCULATION STATEMENT

Of this issue 9000 copies are printed.
None sent free regularly, no returns
from news companies, no back numbers.
Figures are live, net circulation.

Contents

	PAGE
Editorials:	
Leaching versus Total Sliming....	771
Iron and Coke.....	771
Money Incomes and Cost of Living.....	772
Cyanogen Radical Determination.....	772
By the Way.....	773
Largest Direct Current Generators.....	774
Glaciers as Prospectors.....	774
Correspondence and Discussion:	
Illuminating the Cross Hairs in Mine Surveying.....The Bingham Strike.....*Caving System in Chis- holm District.....	775
*The Antimony Industry of China. C. Y. Wang.....	777
Cadmium Nitrate in Acid Radical Determination.....	778
Miners' Wages.....	778
*Multiple Fired Continuous Furnace Deeper Drainage Plan for Cripple Creek.....	779
Effect of Standard Oil Dissolution..	779
Broken Hill South Silver Mining Co.	780
Mineral Production of Tasmania....	780
Utilizing Natural Gas.....	780
Details of Practical Mining:	
Some Details of Mesabi Range Mining.....*Open Cut Work at the Dome Mine, Porcupine.....*Level- ing Dredged Ground at Oroville....	781
*Mine Car with Round Bottom .....*Electric Signal System, Ar- gonaut Mine.....*Factor of Safety for Hoisting Ropes.....New Steel Dredge for Yuba Consolidated Goldfields.....*Practical Test of Strength of Detonators.....	781
Details of Metallurgical Practice:	
Refining Zinc-Box Precipitate....	785
Prevention of Plumbism.....*Trap Spout for Copper Blast Furnace .....Standard Hardinge Mill Sizes .....Dangers from Heavy Chemi- cals.....*Protecting Pulleys from Dust.....	785
The Cost of Doing Things:	
Buffalo Mines..... Motor Truck Haulage in Arizona.....Cananea Consolidated Unit Costs..... Wol- verine Costs..... Power Costs in a 6500-kw. Station.....	787
How the Metals Are Sold—Spelter. W. R. Ingalls.....	789
Standard Curtails California Oil Pur- chases.....	791
*Chicago Pneumatic Air Compressor Canadian Mining Institute.....	791
*Development Methods at Mineville, Guy C. Stoltz.....	792
Iron Blast Furnace Temperatures... Nickel Extraction from Garnierite..	795
*Early Western Lead Smelting.....	796
*The Ore Deposits of Goldfield—I. Augustus Locke.....	797
Patents.....	803
Personal, Obituary and Societies...	804
Editorial Correspondence.....	805
Mining News.....	807
Markets.....	813
*Illustrated.	

is made. The proportions of iron made with anthracite, charcoal and raw bituminous coal are too small to be seriously regarded when we consider the total.

The main sources of supply for those furnaces which sell their iron—and for many which convert it into steel in their own mills—are in western Pennsylvania and in West Virginia. Considerable quantities are made in Alabama and Colorado, but they are made for the use of local furnaces and there is no surplus for sale. The same may be said of the various by-product plants in various parts of the country, nearly all of which furnish coke for special groups of furnaces, and are controlled by the owners of those groups. Last year Pennsylvania made over 60% of the total coke output of the country, most of it in the Connellsville and adjoining regions. West Virginia made much less, about 7% of the total, so that Connellsville is the main reliance of the furnaces which have to buy their coke. The consequence of these conditions is a scarcity of the iron-making fuel and an extraordinary rise in its price.

These advances have come about rather suddenly. Three months ago the production in the Connellsville region had increased more than 50% over what it was at the opening of the year, but prices had advanced only to a moderate degree. At that time there was a sort of agreement among producers to ask \$2.50 per ton for furnace coke at the ovens, but the buyers resisted it with so much success that many contracts were made at \$2.25. Since then, however, so many furnaces have gone or are going into blast that much higher prices have been paid, though the production in the region has gone up to 400,000 tons weekly, the highest point ever reached. It cannot go much higher for a time; there are only a few idle coke ovens, and they cannot be started, since it is impossible to get the necessary labor. Coke for prompt delivery has been sold at \$3.50 and even \$3.75, while \$3 and over is named for contracts. West Virginia cannot increase its production largely without building more ovens, and that will take time.

The fuel problem is rather a serious one for the blast furnaces and it cannot be worked out in a hurry, even though the advance in iron prices enables them to pay the greater cost of coke. Apparently the increased produc-

tion of iron will be limited for a time, not because of diminished demand but by insufficient fuel supply. One ultimate result will probably be an increase in the number of byproduct-coke plants under the control of the ironmakers; and this will be a desirable outcome.

Money Incomes and Cost of Living

Col. Robert W. Thompson, president of the Orford Copper Co., in a recent communication to the editor of the *Evening Post*, asked him, or some of his readers, to tell what would happen if the "bookkeeping wage" of every workman in the United States were doubled and the "bookkeeping income" of all who have incomes and salaries were also doubled. Colonel Thompson, unlike Judge Gary and Daniel Guggenheim, is an economist of no mean attainment. He goes on as follows:

By "bookkeeping wage" or "bookkeeping income" I mean the credit given each month or each year to the individual, which is measured in dollars; whereas by the "economic wage"; or "economic income" I mean the real things, such as food, clothes, shelter, transportation, etc. Each year we have a fund of these things and each year they are all consumed. It seems to me that doubling the bookkeeping figure could have no effect upon the "economic wage"; in other words, if you double the nominal income of every individual in the country you would also double the price of everything. In the same way, I take it, that if you cut the "bookkeeping income" of everyone in country to one-half, you would not reduce the "economic income" a particle, for, after all, the "bookkeeping wage" or "bookkeeping income" is only the machinery to aid in the distribution of real things. I take it as nearly as I can make out that 85% of all the real things are consumed each year by people whose income is less than one thousand dollars a year. Can you increase the quantity of real things for everybody unless you increase the supply of real things?

Each year we bring into this country a million foreigners, who must be fed, clothed, housed, and transported. This puts an abnormal demand upon our power of production. If all of these immigrants went to the land they would support themselves, but when they gather in the cities or along the lines of new railways someone else has to support them. The labor employed on the land has not been particularly efficient. In transportation and manufacturing we have been fairly efficient, and this is true of the wholesale distribution of the products; but the retail distribution is very inefficient. The much-abused Meat Trust for instance, makes about 2½% on its turn-over, whereas the local butchers and meat markets need from 40 to 60% on their turn-over to keep them out of bankruptcy.

We hear a great deal about the high cost of living. Is not the real trouble in part due to the cost of high living and in

part due to this abnormal increase in population, which puts an ever-increasing demand upon our supplies without providing an equivalent increase in the production. When this begins to pinch the workmen the trade unions step in and demand an increase in wages. They get an increase in the "bookkeeping wage," but it is impossible to give them an increase in the "economic wage" because the things that they desire do not exist.

The above views are, of course, the expression of good common sense. Everybody knows that when wages are raised the cost of supplies is raised, or *vice versa*, and things go round in a vicious circle. A cheap coat may make a cheap man, in the words of a martyred president, but if we could all buy our coats cheaper, we fancy that we should all be better off nevertheless. The conditions at Butte, Mont., are illustrative. The miners there receive high wages, but they have to pay 25c. to be shaved, 15c. to have their boots blacked, with other things more or less in proportion, wherefore they do not prosper greatly. A lot of Lake Superior miners went to Butte five or six years ago, but after an experience there were glad to return to Michigan to work for lower wages in dollars but higher wages in net results, as they learned. Those miners, we venture to say, possess now a better idea of economics than most. At the time of the recent increase in the wages at Butte, the shopkeepers received the tip that they must not increase their prices, the advance being intended for the benefit of the men.

Cyanogen Radical Determination

In giving an abstract of Anton Vorisek's paper on cadmium nitrate in acid-radical determinations, we believe we are presenting what will be of interest to the ordinary chemist, as it covers the separation of the AgNO group of Acid radicals, but of especial value to the cyanide chemist who may wish a quick method of determining CN, SCN, Fe²⁺(CN)₆, and Fe³⁺(CN)₆ qualitatively.

The reports that efforts are being made to persuade miners in the Joplin zinc-lead district to go to Utah to take the places of striking miners there have doubtless some foundation in fact. It is not known yet whether they have had any success. Joplin is at present active, ore prices are high and the unemployed few in number.

By the Way

Daniel Guggenheim, upon his return from Europe last week, expressed himself as being still fearful of a runaway copper market. However, he is going to try to prevent it (along with other producers).

A letter from Ely, Nev., Oct. 17, gives the following concise account of the labor trouble there: "The strike is on yet here. Two Greeks killed this morning at the smeltery; they tried to enter the gates against orders, would not stop and were shot. Governor Oddie is here; the sheriff is running for reelection; too much politics. Outlook bad."

The first steel produced in this country was probably made in Connecticut in 1728 by Samuel Higley and Joseph Dewey, according to the U. S. Geological Survey. Crucible steel was first successfully produced in the United States in 1832 at the works of William and John H. Garrard, at Cincinnati, Ohio. Bessemer steel was first made in this country in September, 1864, by William F. Durfee, at an experimental plant at Wyandotte, Mich., and openhearth steel in 1864 by the New Jersey Steel & Iron Co., at Trenton.

The varied character of the labor employed in the steel mills is shown by the complaints that many men are leaving the Pittsburgh district and Gary just when their services are urgently needed. The men who are quitting are Greeks, Bulgarians, Rumanians and others, who are moved by a desire to take part in the war in the Balkans. These men have found work readily in the steel mills, largely as helpers and laborers, and their number is considerable. The emigrants from South-eastern Europe, however, do not as a rule become assimilated or take root in this country; they retain a strong interest in their native lands—to which most of them expect to return some day—and they are easily moved to hasten that return, as in the present case, where the war feeling is strong.

To be president of several going promotions seems more lucrative than most occupations. According to the bill of complaint filed by Courtenay Crocker, counsel for complaining stockholders, Stephen R. Dow has received for at least three years as president of the Franklin Mining Co., a salary of \$5000 per year, and at the same rate from four other companies, Indiana, North Lake, Algolah and the Corbin Copper Co. Other officers have received salaries in proportion from all five companies and, according to the complaint, conspired not only to pay these salaries to themselves but also violated the corporate rights in permitting a loan to one of its directors. In the suit, the restitution is sought of \$76,400 loaned to Stephen R. Dow & Co., by the Franklin Mining Co. The lumping of cash and

accounts receivable in the annual report made it impossible to tell how much cash the company actually had.

Winfield Scott Stratton, prospector, miner and carpenter of Colorado Springs, discovered the Independence mine at Victor in the Cripple Creek district, and took about \$10,000,000 worth of gold out of it. He left a will providing a large sum for building the Myron Stratton home for the poor. For eight or nine years the executors have done nothing, but now by popular clamor they have been compelled to start building, and it is announced from Colorado Springs that the first 13 buildings, including the superintendent's home, two dormitories and ten cottages, will be completed by midsummer of next year at a cost of between \$100,000 and \$110,000.

According to press dispatches, rioting attended the attempt of the management of Nevada Consolidated to resume operations on Oct. 15. Strikers gathered around the entrances to the company's property and maltreated the men going to work. Only strenuous exertions by officers prevented riot and bloodshed. Anticipating trouble, the company had early rushed 350 men inside the stockade around the works, which is now operating under guard of 60 deputy sheriffs. A crowd of striking Greeks and Austrians armed with revolvers and clubs met 200 laborers going on shift Oct. 15, and drove them back to their cabins after a short fight in which clubs and stones were freely used. Several other encounters occurred between the strikers and company employees during the day. American mechanics are taking little part in the fight, and many of them are leaving the district. Industry is theoretically a peaceful and beneficent thing, but the practice at McGill is strenuous and savors too much of reports of fighting in the Balkans.

Several years ago the Illinois Geological Survey was complimented upon its accurate and practical work in pointing out the promising oil formations which were later developed into the Carlyle oil field. However, the medal for geological sharpshooting must be passed to the Michigan Geological Survey for the discovery of oil at Saginaw, Mich. Several years ago, former State Geologist Alfred C. Lane discovered the anticline under the city of Saginaw and repeatedly called attention to it in the publications of the survey. Doctor Lane reported that oil might be expected near the old Wiley mill, at a depth of 2325 ft. The Saginaw Valley Development Co., drilling as near as it could to the Wiley mill, struck oil at a depth of 2317 ft. According to State Geologist R. C. Allen, the oil stands in the casing at a height of 1200 ft. above the source, indicating a pressure of about 120 lb. per sq.in. after shooting; the initial yield will probably be from 25 to

50 bbl. per day. The oil was encountered in a sandy layer about 15 ft. thick in the Antrim shales. Beneath this horizon about 500 ft. lies the Dundee limestone, which is productive in the Petrolia and Port Huron fields. It is planned to sink into this formation.

So long as the copper-metal market holds strong, there will be no fear regarding Amalgamated's dividends, says the *Evening Post*. The recent quarterly increase of 0.25% calls for distribution to shareholders of \$384,000 more than in the last quarter, when 1¼% was paid; but, as the increase in the Anaconda dividend last month turned into the Amalgamated's treasury an additional \$768,000, the advance in the Amalgamated rate seemed well warranted. Maintenance of a 6% rate will mean more than ever now the supporting of the copper-metal market against a break. Statistics on output and stocks must constantly be favorable; reports of "hidden stocks" must regularly be denied; optimistic interviews must appear at short intervals. A 6% dividend will require the payment of \$9,240,000 a year to Amalgamated shareholders, instead of the \$3,077,000 which has been paid since 1908. So long as copper is maintained above 17c., and Anaconda preserves its 12% dividend rate on the \$76,875,000 stock which is in the Amalgamated treasury, the enlarged payments will be made. But all depends on maintenance of copper's price.

Germany has been growing restive under Standard Oil domination in its oil trade, and the government is devising measures to put an end to it. A bill has been prepared for this purpose and its provisions have been freely discussed, though it has not yet been introduced in the Reichstag. In effect this bill provides for a monopoly of the petroleum trade administered not by the government, but by a company which will be closely controlled by the government. The early publication of the bill was brought about by negotiations with the banks, which are expected to furnish the necessary capital. Some of its provisions are not yet fully settled, but the general scope and purpose are plain. The new company is expected to draw its oil supplies from Galicia, Rumania, Russia and independent producers in America. Its manager, it is said, will be Bernhard Durnberg, who was for some time minister of colonies, and who was previously known as a successful business man whose competitive methods were almost as aggressive and ruthless as those of the Standard itself. There is some talk at Washington of diplomatic intervention in favor of American oil producers, but it does not seem likely that such action would be any more successful than in the potash cases, the matter being one of internal regulation, in which Germany would not submit to any intervention.

Largest Direct Current Generators

Seven vertical waterwheel-type electric generators, which represent units of the largest capacity ever built for generating direct current, will be installed in the new plant of the Southern Aluminium Co. at Whitney, N. C. Each machine will have a rating of 5000 kw., delivering 20,000 amp. at 250 volts and operating at a speed of 170 r.p.m. Two smaller direct-current generators of the same type, rated 2500 kw. at 300 r.p.m.; two 1250 kva. alternators, having a speed of 514 r.p.m., with two 16-kw. exciters, and all necessary switchboards and controlling devices are also included in the installation.

The contract for all the electrical apparatus has been placed with the General Electric Co. and the installation will be one of the largest and most modern of its kind in the world. It is the intention of the Southern Aluminium Co. to push to completion the project now under way and to have in operation in the course of the next eight months a manufacturing plant that will turn out about 25,000 tons of aluminum annually.

The work at Whitney is in charge of Dr. Paul Heroult, an eminent French engineer, who is recognized as one of the most expert authorities in the world on the manufacture of aluminum, and who will operate the plant after completion. Although Doctor Heroult has been directing construction operations there but a few weeks, remarkable progress has been made, and it is confidently expected that the entire plant will be in readiness for turning out the product of the company by the middle of 1914. For partial description of the plant see the *JOURNAL* of Sept. 28, 1912, p. 585.

The immense machines, which will supply the electric current for the several operations of this vast industry, will be installed immediately over wheel pits and direct connected to vertical shafts of S. Morgan Smith turbines by forged-steel flanged couplings. Each 5000-kw. generator will weigh in the neighborhood of 150 tons, measure 22 ft. in diameter and extend 13 ft. above the floor level. The entire rotating element of the generators will be supported from an overhead thrust bearing. While the normal speed will be 170 r.p.m., they will be designed with provision for a safety runaway speed of 75% above normal. The wheel governors will be provided with remote electric control for both hand and automatic operation.

The establishment of the Southern Aluminium Company's plant at Whitney is transforming the site into a bustling city. While the construction of the plant is under way, it is anticipated that 2000

people will reside there, and 500 new concrete houses are being erected to accommodate the influx of population.

Glaciers as Prospectors

BY H. W. HARDINGE*

In a recent issue of a technical mining journal reference is made to geographical situation of minerals as being a basis for the valuation of such minerals. The article states as an illustration, "that ice at the North Pole has no value while it would be of immense value at the Tropics." Paradoxical as it may seem, especially in regard to its mineralogical reference, we admit the metaphorical truth yet practical falsity of the illustration cited. For the third time in one year I have been called upon to make investigations which would not have been necessary but for "the ice at the North Pole."

A recent trip to the iron mines of Lapland, 150 miles or more north of the Arctic Circle was a forcible reminder that the greatest of all prospectors is the glacier, carrying upon its back geological tools for its work in the form of immense boulders and fields of debris which finally work down, through, and under the ice to do its erosive prospecting. The modern prospector also carries his tools upon his back imitating his glacial predecessor.

It is true the glacier as a practical worker is not an economist, for it scatters outcrops and metal contents of veins and deposits far and wide, at the same time its work is no surface scratching, for it digs deep, carrying away mountains as easily as the modern prospector shoots away his outcrops, exposing ore and coal deposits which even the most advanced geological miner of today would hardly anticipate existing below primal "indications." The glacier has cut deep into the rocky storehouses of Alaska, scattering the country rock and gangue broadcast, detaching bunches of gold from the original matrix of rock, rolling them into nuggets which have been later covered by the tundra.

The miner of today is profiting by the work of the glacier, virtually "jumping its claim" as is evidenced in the silver and gold mines of Cobalt and Porcupine of Canada, where the "development" has exposed veins of native silver and gold, which still show the "first prospector's" tool marks, made years ago. Here again this first prospector and miner has scattered his winnings with the groundup rock formations, making the farm lands hundreds of miles to the south. This ancient

*Mining engineer and president, Hardinge Conical Mill Co., 50 Church St., New York.

prospector has exposed the remains of the tropical Carboniferous age of Spitzbergen in coal veins which preceded his own advent into the region of this present land of ice. Further to the south in the islands of the North Atlantic, where the raised plateaus attest to the effect of the glacial forces which cut great fjords through the superincumbent strata of igneous formations, veins of coal are found throughout these islands as vast conformable strata, showing but slight displacement. It provides evidence of an age in which carbonic acid practically formed the atmosphere, giving existence to the heat-forming elements locked beneath the "ice measures" of the present time.

It is more easy to understand the original occurrence of coal than it is to comprehend the vast quantities of iron ore which are today exposed in Lapland. In one deposit or vein alone, I computed as "in sight" over five hundred millions of tons, while double this amount is probably theoretically "in sight"; iron of a grade which no modern concentrating device can duplicate. This ore forms an immense hogback rising from the surrounding country to an elevation of nearly 500 ft. for over a mile in length before it disappears beneath the surface. The width varies approximately from 500 to 1000 ft. Surface developments and results of prospecting by diamond drills indicate a depth and quantity which will give the total mass a life of over 200 years, when mining daily shipments of 10,000 to 15,000 tons. The iron is of a purity and grade almost as incomprehensible as the quantity, for the average analysis of a one-year sample comprised of 3,800,000 tons, shows an actual average of a little over 68%, of a possible theoretical content of 72% of iron.

We Americans are apt to consider that we are materially ahead of the world in mining, at least in advanced ideas, but our Swedish friends are certainly capable of giving us "pointers" of which I hope to speak a few words in their praise in another short article bearing on this subject.

The natural gas produced in the United States in 1911, according to figures compiled by the U. S. Geological Survey, was 508,353,241,000 cu.ft., valued at \$74,000,000, as compared with 509,155,309,000 cu.ft. in 1910. Pennsylvania was the greatest consumer of natural gas in 1911, being followed by Ohio, West Virginia and Kansas in the order named. On Dec. 31, 1911, the number of productive wells in the United States was 28,428, of which 10,809 were in Pennsylvania, 4755 in West Virginia, 4717 in Ohio, 2633 in Indiana and 2004 in Kansas.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Illuminating the Cross Hairs in Mine Surveying

In the JOURNAL's discussion column I notice space given to the question of illuminating cross-hair in underground surveying. The practice at the Copper Queen Consolidated Mining Co., Bisbee, may be of interest.

In transit work all angles are doubled; and as survey parties consist of but two men a small pent-house shaped lantern is used for illuminating one plumb-bob string, which saves extra trips. The lantern has slots for inserting a piece of frosted glass, candles are used for light. The lantern is made at the mine of heavy sheet tin and is approximately 8x6 in. The other plumb-bob string is illuminated by an acetylene lamp held behind tracing cloth.

MAXWELL C. MILTON.

Tucson, Ariz., Oct. 17, 1912.

The Bingham Strike

The editorial in the JOURNAL of Oct. 12, 1912, is not quite fair to the Bingham operators. I am sure that the JOURNAL did not intend or would not wish to do any injustice to them.

The following scale of wages went into effect at Utah Copper and other Bingham mines on Sept. 1, 1912, 17 days before the strike was called. Machine miners, \$3.25 per shift of eight hours; machine helpers, \$3; hand-steel miners, \$2.75 and \$3 (maximum to apply only to skilled hand-steel miners); muckers, \$2.75; timbermen and timbermen's helpers increased 25c. per shift with maximum for timbermen of \$3.25; hand trammers, \$2.75; horse and mule trammers, \$3; horse and mule helpers, \$2.75; nippers, \$2.75. All of these are for shifts of eight hours.

The Utah Copper Co. put the above scale into effect on Sept. 1, the same day as the other Bingham operators. Common surface labor at the Utah Copper Co.'s mine is paid \$2. The Utah railroads are paying for similar kind of common labor to section men on desert divisions, \$1.50; section men on mountain divisions, \$1.60; special gangs laying rails, \$1.75. The railroad men pay their own board in railroad construction camps in this region. I am informed that the ruling wages are \$2.25 per day out of which men pay \$5.25 per week for

board; and in some cases \$2.50 with 75c. per day deducted for board.

OPERATOR.

Salt Lake City, Oct. 17, 1912.

[We certainly did not intend to do any injustice to the Bingham operators or cast any reflections upon them, but simply to discuss certain economic conditions. The facts are that the Lake Superior mines raised wages last April, the Butte mines on June 1 and the Arizona mines a little later. The Bingham operators advanced wages by 25c. per day on Sept. 1, and the men struck on Sept. 18, because they wanted 50c., which the companies refused.—EDITOR.]

Caving System in Chisholm District

There has recently been completed in the JOURNAL' a series of articles on the development and method of working of the Nels mine, an imaginary but typical property on the Mesabi range in Minnesota. There are a few points not made clear and others which possibly might bear discussion.

The surface plant is situated over ore on an adjoining "forty." A case of this sort where the surface rights could be leased for the period of time necessary to mine out a property the size of the Nels is hardly typical. However, granting that it could be done, it would seem probable that the fee owners of this adjoining forty would permit the sinking of the shaft on their ground far enough from the line so that no ore would have to be left on the Nels to support the shaft. There are several mines on the range where this has been done, a requirement being that the shaft, station and head-frame be left in good repair for the company owning the ground occupied. The first article states that the shaft is placed as it is so that it "can be used for hoisting until the mine is completely worked out" but it does not explain how to mine the shaft pillar.

Another situation for the plant and shaft worthy of consideration is the northwest corner of the Nels. If the shaft were placed here it would be permanent with plenty of stockpile and timber-yard space requiring but little grading, and would be available for the whole of both properties. The owners of the forty on the west apparently do not intend start-

¹Sept. 7, 1912, p. 437; Sept. 14, 1912, p. 511; Sept. 21, 1912, p. 559.

ing operations until the Nels is finished and the Nels company probably could sell them the shaft and surface equipment when it is done operations. The disadvantage would be the extra extra expense of rock sinking and drifting.

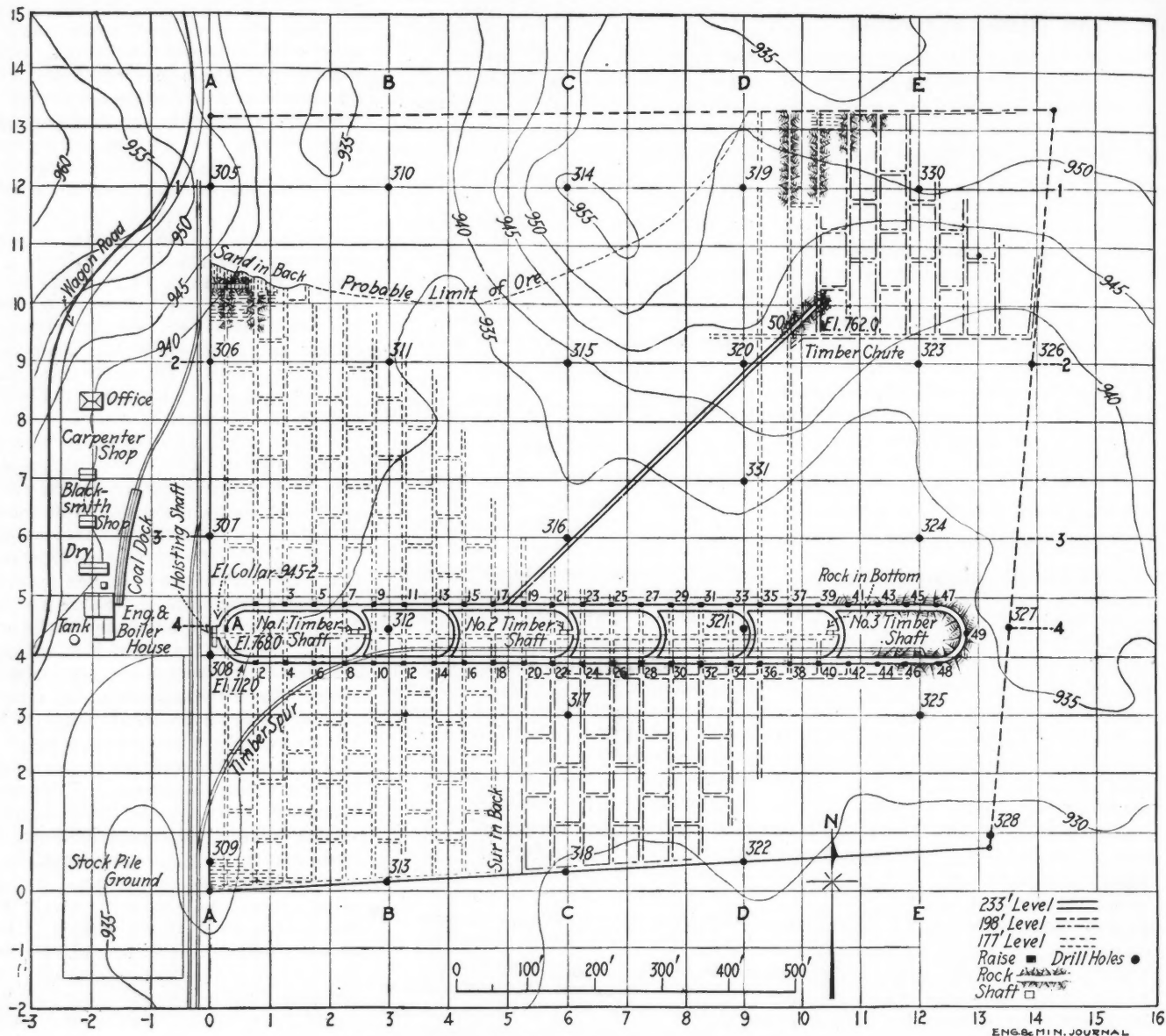
Slicing is started at the west property line. Now at one mine on the eastern end of the Mesabi, having an overburden of glacial drift material of the same character as that of the Nels, the surface caved back 35 ft. in 140 ft. vertical when two subs were mined out. At another mine a shaft 70 ft. horizontally from the outer line of workings on the 130-ft. level was seriously injured by the pulling of the ground after this "sub" was caved. The shaft track and the timber spur at the Nels do not seem to be in a safe place as shown.

A pillar of ore wide enough to support a strip of ground for a timber yard probably 90 ft. across extends from the main shaft east across the forty. This pillar should be at least 160 ft. wide at the top of the ore, 150 ft. from surface, and is a large body of ore to be tied up until the rest of the mine is finished and to be mined out after the timber shafts are caved. Besides, leaving a block of ore standing in this way is not good mining unless absolutely necessary, for a considerable amount of ore is bound to be worn away by the surface material as it settles into the mined-out space alongside the pillar. Assuming it slopes one-fourth as much as the surface overburden in an equal vertical distance, or about $4\frac{1}{2}$ ft. in 66 ft., there would be a loss of 10 tons of ore per linear foot of pillar exposed, or a total of over 26,000 tons. This could all be avoided if the timber yard were to be located near the main shaft. An extra compartment in the main shaft or a timber shaft close by would lower the timber for the whole mine. A $4\frac{1}{2}$ x5-ft. counter-balanced timber cage will handle the daily timber necessary for 50 gangs, working at the depth of 200 ft., in eight hours. A disadvantage of this plan would be the long tram necessary to get the timber to the working places, but a solution for this is mentioned later. There would be little circulation of air by this arrangement, but the three timber shafts as shown are not well located for ventilation anyway. One or perhaps two small air shafts, $4\frac{1}{2}$ x5 ft. inside, provided with ladders so that they could be used for emergency exits, should be sunk along the south line where they would last the longest, and one in the northeast corner.

Going on to the layout of the main level, the article does not state the power to be used for haulage. It is probably electric as motors are usually used in mines of this size in this district and as the curved crosscuts would be unnecessary for mule or hand tramping. The main drifts on the bottom level are driven at 0.5% grade and at 1050 ft. in, strike rock in the bottom. At the east end the

mine with a hand tram of 400 ft. and on the north side with a tram of 500 ft., while the motor haul is less than 100 ft. This could be avoided on the south side by driving lateral drifts 100 ft. apart off the main entry to the south line and putting up raises 50 ft. apart along them. Then the hand tram would never be much more than 100 ft. Besides the labor saved, the air would be much better, due

Two 5-ton motors would probably be necessary because of the low chutes, Trucks of timber for the south side could be spotted at the most convenient crosscut or some of these crosscuts could be laid out so that the motors could push the timber nearer the working places. But little extra work would be needed to install motor haulage on the subs for, I believe, tracks of 2-ft. gage are used on



MAP OF NELS MINE, AN IDEAL IRON-ORE PROPERTY

bottom level has 3 ft. of rock in the bottom. If the grade of the drifts had been changed on striking this rock so that they would clear it as shown by the drill holes then considerable dead work would have been saved and the last crosscut could have been at the east line instead of 75 ft. from it, making a material saving in the hand tramping necessary on the subs above. A 2½% grade would be necessary, but a motor can climb this for a short distance with a considerable train.

Slicing is started on the south side of

to the circulation through the raises, and they would afford a convenient means for opening a new sub in several places at once. On the north side, however, the laterals would strike rock before they would be far enough in to be of any use. On this side the third sub above the main level could be made a motor sub and, according to the sections, would have 20 or 30 ft. of ore in the back. This sub should open to the timber shaft, so it can be used for distributing timber, and to raise A so the ore can be dumped directly from the motor cars into the pocket.

the subs in the Chisholm district. The longest hand tram on the north side would then be about 250 ft., while before there was a 550-ft. tram, as shown on Section C, and one of 800 ft. on Section D. When the ore above this sub motor level is mined out a second sub motor level two subs down and one sub above the main level would underlie much more of the remaining ore than the main level 12 ft. lower, which would not need to be opened up until ready for mining.

TODD KENNEDY.

Gilbert, Minn., Oct. 19, 1912.

The Antimony Industry of China

By C. Y. Wang*

Antimony is found in nearly all of the southern provinces of China. The antimony industry of recent times was first developed under grants of monopoly, but these have now been canceled in most of the provinces.

*Care of Board of Industries and Commerce, Canton, Kwangtung, China.

Undoubtedly the natural sulphide of antimony has long been known to the Chinese porcelain manufacturers as a coloring material, under different local names. Antimony ore has been found in almost all of the southern provinces, namely, Hunan, Kwangsi, Kwangtung, Yunan, Kweichow, Szechuen, Fukien and Kiangsi; the last four provinces, however, are unimportant commercially. It has been reported that antimony has also been found in Anhwei and Chekiang provinces.

MINING CENTERS IN THE SOUTHERN PROVINCES

The mining centers of these provinces are:

For Hunan: Yiyang, Anhwa, Sinhwa, Supu, Chenki, Pasa.

For Kwangsi: Fengyi, Lungan, Pin, Hochi, Tienho, Ining.

For Kwangtung: Kok-kong, Yingtak, Tsingyun, Fongshing, Tingan, Yuyuen, Yanfa.

For Yunan: Paoning, Kaihwa.

For Kweichow: Siushan.

The ore found is generally stibnite; this holds good in almost all of the districts, except at Fengyi, where the ore is composed mainly of senarmontite, Sb_2O_3 . Alteration products—valentinite, senarmontite, kermesite and cervantite—are sometimes found in comparatively small quantities associated with the original sulphide. At the Kok-kong mines, situated from 20 to 30 *lis* directly west of the city of Shiuchow, the formation consists mainly of limestone, which is underlain by shale and sandstone. The whole region has been greatly disturbed. The general strike is east-west, and the general dip is to the south. The ore, in the form of pockets, occurs disseminated in the limestone. This deposit belongs to the type of epigenetic stocks¹ and undoubtedly originated from metasomatic replacement. It is similar to a few of the Wheaton River antimony deposits, Yukon Territory, as described by Cairness², and also perhaps to the antimony deposit at Ardèche, France.³ One peculiarity of this deposit is that at the Tsar Lou Ting mine, the mining was at first confined to the clearing off of the surface soil, thus exposing here and there round balls of ore, ranging from a few inches to three or four feet in diameter, covered superficially with a thin layer of decomposed stibnite. These are known locally as Ma-tsai. Undoubtedly these round balls are remnants of former pockets in the

limestone which has been eroded or dissolved away.

ORE RANGES FROM 20 TO 60% Sb

I have seen specimens of ores from almost all the antimony-producing provinces. The ore in Hunan occurs mainly

Hoichi is sometimes argentiferous as well as auriferous, as shown from the following analysis: Sb, 45.88%; insoluble, 54.12%; Ag, 7.5 oz.; Au, 0.02 oz. per ton.

THE HUNAN BUREAU OF MINES MONOPOLY

Some years previous to 1896, the Hunan Bureau of Mines enjoyed the monopoly of exporting antimony ore, through foreign agents, to foreign countries. It was in 1896 that they entertained the idea of smelting the ore. In 1897, the Tai Shing Co. was formed, under contract with the Bureau of Mines, with a 10-year monopoly, to smelt the ore to crude antimony. The life of the monopoly was a short one. For the people soon got to know that the smelting business was a profitable one and, by mere force exercised by the local gen-



SOUTHERN PROVINCES OF CHINA, SHOWING PRINCIPAL ANTIMONY CENTERS

in quartz veins. The tenor ranges from 20% up to 50 or 60%. The low-grade ore is sometimes argentiferous, as well as auriferous. An analysis of this gives the following: Sb, 31.2%; As, trace (less than 0.1%); Cu, nil; Pb, trace; Fe, 0.7%; insoluble, 49.5%; Au, 15 dwt. 5 grains per ton; Ag, 11 dwt. per ton.

The ore from Kwangsi and Yunan Provinces is found associated with quartz, slate or limestone. Probably the slate type is of sedimentary origin, similar to that found at Su Suergin, Sardinia, as described by Traverso.⁴ The ore from

tries, another smelting works was started in 1901 under the control of the Shan Yu company.

Thereafter company after company sprang into existence until there are at present more than a hundred companies were formed for mining the ore, and about eight smelting works, seven for crude and one for regulus. The smelting for regulus was started by me in 1908, when the Wah Chang Mining & Smelting Co. was formed with a capital of 300,000 taels, under grant of a 10-year monopoly, including a government subsidy; in the next year Chinese regulus was for the first time quoted in the London market.

¹"Antimony," by C. Y. Wang; Charles Griffin & Co., London, 1909, p. 47.

²"The Wheaton River Antimony Deposits, Yukon Territory, Canada," by D. D. Cairness; Canadian Min. Inst., 1910, Quart. Bull. No. 10, pp. 177-188.

³Vide "Antimony," by C. Y. Wang, p. 152.

⁴Ibid, p. 53.

The concentration plant for lead and zinc ore, owned at present by Carlowitz & Co., in Hankow, belonged once to a Mr. Laidrich who tried to concentrate antimony ore. The crude smelting works, belonging to a joint company of Chinese and Japanese, stopped operation about 1908. It was in the same year that a German firm, Gomes & Co., started a crude- and regulus-smelting plant. The undertaking has apparently proved a failure.

Antimony ore was discovered in Kwangtung Province about the year 1896; but it was not until the next year that operation began. The mining continued until 1899, when a lawsuit drew the attention of the Canton government, which under the notion that the ore was used for manufacturing explosives, at once prohibited its mining. However, in the next year, mining was resumed in the form of a monopoly under government control. This continued until 1910 when I obtained permission to form a limited company, the Pao Chang Mining & Smelting Co., with a capital of \$200,000 (silver currency) half of which belonging to the government, for the purpose of mining and of smelting the ore to regulus. Owing to mismanagement, I severed my connection

eral years previous to this date, small quantities of ore found their way out through Wuchow. The Pao Wah smelting works has never been started and the company, owing to the present unsettled condition, has been temporarily dissolved.

The antimony production is shown in the accompanying table. These figures⁵ are taken from the annual reports of the Chinese Maritime Customs.

Cadmium Nitrate in Acid Radical Determination

The use of cadmium nitrate as a reagent to separate the anions of the second (AgNO₃) group of acid radicals was discussed by Anton Vorisek, of New York, at the International Congress of Applied Chemistry. These anions are Cl, Br, I, CN, SCN, Fe^{II}(CN)₆, Fe^{III}(CN)₆, and S. The attempt was made to remove the last three as these interfere with the ordinary methods of determination, but most reagents also completely remove CN with them. Cadmium does not do this quantitatively, but under conditions as described below leaves four-fifths of the CN ions in solution where they may be determined later.

bath for five or 10 min. Filter hot and reject precipitate. With Fe^{III}(CN)₆ present, the filtrate may contain traces. To remove them, add a few drops H₂SO₄, heat to boiling, and filter.

TESTS ON THE FILTRATE

Test one-fourth the filtrate for CN by adding FeSO₄ and KOH, heat, add a drop of FeCl₃; and acidify with HCl. SCN may interfere, but can be eliminated by HgCl₂ solution. Acidify the remainder of the filtrate with dilute HNO₃, and treat for the detection of Cl, Br, and I as usual.

The author also points out that citric and tartaric ions, when the customary calcium-salt precipitations are interfered with by ammonium acetate or thiocyanate, may also be precipitated by cadmium nitrate.

Miners' Wages

The Bureau of the Census has recently published some advance sheets covering mining in the United States, from which we abstract a table showing the number of mines, the wage earners employed therein, the total wages paid during the year, and the average yearly wage. As in all statistical work, the average is a figure requiring some explanation. The amount of wages paid

CHINESE ANTIMONY PRODUCTION
(Long Tons)

	Canton		Wuchow		Yochow		Changsha		
	Ore		Ore	Regulus	Ore	Crude	Ore	Crude	Regulus
1900	...	237	..	..	..	..	..	..	..
1901	...	71	..	..	..	..	..	..	..
1902	...	..	..	..	200	1795	..	..	..
1903	...	..	..	..	2438	4554	..	..	..
1904	473	..	..	..	1370	3265	224	851	..
1905	261	..	..	..	340	1487	1774	1679	..
1906	292	..	..	..	1199	733	2271	2375	..
1907	504	..	..	..	2758	666	3092	1751	..
1908	142	..	3	..	1128	1903	853	5956	..
1909	51	41	1	..	1964	974	1101	5542	240
1910	5	115	19	..	..	..	..	..	..

with the company at the end of the year, the smelting works were never erected and the company went into bankruptcy. At the beginning of 1912, the antimony monopoly was discontinued by order of the Bureau of Industries and Commerce.

KWANGSI AND YUNNAN PROVINCE MONOPOLIES

The Kwangsi governor, wishing to make the antimony industry a provincial monopoly, sanctioned, in 1906, the erection of a government smelting works at Wuchow with a fund of 200,000 taels. It commenced operation in the next year and continued until the early part of 1909 when it had to stop working; owing partly to technical difficulties and partly to the declining market. I was then asked to assume charge as managing director, the Pao Tai Mining & Smelting Co. was formed and is still in operation.

In 1910 the Pao Wah Mining & Smelting Co. was formed with a capital of 200,000 taels, and under grant of a monopoly in the Yunan Province. Sev-

PROCEDURE

For the preliminary tests, take three small portions, 0.5 to 1 c. c. To one add KOH to alkalinity, dilute with water, and add a dilute solution of Na₂(NO)₂Fe(CN)₆ [sodium nitroprussiate]. The other two are acidified with HCl, and one tested for Fe^{II}(CN)₆ with FeCl₃ (which will also test for SCN at the same time, as its presence is shown by a deep-red color), the other for Fe^{III}(CN)₆ by FeSO₄ solution. If any or all are present proceed as follows:

Neutralize about 10 c. c., of the solution, with KOH or HNO₃ as necessary. Add an excess of 10% Cd(NO₂)₂ solution and add KOH solution to faint alkalinity. Neutralize the excess KOH with a few drops of Cd(NO₂)₂ solution, or of dilute acetic acid, dilute, and heat on steam

⁵It should be noted that these statistics do not agree with those published in "The Mineral Industry," possibly due to difficulties in translation or in constructing the report of production in which Mr. Wang should have all the advantage.—Ed.

MINERS' WAGES

Industry	Mines	Wage Earners		Annual Wage
		Wage Earners	Wages	
Anthracite.....	423	173,504	\$92,317,659	\$532+
Bituminous.....	6013	569,789	294,196,488	516+
Copper.....	368	53,143	49,382,979	929-
Iron.....	483	52,230	29,731,456	570+
Prec. Met. Lode.....	2845	33,316	30,868,371	918-
Prec. Met. Placer.....	880	4,199	2,669,574	636-
Lead and Zinc.....	1142	21,603	10,477,657	485+
Phosphate.....	153	8,186	3,215,661	393
Gypsum.....	222	3,778	1,820,877	482
Sulphur.....	4	408	324,538	795

is the gross expenditure, as shown by the records of the operators, and should be correct.

The number of miners is, however, not the average number of men employed during the year, but is the number employed on Dec. 15, 1909, or the nearest representative day. In the copper and precious-metal mines this number coincides with the minimum employment of the year, while in bituminous-coal mining and lead and zinc mining it corresponds to the maximum. Consequently any average wage computed on the basis of employment as of Dec. 15, 1909, would, in the bituminous-coal and lead and zinc industries, be too low, while in copper and precious-metal mining it would be too high.

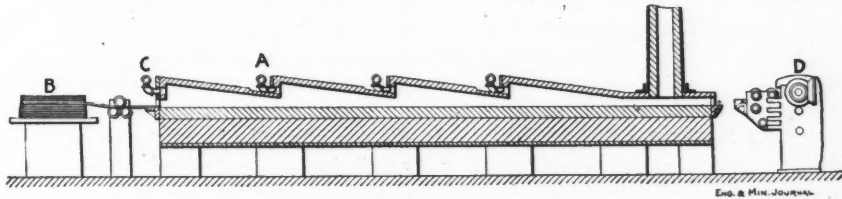
To the average wage we have therefore suffixed the signs + and -, indicating that the wage is probably higher or lower respectively than the amount shown. The saving between maximum and minimum employment is greatest in the lead and zinc mines, the minimum

being 83.4% of the maximum; next comes bituminous-coal mining, 85.2%; while the swing is least in anthracite mining, where minimum is 95.8% of maximum.

The salaried employees are excluded from the list, both in numbers and amounts paid, but even then the figures are averages of the wages of the engineers and mechanics employed around the mines, the common laborers, and the boys employed, although less than 1.7% of all the labor in American mines is under 16 years of age. Of these boys, about 40% are in the coal-mining industry, and over five-eighths of them are employed above ground. The figures given refer only to producing mines of the United States, no account is taken of the non-producers.

Multiple Fired Continuous Furnace

An oil-fired furnace of novel construction is being used at the Republic Iron & Steel Co.'s plant at Youngstown, Ohio, for heating rods for making railroad spikes, although the idea is capable of extension to sintering furnaces, for continuous furnaces for general rolling-mill use,



MULTIPLE FIRED CONTINUOUS FURNACE

glass furnaces, etc. There were three furnaces of this type in use in April, 1912.

The construction consists virtually in having a number of reverberatory hearths in tandem, as shown in the illustration. Gaseous or liquid fuel may be used. The furnace at the Republic's plant is 9½ in. wide, 12 in. high at the burners, and 5 in. high at the "verbs," so that its appearance when fired is that of an incandescent tube. The furnace is the invention of Peter J. Gordon and Ralph T. Prall, of the Republic company, and is covered by U. S. pat. 1,021,144.

Deep Drainage Plan for Cripple Creek

DENVER CORRESPONDENCE

As stated in a previous issue of the JOURNAL, a deeper drainage tunnel for Cripple Creek has already been considered. Now a new idea has been promulgated which is certainly well worth looking into, and that is, the sinking of a deep shaft from the level of the present tunnel and driving laterals from it to tap the known watercourses, the

water to be raised by electric pumps. It is believed by some engineers that the cost per annum would not be greater than the amount of interest and depreciation as figured on the cost of driving another tunnel which would be approximately \$500,000 as against the comparatively small cost of sinking a shaft and driving laterals.

Effect of Standard Oil Dissolution

WASHINGTON CORRESPONDENCE

Attorney-General Wickersham has been making inquiries into the present condition of the business of the country in the production and selling of crude oil and the sale and distribution of refined oil and its products, as affected by the decrees of dissolution in the Standard Oil case. He has already asserted on several occasions the fact that the decree in that case gave precisely the relief which Mr. Roosevelt's attorney-general and his able assistant, Frank B. Kellogg, sought in the bill filed at St. Louis. Mr. Kellogg himself, on more than one occasion, has declared that Colonel Roosevelt's statement that nothing had been accomplished by the decree was wide of the truth, and in

panies not connected with the Standard Oil Co. and its subsidiaries, asking that he furnish as accurate information as he could concerning the present condition of the oil business as contrasted with its condition prior to the decree against the Standard Oil combination in May, 1911. Mr. Chamberlain has replied to that inquiry in the following letter:

October 10, 1912.

Hon. George W. Wickersham,
Attorney General,
Washington, D. C.

My dear Sir:

I am in receipt of your letter of Oct. 9, in reply to which I would state that it is not easy to draw a sharp line for the purposes of comparison between the conditions of the oil business at the date to which you refer, when the Supreme Court decided the Standard Oil case in May, 1911, and the present time, because the effect of the Government's prosecution of the Standard Oil combination began practically with the filing of that suit in November, 1906; and from that date the practices of the Standard Oil combination in large measure ceased to be predatory, and the independent dealers began to have a chance to live.

This condition continuously improved during the pendency of the Government's suit, and that improvement has continued since the decree of dissolution, so that it may be safely stated that the giving of rebates upon which the Standard Oil monopoly was built up has ceased, preferential rates are few and far between, disclosure of information by carriers of competitive shipments is no longer practiced, price-cutting below cost to kill competition is rare, and many other unethical commercial practices have become so infrequent as hardly to cause complaint. Now, however, the independent manufacturer and refiner of oil is able to conduct his business with a fair share of profit reasonably due him, and without the fearful handicap under which he labored before the Government's suit was brought.

In 1906 returns from the oil industry show that the Standard Oil combination controlled about 84% of the entire oil business of the United States, and the remaining 16% was distributed among the independent companies. The most accurate data which I have been able to secure show that at the present time the independent companies control 34%, exclusive of California, where, I am informed, the independents control nearly 60 per cent.

One other practical result of the Government's prosecution and decree is shown in the increased prices secured by producers of crude petroleum. The total production for the last five years (stated in millions) was: for the year 1907, 166,000,000 bbl.; 1908, 178,000,000 bbl.; 1909, 183,000,000 bbl.; 1910, 209,000,000 bbl.; and 1911, 220,000,000 barrels.

You will, of course, recall that it was never the policy of the Standard Oil combination to own the oil wells, and their actual ownership was but a trifling percentage of the whole, being not more than 12% in 1909—the latest data that I have. Their policy was to control transportation, and by controlling transportation and the enormous volume of business in the refined product, they fixed the price of crude at figures, which they chose to give. Since the date of the decree of dissolution (May, 1911) the price of crude oil has advanced from

Mr. Kellogg's annual address before the American Bar Association, at Milwaukee, in August, 1912, he said:

I believe absolutely in the justice, in the soundness and in the economic necessity of the decisions in the Standard Oil and Tobacco cases. . . . The judgment . . . put an end to all the long list of unfair methods of competition used for the purpose of crushing out and destroying competitors; it severed the holding company, separated the subsidiary corporations and prohibited them from being thereafter managed as one harmonious whole, and thereby deprived them of the power to control the commerce of the country. To the smaller corporations and individuals engaged in the business, it brought protection from the control and domination of the great combination and today the independent manufacturer in the oil industry is enjoying the right to engage in business with a fair opportunity to compete.

For the purpose of ascertaining the views of representatives of the independent dealers on this latter point, the attorney-general some days ago wrote to C. D. Chamberlain, who is secretary and general counsel of the National Petroleum Association, an association of a large number of independent refining companies, embracing practically all the com-

44c. to 70c. a barrel in the Mid-Continent field, from 55 to 87c. in the Illinois field, and from \$1.30 to \$1.66 in the Pennsylvania field—those being practically the large fields of production of refinable oil. Of course, these increases in the price of crude, which benefit the producer of the crude, and not either the Standard Oil companies or the independent refining and marketing companies, have resulted in a somewhat increased price of the refined products, added to which the enormous increase in the demand for gasoline in the United States materially contributed.

Of course, too short a period has elapsed since the disintegration of the Standard Oil combination to estimate accurately the full effect of that decree, but it is very apparent to everyone engaged in the oil business that the independent companies have today an unrestricted and uncontrolled opportunity to carry on their business without unfair, secret and oppressive competition on the part of one great rival, than they have enjoyed for years past. This of itself is a tremendous and significant result which has been brought about, and could only have been brought about by the Government's prosecution. With this opportunity and insurance of its permanence growing competition will benefit the public in natural course and as a necessary result, and a monopoly of the business be impossible.

Yours very respectfully,
(Signed) C. D. Chamberlain.

Broken Hill South Silver Mining Co.

The Broken Hill South Silver Mining Co. reports that for the half year ended June 30, 1912, dividends amounting to

duced was 1610 tons. The minor metals included 27.29 tons tungsten ore from five mines; 4.29 tons bismuth, all from the Shepherd & Murphy mine; 550 oz. osmiridium from the Savage River district. The coal mined was 26,112 tons. The total value of the mineral product was £723,147 for the half-year.

The average number of men employed during the quarter ended June 30 was 5538, of whom 5448 were white men and 90 Chinese. Dividends paid by mining companies for the second quarter were £94,561, of which £906 was paid by one coal company; £7996 by two silver mining companies; £40,593 by three tin mining companies, and £45,066 by one copper company, the Mount Lyell.

Utilizing Natural Gas

With the idea of establishing the facts as to meter operation and efficiency of combustion of gas under varying conditions of pressure, experiments were carried on at the University of Kansas, the results of which are reported by P. F. Walker in the Bulletin of the University of Kansas, July 1, 1912.

Pressure, temperature and volume are the three characteristic properties of gases. Since all measurement of gas is by volume, the chief concern is with the effect of pressure and temperature change on volume. After a consideration of all influences, the conclusion is

thoroughly mixed with the gas before the point where ignition occurs is reached. One cubic foot of gas requires about 9.5 cu.ft. of air for complete combustion. Furthermore, the velocity imparted to the air is but 1/50 to 1/30 that of the gas itself. It follows, therefore, that the air opening should be from 300 to 500 times as great as the gas orifice.

When the gas pressure diminishes conditions are changed. The best rule of action in adjusting the mixer is to make the air opening as large as possible when adjusting for high pressures, and as small as possible when adjusting for low pressures, being guided by the color of the flame in all cases.

The two steps in which efficiency may be affected are: (1) the generation of the heat and (2) the imparting of this heat to the substance which it is desired to have heated. Three elements have determining influences upon this passage of heat, namely: the area of surface exposed, the time the gases are in contact with the surface and the difference between the temperature of the gases and the substance being heated. When running a fire low in mild weather, a single burner with comparatively long flame gives better efficiency than two or more burners with shorter flame in cases when this shorter flame fails to reach the heating surface by any appreciable amount.

The only feasible method of measuring the amount of gas used by consumers is by meters through which the gas passes, registering the volume. As a result of tests, it is shown that two variables enter into the problem, namely, pressure and rate of flow. The rate of flow affects accuracy for the probable reason of the greater drop in pressure produced while the gas is passing the meter. The pressure difference tends to produce leakage past the valves and would serve to make the meter register low. Another effect of high velocity is that rapid motion of meter parts and especially the rapid filling of the flexible pockets might serve to give the recording mechanism the necessary impulse before the pocket could be entirely filled. This tends to make the meter register high. The rate of flow was found to be by far the more active agent in influencing accuracy.

Of the four types of meters tested, three showed increasing errors as the rate of flow increased. Therefore when the rate of flow is increased the consumer pays too much or too little, according to the type of meter, if the meter is adjusted to accuracy at the lower rate. The more just method would be to adjust the meters for accuracy at an average rate of flow. Meters have individual idiosyncrasies and need with consideration of the average rate of flow.

CONCENTRATION AT BROKEN HILL SOUTH SILVER MINING CO.

Product	Net Weight Tons	Proportion %	Assay value			Metal contents			Proportion of Metal contents		
			% Pb	Oz. Ag	% Zn	Tons Pb	Oz. Ag	Tons Zn	% Pb	% Ag	% Zn
Concentrates...	26,630	16.1	70.0	23.2	5.9	18,652	617,178	1,572	78.8	57.5	7.0
Tailings—Zinc...	125,294	75.6	2.9	3.0	15.4	3,674	378,921	19,322	15.5	35.3	85.5
Tailings—Quartz	160	0.1	1.9	1.5	7.1	3	240	11			
Slimes.....	13,448	8.2	10.1	5.7	12.7	1,350	77,104	1,703	5.7	7.2	7.5
Totals.....	165,532	100.0	14.3	6.5	13.6	23,679	1,073,443	22,608	100.0	100.0	100.0

60% have been paid, an allowance made for depreciation, and a balance carried forward to surplus. The concentration process has given better recoveries than ever, the results being as shown in the table:

Working costs per ton of ore have been: Mining, \$3.13; filling depleted stopes, \$0.35; development, \$0.39; concentrating, \$0.91; total, \$4.78. Concentration was 6.2:1, making the costs per ton of concentrates, \$30.352.

Mineral Production of Tasmania

The report of the minister of mines of Tasmania states that the gold production for the half-year ended June 30 was 21,300 oz. Silver-lead ore mined was 43,889 tons, the metal contents of this ore not being given. Copper included 2830 tons blister copper and 592 tons classed as copper ore and copper. Tin ore pro-

duced that varying pressure within the limit possible in gas-distributing systems is a negligible factor in its effects upon the theoretical heat value of the gas. In using gas, however, the theoretical heat value is but one of several factors influencing its value as a heat producer.

Two other important factors are: (1) the supply and mixing with the gas of the proper amount of air to furnish the requisite oxygen for complete combustion without which the full heat value will not be generated; (2) the handling of the heated gaseous products of combustion so that the generated heat may be effectively utilized. The latter point is one mainly of the consideration of designers and builders of furnaces and stoves. All users of gas have the manipulation of the air-opening into mixers in their power, however, so that a consideration of the requirements at that point is of great importance. Air should be

Details of Practical Mining

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

Some Details of Mesabi Range Mining

By E. W. R. BUTCHER

The orebodies on the Mesabi Range are generally outlined according to the results of drill holes, and the probable positions of sublevels determined upon; each sublevel represents about 12 ft. of ore. The first main level is usually driven from the shaft about 60 ft. below the top of the orebody, thus allowing five sublevels between the main level and the roof. Other main levels are driven from the shaft at intervals of 60 ft. Two main drifts are driven 100 ft. apart, about parallel to the major axis, and in the center of the orebody. These are connected every 200 or 300 ft. by means of crosscuts. Other crosscuts are driven to the limits of the orebody from the

the slice being worked is finished and the side of the pillar along the slice is boarded up. A bulkhead is built in the crosscut where the last slice was taken and the room, which may be from one to five slices wide, is blasted by shooting out all posts, except those to which the boards have been nailed. The room then fills and the slicing is continued, the boards and the bulkhead keeping the caved material separate from the ore. Boards lapped end to end are placed in the bottom of the slices and drifts, at every set, as the working place advances; this keeps the caved material separate from the ore below.

It is essential not to do any work on a sublevel until the ore above has been removed, as any drifts that are driven will be badly crushed when the sublevel above is worked and a large amount of extra timber will be necessary for its support.

Open Cut Work at the Dome Mine, Porcupine

The Dome Mines Co., Ltd., of Porcupine, is doing some open-cut mining that is worthy of attention. There is an elaborate system of cross veins of quartz running in all directions through a country rock of schist, and within a certain zone of mineralization the rock is all rich enough to be milled. In order to recover this ore at a minimum cost it is being mined by the "glory hole" system.

There is a drift at a depth of 100 ft. under this orebody and crosscuts radiating from the main drift. At intervals of 50 ft. chutes are put in from the surface to the drift and to the crosscuts. The chutes are large enough to take care of ordinary boulders resulting from blasting away the rock at the surface. The rock is blasted from the surface into



GLORY HOLE SYSTEM OF MINING, DOME MINE, PORCUPINE, ONT.

outer side of the main drifts, 100 ft. apart. As these crosscuts advance raises are put up to the top of the ore at intervals of about 100 ft. A sample of the ore in the raise is taken every five feet before cribbing-up and a careful record kept of these analyses for future estimates. When the probable extent of the sublevel is determined from the drill holes and raises, a layout is made and the ore mined accordingly. Trimming drifts are driven along the raises and from these drifts crosscuts are driven at intervals of from 30 to 50 ft. in the block of ore to be mined. These extend to the limits of the orebody. The pillars are now taken out by slicing either in a straight line or in step fashion.

When a room shows weight, as indicated by timbers breaking and cracking,

In developing a sublevel it is important to drive the main drifts and crosscuts so that the grade will favor the loaded car.

Slices and drifts are as a rule cut about nine feet wide, except on main levels where they are 10 ft. or more in width. The timbering reduces this width about two feet in each case. Sets are placed five feet centers except in special cases. In some cases a drift will weaken and crush and it is necessary to put in extra sets (lining sets) and props. No timber is recovered.

The structure of the ore varies in the same mine and in different mines. Most of it is soft enough to allow easy drilling with a hand auger, while some is hard and requires machine drilling. Dynamite of 30% and 40% strength is used in blasting. Miners work by contract and are paid by the car of ore mined or by the number of feet of drifting done.

these chutes, beginning wide at the surface and working on such an incline that the broken rock will fall down without much assistance. The openings of the surface will run together and eventually all the pay ore will be mined in this way to a depth of 100 feet.

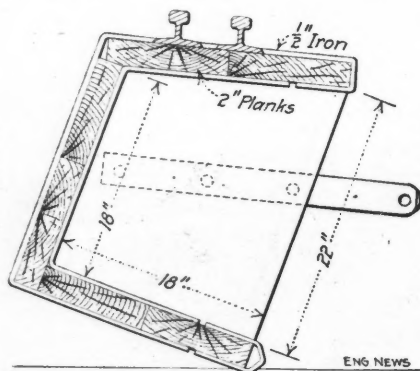
Air pipes are distributed over the surface at convenient intervals and air drills are connected with them. The drills in use are one-man machines of the Butterfly type. They are satisfactory, the only difficulty being in getting steel that will stand the work. The cars are run underground in such a way that there is no interference with the regular work. Empties are run in on one track, stored in dead ends of the crosscuts until desired, and then run out into the drift. The empties are drawn in by a mule and the full cars are also drawn out by the mule and delivered at the incline station, where

*Mining engineer, Gilbert, Minn.

they are taken in tow by the hoist which draws the cars up a slight incline to the surface and into the crusher house. The whole system is simple, the rock breaks easily, and the operation is inexpensive. Large boulders which cannot be broken by one man with a hammer, are block-holed and broken with a small powder charge. The photograph shows three of the glory holes.

Leveling Dredged Ground at Oroville

The gold-dredging industry of California has given rise to a method of leveling ground that offers possibility of a considerably more general application than has been developed to date. The method, by the electric drag scraper, was originated in the Oroville field, where one of the dredging companies was required by the municipality to restore to an approximately level surface the ground that it had dredged within the city limits. Although some such leveling had been done by means of horses and scrapers, prior to the development of the electric drag scraper, it had been on small tracts



SECTION THROUGH BUCKET USED ON ELECTRIC DRAG SCRAPER

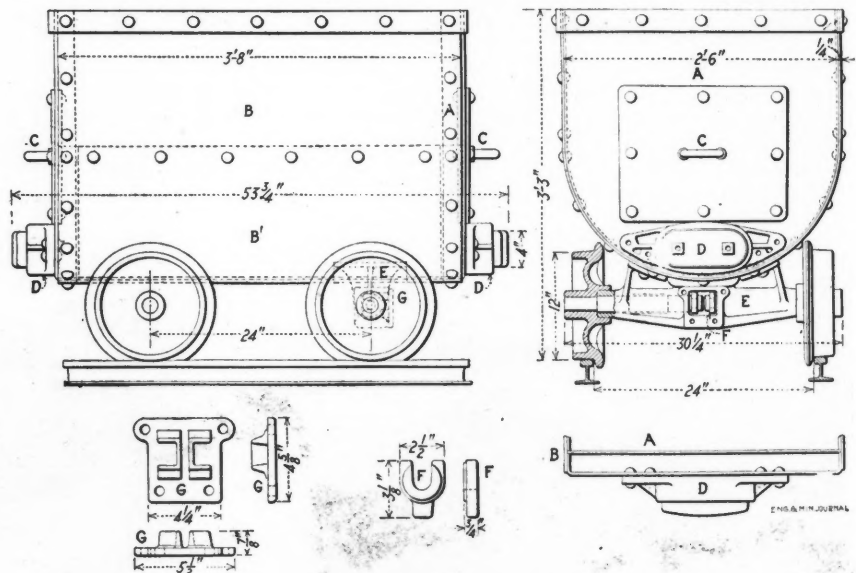
only, and the cost had been almost prohibitive when the acreage involved amounted to more than one or two, or possibly three acres.

The equipment for the electric drag scraper, described by James C. Bennet (*Engineering News*, Oct. 17, 1912), consisted of a winch, motor, transformers, drag scraper, hauling and back lines, and snatch blocks. The winch was of the type commonly used on gold dredges, having been taken from a dismantled dredge. It was driven by a 50-hp. motor, through one belt and two gear reductions, giving a rope speed—both lines—of about 130 ft. per min. There was but one drum on the winch, having a central flange to separate the ropes. The hauling speed proved a satisfactory one, but the return rope should have been speeded up to at least 150 ft., and possibly would have worked satisfactorily at 175 ft. per min. In fitting up the winch for the

scrapping work, the original cast-iron frame was discarded in favor of a much lighter timber frame, in which skids were made a part of the machine. For transmitting power from the transformers to the motor, an armored three-conductor cable was used. This permitted the winch to be moved about the field with its own power, and made unnecessary any moving of transformers. During the execution of the work, the winch was moved twice, that is, had three positions, including the original.

The transformers were not disturbed after being originally connected, as the nature of the ground permitted the selection of a site within reach of the several positions of the winch.

The scraper was made of 2-in. planks, the cross-section being of the shape shown by the accompanying sketch. The inside measurements were 18x18 in. and it was 12 ft. wide. A little experimenting



ROUND-BOTTOM MINE CAR USED IN FLAT RIVER DISTRICT

was necessary at the beginning of the work to determine the correct angle at which the bail irons should be set. It was found necessary to make one or two changes of this angle during the progress of the work, owing to different conditions of ground and material. The planks were well strapped together with bar steel, and the ends were of steel plate. One, and some of the time two, pieces of rail were fastened to the top of the scraper for added weight. Both hauling and back lines were second-hand mine-hoist ropes, in good condition, but discarded for mine use in compliance with state mining laws. With the exception of one or two small portions of the work, the hauling line ran over only one snatch block, while the back line ran over three blocks a large portion of the time. A fairly liberal use was made of deadmen, it being more economical to employ them than to move the

Mine Car with Round Bottom

In the accompanying drawings are shown the details of the mine cars used by the St. Louis Smelting & Refining Co. in its mines in the southeastern Missouri lead district. The car is made to dump by a tippable arrangement, as there is little necessity of dumping a car underground, except where on account of tramming arrangements it is better to dump down to a chute leading to a lower level than to tram directly to the shaft. In these cases the chute is surmounted by a tippable arrangement.

The car is made with a semi-cylindrical bottom, to which the cast-iron bearings are bolted so no truck is necessary. The body is made by riveting together plates $\frac{1}{4}$ in. thick. There are five of these plates; the bottom plate *B*, the two side plates *B*, and the two end plates *A*. The side plates and the semi-cylindrical bot-

tom plates are riveted, so as to form a lap joint, while the end plates are riveted with the flanges of the end plates inside the side and bottom plates. These end plates are flanged at the boiler works where they are cut, but the rest of the building of the body is done at the company's shops. If desired, the plates could be joined together by angle irons, which would stiffen the car somewhat more than the manner shown of fastening the body. Around the top of the car there is a stiffening band of $\frac{1}{4}$ x $2\frac{1}{2}$ -in. iron.

These cars have a capacity of approximately 20 cu. ft. and hold about one ton of lead ore, the gangue of which is a magnesian limestone. They are made to be trammed by hand or pulled in trains either by mule or by electric motor. On that account hooking rings are provided at each end. These are U-bolts of $\frac{7}{8}$ -in. iron, put through the body with stiffening plates of $\frac{1}{4}$ -in. iron 18 in. square put on

the latest cars to spread the strain of the pull over a larger portion of the front. These U-bolts, or hooking rings, C, are made with collars welded to them, so that they can be riveted tightly to the body of the car.

Owing to the fact that the cars are hauled in trains by electric motor, cast-iron bumpers E are riveted to the body of the car at its bottom, where the strain of the bump will be distributed directly to the reinforcement afforded to the ends by the riveting flanges. The details of the bumpers are shown in the accompanying illustration.

The bearings E for the wheels are riveted directly to the body of the car by brackets that extend up to reach the cylindrical bottom plate. These bearings are made of cast iron, the rough castings which weigh about 100 lb., being bored

Electric Signal System, Argonaut Mine

BY R. S. RAINSFORD*

The electric signal described below was devised to meet the following requirements: (1) To be available from a moving skip or cage, as well as from a station platform; (2) to be easily rung, as by a light pull on the bell signal cord; (3) to be absolutely reliable, even if portions of the signal cord in the shaft were broken; (4) to register one stroke of the electric bell for each tug on the cord. For reasons to be explained this last requirement is the crux of the whole problem.

The great depth of the Argonaut shaft, and the fact that it is an incline (60°) made the ringing of signals by the ordi-

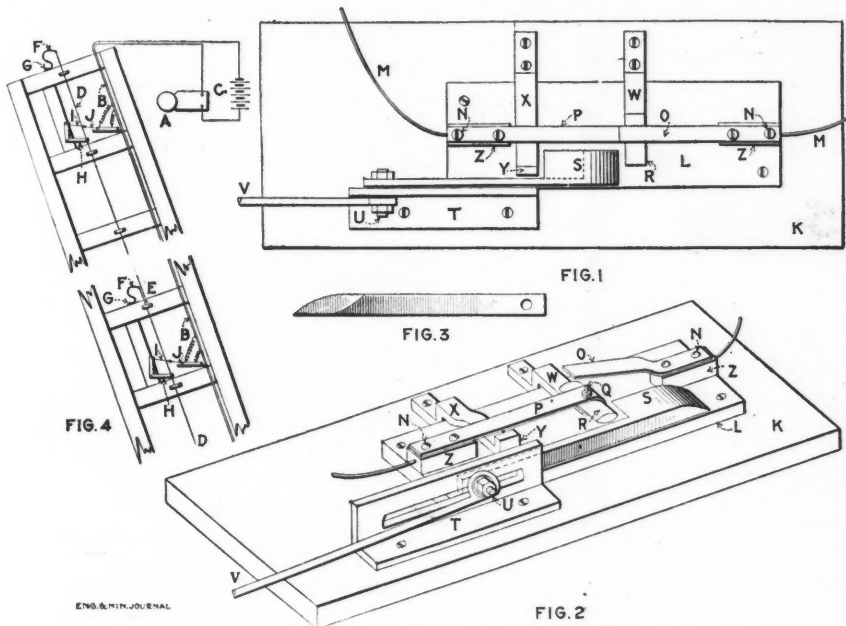
hoisting compartment about four inches apart, and charged with current of exceedingly low potential; is usually unsatisfactory and dangerous. To ring a bell one has only to short circuit the two wires with any convenient piece of metal, as a candlestick. But two objections present themselves. One is the rapid eating away of any un-insulated wires, whether galvanized iron or copper, when subjected to the mine waters and atmosphere of certain mines. The other is the danger of a signal given by mistake through contact with the wires by any tool in the hands of a miner repairing the shaft, particularly a bar when the skip tender is barring a loading chute in the shaft.

Another system was tried which included bonding the shaft rail for one leg of the current, insulating the skip and using the hoisting cable for the other leg or conductor, together with a signaling device on the skip to make or break the circuit. This system proved exceedingly troublesome, either on closed or open circuit, and was finally abandoned. The only solution remaining therefore was some yet undetermined method of a more sensitive signal cord in connection with the electric gong of the push-button system and its cable.

To make the signal cord sensitive was an easy matter. It was cut in 500-ft. sections, the bottom of each section fastened to a divider of the shaft sets, the top of each section supported by an S-spring, as shown at F in Fig. 4, and the signal cord guided by cleats in the usual way. Then a bell crank, with 8-in. arms, was connected to the signal cord below the S spring and its free upper arm used through an appropriate device to register every pull on the signal cord.

A signal cord has one peculiarity—all pulls on it are not of equal strength. One may easily arrange an electric contact which will be made or broken, depending on whether open or closed circuit is used, by a light tug on the cord. The problem is to prevent a double signal if this sensitive cord is pulled so hard that the contact is passed and the mechanism must retrace its steps and again pass the ringing contact as the signal cord is released. If a long sliding contact is used to meet this difficulty the electro-mechanical gong at the surface may have time to ring twice before the contact is broken. The solution in the case of the signal device to be described is to jump the contact on the return stroke, or release of the signal cord.

Thus a light pull on the signal cord drives the lifting member S under the lifter pin R and so closes the contacts Q and O by raising R and the spring P. On the release of the signal cord, S drops back to its normal position in front of the stop or guide Y. A heavier pull, however, drives S under R and out beyond, thus both making and breaking the con-



ELECTRIC SHAFT SIGNAL AT ARGONAUT MINE, JACKSON, CALIF.

at the company's shops. These bearings are cut away on the outer side, so as to allow the clips or forks to be slipped over the axles in the bearings, as the wheels are mounted tightly on the axles and the axles are cut in two at the middle, so as to allow the cars to go more easily around curves.

While this type of axle is fairly common in the West where the drifts are crooked, in Eastern metal mines such refinements in car bearings seem seldom to be resorted to, possibly because of the straighter tracks that are generally used. This opening in the journal is closed by a plate F that is fastened to the body by four cap screws. A hole is cut in it for shooting in the oil used for lubrication by a squirt gun, such as is used in watering holes in stopes, but the oil works through the bearing rather rapidly, so that it is the intention to use grease in the bearings in the future, instead of oil.

nary bell cord a difficult task. For despite the addition of long hand levers for ringing and the supporting of the signal cord at intervals by sensitive S-shaped springs, together with the greasing of all cleats guiding the cord and constant supervision of the line, the system was anything but satisfactory. Consequently when telephones were introduced in the mine about three years ago a four-wire cable was laid in the shaft, two of the wires being used for the telephone circuit and two for a system of electric push buttons situated at all stations and loading chutes in the shaft. These push buttons, greatly modified in design, are still in use, but have the great disadvantage that they are not available from a moving skip.

The most common method of meeting the fourth requirement above mentioned, namely two naked wires strung in each

*General manager, Argonaut Mining Co., Jackson, Calif.

tact at *Q* and *O*, but on the release of the signal cord *S*, which has a laterally projecting portion beveled on the under side as well as on the top, as shown in Fig. 3, slides over instead of under *R* and so makes no contact on the return stroke.

The rest of the apparatus is easily understood from the figures, in which *K* is a wooden base, *L* a slate slab, *Z* brass connectors with binding posts *N* for the wire terminals *M* of the electric circuit. On the two brass connectors are mounted the springs *O* and *P*, the latter supporting also the contact point *Q* and the lifter pin *R*. A bracket *W* supports the pin *R* at the proper elevation, while another bracket *X* serves as a guide and backstop *Y* for the lifting member *S*. The latter is fitted with the stud *U* running in the guide *T*. To the stud is fastened the link or rod *V* leading to the upper arm of the bell crank *I* through the insulating block *J*.

The device is applicable to any shaft whether vertical or inclined, and if any section of the signal cord should break, or any individual circuit closer be damaged, signals in other sections of the shaft are not interfered with. In practice, moreover, we find that a signal can easily be rung from a fast moving skip by giving the signal cord a jerk with only one or two fingers. The operation of the system, which we have now been using for a year, has proved most satisfactory, and a patent upon it (No. 1,023,040) has recently been issued to the inventor John Rule, an employee of the Argonaut Mining Company.

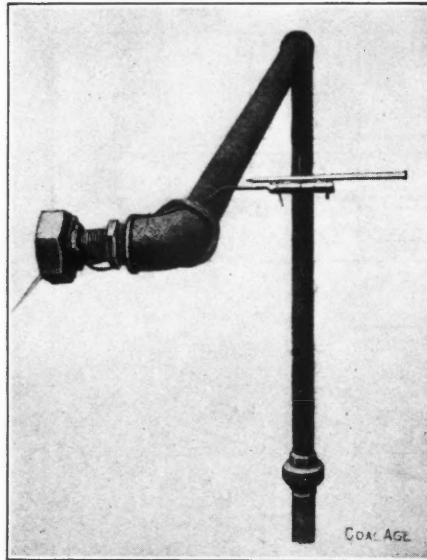
Factor of Safety for Hoisting Ropes

The present safety regulations of the Transvaal government require a factor of safety of six, which R. B. Greer says means a margin of safety of seven when the rope is new, so as to show the above government requirements after a little wear (*Journ. South African Inst. Eng.*, April, 1912).

The factor of six was decided upon in 1877, when the depths of mines were by no means so great as now, and was the result of experiments hoisting with a 9-in. slack chain, when it was found that the strain at starting was about $2\frac{1}{2}$ times the weight to be hoisted. Mr. Greer contends now that with depths of 3000 ft., a slackness in the chain at the top of the cage would not, if tested with a dynamometer, give anything like these alarming results, because the elasticity of the rope would take up the effect of any sudden strain, therefore a $4\frac{1}{2}$ margin at 4500 ft. would give more real safety than a six margin, 20 ft. from the top. It would, therefore, be wise to put the factor of safety on a sliding scale after a depth of 2500 to 3000 feet.

In a number of Transvaal mines, the weight of the ropes in the shaft is equal to the weight of skip and rock together. As a result the mine engineers are constantly requiring higher tensile strengths in order to haul heavier loads without increasing the weight of the ropes. There is danger in going to too high tensile strengths, for the rope requires too much carbon in it, and is so drawn that it is likely to become brittle in a few months, and break without notice.

Mr. Greer believes it would be much safer to lower the margin of safety for great depths, rather than to get high-breaking-strain steel to overcome the dead weight of rope carried. In general support of his contentions, he says it will be found ropes do not break when there is a great length of rope out and the margin



MANNER OF TESTING THE STRENGTH OF DETONATORS

of safety at its lowest, but when the cage is nearing the top of the shaft and the margin of safety is at its highest.

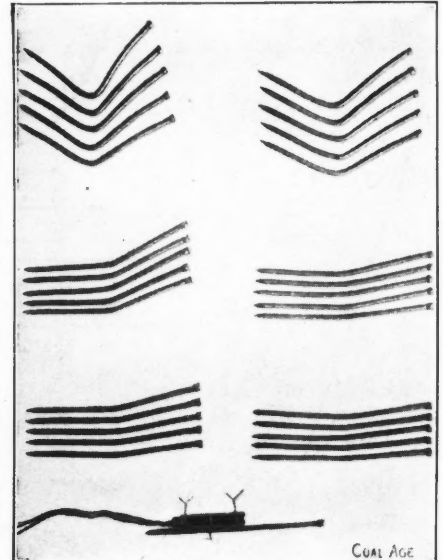
New Steel Dredge for Yuba Consolidated Goldfields

A new dredge will be built by the Yuba Construction Co. for the Yuba Consolidated Goldfields to be operated on the Yuba River, at Hammonton. It will be a duplicate of Yuba No. 13 in dimensions and will have 15-cu.ft. buckets; but will be provided with steel instead of wooden hull. The operating machinery will be of improved design. This will be the third steel-hull boat built by this company for the Hammon interests. The design includes a steel deck, the first to be provided for a gold dredge in California. As a type of large steel dredge it is designed to hold the highest position, as the Natoma No. 9 does in the wooden-hull field of construction.

Practical Test of Strength of Detonators

Sometimes a miner will find that he does not get a satisfactory result with his shots and he is in doubt whether the trouble is due to the deterioration of the explosive or to a loss of strength in the detonator, says *Coal Age*, Oct. 12, 1912. The illustrations accompanying this article show how the uncertainty can be removed.

A small finishing nail is attached by wire to a detonator and the electric leads are connected. These leads are stiff enough to hold the explosive cap and the nail in a level position. The stand on which the detonator is mounted will, of course, vary with convenience, but the one shown will serve the purpose well.



EACH GROUP OF NAILS WAS BENT BY DETONATORS OF EQUAL STRENGTH

It has been found that detonators of equal strength, when fired as shown, produce equal deformation of nails of like character. The groups of nails shown were bent by the action of detonators, the members of each group being bent by exploding caps of equal strength. The miner has but to observe the bending produced by a detonator, of which the strength is sufficient and condition suited for perfect detonation of undeteriorated powder. He can then gage the condition of any other detonator.

This scheme has been developed by Clarence Hall, of the Bureau of Mines. In proving detonators, to obtain the best possible results, they should be tested with explosives artificially aged by the addition of water and their effectual action judged by the energy developed by the explosive in a Trauzl block or on a ballistic pendulum. But this method of testing would not be available for a miner, whereas the new test may be used readily by the man in the field.

Details of Metallurgical Practice

Records of Experience in Ore Dressing, Cyaniding and Smelting

Refining Zinc-box Precipitate

BY WILTON E. DARROW*

I have read your editorial in the *ENGINEERING AND MINING JOURNAL* of Sept. 7, regarding a field for improvement in the melting and refining of zinc-box precipitate. I have tried a number of suggested methods and devised several schemes of my own that have been fairly satisfactory.

For a number of years I used to smelt the acid-treated precipitate in the ordinary way and blow the impure bullion up with an air jet. Air under about 10 to 15 lb. pressure was introduced into the furnace by means of a section of $\frac{1}{2}$ -in. hose terminating in a piece of $\frac{1}{4}$ -in. pipe about four feet in length. The air line from the compressor comes in along the ceiling of the melting room, and the hose and $\frac{1}{4}$ -in. pipe nozzle were adjusted to enter the melting pot through a notch cut in one side of the crucible cover.

By this means the air jet impinged on the surface of the molten metal at an angle of about 45° . The point of the pipe was kept about four inches from the surface of the metal, so as to diffuse over about one-half of the surface. In this way I could turn up about 15 lb. of speiss and lead in the bullion in an hour. The fumes, however, were extremely unpleasant. The slag produced was also exceedingly corrosive and destroyed the plumbago crucibles rapidly. The greatest objection, however, was that the slag was rich, containing on an average about 4% of the gold and about 10% of the silver.

About six months ago, after making a few laboratory tests, I installed a small chlorination plant for refining the precipitate. In my laboratory tests I found that I could extract about $999\frac{1}{2}$ parts in a thousand of the gold from the acid-treated precipitate by treating it with a strong chlorine solution, and that after the chlorine treatment nearly all of the remaining gold and the silver chloride was soluble in cyanide solution. The small chlorine plant generates the gas in a small tub by means of sulphuric acid, salt and potassium permanganate.

The acid-treated precipitate is placed in the tub and allowed to remain in the chlorine solution over night. The solution is then decanted off and the residue given several washes with clear water to remove the dissolved gold. The decanted solution and wash water are flowed

to a larger tub set on a lower level in the refinery. When the gold solution has been transferred to the second tub, it is precipitated with iron sulphate solution and allowed to settle for 48 hours before the waste solution is siphoned off.

As soon as the gold has been washed out from the original residue, the acidity is neutralized with caustic soda and cyanide solution added for the recovery of the remaining gold and the silver. The solution is agitated with an air blast through a pipe and hose for several hours and then siphoned off slowly to a couple of small iron zinc boxes and the treatment repeated several times during the two days before the final cleanup of gold precipitate. The silver precipitate from the zinc boxes and the gold precipitate from the precipitation tub are then cleaned up and melted together, bullion about 960 fine resulting. The recovery from the original precipitate averages about $99\frac{1}{2}\%$ of the gold and silver value.

By the former method it took about 16 hours, with two furnaces using No. 25 plumbago crucibles, to melt and refine the gold-silver bar. Now I do it in about four hours, with one melting pot. I think that the process is good, but the installation of a small lead-lined chlorinating barrel for dissolving the gold would be an improvement. Perhaps some metallurgists would go a step farther and recover the gold by electrolysis, thus dispensing altogether with the disagreeable melting process.

Prevention of Plumbism

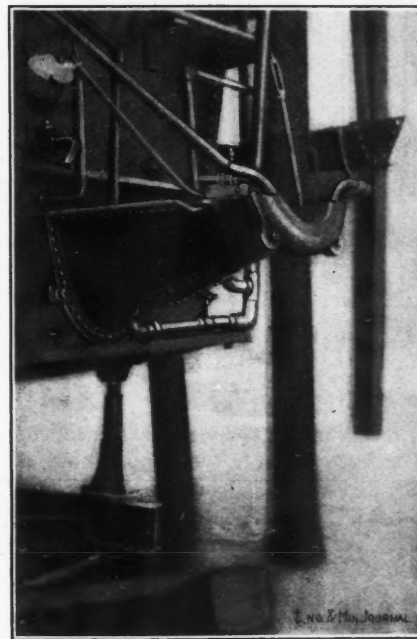
Lead works in Germany produce 44,500,000 marks worth of lead, of which one-third goes to the making of lead colors, chiefly white lead. The earliest attempts at the control of plumbism date from 1876, but the problem has not yet been solved (*Journ. Soc. Chem. Ind.*, Aug. 31, 1912, abstr. from *Chem. Zeit.*, 1912, p. 882). Substitutes for white lead are not successful and the present position is that lead may be used in coloring-making under certain precautions, some technical and some personal, regulated by the German Act of 1903. The chief technical precaution is the avoidance of dust. Personal precautions include medical examination and the supply of prescribed food and medicines. Alcohol is prohibited in the works. Respirators and special wearing apparel are furnished. As a result of the new act, plumbism has been reduced by 25% in the Cologne dis-

trict. The author considers that the most essential problem is the education of the worker to a higher standard of cleanliness.

Trap Spout for Copper Blast Furnace

BY ARTURO POUPIN*

Since the late Mr. Shelby gave us the details of the Cananea furnace, the want of more such work has been felt by those that have followed closely the design of furnaces and converters. I had, three years ago, the opportunity to



BLAST FURNACE TRAP SPOUT

take advantage of the complete drawings and description of the copper spout designed for the Cananea smeltery; and made a spout that was a success and did away with the other types that were troublesome. Trap spouts are not new, but there are some points that I want to make clear, that may be helpful to some of the *JOURNAL* readers.

The sketch shows our old design that must have met with difficulties wherever used, and probably never worked satisfactorily, and the reason can be explained by the impossibility of keeping a stream of hot liquid in contact with the cooled

*Amador City, Calif.

*Cia. Minera de Gatico, Gatico, Chile.

surface of the spout, causing the formation of a crust that would stop up the tap hole of the breast jacket. After that, not having an outlet, slag and matte would soon fill up to the level of the tuyeres and stop the working of the furnace.

To obviate this fault the later design provides space below the taphole that can be kept filled with brasque, preventing the formation of a crust. Another point also worth remembering is that the opening in the furnace wall is made ample in the last design, so that any iron sow can be taken out easily.

The halftone engraving shows another spout made of $\frac{3}{8}$ -in. steel plate, with the addition of a copper nose at the end. The spout is made of two $\frac{3}{8}$ -in. plates bent to shape and riveted outside all round the sides, has an inlet of $1\frac{1}{2}$ in. at the bottom and two outlets for the water at the top; on the lower part there is a cover bolted to the shell which serves for clean-

Standard Hardinge Mill Sizes

The increasing use of the Hardinge conical pebble mill makes interesting the accompanying table compiled by the Hardinge company. The short cylinder mills are recommended for fine grinding

thrown out in this way; metallic sodium must be kept from air and water; and cyanamide should be kept from water and naked lights, because of occasional calcium carbide in it. A Norwegian vessel and its crew of eight men were lost for lack of these precautions. To this

STANDARD SIZES OF HARDINGE CONICAL PEBBLE MILL

Size	Floor Space	Weight Pounds				Horse-power	Nominal Capacity per hour
		Mill	Silex Lining	Mill Charge	Pebbles Supplied		
Ft. In.	Ft.						
4½x13	6x8	4,000	2,000	1,500	2,000	6-8	1-1½ tons
*4½x72	8x15	8,000	5,000	5,000	6,000	15-18	1½-2½ tons
6 x16	8x10	7,500	4,000	3,500	4,500	12-15	1½-2½ tons
6 x22	8x11	8,000	4,500	4,000	5,000	15-18	1½-3 tons
6 x48	11x12	8,750	6,000	6,000	7,000	20-25	1½-2½ tons
*6 x72	11x16	10,000	7,500	8,000	10,000	25-30	2-3 tons
8 x22	11x12	11,000	7,000	8,000	10,000	30-35	2-3½ tons
8 x30	11x13	11,500	7,500	10,000	12,000	35-45	2-4 tons

*For very fine or slime grinding only.

with a minimum of slimes while the longer cylinders are better adapted for grinding with a maximum of slimes.

he might have added that at least one building containing potassium chlorate has gone up in the air, apparently through detonation of its contents.

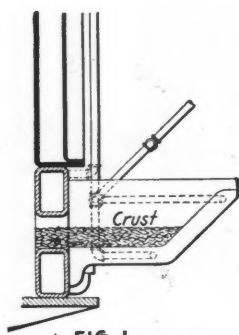


FIG. 1

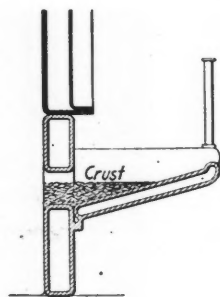


FIG. 2

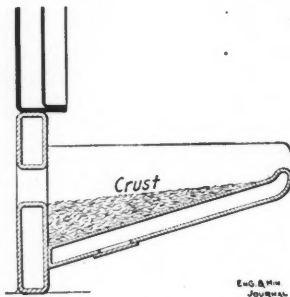


FIG. 3

EVOLUTION OF THE TRAP SPOUT

ing the salts and sediment that is carried by the sea water. The copper nose is composed of a 1-in. water pipe imbedded in copper; water enters one side and leaves on the other. In the line engraving, Fig. 1 shows spout built in 1903, Fig. 2 in 1906, Fig. 3 about 1910, an illustration of evolution.

The following grading analysis of the product of a Lane slow-speed chilean mill, made at the Lane Mill Works, Cue, Western Australia, on ore from the Chunderloo Gold mine, Yaloginda, Western Australia, is reported by John McDermott, the results being expressed cumulatively: Through 40 mesh, 99%; through 60 mesh, 97%; through 80 mesh, 94%; through 100 mesh, 90%; through 150 mesh, 81%; through 200 mesh, 67%. The mine ore was crushed to about $1\frac{1}{4}$ in. in preliminary breakers and then fed to the Lane mill, the height of overflow in the latter being seven inches above the mill track. The above results were obtained at the rate of 36 tons per 24 hr., which is slightly less than the rated capacity of 40 tons.

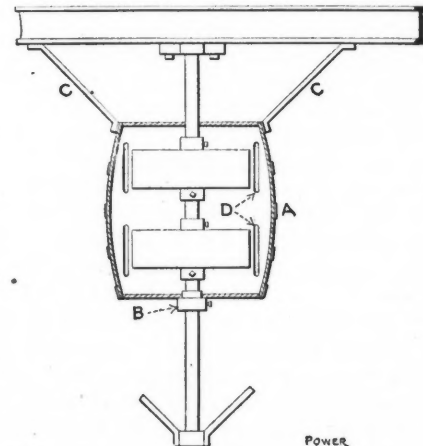
Size of mills is given in diameter of drum in feet and length of cylindrical portion in inches. Capacity and power depend upon weight of pebble charge and will vary according to hardness of material to be ground as well as size of material fed and product required. The lining is made up of silex (flint) blocks, or a combination of ribbed iron or steel plates with Hardinge lifting bars and silex.

Dangers from Heavy Chemicals

Some of the dangers of frequently used heavy chemicals were discussed by Dr. Julius Aeby before the International Congress of Applied Chemistry: Bleaching powder will occasionally decompose under elevation of temperature, although the manufacturers say only when it is new; potassium permanganate accidentally mixed with sawdust or fine sweepings will ignite by friction; arsenic acid may retain enough nitric acid to burst its drums under influence of summer heat, and a man was killed in New York by being sprinkled with powder

Protecting Pulleys from Dust

In some processes, it is highly desirable to avoid drops of oil from pulleys or shafting. A simple way of protecting pulleys from dust or to prevent oil from being thrown about the room, is to cover



BARREL OIL BAFFLER

the pulleys with a barrel as shown in the accompanying illustration. As described in *Power*, in a certain mill a flour barrel A, was placed around the pulleys as shown in the illustration. The barrel was thoroughly reinforced throughout, and a hole bored in the bottom of the size of the shaft. The braces were removed from the bottom of the shaft and the barrel slipped over the pulley into position. The collar B was fastened to the shaft to support the barrel, and braces C to the top of the barrel and I-beam for the same purpose. Slits D were cut in the barrel for the belt. This device was used in this way on pulleys revolving on a vertical shaft.

The Cost of Doing Things

Data from Mining and Metallurgical Practice

Buffalo Mines

The annual report of the Buffalo Mines Ltd., Cobalt, Canada, for the year ended Apr. 30, 1912, states that 50,167 tons of mill ore were broken during the year, of which 44,510 tons were hoisted, 5118 tons discarded as waste and 6689 tons of ore added from the surface dumps, making a total of 46,081 tons of ore to the mill. This ore averaged 32.35 oz. of silver per ton of which 83.88% was recovered.

Based upon the tons milled the cost of operating was approximately as follows: Mining, \$2.82; milling, \$1.66; cyaniding, 50c.; installation and repairs, 20c.; depreciation, 52c.; boarding house, 11c.; shops, stable, assaying, surveying and drafting, 19c.; total, \$6 per ton milled. In addition to these costs the Cobalt office cost 37.8c., New York and Buffalo offices 23c., insurance 16.2c., and taxes 30.8c., making the total cost of production \$7.07 per ton of ore milled.

The development work consisted of 37 ft. of sinking, 85 ft. of raising, 20 ft. of station cutting and 1157 ft. of drifting, a total of 1299 ft. of development or about one foot of development for every 35 tons of ore milled. It is stated that the conversion of the cyanide plant to a continuous process proved unsuitable to the treatment of the ore and the original system of individual tank charges had been resorted to. In order to catch up with the underground work machine drills were increased from nine to twelve.

Motor Truck Haulage in Arizona

The Inspiration Consolidated Copper Co. has three Velie motor trucks in continuous service, hauling supplies from the town of Miami to the Inspiration and Live Oak mines, distances of from one to three miles. One is of 1500 lb. capacity, another 1½ ton, and the largest 3 tons.

A record was kept for one month of the performance of the 3-ton truck in hauling fuel oil from the railroad station at Miami to Live Oak No. 2 shaft, a distance of 3.1 miles. The load consisted of 870 gal. of oil weighing 6740 lb. The road was in fair condition, with less than 3% grade for most of the distance, the last 300 or 400 yd. having a grade of from 3 to 8%. About 45 min. was required for a trip loaded and 20 min. for the return trip, empty. The maximum number of loaded trips per day was six. The

cost per ton-mile was 48c., of which 24c. was for labor and depreciation, 13c. for repairs, and 11c. for fuel and oil. This was 9c. per ton-mile less than the cost of hauling by teams, a saving of 16 per cent. The two lighter trucks haul other supplies, from Miami to the mines and between various points on the property.

Cananea Consolidated Unit Costs

The following costs of the Cananea Consolidated Copper Co., Cananea, Mexico, were compiled from data furnished by John V. Montague, treasurer. The company owns and operates the following mines: The Cananea-Duluth, Cobre

CHARACTER OF ORE DEPOSITS OF CANA-NEA CONSOLIDATED

Mine	Predominant Formations	Ore
Cananea-Duluth	Siliceous brecciated diorite	Chalcopyrite and tetrahedrite.
Cobre Grande	Decomposed diorite in veins in siliceous diorite	Malachite, chalcocite and chalcopyrite.
Kirk No. 9	Soft decomposed limestone	Chalcopyrite and bornite.
Kirk No. 15	Diorite	Chalcoite and cupriferous pyrite.
Veta Grande	Diorite	Chalcoite and cupriferous pyrite.
Oversight	Soft decomposed diorite.	Chalcoite and cupriferous pyrite.
Capote	Brecciated quartzite and diorite	Chalcopyrite and bornite.
Eureka	Limestone	Chalcopyrite and cupriferous pyrite.
Elisa	Metamorphosed limestone garnet rock	Chalcopyrite
Henrietta	Siliceous diorite and quartz porphyry	Chalcopyrite and bornite.
Puertecitos	Metamorphosed limestone and granodiorite	Malachite, bornite and chalcopyrite.

Grande, Kirk No. 9, Kirk No. 15, Veta Grande, Oversight, Capote, Eureka, Elisa, Henrietta and Puertecitos. During the month of July 131,175 tons of ore and waste were produced from these mines; 39,173 tons or 29.8% of which were hoisted from an average depth of 400 ft., the remainder being brought to the surface through tunnels. Of the tonnage mined 91,127 tons were ore and 40,048 tons waste. Stopes produced a total of 87,025 tons consisting of 77,362 tons of ore and 9663 tons of waste. Development work produced 13,765 tons of ore and 30,385 tons of waste. The accompanying table gives the character of the formation and ore mined.

Of the ore mined an average of 5% is extracted by the square-set system, 19% by stulling, 60% by top slicing, 8%

by shrinking and 8% by the caving system. Two 9-hr. day shifts, and an 8-hr. night shift are worked. The labor consists of approximately 93.1% Mexicans and the remaining 6.9% is composed mostly of Americans. The total average number of underground employees is 1480 men of which 533 are engaged in stoping and 947 in development work. The labor in the stopes is divided as follows: Breaking ore, 320 men; shoveling ore to chutes and mucking, 153; and timbering 60 men. In development work 395 are engaged in advancing, 400 in mucking and tramping, and 152 in timbering. The development work during this period amounted to 8135 linear ft. of which shaft and stations consisted of 182 ft., drifts and crosscuts 5327 ft., raises 1590 ft., winzes 15 ft., and tunnels 1021 feet.

According to these figures, of the total tonnage mined 69.4% was ore and 30.6% waste or about one ton of waste was mined for every 2.28 tons of ore produced. In stoping about 11.1% of the tonnage mined was waste or one ton of waste for every eight tons of ore. In development 68% of the tonnage produced was waste or about 2.2 tons for every ton of ore produced by development work. Of the total tonnage stoping produced 66.4% against 33.6% from development, or 84.4% of the ore and 22.5% of the waste against 15.6% of the ore and 77.5% of the waste for development work. Based upon the total men engaged underground the average output is about 88.5 tons of ore and waste or 61.5 tons of ore per man per month including development. In stoping the average output per man per month is equal to about 163 tons of ore and waste or 145 tons of ore produced from stopes. Based upon the men engaged in breaking ore in stopes the average is 272 tons of ore and waste or 242 tons of ore from stopes per man per month; on men shoveling ore to chutes and mucking it is about 569 tons of ore and waste or 506 tons of ore; and upon the men engaged in timbering stopes, there is one man for every 1450 tons of ore and waste or 1289 tons of ore mined from the stopes per month. The development work is equal to about one foot for every 11.2 tons of ore produced from development and stoping or 9.5 tons of ore from stopes. The ore produced from development was equivalent to one ton for every 0.59 ft. of advance. Based upon the men engaged in development the advance was equal to 8.6 ft. per man

per month; on men engaged in advancing 20.6 ft. per month; on men mucking and tramming 20.4 ft. and men timbering 53.5 ft. advance per man per month.

The timber consumption is equal to about 13.6 b.ft., per ton of ore produced, or in stoping 9.5 b.ft. per ton of ore from stopes. In development the timber consumption averages approximately 53.7 b.ft. per ft. of advance. The timber used in general repairs during July was equivalent to 0.55 b.ft. per ton of ore produced. The dynamite consumption in stoping was equivalent to 0.814 lb. per ton of rock broken and in development 8.7 lb. per ft. of advance. The main drifts and stations of the mines are lighted by electricity and in nearly all the mines carbide lamps are used by the men instead of candles, the average number of candles consumed, where used, is about three per nine-hour shift. In development during July, 9385 machine-drill shifts were worked and 8504 in stoping, this is at the rate of about 0.865 ft. of advance in development and 10.2 tons of rock in stoping per machine shift worked, but includes all advance or tonnage from hand-drill work. Drill-steel consumption averages about 8610 lb. of machine-drill steel and 2690 lb. of hand-drill steel per month; or a total consumption of one pound for every 8.6 tons of ore produced. On an average of 128 piston and 87 hammer drills are used per day and 2650 pieces of machine-drill steel are sharpened by eight men and eight helpers in nine hours using a drill sharpener. The air blast is furnished to the forges by Connersville positive blowers. One set-up of machine drill is made in drifts per shift and requires on an average of 40 min.; the drilling rate is approximately 40 ft. per shift in drifts. In stopes using Ingersoll BC 21 stoper drills the drilling rate is about 90 ft. per shift. Lubricating oil for piston drills is consumed at the rate of one-half pint per machine per shift.

In driving a 4.5x6.5-ft. drift through a hard quartz two men working on shifts of nine hours advance on an average of three feet per shift, drilling about six hours of the time; the dynamite consumption was 6.6 lb. per linear ft. or 0.21 lb. per cu.ft. of drift; the advance was equal to one linear foot or 29.25 cu.ft. of drift per six man-hours. In running a 6x11-ft. raise two men working on a shift of nine hours, six hours of which were spent in drilling, advanced at the rate of three feet per shift. This is at the rate of one linear foot or 66 cu.ft. of raise per six man-hours; the dynamite consumption was approximately 8.3 lb. per linear ft. or 0.126 lb. per cu.ft. of raise. In sinking a 7x15.5-ft. shaft through hard limestone, six men working on a shift advanced 15 ft. in 20 shifts, 10 of eight hours and 10 of nine hours each, drilling one 5-ft. round per day. This is at the rate of 0.75 linear ft. or 81.37 cu.ft. of

shaft per shift; or the equivalent of 0.0129 linear ft. or 1.399 cu.ft. of shaft per man-hour. The consumption of dynamite as reported was equal to about 0.1 lb. per cu.ft. of rock.

A man shoveling into a 2.5x2.25x3-ft. car and tramming 300 ft. to shaft averages 17 cars in eight hours which is equal to about 119 cu.ft. per man-hour. A trammer shoveling from a plat and loading into the same size car and tramming the same distance as mentioned will average 20 cars in eight hours or 140.6 cu.ft. per man-hour. A man tramming from a chute for the same distance and with the same size car will average 40 cars per eight-hour shift or 281.2 cu.ft. of material per man-hour, which according to these figures is just double the efficiency of a man loading from a plat and tramming. The usual life of a mine car at these mines is about four years by replacing worn-out wheels. Manganese-steel wheels have been in use for two years on a nine-mile tram per day and are still in good condition. The average length of tram is 600 ft. in the mines and about 0.6 gal. of lubricating oil is used per car per month.

Wolverine Costs

According to the annual report of the Wolverine Copper Co., Lake Superior copper district, Michigan, for the year ended June 30, 1912, it produced 9,408,960 lb. of refined copper from 401,308 tons of ore stamped, at a total cost of 7.586c. per lb., of which 6.75c. was for mining, transportation and milling, and 0.836c. for smelting, freight and marketing, including New York office expense. The average yield of the rock treated was 23.45 lb. of refined copper per ton, or 1.172%. Tons hoisted amounted to 414,544, of which 13,236 tons, or 3.2%, were discarded as waste. The cost per ton for mining, transportation and milling was \$1.53 per ton hoisted, or \$1.58 per ton stamped.

During the year, 541 ft. of shaft sinking averaged \$15.34 per ft.; 4293.3 ft. of drifting, \$6.12 per ft., and 25,844 fathoms of stoping, \$8.15 per fathom. It is stated in the report that 795 ft. of diamond drilling was performed underground on the Osceola lode, and in the statement of expenditures this account is charged with \$4039 for drilling, which would indicate that the average cost was about \$5.07 per foot.

A general summary of the costs is as follows, the underground expenses being based upon the tons hoisted: Sinking, drifting and stoping, 59.4c.; timbering, 1.2c.; tramming, 17.4c.; mining captains and labor, 10.6c.; mechanics, 2.8c.; hoisting and pumping, 4.7c.; compressor, 8.8c.; teaming, etc., 0.5c.; supplies and fuel, 5c.; electric lights, 0.5c. per ton hoisted. From these costs a credit of

about 18c. per ton was deducted for profit on supplies furnished contractors. Rock-house expense amounted to 4.8c. per ton hoisted and general surface expenses, including superintendence, taxes, insurance and freight on mineral from mill to smeltery, 17.9c. per ton of ore treated. From these costs a credit of 1.85c. was deducted for rents received from houses. The stamp-mill expense was 40.4c., including transportation charges on rock from the mines to the mill, which amounted to 14.41c. per ton. Other items of stamp-mill expense were: Supplies and electric lights, 5.06c. per ton; machinists, 2.47c.; fuel and teaming, 6.96c.; labor, 8.34c., and pumping, 3.16c. per ton treated. The average yield of mineral at the mill was about 30.2 lb. per ton of ore and averaged 77.346% refined copper.

Power Cost in a 6500-kw. Station

Figures for the Fall River (Mass.) Electric Light Co.'s generating plant for the year ended June 30, 1912, are given in *Electrical World*, Sept. 28, 1912. The station is a tidewater plant of 6500-kw. rating, containing six 350-hp. water-tube boilers, one 4000-kw., one 500-kw. and two 2000-kw. turbines. The 4000-kw. unit was new in 1911. In 1911 the plant

FALL RIVER STATION OPERATING COSTS, 1912

Fuel (0.47c. per kw-hr.)	\$34,164
Oil and waste	900
Water	1,206
Wages at station (0.19c. per kw-hr.)	13,687
Repairs of building	1,688
Repairs of steam equipment	1,538
Repairs of electrical equipment	686
Miscellaneous	1,490
Total, excluding fixed costs (0.76c. per kw-hr.)	\$55,359

produced 5,764,466 kilowatt-hours at a manufacturing cost of \$51,840, or 0.9c. per kilowatt-hour, coal costing \$3.67 per ton. The fuel consumption averaged 3 lb. per kilowatt-hour. This year the plant generated 7,293,783 kilowatt-hours at a station cost of \$55,359, or 0.76c. per kilowatt-hour, coal costing the company \$3.53 per ton. The payroll of the generating department listed 16 men in 1911 and 18 in 1912. The costs given include no fixed charges or administrative expenses, but show the results of station operation in 1912. The station load-factor for the year was 32.5 per cent.

According to the United States Geological Survey, the number of miners engaged in bituminous and lignite mining in 1911 was 549,750, and those in anthracite mining, 172,585, a total of 722,335. The average production per man was 738 tons for the year in the bituminous and lignite mines and 524 tons in the anthracite mines. In 1910 the corresponding averages were 751 and 498 tons.

How the Metals Are Sold—Spelter

By W. R. Ingalls

An account of the customs and practices obtained in the marketing of an important metal and the conditions that determine them.

The American zinc industry has escaped any general consolidation and there has not developed in it any single concern of sufficient power even to attempt to regulate the price. This may be ascribed primarily to the nature of the occurrence of the ore deposits which are worked in a multitude of mines whereof a general control would be a hopeless undertaking. Given therefore an open supply of ore and a metallurgical process for its reduction that does not so strenuously demand mixtures as does the process of lead smelting, the metallurgical side of the industry is also bound to remain open. There are other conditions favoring the maintenance of that condition, but what I have stated will suffice as a broad generalization. There have, indeed, been numerous consolidations of groups of works during the last 20 years, but these have been simply promotive of efficiency, not restrictive of competition. In many cases the vendors of works have promptly built new works with the money received for their old ones, and have successfully continued in the smelting business. With such an ability, what would be the use of any trust organizer in buying up all the works of the country? However, there has been during the last 15 years a natural segregation of interest, which has been merely a manifestation of the modern tendency to substitute strong industrial units for small and weak ones, and this of course has had an effect upon market conditions, especially in the conversion of the brokerage houses into producers.

ELIMINATION OF THE MIDDLEMEN

Twenty years ago the production of spelter was largely made by small concerns, mostly of small capital and frequently on the ragged edge of insolvency. Their policy was commonly to combine smelting and speculation and their purchases of ore and sales of spelter were largely governed by their forecasts of the market. When pinched by some unforeseen turn and caught with a stock of spelter on hand their lack of resources compelled them to unload at a sacrifice upon some one of the metal houses able to carry the stock and distribute it to consumers later on. These metal houses often were called upon to make advances to smelters and through the combination of their banking and merchandizing facilities became great factors in the business.

As the smelting industry became concentrated in fewer and stronger hands the necessity for such middlemen disappeared, and the latter being desirous of maintaining their well organized system of merchandising their only recourse was to go into the smelting business

themselves, whereby their purview was extended beyond the production of zinc as spelter and to the zinc-ore market, but none has actually entered upon the production of ore.

THE SMELTING INTERESTS

A list of the American zinc smelters has been published repeatedly, wherefore it is unnecessary to repeat it here, but it will be of interest to present a list of the controlling factors of the industry, which is given herewith:

Name	Retorts
American Zinc, Lead & Smg. Co., 3 wks....	11,488
American Metal Co., 3 wks.....	11,840
Chanute Zinc Co., 1 wks.....	1,280
Beer, Sondheimer & Co., 1 wks.....	4,256
G. E. Nicholson, 2 wks.....	5,696
Collinsville Zinc Co., 1 wks.....	1,536
Edgar Zinc Co., 2 wks.....	6,800
Granby Mg. & Smg. Co., 1 wks.....	3,840
Grasselli Chemical Co., 1 wks.....	9,216
Hegeler Bros, 1 wks.....	1,800
Illinois Zinc Co., 1 wks.....	4,460
Matthiessen & Hegeler, 1 wks.....	4,380
Nevada Zinc Co., 1 wks.....	648
New Jersey Zinc Co., 4 wks.....	16,116
Pittsburgh Zinc Co., 1 wks.....	448
Sandoval Zinc Co., 1 wks.....	896
U. S. Zinc Co., 1 wks.....	1,680
United Zinc & Chem. Co., 1 wks.....	3,680

It will be observed from this list that there are five concerns each possessing upward of 6000 retorts. Of these the Edgar Zinc Co. is controlled by the United States Steel Corporation and supplies it with spelter to a large extent. There are seven concerns with less than 2000 retorts each. There are six concerns with from 2000 to 6000 retorts. Of these, the Matthiessen & Hegeler Zinc Co. and the Illinois Zinc Co. consume the major part of their product in the manufacture of sheet zinc. The New Jersey Zinc Co., the American Zinc Lead & Smg. Co. and the Granby Mining & Smelting Co. are the only ones of these smelters who have any mining interests worth mentioning.

KINDS OF SPELTER

At the annual meeting of the American Society for Testing Materials in June, 1911, Prof. William Campbell, of Columbia University, chairman of the committee on "Non-Ferrous Metals and Alloys" reported a classification of the kinds of spelter, the figures representing the maximum percentages of impurities allowable. This classification is rational and

corresponds substantially to the understanding among American zinc smelters.

The trade recognizes different grades of some of these kinds of spelter. Thus, "Horsehead" and "Bertha" spelters are considered to be superior to any other brands of high grade spelter and realize the highest premiums. "Glendale Refined" is, so far as I am aware, the only kind of intermediate spelter. This is made out of especially selected ore. Prime Western spelter corresponds to the "Good Ordinary Brands" of the European market. The bulk of the American spelter product is of this class. There is considerable variation in the quality of the several brands. Most of the Prime

KINDS OF SPELTER

Kind	KINDS OF SPELTER			Total not over
	Pb.	Fe.	Cd.	
A. High grade*.....	0.07	0.03	0.05	0.10
B. Intermediate*.....	0.20	0.03	0.05	0.50
C. Brass special*.....	0.75	0.04	0.75	1.20
D. Prime Western.....	1.50	0.08	....	....

*to be free from aluminum.

Western spelter is now made out of ore from the far West. There are some smelters who continue to use mainly a good grade of Joplin ore and produce a spelter standing between Prime Western and Brass Special and realizing therefor a small premium.

The price commanded by the high grade spelter is so much above that realized for Prime Western that to all intents and purposes it is a different metal. The premium runs anywhere from 2 to 4c. per lb.¹ The premium for intermediate spelter is usually from 1 to 2c. per pound. Brass Special fetches a premium of from 5 to 25c. per 100 lb. The high grade and intermediate spelters are made by few concerns, which are able to command their own terms. Brass Special is made by many concerns and the supply of it is relatively abundant. In speaking commonly of the price of spelter, the price for Prime Western is meant.

MARKETING

In the main the producers of spelter market their own spelter, i.e., they sell it directly to consumers. So far as I am aware there is none sold regularly through the metal selling agencies on commission², but these agencies not in-

¹The supply of high-grade spelter could no doubt be greatly increased if there were need for it, and prospective competitors in this market would find it hazardous to reckon upon the full premium now realized.

²I exclude from this statement the sales by L. Vogelstein & Co., for the American Zinc, Lead & Smelting Co., and of Beer, Sondheimer & Co., for the National Zinc Co., where the agents are interested in the respective producing companies.

frequent¹ by outright from some of the weaker smelters still remaining, who find among them an ever present market at a price. It goes almost without saying that with so many producers of spelter the competition among them to dispose of their product is keen. In this market in fact the common condition is reversed, the concentration being on the consuming side, not on the producing. The United States Steel Corporation alone takes upward of 30% of the entire make of prime western spelter, and the activity in the spelter market is likely to depend upon whether that company is buying or not buying.

GENERAL CONDITIONS

The conditions governing the marketing of spelter are in the main the same as in the marketing of copper which I have described in a previous article. The so-called "spot" business is essentially of a retail character, the main business in the metal being in contracts, which are made for a longer or shorter period ahead according to notions of what the future is going to develop. The stock of spelter in the hands of the smelters is always relatively small. Anything like 25,000 tons is considered large, but in fact that is only about the production of one month and includes all kinds of the metal. At some times there may be a practically complete disappearance of stocks, as for example, during the last year, and buyers who must have some metal for immediate delivery are likely to be required to pay stiff premiums, but such are in no way representative of the broad commodity market because but relatively little business is done under those conditions, the bulk being in contracts anticipating requirements.

When contracts are made for a long time ahead there may be a differential in the price, plus or minus, according to the preponderance of views respecting the future. Most of the smelters are governed by their position as to ore supply. Those who take in ore under contract, on a sliding scale, desire normally immediately to sell spelter against it. The trend toward a rising market must be very well defined and certain to cause them to adopt a policy of reserve in their selling. The smelter who buys his ore as needed or as offered will always be governed in his attitude toward the spelter market by the quantity and cost of his stock.

ST. LOUIS THE BASING POINT

It has become the custom in the American spelter market to adopt the price at St. Louis as the basis for contracts and business generally. The spelter may not actually be sold there and it may not even pass through there on its way to the buyers. Some spelter is actually sold in St. Louis, but a very large quantity is sold in New York on St. Louis basis.

The price at New York, if ever it be necessary to refer to it, is simply the St. Louis price plus 15c. per 100 lb., which is the freight rate from St. Louis to New York.

St. Louis is a natural basing point, because the major part of the consumption of spelter in the United States occurs at places between it and New York. Upon the rare occasions when European spelter is imported through New York, as in September, 1912, New York may become an independent basis point and there may be a variation from the normal freight differential, but this is only temporary. Importations of foreign spelter will begin, of course, when consumers in the immediate vicinity of New York, or in Connecticut, can be supplied more cheaply than from the western smelting points, while the latter may still retain the interior market.

SPECULATION IN SPELTER

There is more speculation in spelter than there is in copper. The fluctuations in the price are rapid and often violent, the sellers of spelter for distribution are numerous, no single interest is predominant, all of which conditions contribute to the absence of aversion to speculative participation in this market such as exists in the copper market. There are many smelters who will sell spelter to anybody who wants to buy it, hold the spelter and issue certificates representing it. These certificates may pass from hand to hand and be redeemed after five or six endorsements have been made on them. They correspond, of course, to any warehouse receipt. It is, however, only at times that there are general transactions of this kind.

Similarly as to transactions on the New York Metal Exchange. They are never of any great volume or significance. Long periods may elapse without there being any at all. Then several hundred tons may be sold in a day. These reflect speculative business. Consumers do not buy through the Metal Exchange. Most of the smelters do not try to sell through it or indeed pay any attention to it. Some smelters are represented upon it and may buy up what is offered there, especially if it be desired to clean up the market of speculative spelter. In the same way there are transactions from hand to hand in St. Louis, although there is no organized exchange there, the business being of the nature of that of a curb market. The entire volume of the business of this kind, both in New York and St. Louis is only a few hundred tons per month and is insignificant in comparison with the marketing of the bulk of the spelter product, which is done directly between producers and consumers. Almost without exception the smelters give preference to orders from consumers over orders from dealers, and frequently give the former as much as 5c.

per 100 lb. advantage in price, and even more.

The real spelter market being established by private transactions between producers and consumers the information reflecting the market can come only from them. Among such transactions there are often considerable differences, the means of exchanging information in the spelter market being distinctly inferior to those of the copper market. Some consumers do considerable "shopping," Others do not. Some who do so ordinarily may upon certain occasions make a negotiation with some one smelter without letting anybody else know that he is in the market. The direct market, if I may use that term, is often quite different from the speculative, or semi-speculative, street market. The quotations made on the New York Metal Exchange do not ordinarily command any serious attention anywhere. Before accepting any quotations made there it is necessary to know whether anybody trading in spelter was present at the call and whether the price was the result of a genuine transaction. If nobody who wants to buy or sell spelter be present at the call it is easy of course to bid up, or offer down, the price $\frac{1}{8}$ to $\frac{1}{4}$ c. above or below the real market.

The conditions above recited explain the contradictory reports about the spelter market that frequently are in circulation. In cases of discrepancy the high figures are generally to be rejected on the probability that they represent merely prices that are squeezed on a small order required under special conditions or in speculative business that is small in volume anyway.

FOREIGN RELATIONS

The tariff on spelter causes the American market to be independent of the European market during most of the time. Formerly, American smelters used to dump a good deal of spelter upon the European market at certain times, but during recent years no such opportunity has arisen. On the other hand, we have lately witnessed circumstances in which we were upon the verge of importing European spelter, duty paid, and have actually made such importations.² At these times the European market was a restraining influence to a further rise in our own. Similarly, upon other occasions, the possibility of exporting spelter has checked a decline in our market. Except for these conditions the European market and American market may display wide disparity and doubtless will continue to do so so long as our producers are protected by the tariff on zinc ore and spelter.

²We are, of course, importing foreign zinc ore all the time and smelting it in bond, the product being exported or entered for consumption according to the market conditions of the moment. The duty on imported spelter is 1% c. per lb.; on zinc in ore, 1c. per lb.

Standard Curtails California Oil Purchases

The Standard Oil Co. is persistent in refusing to renew contracts for crude oil under 18 gravity. The reason seems to be sufficient as the Standard has a steadily accumulating reserve of residuum from its refineries, which with the crude in storage makes a total of about 27,000,000 bbl. in the Standard storage tanks and reservoirs. The company claims that its stocks are sufficient for the requirements of its fuel market. It is evident that it is the intention of the Standard Oil Co., to confine its supply for the fuel-oil market which it controls, as nearly as possible to the residuum pro-

ever its attitude toward independent producers, there appears to be no good cause for the criticisms that have been offered regarding its determination to protect its own interests in the matter of purchasing no crude oil below 18 gravity.

Chicago Pneumatic Air Compressor

The Chicago Pneumatic Air Compressor shown in the accompanying illustration embodies some of the most recent developments in compressor design of the Chicago Pneumatic Tool Co., Fisher Building, Chicago.

The machine, which is of the belt-

thus making it possible to remove the cylinders for repair without disturbing the bedplate of the machine.

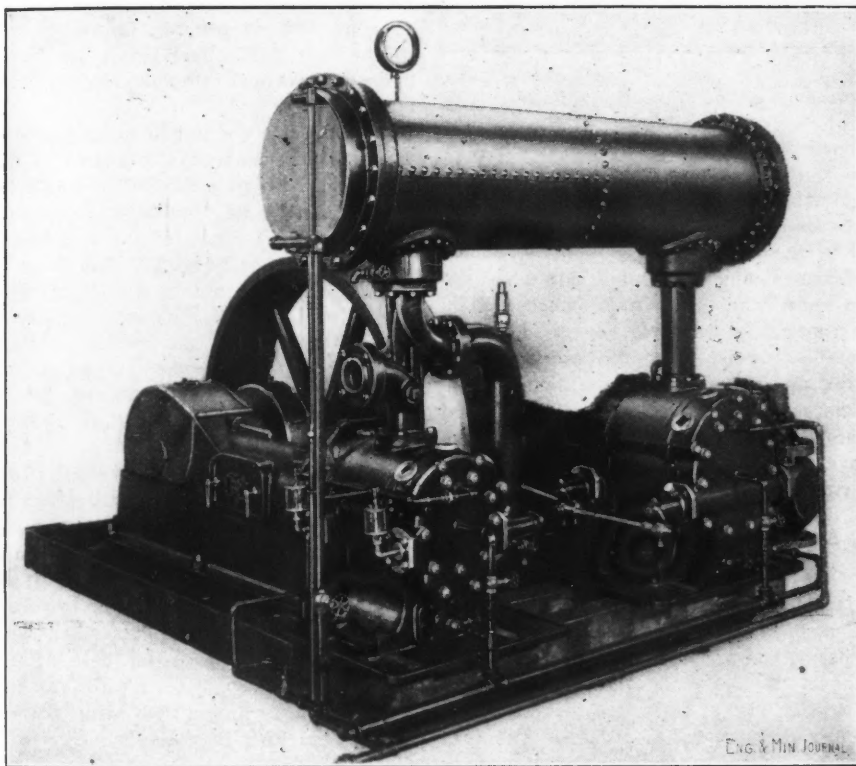
An automatic regulator, controlled by receiver pressure, throttles the intake air so that when no air is being used the machine runs light with a partial vacuum on both sides of the piston. Heads and cylinders are arranged with independent water supply, permitting the use of solid gaskets between the heads and cylinders. The intercooler is somewhat larger than is common with this type of machine. This compressor is built in capacity up to 4000 cu.ft. per minute.

Canadian Mining Institute

The semi-annual or Western meeting of the institute was a successful one, a large number of the Western members being present at the sessions held at Victoria, B. C., Sept. 18 and 19, and at Frank, Alberta, Sept. 30. Dr. A. E. Barlow, president of the institute, presided. At Victoria, the institute was welcomed by the premier and minister of mines, Sir Richard McBride, who delivered an interesting and instructive address on the recent developments of the mining industry of the province and also referred appreciatively to the work of the Institute. The mayor of Victoria and the president of the Victoria Board of Trade also addressed the members. During the morning session of the first day, the proposed amendments to the by-laws were discussed, and a resolution was adopted urging the appointment of a Minister of Mines for the Dominion. At the adjourned meeting at Frank, this resolution was endorsed.

Among the papers read and discussed were, at Victoria: "The Relation of Earthquakes to Colliery Explosions," by Frank Napier Denison; "Fuel Problems of the Pacific," by H. Foster Bain (read by D. B. Dowling); "The Geology and Mineral Resources of Northern Quebec and Ontario," by Dr. A. E. Barlow; "Notes on Copper Mining in British Columbia," by E. Jacobs. At Frank: "Engineers' Reports on Property," by W. D. L. Hardie; "Provincial Mining Legislation," by W. F. McNeill; "Jasper Park Collieries," by R. H. Morris; and "Notes on the Work and Scope of the Canadian Mining Institute," by H. Mortimer-Lamb.

During the meeting at Frank, the members present decided to organize what will be known as the Rocky Mountain Branch of the Institute, to which will be attached all members resident between Fernie and Medicine Hat. The following were elected to serve as an executive committee of the new branch: W. R. Wilson, general manager of the Crow's Nest Pass Coal Company, Fernie, B. C., chairman; J. T. Stirling, Provincial Inspector of Mines, Edmonton, secretary; W. F. McNeil, Lewis Stockett and O. E. S. Whiteside.



THE CHICAGO PNEUMATIC AIR COMPRESSOR

duct of its refineries, and give other producers the right-of-way to the crude fuel. There will no doubt be some demand for 18 gravity oil for fuel purposes, but the demand for this grade of oil for fuel is small compared with the requirements for refining or topping. The congestion of storage that must follow the refusal of 18-gravity oil by the Standard while embarrassing to the Agency producers, will be somewhat relieved by the General Pipeline which will turn over its tanks so far completed to the relief of producers affected by the Standard. The General Pipeline will not be completed until March, 1913, but the present capacity is sufficient to be of material aid. It is difficult to see how the Standard could act otherwise in the present situation, since the increased demand upon its refined products requires the production of increased stocks of fuel residuum. What-

driven type, is completely inclosed and is self-oiling, the oil being fed from the reservoir only while the compressor is in motion. The complete inclosure of the machine makes flood lubrication of the main bearings and crosshead possible and at the same time economical. The crossheads are provided with both top and bottom guides, as it has been found that this provides smoother and more perfect action than the single guide.

The inlet valves are of the semi-rotary Corliss type and are placed high in the head, thus giving them larger area than usual, at the same time reducing the clearance and raising the volumetric efficiency. The discharge valves are placed radially in the cylinder heads and are fastened by one bolt, making easy their removal and repair. None of the valves has parts projecting into the cylinder. The air cylinders are bolted to the frames,

Development Methods at Mineville

By Guy C. Stoltz *

Development work, such as sinking skipways to lower levels, opening and equipping stations, driving drifts, cross-cuts and raises and exploration by magnetometric surveys and diamond drilling, receives constant attention at the magnetite mines owned by Witherbee, Sherman & Co., Inc., at Mineville, N. Y. In fact, development by sinking is favored over operating when there is a shortage of labor. A certain amount per ton, on all ore mined, is set aside to cover such development work. The company is at present operating the Harmony, Joker-Bonanza, Barton Hill and Cook mines.

IN THE HARMONY MINES 20% OF ORE LEFT AS PILLARS

The Harmony mines A and B were opened by vertical shafts sunk through 250 ft. of glacial drift and perhaps 50 ft. of gneissoid hanging wall. The ore was cut at this point, and the double-track skipways were continued along the foot wall, levels being turned off at about 100-ft. intervals, measured along the foot wall. The level interval, of course, depends upon the dip, when the dip is flat sublevels are driven. Both shafts are sunk with the dip, which will average 30°. About 80% of the ore is mined, 20% being left in pillars and braces. Pillars will average 25 ft. high, 30 ft. in diameter and are spaced about 80-ft. centers; this depends upon the lay and condition of the hanging wall.

The Harmony mines have been worked along the incline for about 1200 ft., the elevation at the shaft collars being about 1150 ft. above Lake Champlain and the lowest levels about 400 ft. above the lake. Vertical curves, made necessary by sinking along the variable dip of the foot wall, several horizontal curves (not severe because of long radii) and the knuckles at the foot of the vertical shafts are not conducive to rapid hoisting. Still this permitted all development sinking to be done in ore, and the ore broken has covered the sinking expense.

ONE TON OF CONCENTRATES FROM 1.3 TONS OF CRUDE ORE

Skips of 3½-ton capacity, as shown in Fig. 7 of the accompanying drawings, are used for regular hoisting. A fair rope speed is possible if good back rails are provided and there are plenty of rollers to guide the hoisting rope around both vertical and horizontal curves. The two shafts produce 1000 tons in 24 hours. If the orebody had been sufficiently explored by drilling to permit of a more intelligent choice as to an angle for sinking, that would do away with the horizontal and vertical curves, a much greater capacity could be maintained. Still the value of magnetite ore will not allow

The Harmony mines at Mineville, N. Y., are opened by turn-vertical shafts which follow the irregular foot wall of the orebody. Horizontal and vertical curves make slow hoisting necessary. Sinking methods at the Harmony and Joker shafts were similar. Other development methods on the Witherbee-Sherman properties are described.

*Superintendent of mines, Witherbee, Sherman & Co., Inc., Mineville, N. Y.

much dead work; this is especially true with the Harmony ore, which requires 1.3 tons of crude ore to make a ton of concentrates.

In the old method of sinking, in the Harmony mines, the main skip was used to hoist from the sink; or when the dip permitted, a tram car, operated by an auxiliary hoist, took the ore from the sink up to the lowest operating station, where it was transferred and dumped into the main skip. There was no storage at the levels other than several extra tram cars.

AUXILIARY SKIPS USED IN SINKING

The present method of sinking in the Harmony mines was introduced by H. Comstock, assistant general manager. The method adopted at the Joker mine is shown in detail in the accompanying drawing, Fig. 3, as is also the track system and equipment of pockets. The auxiliary skip used in sinking has a capacity of one ton of broken ore. It is carried on 6x6-in. stringers, the wheels have a 30-in. tread and ride on ½x3-in. flat iron. The 3x6-in. back rails are set 15 in. above the flat iron and are held in place by ¾x6-in. spacers, introduced every 10 feet.

Girts, 3x6 in., act as spacers for the track stringers, and these are held in place by ¾-in. tie rods. The skip wheels are 14 in. in diameter, those forward having a 3-in. tread and the rear 6 in. This allows the forward wheels to ride out on horizontal sticks at the dump, while the rear wheels run on the main stringers until the car is at an angle of 45°. The skips discharge their contents into a small storage bin of from 50 to 100 tons capacity. The ore is drawn from the bin by an air-operated gate, which allows the ore to run down a swinging chute, discharging into the main skip. The swinging chute can ordinarily be kept in a horizontal position, where it

permits hand tramping on the bin level.

The auxiliary skip is kept on the bottom of the sink by means of a pair of 6x6-in. lap slides, girted and fitted with flat-iron shoes, which rest on the permanent stringers. The 18-ft. slides are hooked to the skip and hoisted when firing. A chain ladder reaches from the last timber ladder to the bottom.

MINERS DO THEIR OWN MUCKING

A 6- to 8-ft. pentice is left the full width of the two skipways to protect the men in the sink. In the Harmony mines the skipways are sunk 8 ft. high and 23 ft. wide, and, in general, follow the dip of the foot wall. New levels are being opened at vertical intervals varying from 50 to 75 feet.

Considerable ore is tied up in roof pillars over the hoistways and also in the 15-ft. shaft rib pillars. Still it would be difficult to open new levels, when needed, if the sinks were carried the full height from foot wall to hanging. This distance in some cases would be 40 ft., at right angles to the dip. Two machine crews work in each sink and usually do their own mucking, except when cutting out for a station; then considerable muck can be in the sink and still afford drilling faces.

The main skips ride on 8x8- or 10x10-in. stringers, shod with 45-lb. steel rails. These are bolted to the stringers, as spikes constantly work loose. The back or guard rails which are not put on over the whole length of track, are made up of two 3x6-in. stringers bolted together, shod with ½x3x4-in. angle iron and held 15 in. above the rail by ¾x6-in. iron braces. The stringers are girted with 3x6-in. sticks, held by 1-in. tie rods. Foot-wall plates of 10x10-in. timber are introduced under the stringers at 15-ft. intervals. These are blocked up to proper elevation and held by ¼-in. L-shaped plugs of bent round iron. These are, of course, split at the end, fitted with wedges and driven to hold.

SKIP HOLES CUT AT POCKET LEVELS

Rollers are spaced at about 50-ft. intervals along the skipways, these are 2 to 3 ft. long, and are either basswood, in which case the shaft turns in the boxes, or they may be made of wrought iron with ends made of worn-out skip wheels; this roller turns on the shaft. The objection to the iron roller is that the rope scours before the roller starts rotating, this occurs particularly when lowering an empty skip with the rope bobbing. At the severe knuckles along the hoistways, manganese-steel sheaves with a 3-in. axle are used.

The skips on the Harmony hoistways, which are inclined at about 30°, cannot

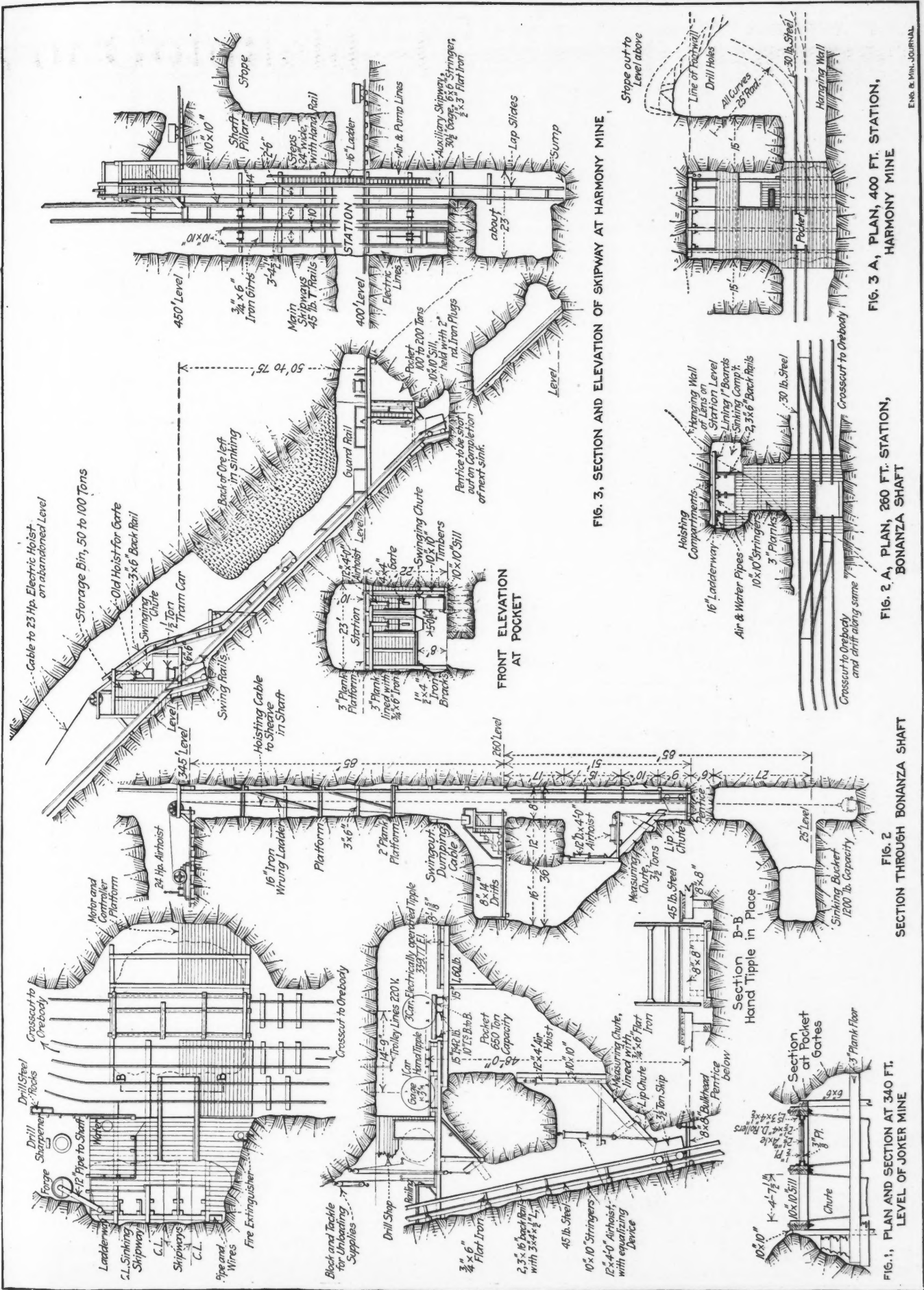


FIG. 1. PLAN AND SECTION AT 340 FT. LEVEL OF JOKER MINE

FIG. 2. SECTION THROUGH BONANZA SHAFT

FIG. 3. SECTION AND ELEVATION OF SKIPWAY AT HARMONY MINE

FIG. 3 A, PLAN, 400 FT. STATION, HARMONY MINE

FIG. 2 A, PLAN, 260 FT. STATION, BONANZA SHAFT

METHODS OF SHAFT SINKING, AND STATION AND LEVEL EQUIPMENT IN WITHERBEE-SHERMAN IRON MINES

ENG. & MIN. JOURNAL

be filled by the pocket chutes unless the axis of the skip is brought to an angle of almost 80° from the horizontal. To accomplish this a skip hole is shot out in the foot wall; at each pocket level a knuckle is made in the stringers and rails to allow the car to rest nearly vertical. This necessitates a break in the stringers and rails at each skip hole. The break is bridged by throw rails about 10 ft. long. These are hinged to the 45-lb. rails just below the skip hole. When the skip is signalled for a certain level, the throw rails are swung to the right and left and the skip lands in a loading position. When a lower pocket is to be emptied the throw rails are closed at the pocket just emptied and the skip rides on over the skip hole to the pocket below.

Measuring chutes are not used at the pockets in the Harmony mines, as they would take up room which could be used to advantage in allowing more pocket storage. The capacity of the pockets varies from 100 to 200 tons.

STAIRS INSTEAD OF LADDERS IN INCLINED SHAFTS

Koppel, roller-bearing end-open tram cars of 1½-ton capacity, Fig. 8, are used on the levels and are tended by two men on a long tram and three men on a shorter tram. Stint work is applied, 12 cars per trammer being required. The tram cars are flared, the top being wider than the bottom of the car. To dump the cars, the 30-lb. tram rails are broken near the center of the pocket, the wheels are stopped by coming against 1x3-in. inverted U-shape iron straps bolted to the ends of the rails. Center-throw switches are used on all tram roads. Some of the switch points are made from 2½x2½-in. iron, while usually points are made on a planer from a 3-ft. length of 30-lb. steel. The points, throw mechanism and frogs with a variable spread, are made in the company's shops. The angle of the foot wall permits of stair steps with hand rails, the stairs following along the side of the skipways as far as the knuckle at the foot of the shaft. Through the vertical portion of the shaft 16-in. iron-rung ladders are used; these are arranged parallel with platforms at 20-ft. intervals.

The A and B shafts of the Harmony mines are served by a four-drum Wellman-Seaver-Morgan hoist, driven by a 300-hp., 440-volt, 250-r.p.m. General Electric motor. Each drum is 10 ft. in diameter and carries 3500 ft. of 1¼-in. steel cable. This length of rope permits of four 250-ft. cut-offs and a change of ends before it is discarded. The skip end of the cable wears because of scouring in starting the rollers.

The Joker shaft, on the Joker-Bonanza orebody, has been sunk about 1000 ft. on an angle of 78°. The method of sinking is similar to that adopted at the Har-

mony mines. The shaft has been carried in the country rock of late, the stations with 700-ton pockets are cut out in the country rock and crosscuts are driven to the orebodies. Koppel cars of 3-ton capacity, Fig. 9, and fitted with roller-bearing wheels, are trammed to the pocket by a five-ton direct-current General Electric locomotive, and the cars are dumped three at a time by a revolving cylindrical tippie operated by a 12-hp. motor. A one-car hand tippie is also installed in case the larger tippie should require repair. Details of the station on the 340-ft. level, the pocket and loading system, introduced by S. Le Fevre, general manager, are shown in Fig. 1. Skips of 3½-ton capacity are loaded at the pocket and these are hoisted in balance by a Wellman-Seaver-Morgan hoist, operated by a 500-hp., 440-volt, 250-r.p.m. General Electric motor. The hoist has 10-ft. drums each with 2500 ft. of 1¼-in. steel cable, and the normal hoisting speed is 900 ft. per minute. The locomotive gathering tracks are all of 45-lb. steel and laid to grade while the spurs to the different workings are 30-lb. steel and laid to a 1¼% grade favoring the loads.

The old method of sinking for new levels in the Joker mine was to use a bucket of 1-ton capacity. The bucket rode to the dumping level on the 78° angle by sliding on a pair of 8x8-in. stringers set 30 in. apart. At the dumping level the bucket was hooked to a "swing out" rope, swung off to one side of the shaft and dumped into a chute discharging into a tram car.

To use the auxiliary skip in sinking the shaft, by the newer method, the main difficulty is to keep the rear wheels on the lap slides near the bottom of the sink. The back rails cannot be kept close to the bottom of the sink, for they would be blasted off, and in hoisting on stringers so nearly vertical, the tendency is for the rear wheels of the skip to raise off the track. To obviate this a hole is drilled in the bottom of the nose of the skip and the bail is tied to the nose by a chain and toggle. The hoistman on the dumping level stops the skip before it reaches the dump and disengages the toggle, after dumping, he again engages the toggle and lowers the skip.

BONANZA SHAFT SUNK BY BUCKET

The Bonanza vertical shaft is sunk by means of a 1-ton bucket, Fig. 4, this is hoisted through a separate compartment. Boards are nailed vertically, several inches apart, against the wall plates and dividers, so that when riding one can prevent the bucket from swinging by keeping the fingers in the gap between boards. The boards, of course, keep material from falling into the other compartments.

The temporary 16-in. ladderway is maintained in the sinking compartment. On the completion of a sink, and after

equipping the station and pocket, the ladderway is moved to the other side of the shaft. Platforms are placed at 20-ft. intervals, the ladders standing at about 65° and are arranged parallel with one another. The pocket arrangement, track system and level equipment is similar to that in the Harmony mines and is shown in an accompanying drawing, Fig. 2.

Drawings are also shown of the several types of skip cars. The regular 3½-ton skip (Fig. 7) is now hung by having the bail arms reach to the bottom of the skip and cotterpinned after fitting on the turned ends of 3x3-in. iron, which is held by ¾x4-in. straps to the skip bottom.

The 1½-ton hand-tram car (Fig. 8) and the locomotive-haulage car (Fig. 9), are standard equipment in all the mines. The rear-door-dump open-back skip (Fig. 5) of three-ton capacity, is used in the Barton Hill mines, for that portion of the ore above the main-tunnel level, which must be lowered to storage bins in the tunnel level. The front-door-dump open-back skip (Fig. 6) of three-ton capacity is used in the above mines to hoist the ore below the tunnel level.

Iron Blast Furnace Temperatures

Some blast-furnace reaction temperatures are given in the following list, taken from a paper by S. H. Stupakoff before the Engineer's Society of Western Pennsylvania.

Carbon monoxide begins to reduce precipitated iron oxide at 285° F.; roasted carbonate at 390° F.; and is active for all ores at 750° F. The reverse reaction, CO₂ reduced by iron to CO begins from 800° F. to 1110° F., depending on mass-action, etc., and is active at 1475° F. Solid carbon begins to reduce iron oxide at 800° F. The reduction by CO is most active at 1000° F., and begins to lessen above that temperature. A mixture of 3CO₂ and 2CO is oxidizing at 1000° F., and a mixture of 1CO₂ and 2CO is oxidizing anywhere over 1500° F. Limestone decomposes at 1600° Fahrenheit.

Nickel Extraction from Garnierite

The extraction of nickel from garnierite (H₂(Ni, Mg) SiO₃ + aq.) is taken up in French patent No. 441,074, by P. A. M. de Mehereng. The finely crushed ore is roasted in a reverberatory, and then boiled for two hours with a 1 to 5% solution of sulphuric acid. The solution is then treated with powdered chalk, precipitating all metals but nickel and magnesia. The nickel is then precipitated by sodium carbonate, and the carbonate re-

duced to metal in an electric furnace, or else the nickel solution is electrolyzed, using nickel cathodes and carbon electrodes, keeping the solution neutral with the powdered chalk. The patentee also suggests recovery of the sulphuric acid by diaphragm cells, including making a larger quantity of sulphuric acid by use of sulphurous acid in the diaphragm cell.

Early Western Lead Smelting

In 1869, a smelting furnace was erected in the Eureka district, Nev., by C. A. Stetefeldt, which appears to have smelted ores from several of the mines,

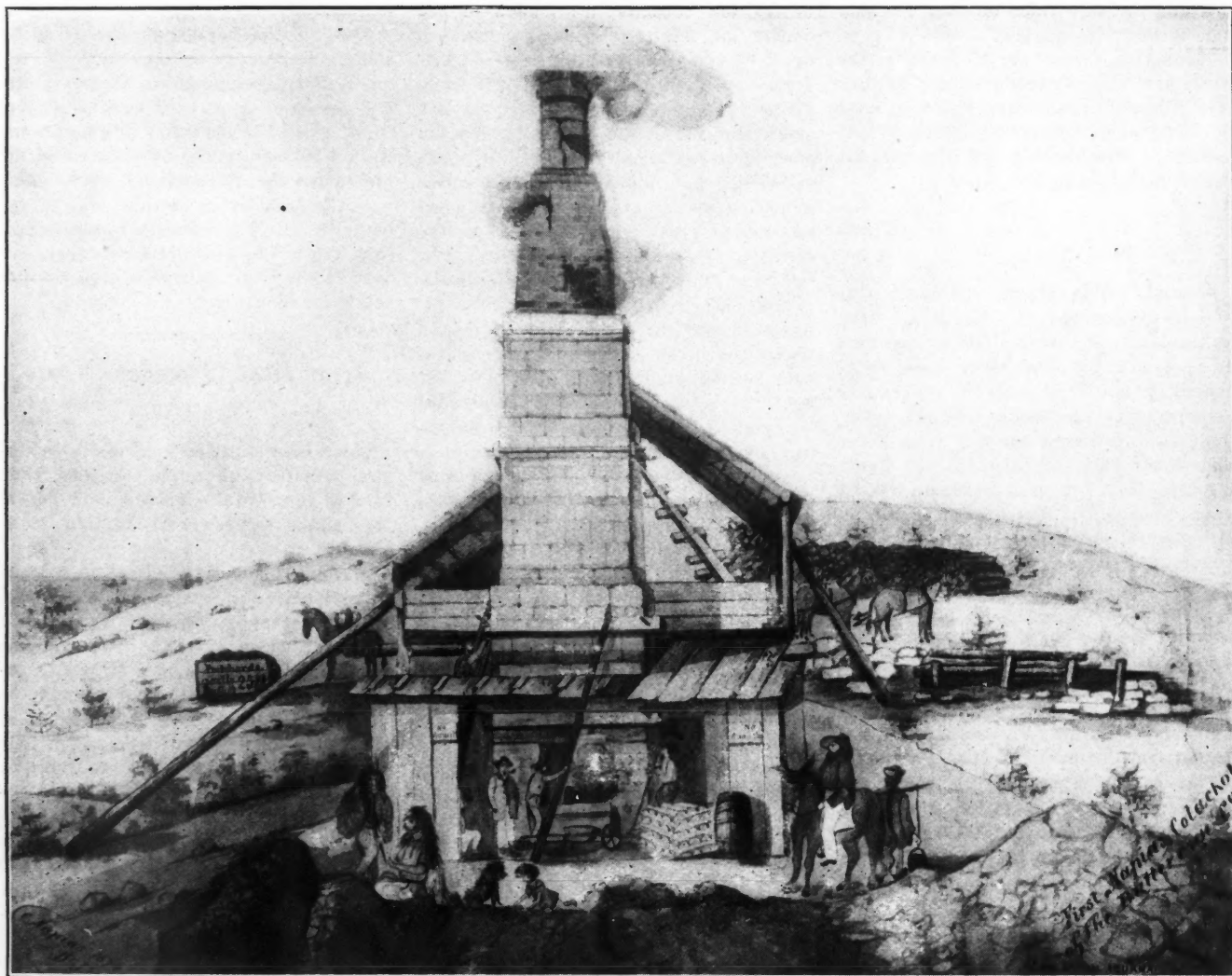
illustration taken from an old drawing, was a draft furnace, through which the mixture of oxide and carbonate ores is said to have "run like butter."

Originally slag was run off into ordinary iron wheelbarrows, and bullion molds were made of sheet iron, folded and reinforced by a heavy wire rim. In 1870, the original draft stack had already given way to two small blast furnaces, and within the next four or five years there were 12 or more plants erected. However, it did not take the mine owners long to learn that the smelting toll charged by a large plant was less than the operating costs of an individ-

ful hourly analyses of slags were made on the point of a long-handled shovel.

The Pritchard, whose name appears on the box eyed by a meditative mule, was the smeltery foreman, a son of a Welshman and a Mexican woman, described as racially a metallurgical marvel. The crew was Mexican and Indian and celebrated feast days with great vigor. During one of these shut downs Pritchard whitewashed the furnace interior with bone ash, having gotten the idea from the resisting properties of the cupel.

Three young German metallurgists, Karl von Leibnau, Albert Arents and Otto H. Hahn came to the camp about



THE FIRST SUCCESSFUL LEAD SMELTING FURNACE IN NEVADA, ERECTED AT EUREKA IN 1869

but a large proportion of gangue in the ores rendered the flux required too great, and pecuniary difficulties prevented the completion of the plant.

The first successful commercial plant appears to have been erected by Col. G. C. Robbins at Eureka, in 1869, which plant was described by R. C. Canby before the International Congress of Applied Chemistry, the data being furnished Frank Robbins, son of Colonel Robbins. The stack, shown in the accompanying

ual one, so that eventually two only; the Eureka Consolidated, and Richmond Consolidated, survived. These eventually combined to fix a smelting charge which was all the miner could stand and just low enough to prevent the ore going to Salt Lake City.

In 1870, with the exception of Stetefeldt, there were no skilled metallurgists, there were two or three itinerant assayers whose knowledge did not extend beyond the use of crucible and cupel, but care-

this time. Hahn, probably with Leibnau as his assistant, planned and constructed the smelting plant of the Richmond company in 1871. Arents remodelled that of the Eureka. These men probably brought with them the plans of the Raschette furnaces from Germany. They were the first to introduce dust chambers into the camp and Arents invented and patented his siphon tap. For many years metallurgical pilgrims came to steal ideas from these works.

The Ore Deposits of Goldfield—I

By Augustus Locke*

The Goldfield discoveries were antedated several years by those of the Yukon and the Seward peninsula. Their lateness has caused much wonder; it has seemed to be something of an anomaly that Nevada should hide its wealth longer than Alaska. The conditions which surrounded the Goldfield discoveries, however, rendered them more difficult than the discoveries in any notable North American gold district.

In the first place, the Goldfield district, though not so remote as Nome or the Yukon, was, in reality, further from the beaten trail. The forbidding Nevada desert offered no motive for exploration except that of prospecting. Even now, when the state contains several centers of successful mining enterprise, it possesses interior expanses of which little is known.

ORE DIFFICULT TO RECOGNIZE

The ore deposits themselves were intrinsically hard to recognize. The region was by no means entirely unknown, from the sixties onward, the excitements at Montezuma, Lida and Silver Peak had brought prospectors to the vicinity, and in 1902, some months before the initial discoveries, a genuine invading horde had come in, applied their energies for a time to prospects near the sites of the present mines, and then gone away. But, in spite of these explorations, the existence of the Goldfield ore deposits was still unsuspected. There was nothing to hold the gold-seeker's eye; rusty, siliceous ledges existed in vast quantity, and good ore reached the surface in several places, but the croppings which carried gold were effectively hidden in the multitude of their similar brethren which carried no gold whatever. The country had that "burnt up" aspect which the miner associated with the idea of barrenness. Moreover, the sign of the placer was lacking. In other localities, placers have served as infallible trails, easily recognized and yielding such rich rewards that, once found, they were inevitably and instantly followed. The remarkable fact is, not that the Goldfield deposits were so long undiscovered, but that they were discovered at all.

It was in 1901 that Tonopah became a noteworthy producer. Like California in the fifties and Virginia City in the sixties and seventies, it constituted, during its early days of prosperity, a source of prospecting impulses, and overflowed with men, eager to follow whatever gleams of hope the desert afforded. One such gleam of hope was the discovery, in the latter part of 1902, of float gold on Columbia Mountain, about 30 miles south of Tonopah, and a mile or so north of Goldfield. The resulting stampede, and

Goldfield developed as a boom camp where promoters, speculators and lessees delimited the ore-bearing ground and then gave way to the consolidations which followed. Ore never occurs in unaltered rock but usually in rock which is well silicified. The productive area may be considered part of an irregular lode, the walls of which are better defined in dacite than in latite.

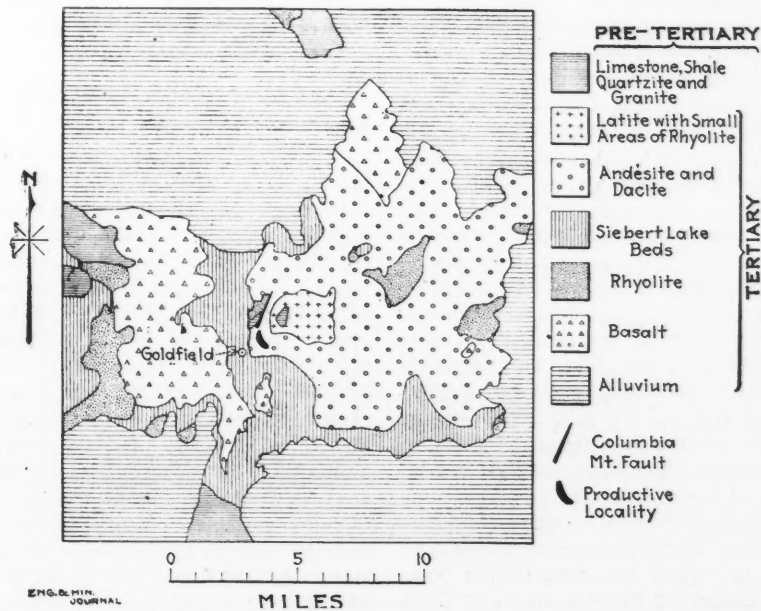
Note—The work on which this article is founded was done under the direction of Henry Lloyd Smith, professor of mining and metallurgy, Harvard University, and while Mr. Locke was a holder of a Sheldon fellowship from Harvard University.

*Mining geologist, Apartado 34, El Oro, Mexico.

at or near the surface. The Jumbo, January and Florence were actively and successfully worked by lessees during 1904 and, during the year, the high-grade portion of the Jumbo and the greater part of the January were worked out. Up to the end of 1904 the total production was as follows: January, \$500,000; Jumbo, \$1,100,000; Florence, \$650,000; Combination, \$500,000; total, \$2,750,000.

The important discoveries in the Red Top were deferred until the beginning of 1905. The long delay would seem surprising; for in one place ore has since been stoped to the surface. A consideration of the facts affords an explanation; the finds in the Jumbo, Florence, Combination and January were so scattered as to give little suggestion of the trend of the ore, and the relations of the individual ore occurrences to each other were exceedingly puzzling.

At the beginning of 1906, the parts of



ENG. & MIN. JOURNAL
GEOLOGICAL MAP OF GOLDFIELD AND VICINITY
(Adapted from Bail)

the quick discouragement and departure of the stampede have been noted already.

A few prospectors, however, remained, and in the spring of 1903, a location was made on the Combination. Shallow holes revealed ore which was later to be mined in open cuts. Almost from the start, the orebodies developed automatically, paying for their own exploration. The first shipments were made in November. By the end of 1904, the production amounted to half a million; by the end of 1905, it amounted to a million. The Combination had immediately become a great mine.

The discovery of the Combination was quickly followed by the discoveries of most of the other orebodies which apexed

the district known to be ore bearing are to be regarded as the outliers of the far richer central portion, that of the Mohawk, which was still unrevealed. The Jumbo, the Red Top, the January, and even the Florence and Combination, are according to present indications, shallow mines; they have yielded little below depths of 300 and 400 ft. But the Mohawk (or, rather the Clermont, for the Mohawk in its lower levels goes under that name) has rich ore in considerable quantity down to the depth of 1000 ft., and there is a chance that further development will find deeper ore.

The discovery of the Mohawk was delayed by the barrenness of its croppings. For over two years, while its neighbors

were enjoying the full measure of prosperity, the Mohawk was generally scorned. Not until the mining excitement prompted the sinking of numerous shafts (chiefly by lessees) was its worth learned. One of these shafts, quite by accident it seems, found the Mohawk ore in the spring of 1906, at a depth of 250 ft. The very core of the district was now reached, and in 1906 Goldfield yielded over seven millions.

GOLDFIELD BOOM FOLLOWED THE MOHAWK DISCOVERIES

Goldfield was in a state of boom the greater part of the time from the early discoveries until 1908. As early as the beginning of 1905, it had a population of about 8000, a number exceeding the industrial need several times over.

It is not, however, to the conditions of the earlier years that the term, Goldfield boom, is ordinarily referred, but to the period succeeding the Mohawk discoveries. By the end of 1906 Goldfield had developed into a speculative bedlam with a population of at least 15,000.

Of themselves, the discoveries had those sensational qualities which create excitement, but it was to certain accompanying conditions that the full flow of this excitement was due. The first and most important of these conditions was the coincidence of a nation-wide industrial optimism. Promoters made clever use of the prevailing speculative tendency. Two hundred shafts were in simultaneous operation and, according to some estimates, the public paid \$30,000,000 for shares in Goldfield mining companies. The facts that only a dozen or so shafts are now active, that dividends have been considerably less than \$30,000,000, and that the bulk of this amount has been gained by a restricted group of stockholders, show impressively the magnitude of the inflation.

A second important accompanying condition was the prevalence of ore stealing. I like to regard that part of the boom which concerned the inhabitants of Goldfield as a sort of maelstrom, in which money, easy to get and easy to spend, circulated at an enormously rapid rate, giving the illusion of abundance by the frequency of its appearance. Ore stealing added an impulse, indirect but effective, to the maelstrom. The highgrader who got \$20 during the day made haste to get rid of it at night. Goldfield was a community containing some thousands of gamblers.

The result of all the conditions together was a mining excitement as intense, though not as prolonged, as that of the Comstock. And it is interesting that the delimitation of the ore-bearing ground was accomplished entirely during the period of the boom, and largely at the expense of speculators. When it had been finished, a few cool-headed organizers stepped in and took possession.

Lessees enjoyed much prosperity in Goldfield between 1903 and 1908. The first important discoveries in all the mines, except the Combination, were made by the lessees. Goldfield had no such inherent characteristics as those of Cripple Creek which made leasing a logical and permanent necessity, it got a hold largely because of the vagueness with which the ore occurrence was at first understood. Its application was an expedient used only during the stage of preliminary development. Once the limits of the ore locality became known, leasing on a large scale ceased.

Curiously enough, leasing and ore stealing coincided closely in duration, and if leasing had not existed, I doubt if ore stealing would have attained its enormous development. It must be understood that the owner of a productive lease was invariably in a hurry; good miners were hard to get, and the lessee who deprived his men of their "right" to steal ore was likely to have no men at all. In short the consenting silence of the lessees made of Goldfield a place in which ore stealing, approved by the bulk of the population, could scarcely be regarded as immoral.

GOLDFIELD CONSOLIDATED MINING & MILLING CO. FORMED

As already suggested, leasing constituted a sort of intermediate stage between the prospector and the large company. Eventually the time came for big-scale operations. Such operations, however, could have been carried on without consolidation; for the unit mines would individually have constituted enterprises of great magnitude. I believe that the scheme of consolidation was first suggested because the Sheets-Ish lease workings in the property of the Combination Mines Co. followed ore from the surface downward into the Mohawk No. 2 claim, threatening the right of the Mohawk company to important orebodies. The possibilities of apex troubles as here suggested were large, and they looked the more ominous because the relations of one orebody to another were regarded as hopelessly complicated. The fear of destructive litigation caused the possible enemies to enter into an alliance which converted them into permanent friends. Just how much trouble was avoided by this alliance is impossible to say, but Goldfield has been conspicuously free from apex litigation.

The motive afforded by the fear of litigation was, of course, only one of several conditions which promoted consolidation. The orebodies were so arranged that they logically constituted a single unit for exploitation. The ore-bearing area was compact and small, and was controlled by a small number of interests. I know of no great gold district where consolidation has been so easy a matter.

MINERS OBJECT TO CHANGE HOUSES

For several years after the early discoveries, Goldfield existed in a state of abnormal excitement. Certain conditions which existed during these years, notably ore stealing and high wages, became fixed habits. The breaking of the habits involved serious labor troubles.

The first of these troubles came in 1906. In that year and in 1907 occurred numerous brief strikes, largely inspired by attempts to reduce wages or to introduce change rooms. The miners were in a most sensitive frame of mind, especially those who had been blacklisted in the Cripple Creek labor troubles.

Meanwhile, important changes had taken place in the character of the Goldfield community. The wages of the early days had been rightly high. But now the excitement was over. Railroads communicated with both the north and the south. The population was three or four times larger than the industrial need. The continuance of high wages was an economic anomaly. At the same time, leasing, except in the Florence, had ceased. The large number of small operators in the mines of the Goldfield Consolidated were replaced by a single deliberate management. The odds were turning rapidly against the strikers.

The decisive struggle started in November, 1907. About 2000 men then quit work, their immediate grievance being the desire of the mining companies to make part payment of wages in clearing-house certificates. Any repetition of the Cripple Creek disorders was rendered impossible by the prompt arrival of Federal troops, and under their protection, the mining companies within a short time announced a reduction of wages amounting to something over a dollar per shift. In April, 1908, the miners' union admitted defeat, declaring the strike to be at an end.

The defeat was a complete one. Wages have continued at the figure set during the strike by the mine owners. Ore stealing, through the institution of change rooms, has been mostly done away with. Since 1908, no effective miners' organization has existed in Goldfield.

FIRST MILL BUILT IN 1905

The early production was shipped out of the district in the form of ore. At first, there was a wagon haul of 60 miles. Soon this was shortened to 30, a railroad then reaching Tonopah. In 1905, the railroad reached Goldfield. A 10-stamp cyanide mill was built in 1905 for the Combination mine. Later, its size was doubled. Three custom mills with a total maximum capacity of 70 tons per day, were, according to Ransome¹ running in 1905. The Florence mill was put into operation as a 20-stamp cyanide mill;

¹U. S. Geological Survey, Professional Paper No. 66, "Geology of Ore Deposits."

this was later enlarged to 40 stamps. Close to the beginning of 1909, the Goldfield Consolidated company put into operation a 100-stamp mill and later in that year, the 20-stamp Combination mill was dismantled.

It was only while leases were in operation, that there was room for custom mills; at present the custom mills are doing little or nothing. Formerly, the Consolidated shipped to smelters the concentrates from its mill and a considerable amount of high-grade ore. In 1911, the shipments of high-grade ore were mostly discontinued and lately a local concentrate treatment plant has been put into operation. The greatest part of the bullion production is now accomplished within the district.

A large part of Goldfield's prosperity is due to the successful application of cyaniding to the treatment of its ores.

do not apex at the surface, there is no reasonable warrant for suspecting their existence outside the area which is now productive. A conservative estimate of future production then, must be limited to the locality known to be ore bearing.

The last annual report of the Goldfield Consolidated company states that in the latter part of 1911, its mines had in reserve 600,000 tons of ore, a two years' supply, of a value per ton probably considerably lower than that mined in the past. The Florence mine keeps little ore developed. It is safe to say that in general, above the depth of 300 ft., the ore-bearing quartz bodies have been well prospected, and that the bulk of the ore has been extracted; yet some ore is still being found there. Below 300 ft., ore in important quantities is being mined in the Red Top, Mohawk, and Clermont, and below 400 ft., in the Mohawk and Cler-

of 450 ft. Altogether, the deep exploration strongly indicates that the ore dwindles with depth.

But if it is certain that the life of the district is limited, it is equally certain that it will be much longer than that of the present ore reserves. The deposits so far found have been the more obvious ones. I believe that the discovery of additional orebodies will be gradual and that the great quartz masses will long continue to yield them up. Without any enlargement of the productive area, and without the discovery of important ore below the depth of 1000 ft., Goldfield ought to keep up a production, important though diminishing, for a considerable number of years.

SKETCH OF ROCK OCCURRENCE

The following is from Ransome: "The district is essentially a low, conical uplift of Tertiary lavas and lake sediments, resting upon a foundation of ancient granite and metamorphic rocks."

The Tertiary rocks, as Ransome lists them, are given in the accompanying table, the youngest at the top.

The pre-Tertiary rocks are: Alaskite and granite (occurring as large irregular intrusions in shale); shale and quartzite.

All but 2 or 3% of the production has been derived from latite or dacite. The rocks encountered in mining operations are chiefly:

Shale: Thin-bedded, contorted, exceedingly metamorphosed, consisting of fine-grained quartz with pyrite and abundant microscopic black specks, probably carbon.

Alaskite.

Latite: Never fresh. Has marked flow structure. Biotite occasionally fresh. Hornblende never fresh.

Andesite: Distinguished from the latite by absence of flow structure and by frequent freshness of dark phenocrysts.

Dacite: Closely resembles the andesite; distinguished by possession of quartz phenocrysts. The most common rock distinction required in mining is that between dacite and latite: this is often rendered difficult where the rocks are much altered by the presence in latite of blebs of secondary quartz resembling quartz phenocrysts.

FOUNDATION ROCKS PRE-TERTIARY

The foundation rocks of Goldfield belong to that body of material which constitutes the pre-Tertiary floor over many thousand square miles in this part of North America. Broadly, their age relations to the overlying Tertiary rocks are analogous to those between the "bed-rock complex" and the "superjacent series" of the Sierras, and also, I believe, to those between the foot wall and hanging wall of the Comstock.

No fossils have been found in the Goldfield metamorphics; yet fossils of

TERTIARY ROCKS OF THE GOLDFIELD DISTRICT—RANSOME

Formation or map name	Petrographic name	Occurrence
Malpais basalt	Dolerite	Flow or flows with a few small intrusions.
Rabbit Spring formation	Breecia, conglomerate and sandstone.	A variable and for the most part thin deposit; probably fluvialite.
Spearhead rhyolite	Rhyolite	Flow or flows.
Pozo formation	Conglomerate	Fluvialite deposit. Conformably underlies Spearhead rhyolite and unconformably overlies the Siebert formation.
Siebert formation	Conglomerate, sandstone, tuffs and diatomaceous earth.	Lake beds.
Mira basalt	Quartz bearing doleritic basalt	Flow intercalated in Siebert formation.
Siebert formation	Conglomerate, sandstone, tuffs, etc.	Lake beds.
Espina breecia	Dacite breecia	Roughly bedded deposit.
Andesite breecia	Andesite breecia	Roughly bedded pyroclastic deposit.
Meda rhyolite	Rhyolite	Flow.
Dacite vitrophyre	Dacite vitrophyre	Flow.
Chispa andesite	Andesite	One or more flows in dacite vitrophyre.
Dacite vitrophyre	Dacite vitrophyre	Flows.
Dacite	Dacite	Sheet-like and irregular intrusive masses passing into flows and breccias east of the area mapped.
Milltown andesite	Andesite	Mainly flows, but some dikes and intrusive masses and with some tuff and breecia. Locally includes some effusive basaltic rocks which are not exposed at the surface.
Morena rhyolite	Rhyolite	Intrusive masses.
Sandstorm rhyolite	Rhyolite	Flows.
Kendall tuff	Rhyolitic and andesitic tuff	Obscurely bedded and in part lenticular deposits closely associated with the sandstorm rhyolite.
Latite	Latite	Flow.
Vindicator rhyolite	Rhyolite	Flow.

Goldfield did not have to experiment and wait for the application of this process. Mexican silver deposits, notably those of Pachuca, furnished the motive for the development of the patio process; the quartz veins of California, for the development of stamp milling and amalgamation; the Comstock, for the development of pan-amalgamation; and the Rand, for the development of cyaniding. But when Goldfield got ready, there was a process suitable for the treatment of its ores already in a high state of perfection. No other locality of refractory gold ores was ever discovered under such propitious metallurgical circumstances.

ORE-BEARING AREA LIMITED

It is not safe to count on the Goldfield ore area being enlarged. That any important orebodies apexing at the surface remain undiscovered, is entirely unlikely. And as for important orebodies which

mont. On the 1000-ft. level, the Clermont has important orebodies about 400 ft. long. On the bottom level, the 1200, which is the level immediately below the 1000, little prospecting has been done, and the results have so far been negative.

Goldfield has certainly reached, and perhaps passed, the crest of its production. In the last two years, about 20 miles of development work have been accomplished; yet none of the orebodies discovered has a value equal to that of the orebodies of the earlier years. It must, of course, be remembered that the work done on the lower levels is relatively meager in amount. Nevertheless, at present the presumption is that, should the deep ground so far unexplored prove productive, it will be far less productive than the upper levels have been. Even in the last year, the important new discoveries have taken place above the depth

Cambrian age are known in foundation rocks a few miles distant, and the presumption is that the corresponding rocks of Goldfield are also Cambrian. And because, in California and in some parts of Nevada, the late Jurassic or early Cretaceous time was a period of enormous granitic intrusion, the granitic intrusions of Goldfield are reasonably regarded as belonging to this class.

Concerning the shape of the pre-Tertiary floor, little is known. In Columbia Mountain, which has a relief of 400 ft., and in several places further east, the old rocks emerge as islands. But these are the only islands in an area of some scores of square miles. Immediately south of Columbia Mountain, in the vicinity of the productive mines, the slate and granite are occasionally encountered in the mine workings.

Underground exposures are so fragmentary as to define the floor only imperfectly. Perhaps the old surface is roughened by pre-Tertiary eminences, like Columbia Mountain. Or, it may be smooth on account of pre-Tertiary erosion, or, locally, on account of faulting. About all that we can be sure of concerning the shape and position of the pre-Tertiary floor in the productive locality is this: Its depth below the surface increases directly with the distance southeast from Columbia Mountain. Close to Columbia Mountain it lies at 300 ft. below the surface; one-half mile further southeast, at 1000 ft.; and a little further southeast, in the Clermont, at 1200 feet.

If several layers of rocks, each having a uniform thickness, had been laid down on a floor of basement rocks; and if, subsequently, the basement rocks had been at some point forced upward, so that the surface sloped in all directions away from the top of a dome; then, after sufficient truncation of the dome by erosion, the layered rocks would appear at the surface in rings with a core of older rocks at the center. The Black Hills uplift of South Dakota constitutes an almost ideal example of this condition.

In Goldfield, as Ransome believes, this condition is exemplified, but incompletely. Broadly, if the effects of faulting be taken into account, the grouping of the volcanic rocks is such that the older are nearer to the exposures of slate and granite and the younger are farther from them. Ransome's map shows a roughly circular area of rhyolite and latite, two miles in diameter, containing all of the islands of granite and shale (excepting Columbia Mountain, which owes its position to faulting) and surrounded by dacite and andesite.

DACITE WHOLLY EXTRUSIVE

The matter of the structural relations of dacite and andesite is of little economic importance. Yet it has considerable geological bearing; for the acceptance of Ransome's conclusion that the

dacite is partly intrusive and partly extrusive would necessitate the belief that the intrusive phase of the rock passed before our eyes into the extrusive phase, making what would be surely a most interesting situation.

The more important arguments favoring Ransome's conclusions are as follows: (1) There is a steep dacite-andesite contact in the Florence mine. (2) The dacite transgresses the rule of ring distribution. The first of these arguments is weakened by the fact that the contact referred to is so obscured by the extreme alteration of the rock that it seems fully as likely that the contact is one of faulting as that it is one of intrusion.

The second is weakened by the absence of dacite dikes, by the fact that the andesite, as mapped, includes a number of irregularly distributed varieties, and the possibility that the dacite may be merely an additional variety. Indeed, the chief mineralogical difference between the dacite and the andesite is the possession by the dacite of the scattered quartz phenocrysts. Ransome's rock analyses show that the dacite is more acid than the most basic of the andesites and more basic than the most acid of them. Altogether it is noteworthy that the structural relations of the dacite and of the andesite to the other rocks are in the main identical. For example, both rest on latite. And when the two are mapped together as andesite, the andesite ring becomes at once complete. The evidence now available favors the view that the dacite in the vicinity of the mines was wholly extrusive.

Certain hills in the district which are known to have been produced by erosion, possess a relief as great as 500 ft., and this figure may be taken as a minimum for the total erosion.

Post-ore erosion is difficult of determination. There are several conditions which suggest that it was small: (1) The relative youth of the ore; (2) the extreme slowness of present erosion; (3) a marked increase in the complexity of ore and lode from a depth of 600 ft. upward, suggesting an originally shallow deposition; (4) the entire absence of placers.

SILICEOUS OUTCROPS INVARIABLE CONDITION OF ORE OCCURRENCE

The Goldfield district is clearly distinguished from the surrounding monotonous expanses by the occurrence within it of siliceous croppings. These lie scattered over an area of several square miles, as Ransome says, they "stud the hills." Not 1% has been proved to cover ore. Yet little ore occurs without them. They, and the buried quartz of which they are the superficial manifestation, are to be regarded as the largest invariable condition of ore occurrence.

The siliceous croppings belong to an

area of intense solfataric rock alteration. Within this area, the rock minerals are seldom sufficiently fresh to show good cleavages; the rock itself is either softened, with the production of much kaolin and alunite, or hardened by silicification. A great body of softened rock, it may be said, carries an incomplete siliceous skeleton. The differences in hardness between the softer and harder parts have produced a topography of rough details, but generally subdued elevations, the soft parts being designated by the depressions, and the hard parts by the siliceous croppings.

SURFACE INDICATIONS MISLEADING

From the time of the first discoveries, the puzzling characteristics of the area of alteration have bewildered the prospector and miner. The distribution of the quartz bodies suggests, not a mineralization which followed dominant fissures, but one which progressed along complex and tortuous channels. How one quartz body is related to another; how silicification is related to softening alteration; and how alteration in general and silicification in particular are related to ore mineralization, are problems of great difficulty. When the fact became known that some of the croppings covered ore, it became at once a question why all or many of them did not do so, and the question has not yet been definitely answered. The surface material is frequently a barren cover which hides ore; one cropping looks as inviting as another. Until the ore-bearing ground had been delimited, the prospector was in a state of frenzied expectancy and indecision, attracted equally by the "surface indications" of some thousands of acres. Moreover, when he made a choice of locality, taking usually a strong outcrop, he often found that his outcrop was a boulder, that his shafts soon passed out of quartz, or that his tunnels even failed to enter quartz. Or, if the outcrop was more than a boulder, he often found that its limits were crooked, he could scarcely call it a vein, for it had no definiteness of trend either on strike or dip.

In reality, the only established rule of association between rock alteration and ore is this: Ore never occurs in unaltered rock, never in rock not to some degree silicified, and usually in rock which is well silicified. The fact that the orebodies lie within the region of general solfatarism establishes a connection, however vaguely it may be understood, between solfatarism and ore deposition. It would seem, at least, that both were results of volcanism. There is no better indication, however, of our ignorance of the fundamental facts of ore genesis, than our failure here to produce useful working theories, and there is no better proof of the present unsuitability of the so called "genetic" classifications to the purposes of the miner.

ORE AND DACITE NOT COEXTENSIVE

The map shows the ore area, with the exception of its southern end, to lie wholly within an area of dacite. For a long time, dacite was regarded as the only favorable rock. The statement, "We are in the dacite," was frequently and profitably used by promoters. The situation prompts an inquiry into the causes of the almost exclusive limitation of the ore area to dacite.

In the first place, it is evident that ore and dacite are in no way coextensive. There is no such large coincidence between the ore and the dacite as there is in Tonopah, for example, between the ore and the trachyte, or in Cripple Creek between the ore and the body of volcanic rocks. Large areas of dacite are barren. Even of that particular area which comprehends the ore locality, it is only a limited portion (near the western edge) which is ore bearing. But if ore and da-

the Mohawk. The ore on the 900- and 1000-ft. levels also lies in latite. The limitation of the chief ore field to the area of dacite, looks, then, far less significant than it did before the mine workings reached below the bottom of the dacite.

Following are five hypotheses concerning the relations of ore and dacite: (1) The source of the ore minerals was the dacite itself, or the magma from which the dacite was derived. For example, the ore may have come from solutions or gases belonging to a period of expiring vulcanism which closely followed the dacite eruption.

(2) Dacite was intrinsically more favorable than other rocks to the circulation of the transporters of gold.

(3) Dacite was more favorable than other rocks to the precipitation of gold.

(4) The dacite was localized by faulting. The ore was localized by renewals of this faulting.

Or it may be wholly effusive and occupy a pre-dacite basin whose position was similarly directed. As is stated later, there is no convincing proof that any part of the Columbia Mountain fault movement preceded the solidification of the dacite.

Altogether, the occurrence of ore is a matter of locality rather than of petrography. There is no indication that, had the present dacite area been occupied by andesite, rhyolite, latite, or even shale or alaskite, it would not still have comprehended the ore area.

THE GOLDFIELD LODGE

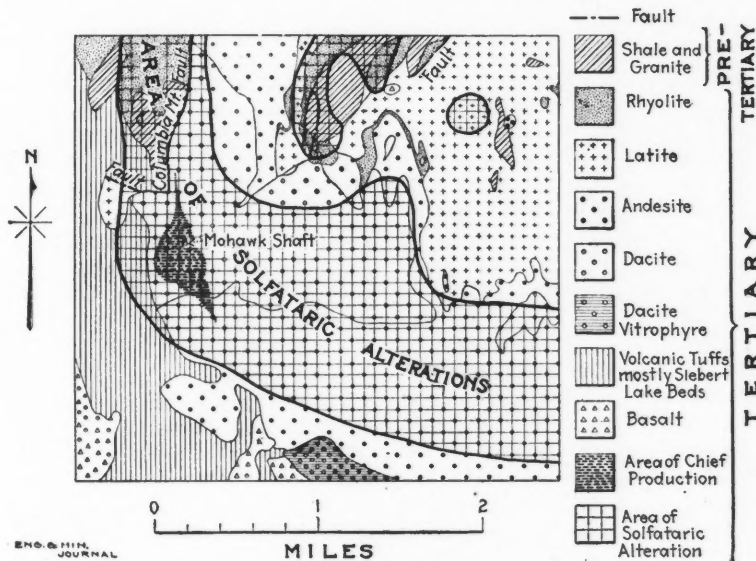
The Goldfield ore is chiefly silicified rock-bearing ore minerals; the ore contains larger masses of silicified rock lacking ore minerals. Ransome believes that the ore containers have not sufficient continuity and definiteness of shape to deserve the term, lode. I have found, however, that they possess greater continuity and definiteness of shape than Ransome's report led me to expect, especially in the levels which have been opened since Ransome's time, those below the 600. Indeed, they are now clearly proved to be parts of a great and complicated lode, having many spurs, curves and interruptions, but showing characteristics which demonstrate its essential unity. It is the presence of this lode which constitutes the second invariable condition of ore occurrence.

The known extent of the lode along the strike is one mile, and along the dip is 2500 ft. These measurements are from the south end of the Florence to the north end of the Red Top, and from the outcrops of the Mohawk to the 1200-ft. level of the Clermont. The siliceous croppings of the lode lie close to the western edge of the area of solfataric alteration, and are weaker than those of many other parts of this area. The sole lode-like suggestion yielded by them comes from the possession of a fairly well marked fracturing striking northerly and dipping easterly, and of a vague north-south orientation.

On the 600-ft. level of the Mohawk, the lode is continuous for a distance of 2000 ft. or more. It has a width, measured at right angles to the walls, of 75 to 100 ft.; it dips 30° easterly.

It is possible to follow this lode upward on its 30° dip and keeping always in quartz; to come out in the Mohawk croppings, or by rising on a steep-dipping, hanging-wall spur, to come to the surface further east. Or it is possible to work northward on the 600-ft. level and, again keeping always in quartz, to come out in the Red Top, or to work southward on the 350-ft. level and come out in the Combination.

The Mohawk, Red Top, and Combination quartz masses, then, have a common root. That the Jumbo and Florence connect with this root has



GEOLOGICAL MAP OF THE GOLDFIELD DISTRICT
(Compiled from Ransome's maps.)

cite are in no sense coextensive, then does the presence of dacite constitute an invariable condition of ore occurrence? Later explorations, and especially those of the last three years, prove conclusively that it does not.

Ore occurs in andesite. As has been already suggested, the ore area runs across the andesite-dacite contact of the Florence mine into andesite, and persists there for several hundred feet. True, the andesite orebodies have been so small as to look insignificant beside those of the Mohawk, but they are sufficient to spoil the rule.

Again, ore occurs in latite. The great orebody of the Clermont 750-ft. level, to which a considerable part of the extraordinary production of the Consolidated during the years 1910 and 1911 was due, lies in latite on the downward prolongation of the ore-bearing quartz of

(5) The inclusion of the bulk of the productive ground in the area of dacite was accidental.

Concerning the applicability of the first, second, and third of these hypotheses, I have no conclusive evidence. The utter barrenness of large stretches of dacite (the ore belt occupies only one-sixteenth of the dacite area which immediately contains it) creates a strong presumption against them, however.

The fourth hypothesis has plausible arguments in its favor. The ore-mineralizers followed, as seems most likely, fissures belonging to the Columbia Mountain fault movement. Ransome believes the dacite body which contains the ore to have been intrusive and to some extent to have been directed by this same movement. I believe the dacite to have been effusive. But, though effusive, it may possess intrusive roots, similarly directed.

not been proved. The lode crops, as we have seen, near the western edge of the area of solfataric decomposition, and dips under this area. The bulk of the solfatarically altered rock is in its hanging wall, and, in a general way, it constitutes the western and approximate lower limit of such rock. Altogether, there is a strong suggestion that the lode channel was an important route for the travel of the solfataric mineralizers, and that from it they departed upward by devious and manifold paths, into the hanging wall. Following this hypothesis, the barren quartz bodies lying to the east may have somewhat the same structural relation to the lode as the nearer upspringing spurs. The limitation of the productive locality to the foot-wall region of the solfatarically altered rock appears even more strikingly at the Comstock, and is a matter well worth the attention of prospectors.

LODE BETTER DEFINED IN DACITE THAN IN LATITE

King's famous cross-sections of the Comstock lode, showing a simplification and contraction of the lode from the surface downward, in a large way, represent the conditions as they exist in Goldfield. Not that there is in Goldfield any such well defined foot wall, or that all the superficial quartz masses so definitely connect at depth with a common channel, but that while, in the upper 600 ft., Goldfield has several ore-bearing quartz bodies, in the lower levels; so far as is known, it has but one; and that, again, this one, the persistent quartz body, has an easterly dip on which it extends from the surface to at least the 1200-ft. level, while the other ore-bearing quartz bodies are usually steeper hanging-wall branches.

The most definite lode boundaries exist on the easterly sides of the Combination and of the Jumbo. In these places, the wall is usually marked by a selvage or gouge, and the change from quartz to soft rock is instantaneous. The westerly sides are vaguely bounded. In a direction at right angles to the strike, the silicification diminishes gradually, and there is difficulty in determining where lode material ceases.

Generally speaking, the lode walls are definite when they have gouges and indefinite when they lack gouges. The conclusion is suggested that any sharpness of definition which they may possess is the result of post-lode movement. Ransome expresses his belief in post-lode movement when he states that the gouges have been caused by the squeezing and consequent movement of soft rock around hard kernels (the quartz bodies) which it contains. Altogether, the walls are better defined when the lode is in dacite than when it is in latite, probably because dacite lode material is harder than latite lode material.

QUARTZ BODIES WEAKEN WITH DEPTH

Ransome's generalization that the quartz bodies weaken with depth survives the developments of later years. The clearest example of such weakening is in the Jumbo. The Jumbo stands vertical or nearly so. At the surface, the quartz is (for Goldfield) excellently defined. At the depth of 300 ft., it is narrower and its outlines are vague. At 600 ft., crosscuts exploring the locality through which its downward continuation ought to pass, have so far intercepted no trace of it. The Jumbo appears to have the non-persistence of a gash vein.

The January acts much as the Jumbo does, a crosscut to it at the depth of 380 ft. reveals only a feeble and barren silicification.

The Combination, apparently, acts somewhat similarly. Since the opening of the lowest, 380 ft., level, questions as to where the lode and where the ore have gone have been asked repeatedly. So far, the most plausible answer is that they quit as they come down to an east-dipping quartz body, and that this quartz body, pitching to the north, forms the connection with the Mohawk.

The Red Top is still strong at the 600-ft. level, some lease workings in a crosscut somewhat over 1000 ft. deep and on the dip of the lode show excellent quartz actually below the porphyries and in the underlying shale.

The Mohawk has great strength on the 600-ft. level. Here it is continuous with the Red Top and the two together are traced for over 2000 ft. On the 750-ft. level, the area explored is smaller, but the lode shows no signs of giving out. On the 900-ft. level, the area explored is still smaller; yet within it, one limit to the well defined portion of the lode has apparently been reached; for to the north the lode merges into a locality of extremely feeble and irregular silicification. It is likely that the quartz comes in strong again further to the north, but at present good quartz is visible for a distance of only 400 ft. along the strike.

On the 1000-ft. level conditions resemble those on the 900. On the 1200, the small amount of exploration work accomplished proves that the quartz is persisting along the dip, but it gives no basis for a generalization as to its persistence along the strike.

Now the three quartz bodies noted as giving out at shallow depths, the Jumbo, the Combination, and the January, are steep or vertical, while the two which have more extensiveness along the dip, possess dips of about 30°. I am unable to avoid the conclusion that steepness of dip is fundamentally connected with persistence in depth.

The Combination quartz weakens when it reaches the dacite-latite contact; the Jumbo and the January quit far above

it and the Mohawk and Red Top go down through it. Of what is going to happen when the Mohawk and the Red Top go down into the shale, present developments give us only a hint, that rendered by the single crosscut before referred to, which shows good quartz existing in shale at a point on the downward projection of the Red Top. The 1200-ft. level of the Clermont appears to be immediately above the latite-shale contact.

THREE GRADES OF QUARTZ

But if the vertical persistence of the lode has no clearly proved general relation to the rock contacts, there is nevertheless a marked connection between them just above the latite-shale contact.

An inspection of Ransome's surface geological maps shows that silicified croppings are abundant in dacite and andesite, but conspicuously scarce in latite. For some reason or other, hard quartz failed to attain any such development in latite as it attained in the other rocks. In my work underground, I gathered much evidence of the general truth of this rule. I found it convenient to distinguish three grades of quartz, the first being flinty, the third soft with much included unsilicified rock, and the second, intermediate. Quartz in dacite, that is, quartz resulting from the alteration of dacite, is chiefly of the first and second grades, while that in latite is chiefly of the third. When the lode passes from one rock to the other, the rule is strikingly exemplified.

For example, the Mohawk comes down to the bottom of the dacite at close to 600 ft. Above 600 ft. there exist huge bodies of hard quartz; below 600 ft. almost the only hard quartz is the ore itself, sometimes 20 ft. wide, and sometimes only half a foot, and the bulk of the lode which attains widths as great as those on the higher levels, is composed of material so soft that the pick in striking it often fails to ring. For the softness of the lode in latite, no satisfactory explanation has been offered.

(To be concluded)

Recovery of Metallic Iridium

Metallic iridium, used for the points of gold pens, is made from the iridium powder left in the wet processes of platinum refining. This powder cannot be smelted alone, says the *Brass World*, Sept. 1912, but is strongly heated in a sand crucible and stick phosphorus added, the mass melting down as iridium phosphide. This is then heated with lime, removing the phosphorus, leaving a brittle white mass of iridium, which cannot be filed or cut, but is broken into the small pieces necessary for pen points, which are ground by corborundum into shape. These pieces of iridium are said to be about the hardness of a ruby.

Mining and Metallurgical Patents

A Classified List of New Inventions

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

COPPER

ALLOY OF COPPER AND ZINC. Alfred Schmid, Zurich, Switzerland. (U. S. No. 1,040,027; Oct. 1, 1912.)

ELECTROLYSIS—Improvements Relating to the Production of Copper by Electrolysis. Raymond Dovvreleur, Veauche, Loire, France. (Brit. No. 21,593 of 1911.)

EXTRACTION—Improved Process for the Extraction of Copper and Nickel Particularly from Low-Grade Ores and Products. W. Borchers, Aachen, Germany, and H. Pedersen of Trenchjem, Norway. (Brit. No. 227 of 1912.)

LEACHING—Improvements in the Oxidation of Ferrous to Ferric Solutions Applicable to the Extraction of Salts of copper and Other Non-ferrous Metals from Ores, Mattes, Residues and the Like. A. McKechnie and F. G. Beasley, Birmingham, Ala. (Brit. No. 15,489 of 1911.)

ROASTING—Ore Burner for Sulphuric Acid Manufacture. Curtis C. Meigs, Woodbury, N. J. (U. S. No. 1,038,408; Sept. 10, 1912.)

GOLD AND SILVER

CRUSHING—Gold-Ore Grinding Mill. John H. Buston, Baltimore, Md. (U. S. No. 1,040,876; Oct. 8, 1912.)

CYANIDE CYLINDER. Henry B. Meade, Los Angeles, Calif., assignor of one-half to William F. Shedd, Los Angeles, Calif. (U. S. No. 1,038,173; Sept. 10, 1912.)

CYANIDE PLANT. Albert F. Tanner, Greenfield, Wis. (U. S. No. 1,034,532; Aug. 6, 1912.)

CYANIDING—Filter. Bruce W. Traylor, New York, N. Y. (U. S. No. 1,037,561; Sept. 3, 1912.)

HYDRAULIC CLASSIFIER—Apparatus for Classifying or Grading Crushed Ore and the Like. George Hardy Stanley, Johannesburg, Transvaal, assignor to Sands Limited, Johannesburg, Transvaal. (U. S. No. 1,040,804; Oct. 8, 1912.)

STAMP MILLING—Pneumatic Ore Stamp. Hans Charles Behr, Johannesburg, Transvaal. (U. S. No. 1,038,521; Sept. 17, 1912.)

STAMP MILLS—Supporting and Lifting and Adjusting Device for Stamp Mills. Edward H. Moyle, Los Angeles, Cal., assignor to Edward Moyle, Grass Valley, Cal. (U. S. No. 1,040,235; Oct. 1, 1912.)

IRON AND STEEL

AIR-BLAST HEATER. Edmund Hohmann, Stettin, Germany, assignor to Stettiner Chamotte-Fabrik Actien-Gesellschaft vorm. Didler, Stettin, Germany. (U. S. No. 1,038,887; Sept. 17, 1912.)

FERROMANGANESE—Improved Process and Furnace for Melting Ferromanganese and other Ferro-alloys. J. I. Bronn, Rombachi/Lothringen, Germany. (Brit. No. 20,121 of 1911.)

HARDENING—Compound for Hardening Steel and Other Metals. Patrick W. Brennan, Philadelphia, and Michael Meehan, Williamstown, Penn. (U. S. No. 1,036,434; Aug. 20, 1912.)

INGOTS—Solidifying Ingots. James E. York, New York, N. Y. (U. S. No. 1,035,933; Aug. 20, 1912.)

MIXERS—Safety Device for Metal Mixers. William P. Gleason, Gary, Ind. (U. S. No. 1,038,872; Sept. 17, 1912.)

REGENERATIVE FURNACE. Peter Patterson, Pittsburgh, Penn. (U. S. No. 1,038,640; Sept. 17, 1912.)

TITANIUM ALLOY—Compound or Composition of Matter and Method of Producing Same. Auguste J. Rossi and William F. Meredith, Niagara Falls, N. Y.

assignors to Titanium Alloy Manufacturing Co., New York, N. Y. (U. S. No. 1,039,672; Sept. 24, 1912.)

LEAD, ZINC AND OTHER METALS

ALUMINUM—Channel Furnace. Alfred H. Cowles, Seward, N. J., assignor to Electric Smelting & Aluminum Co., Seward, N. J. (U. S. No. 1,040,895; Oct. 8, 1912.)

ALUMINUM—Charge Mixture for Forming Alkali-Silico-Aluminate and Hydrochloric Acid. Alfred H. Cowles, Seward, N. J., assignor to Electric Smelting & Aluminum Co. (U. S. No. 1,040,893; Oct. 8, 1912.)

ALUMINUM—Method of Protecting Tunnel Furnaces from Injurious Gases. Alfred H. Cowles, Seward, N. J., assignor to Electric Smelting & Aluminum Co. (U. S. No. 1,040,892; Oct. 8, 1912.)

ALUMINUM—Process for Producing Hydrochloric Acid and Alkali-Silico-Aluminates. Alfred H. Cowles, Seward, N. J., assignor to Electric Smelting & Aluminum Co. (U. S. No. 1,040,977; Oct. 8, 1912.)

ALUMINUM—Process for the Manufacture of Ammonia by Means of Aluminum Nitride. Ottokar Serpek, Paris, France, assignor to Societe Generale des Nitrures, Paris, France. (U. S. No. 1,040,439; Oct. 8, 1912.)

ALUMINUM—Process for Welding Aluminum. Franz Jordan, Reinickendorf, Germany. (U. S. No. 1,033,412; July 23, 1912.)

ALUMINUM—Process of Forming a Charge Mixture for Producing Hydrochloric Acid and Alkali-Silico-Aluminate. Alfred H. Cowles, Seward, N. J., assignor to Electric Smelting & Aluminum Co. (U. S. No. 1,040,894; Oct. 8, 1912.)

ALUMINUM—Process of Making Aluminum Sulphate. Percy Hutchins Carter, Harry Horace Shackleton, and Thomas Edward Grafton, Rome, Ga. (U. S. No. 1,037,591; Sept. 3, 1912.)

TIN—Recovery of Tin from Tin-Bearing Ores and the Like by Conversion into Volatile Tin Compounds. A. Richards, London, Eng. (Brit. No. 56 of 1912.)

VANADIUM—Improvements in Processes for Extracting Vanadium from Ores. B. D. Saklatwalla, Pittsburgh, Penn. (Brit. No. 6119 of 1912.)

ZINC—Improvements in Condensers for Zinc Vapors. A. L. J. Queneau, Philadelphia, Penn. (Brit. No. 2669 of 1912.)

ZINC—Improvements in or Relating to the Separation of Metals from Zinc-Bearing Ores or Compounds and Apparatus Therefor. E. A. Asheroft, London, Eng., and Sande Gaard, Balestrand, Norway. (Brit. No. 19,257 of 1911.)

ZINC—Improvements in the Extraction of Zinc from Zinc Ore. A. Rotzheim, Duren, Prussia. (Brit. No. 19,587 of 1912.)

NONMETALLIC MINERALS

CLAY—Process of Purifying Clay, etc. Hermann Gruber, Leipzig-Plagwitz, Germany, assignor of one-half to Fritz Schulz jun. Aktiengesellschaft, Leipzig, Germany. (U. S. No. 1,036,831; Aug. 27, 1912.)

CLAY-SIEVING MACHINE. Alfred H. Cowles, Seward, N. J. (U. S. No. 1,040,639; Oct. 8, 1912.)

FELDSPAR—Process for Extracting Alumina from Feldspar. Samuel Peacock, Chicago, Ill. (U. S. No. 1,036,897; Aug. 27, 1912.)

MINING GENERAL

BLASTING—Miner's Combination Tamping-Tool, etc. Lewis Shaffer and Alfred W. Shaffer, Duryea, Penn. (U. S. No. 1,040,037; Oct. 1, 1912.)

CAR-DUMPING MECHANISM. K. N. H. Hansen, Pittsburgh, Penn., assignor to Orenstein-Arthur Koppel Co. (U. S. No. 1,040,670; Oct. 8, 1912.)

DRILL. William E. Thrasher, Bisbee, Ariz. (U. S. No. 1,037,082; Aug. 27, 1912.)

DRILL—Down-Hole Handle-Supported Rock Drill. John George Leyner, Denver,

Colo., assignor to J. Geo. Leyner Engineering Works Co., Littleton, Colo. (U. S. No. 1,039,971; Oct. 1, 1912.)

DRILL-BIT SHARPENING—Fluid-Operated Drill-Steel-Gripping Vise for Drill-Bit-Sharpener Machines. John George Leyner, Denver, Colo. (U. S. No. 1,040,221; Oct. 1, 1912.)

DRILL RODS—Safety-Clamp for Drill Rods and the Like. Charles Wommer, Mammoth, Calif. (U. S. No. 1,036,400; Aug. 20, 1912.)

DRILLING—Dust Receptacle. Thomas E. Mitchell, Meaderville, Mont. (U. S. No. 1,038,413; Sept. 10, 1912.)

DRILLING—Jack for Removing Pipes or Casings from Earth Borings. Albert C. Ludlum, New York, N. Y., assignor to New York Engineering Co. (U. S. No. 1,037,179; Aug. 27, 1912.)

EXCAVATING AND LOADING MECHANISM. Job Sheridan Tindall, Pueblo, Colo. (U. S. No. 1,038,684; Sept. 17, 1912.)

HOISTING—Self-Dumping Mining-Tub. Oscar Belford, Golconda, Ill. (U. S. No. 1,039,688; Oct. 1, 1912.)

LAMP. Alva E. Thompson and James Cameron, Hastings, Colo., assignors, by direct and mesne assignments, to Miners Electric Safety Lamp Mfg. Co., Trinidad, Colo. (U. S. No. 1,040,056; Oct. 1, 1912.)

ORE POCKETS—Door Mechanism for Ore Pockets or Similar Receptacles. Robert B. Pearson, Duluth, Minn. (U. S. No. 1,040,237; Oct. 1, 1912.)

VENTILATION—Improvements in or Connected with Means for Use in Promoting Ventilation in Subterranean Mines. Mavor & Coulson, Ltd., and S. M. Mavor, Glasgow, Scotland. (Brit. No. 20,188 of 1911.)

ORE DRESSING—GENERAL

CLASSIFICATION—Improvements in Apparatus for Classifying Ores. Comp. d'Enterprises de Lavage de Minerais, Paris, France. (Brit. No. 5235 of 1912.)

CONCENTRATING TABLE. Emil Deister and William F. Deister, Fort Wayne, Ind. (U. S. Nos. 1,040,164 and 1,040,165; Oct. 1, 1912.)

CONCENTRATOR—Ore Concentrator. Thomas W. A. West, Ocotlan, Oaxaca, Mexico. (U. S. No. 1,038,046; Sept. 10, 1912.)

CONCENTRATORS—Head Motion for Ore Concentrators. Henry Eggers, Denver, Colo., assignor to the Mine & Smelter Supply Co., Denver, Colo. (U. S. No. 1,038,322; Sept. 10, 1912.)

CRUSHING—Adjusting Mechanism for Crushers or Pulverizers. Milton F. Williams, St. Louis, Mo., assignor to Williams Patent Crusher & Pulverizer Co. (U. S. No. 1,039,623; Sept. 24, 1912.)

CRUSHING—Gyratory Ore Mill. George H. Bradford, Berkeley, Cal. (U. S. No. 1,036,433; Aug. 20, 1912.)

MAGNETIC SEPARATION—Improvements in and Relating to the Magnetic Separation of Ores. I. S. Dalgleish, London, Eng. (Brit. No. 19,678 of 1911.)

MAGNETIC SEPARATION—Improvements in or Relating to the Separation of Ores or the Like. Murex Magnetic Co., Ltd., and A. A. Lockwood, London, Eng. (Brit. No. 18,189 of 1911.)

SLIME CONCENTRATOR. William F. Deister, Fort Wayne, Ind. (U. S. No. 1,037,212; Sept. 3, 1912.)

METALLURGY—GENERAL

AGGLOMERATING—Method of and Apparatus for Agglomerating Fine Ores, Metalliferous Residues, etc. Carl Dellwik, London, England. (U. S. No. 1,039,706; Oct. 1, 1912.)

ELECTRIC FURNACE. Eugen Assar Alexis Gronwall, Axel Rudolf Lindblad, and Otto Stalhane, Ludvika, Sweden. (U. S. No. 1,039,732; Oct. 1, 1912.)

MELTING FURNACES—Attachment for Melting Furnaces. Robert T. Johnston, Scotch Plains, N. J., assignor, by mesne assignments, to Automatic Furnace Co., New York, N. Y. (U. S. No. 1,036,853; Aug. 27, 1912.)

PERSONALS

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

Percy E. Barbour has returned to the Uwarra mine, Candor, N. C., after a week passed in New York.

W. F. Ferrier has returned to Toronto, Ontario, after having spent the summer in Alberta and British Columbia.

Benjamin Talbot, manager of the Cargo Fleet Iron Co. Ltd., Middlesbrough, England, will visit the United States soon.

E. C. Musgrave, after having spent several weeks in British Columbia, recently left Victoria on his return to Mexico.

H. Oeking, founder and managing director of the Oeking Steelworks, Düsseldorf, Germany, is in this country on business.

N. C. Vigeon, assistant general manager of the Spassky Copper mines in Russia, left London Oct. 4, on his way to Russia.

W. Hoesch, of the Hoesch Eisen & Stahlwerk, Dortmund, Westphalia, is visiting the important steel-manufacturing centers of the United States.

R. B. Lamb, of Toronto is making a professional trip to the Gowganda silver district in Ontario. He will extend his trip to the goldfields of Northern Ontario.

Otto Frick, inventor of the Frick induction furnace for the electric production of steel, is in the United States in connection with the introduction of his furnace.

W. J. Elmendorf, of Victoria, B. C., formerly general manager of the Portland Canal Mining Co. is now manager of the Portland Canal Tunnels, Ltd., in the same district.

R. G. McConnell, of the Geological Survey of Canada, has returned to Ottawa, after having spent the field-work season in the coast district of British Columbia.

Joseph Banks, formerly of Auckland, New Zealand, is now manager of the gold-quartz mine and stamp mill of the Jewel Syndicate, at Long Lake, Boundary district of British Columbia.

William Fleet Robertson, provincial mineralogist for British Columbia, has returned to Victoria from a trip to Groundhog basin, a new coalfield in the Upper Skeena district of that province.

R. H. Stewart, of Trail, B. C., general manager of the Consolidated Mining and Smelting Company of Canada, Ltd., has been in Toronto, Ontario, to attend the annual meeting of shareholders in that company.

H. M. Wolfen, for several years engineer in charge of the United States Bureau of Mines mine-rescue station at Seattle, Wash., is in New York tak-

ing some post-graduate work at Columbia University.

Harry Howard Johnson, of Johnson & Hoffmann, London, has been some weeks on Vancouver Island, B. C., in connection with the intended development of a large deposit of low-grade copper ore on that island.

H. B. Kaeding has gone to the copper-mining region of Lake Superior for an extended trip. His address for mail, in the meanwhile, will be in care of the American Institute of Mining Engineers, New York.

W. W. Leach, of the Geological Survey of Canada, having concluded his season's field work in the Blairmore-Frank district, southwestern Alberta, paid a visit to Vancouver and Victoria, B. C., before returning to Ottawa.

E. T. McCleary, formerly assistant superintendent of the blast furnaces and steel department of the Youngstown Sheet & Tube Co., Youngstown, Ohio, has been appointed general superintendent, succeeding Henry A. Butler.

Joseph G. S. Hudson, of the Mines Branch, Canada Department of Mines, has been in Alberta and British Columbia, obtaining information for a new edition of the "Report on the Mining and Metallurgical Industries of Canada."

Robert M. Black, a graduate of the Michigan College of Mines, and subsequently engineer with coal mining companies in West Virginia and Illinois, is now assistant professor in the School of Mines of the University of Pittsburgh.

Herbert Carmichael, assistant provincial mineralogist in British Columbia, about the middle of September left Victoria for Tete Jaune Cache, in the Upper Fraser River district, to investigate the mineral resources of that part of the province.

D. D. Cairnes, of the Canadian Geological Survey, has returned to Ottawa, after completing the Canadian part of the international geological work along the Alaska-Yukon boundary line from the Yukon River to the Arctic Ocean, about 350 miles.

Milnor Roberts, dean of the College of Mines, University of Washington, Seattle, Wash., has returned to the university work after having spent the summer examining placer ground suitable for dredging, on Kenai River, Kenai peninsula, Alaska, for German capitalists.

Dr. M. E. Wadsworth of the University of Pittsburgh has been unanimously elected the first honorary member of the Alumni Association of the Michigan College of Mines. Dr. Wadsworth had charge of the Michigan College of Mines for 12 years and was its first president.

Among passengers sailing from New Orleans last week for Nicaragua were: Barry Searle, who will spend a month or

so at the Lone Star mine; H. B. Sherrick, manager of the Mars mine, who returns from a vacation; Dr. Theo. Bouchelle, metallurgist, who is now connected with the Snyder Brothers interests; Richard B. Stanford, who will spend a few weeks at the Topaz mine; M. Macdonald and W. Feilds.

OBITUARY

Frederic Austin Warren, for 11 years chief electrician of the Colorado Fuel & Iron Co., died at Cañon City, Colo., Sept. 18. Prior to his connection with this company, he was employed by the General Electric Co., and later served as electrician at the Fremont and Coal Creek mines.

Charles R. H. Blyth, chief surveyor for the Mazapil Copper Co., Ltd., operating in Zacatecas, Mexico, died at the company's hospital on Sept. 19, aged 28 years. The cause of Mr. Blyth's death was typhoid fever coupled with complications of the lungs. Mr. Blyth was educated at Freiburg, Germany.

Societies and Technical Schools

Queens University—The Nicol Mining and Metallurgy Building, which has just been completed and equipped at Kingston, Ont., was formally opened by Hon. W. H. Hearst, Ontario Minister of Lands, Forests and Mines on Oct. 16. He was introduced by D. M. McIntyre, chairman of the Board of Governors of the Mining School, and in his address congratulated the University upon having such a benefactor as Prof. Nicol upon its staff. Addresses were also given by Dr. James Douglas, New York; D. H. Brown, Copper Cliff, Ont.; and Dr. Willet G. Miller, provincial geologist.

Michigan College of Mines—Four new courses under the head of technical writing are offered this year. Two of these will be required for graduation, the others will be optional. Up to last year no courses in English or report writing were given by the college. Last year the work was tried out experimentally and it was then decided to outline a set of courses under the general heading of technical writing. They are as follows: Elements of technical writing, forms of technical discourse, technical journalism and business correspondence. John D. Black, a graduate of the University of Wisconsin, has charge of the new department. The courses in the new department are founded upon the principle of collaboration. Portions of the subject matter of the other courses in the college are re-employed in the new work. The written work in many of the regular courses, usually in the form of reports on laboratory work, on mines, smelters and power plants will now be given a direct connection with the department of technical writing.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Oct. 16—An important item of new dredge construction, is the contract made for the building of another all-steel dredge to be operated in the Yuba River field. It is the purpose of both the Yuba Construction Co. and the Yuba Consolidated Gold-fields to make this dredge, which will be known as Yuba No. 14, the acme of steel dredges of the 15-cu.ft. type, as Natoma No. 9 in the Natoma field is considered the greatest of the wooden-hull dredges of the 15-cu.ft. type now in operation in California.

Without any doubt the most interesting operation in the reopening of old quartz mines is in the active preparations at Forbestown in Butte County. These mines, which produced about \$10,000,000, including the adjoining placers, in the early days, have recently attracted the attention of men of large capital who have sent engineers into the camp to make careful examinations as to the possibilities of further development and operation on a large scale. The most prominent of these quartz mines, based on past production, are the properties of the Forbestown Consolidated Gold Mines, which are being reopened. The Burlington mines, though not so active in past production, are showing positive improvement under the new prospecting recently undertaken. There had been for several years an impression obtaining that the Forbestown mines had been worked out, until recent publicity of the history of the camp and the present conditions indicated the contrary. Not only have the old mines been attracting attention, but some of the smaller ones in the same district have within the last few months been put in working order for new development and renewed operation.

Denver

Oct. 18—One of the largest public-land suits ever brought by government officials in this state, and in which they sought to recover 9500 acres of coal land in Routt County, has just been settled by a compromise, in which the Union Land Co. gives back to the government 7000 acres, retaining 2500. According to the suits the company paid agents to file on the coal lands for the purpose of turning them over to the company. The value of the land is now from \$100 to \$200 per acre. Judge Lewis allowed the stipulation agreed upon by attorneys on both sides to be filed, and entered an order

dismissing the actions against the company and its officials.

A big movement of labor is taking place through Colorado of men being imported by the Utah Copper Co. to take the place of the striking miners of Bingham, Utah, and as they pass through Denver the Western Federation of Miners endeavors to prevent them from continuing their journey, by telling the strike breakers that railroad work in this state is hampered for lack of labor, and that if they stop here they are sure to receive good wages. This has been successful in some instances. A special train of seven coaches with 300 men on board left Omaha over the Union Pacific, Oct. 15, for Salt Lake City.

The case of the Consumers League against the Colorado & Southern Ry., and the Burlington and Union Pacific as interveners, is being continued. This is being brought to reduce the tonnage rate to Denver on coal from the northern field. The Burlington has adduced testimony in facts and figures to show that the reduction in rates ordered by the railway commission would be confiscatory and under it impossible to operate their Lyons branch on which are the coal camps. The Colorado & Southern testimony was to the effect that if the coal schedules ordered by the commission were put into effect the road would lose money. The high rates of haulage were blamed on the delay of cars between the mines and Denver and also on the high cost of railroad labor. It was shown that an average of 15 days was required to load one car of coal at the mines, transport it, say 20 miles to Denver, unload it and re-deliver the car to the mine. All this made operative expenses extremely heavy.

Butte

Oct. 16—E. O. Meinzer, of the government underground water-supply research work, who recently arrived at Butte, has made a preliminary examination of the flat south of Butte City. At a meeting of the members of the Butte chamber of commerce, at the solicitation of which Mr. Meinzer came here, he stated that in his opinion a sufficient flow of water for reclaiming a large acreage on the flat may be obtained by pumping from bored wells. He thought there was little probability of discovering artesian water, owing to the absence of sedimentary deposits, Butte and the adjoining territory for several miles in all directions being un-

derlain entirely by volcanic rocks. The flat which is in the form of a basin several miles in diameter is, however, covered with wash from the erosion of the surrounding mountains to the depth of several hundred feet, some of the material being water bearing. Experimenting has been going on with shallow bores to ascertain the possibility of obtaining water for Sen. W. A. Clark's zinc concentrator, shortly to be built near-by. A small pumping plant has been erected and from the eight holes that have been sunk about 800 gal. of water per min. is being pumped, which is said to be about 1% of the rainfall in the basin. Mr. Meinzer stated that the supply from these wells would undoubtedly be permanent, as he noted that after the pumps were shut off for a period of half an hour, the water in the wells rose rapidly nearly to the surface. From figures compiled by H. H. Cochrane, an engineer of the Butte Electric & Power Co., it is shown that water could be pumped from a depth of 50 ft. and supplied for irrigating at a maximum cost of \$6 per acre.

Salt Lake City

Oct. 17—The backbone of the strike at Bingham appears to be about broken. At the mines of the Utah Copper Co. an increasing number of steam shovels are being worked, and about 5000 tons of ore is being mined daily. D. C. Jackling has expressed the opinion that it will be possible to mine between 10,000 and 11,000 tons of ore before the close of another week. Many of the men now at work are unskilled and therefore the production is not up to what would be expected from the number of men employed. Work has been started at the Utah Consolidated, the New England, and the Ohio Copper mine. At Butte, Mont., the miners union decided to submit to a referendum vote, an assessment of one day's pay from each member for the benefit of the striking miners at Bingham. This assessment would amount to about \$24,800.

A dividend of 15c. per share, or \$27,000, has been declared by the Daly West payable Oct. 25. The total distribution to date, including this dividend, will be \$6,511,000. The output at present is 350 to 400 tons of ore weekly. During September, 1461 tons was shipped. The company is working on the lower levels, having turned the levels above over to a leasing company.

Negaunee, Mich.

Oct. 18—Fifteen fatal accidents occurred in the mines of Marquette County during the year ended Sept. 30, 1912, according to the annual report of the mine inspector. This is a ratio of 2.83 per thousand men employed, the lowest proportion on record in the county. The proper safeguarding of machinery and underground workings by the mining companies, and their policy of teaching the men to observe habits of caution, are the main reasons for this low fatality record. It is to be noted also that during the last 18 months the Cleveland-Cliffs Iron Co. has maintained a safety department. This company is the largest employer of labor in the county. Of the 15 men killed, five were employees of the Cleveland-Cliffs Iron Co.; one was an employee of the Oliver Iron Mining Co., which has also devoted considerable time and expense to safeguarding machinery and stopes; four were employees of the Breitung-Kaufman mines which have recently decided to create a safety department; one was an employee of the Jones & Laughlin company; one of the Republic Iron Co.; and the American-Boston mine of the M. A. Hanna Co., was responsible for three deaths. The causes of 13 of the fatalities were as follows. Falling down shaft 1, falls of ground 4, gas and smoke 2, falling in open pit 1, caught between cage and shaft-house 1, caught between tram car and chute 1, falling from shaft-house 1, falling down raise 1, being thrown from trestle, caught between motor and timbers 1. Study of the reasons for accidents is being made by the mining companies' safety departments in order to guard against recurrences.

Birmingham, Ala.

Oct. 21—Development in ore fields around Birmingham is taking on considerable life and three or four companies have recently been organized to operate mines on red- and brown-ore tracts. J. J. Shannon and associates have taken steps looking to the operation of mines on a tract of 2500 acres of ore land in Shades Valley, across Red Mountain from Birmingham, the ore running 35 to 37% iron. The McDonough Ore & Mining Co. has been incorporated, for the purpose of developing an ore tract. The capitalization of this company has been placed at \$5000, with the right to increase. J. N. McDonough is president of the company. Several prominent men of Birmingham are interested in a company being organized to develop a tract of ore lands on Red Mountain, a friendly suit having recently been instituted to quiet title to the property. Full announcements will be made shortly of this company. The brown-ore beds in Alabama, especially those near Russellville, are being developed.

Spokane, Wash.

Oct. 16—The Emperor-Quilp company of Spokane, a mining corporation which until recently has been operating the Quilp mine in the Republic district under option to purchase, instituted suit in superior court against the Quilp Gold Mining Co. and E. L. Tate, secretary, for \$410,000 damages. The action is based on the allegation that the Quilp company supplied J. L. Harper, by whom the mine was taken under option in October, 1910, with fraudulent maps of the property in order to consummate the deal. The Quilp was taken over by Harper on an option of \$250,000, of which \$15,000 was to be paid on or before Sept. 24, 1910, and \$5000 every 90 days thereafter until the purchase price was paid, provided the obligation was liquidated by Mar. 9, 1913. The complaint alleges that at the time the contract was made there was said to be developed and exposed in the Quilp workings ore estimated to be worth \$200,000, and that it was upon the maps and charts provided by the Quilp company, in which this ore was shown to be within the Quilp lines, that the contract to purchase was entered into.

Cordova, Alaska

Oct. 16—Mining men here are interested in seeing that men thoroughly familiar with conditions become candidates for the territorial election in November. At that time 16 representatives and eight senators will be elected for the first territorial assembly to convene in Juneau next spring.

Recent heavy floods have caused damage to mining property in Copper River valley. For the month ended Oct. 10, 1912, the rainfall was 40 in. at Cordova, on the coast, which is unusual. To a lesser degree, the rainfall extended over the whole of the Copper River valley. This also is unusual, as the heavy rainfall ordinarily is confined to the narrow coastal belt. Beside direct losses of machinery and buildings, the mines had been suffering from lack of supplies, owing to the interruption of traffic by numerous washouts and slides along the Copper River & Northwestern Ry. George M. Esterly, operating a group of placer claims on Chittitu Creek, saved his buildings and machinery from the flood with the aid of loyal employees. Last year the cleanup amounted to \$80,000. Operation has been on a larger scale this season. The most damage was caused by the filling of a recent cut. Workmen are now trying to find the sluice boxes in this cut, which contain some of the cleanup, and it will be a race between them and the frost. The Bonanza mine, at Kennicott, suffered minor losses through the flood. No copper-ore shipments have been made to the smelteries in Tacoma for more than a month, owing to the

washout on the Copper River & Northwestern Ry. The mine has been worked short hours, owing to lack of supplies. The mining industry in the Chitina district is paralyzed.

Toronto

Oct. 18—An important decision affecting the rights of prospectors has been made by Judge Kehoe, of Sudbury, to the effect that unpatented claims are still Crown lands and consequently not subject to assessment for local taxation when situated in organized municipalities. Both Whitney and Tisdale townships, in the Porcupine area, are affected by this decision, which will enable many men to retain claims which they might otherwise lose.

It is announced that the provincial government of British Columbia will investigate the commercial value of the mica deposits on Mica Mountain, at Mile 53, B. C., on the line of the Grand Trunk Pacific Ry. This deposit is at an altitude of 5000 ft., and was practically inaccessible before the advent of the railroad. The beds are said to yield unusually large sheets of mica. The work will be undertaken next summer by Herbert Carmichael, assistant provincial mineralogist.

Chihuahua

Oct. 15—The active mines in the western part of the state are the Dolores, Concheño, Yoquiva, Batopilas, Tres Hermanos, Barranca del Cobre and Cienega, together with those in Cusiuhiriachic. In the last camp there are no less than six shippers, the most important being the Promontorio, Princess and Cusi-Mexicana, and at least as many more properties are under active development. The reworking of several formerly productive mines, together with new discoveries in both old and virgin ground, has given an impetus to activities and withal has occasioned many new denouncements.

The taking over of the mineral railroad, in service between Chihuahua and Santa Eulalia, by the Mexico Northwestern Ry. Co. and completion of laying standard-gage track on the line will facilitate shipments from that camp. All the mines there have considerably increased production of late, and it is announced that the Chihuahua-Potosi mines will shortly be producing at the rate of more than 700 tons daily.

The Chihuahua smeltery of the American Smelting & Refining Co. is operating furnaces regularly, an abundance of ores being furnished by the mines of Santa Eulalia and neighboring districts. The Rio Tinto Copper Co. is working at normal capacity and is shipping its product via the Mexico-Northwestern to El Paso. By Dec. 1, 1912, the National Rys. line between here and El Paso should be in shape to permit regular traffic.

The Mining News

The Current History of Mining

Alaska

A rich strike has been made on the upper Fairbanks Creek, by Cook brothers, \$85 in gold having been taken from 10 lb. of ore.

Riley & Marston, of Fairbanks, have purchased some claims on Otter Creek, and intend to install machinery next season.

George Nightingale and Roy E. Madox, of Fairbanks, have purchased an interest in the Rainbow quartz claim, and preparations are being made for the erection of a mill.

Alaska Syndicate—This company has purchased the Midas Copper Co. property near Valdez. The syndicate will expend \$300,000 in development work, machinery and improvements before shipping ore. A diamond drill, compressors and other machinery will be installed at once.

Dan Creek Mining Co.—Floods destroyed all the buildings, pipe line, machinery and improvements of this hydraulic property, and swept away the summer's cleanup in the sluice boxes. Last spring the company shipped in 200 tons of supplies and machinery, and began operations last summer on a large scale. The company expected to clean up at least \$150,000. It is supposed that there was at least that much gold in the sluice boxes. In addition to the loss, the damage will approximate \$50,000. Howard Birch is manager.

Arizona

GILA COUNTY

Southwestern Miami—Churn-drill holes Nos. 4, 7 and 8 are 716, 1267 and 1140 ft. deep, respectively. Holes 7 and 8 are still in chalcocite-bearing schist and in No. 8 the grade is increasing with depth. This hole has now passed through 430 ft. of schist carrying chalcocite. No depth is being gained in No. 7 hole, as it is still being reamed.

Prospectors' Group—Frederick W. Hoar, manager for the Southwestern Miami, has taken an option on this group of 13 claims, which is bounded on the east by Southwestern Miami, on the south by South Live Oak, on the west by the Needles group and on the north by the Barney group. The prevailing formation is Pinal schist, much of which is mineralized, and it will be explored by churn drilling, as there are indications of the

existence of a deposit of low-grade copper ore. The total purchase price is \$125,000. The option includes a clause requiring that the assessment work be started at once and this is now being done, in the form of roads to churn-drill hole sites. The claims are owned by William Phillips, Theodore Phillips, Isaac Martindale, William Hobbs, L. H. Trim and George Ward.

South Live Oak—Churn-drill hole No. 4 is more than 200 ft. deep in silicified schist, carrying silicate and carbonate of copper, the samples assaying about 0.3% copper. Drilling is proceeding slowly and with difficulty on account of trouble with the machinery, but it is expected that this will soon be remedied.

Arizona Commercial—The erection of surface equipment at the Copper Hill shaft is finished and the hoist is being operated with steam, pending the arrival of the electrical equipment. The retimbering and enlarging of the shaft to three compartments has been resumed and this work has been finished to a point 80 ft. below the fourth level.

Old Dominion—The first crosscut from the east drift on the 16th level has reached the hanging wall after passing through 8 ft. of chalcopyrite and bornite ore. The ore is of better grade and width than was found at the corresponding point on the 14th level. The next crosscut is 100 ft. farther east. This development is important as it proves the continuation of the east orebody 200 ft. below any point at which it has before been worked. Excavation for the new crushing plant continues and engineers under C. B. Cline, assistant to H. Kenyon Burch, are working on the plans for doubling the capacity of the 500-ton concentrator.

Superior & Boston—The east drift on the eighth level on the Great Eastern vein is reported to have been, for the last 60 ft., in ore from two to five feet wide. The north crosscut on the 12th level has cut a vein 14 ft. wide, showing mineralization, but carrying no ore. Exploration has been started on it east and west. Shipments to the Old Dominion smeltery continue. President W. G. Rice is now at the property.

GRAHAM COUNTY

Detroit Copper Co.—This company is making extensive changes in its reduction works and power plants. The slag dumps built up while the company was producing "black copper" will be re-smelted. As soon as the new smeltery

office, which is about completed, is ready for occupancy, the present office, which is situated on the slag dump, will be abandoned. The smeltery comprises one 500-ton blast furnace, which will be supplemented by a larger furnace as soon as the company decides what size of furnace they will need. The pumping plant on Frisco River has been torn out and brought to Morenci and the two boilers are being installed at the power plant, to work in conjunction with the two units now in place. The two new steam turbines have arrived and will be installed as soon as the boilers are in place. It is the intention to furnish steam power for all the engines, excepting those which operate the blowers; these will continue to be operated by gas.

PINAL COUNTY

Lake Superior & Arizona—After unwatering and making an examination, the American Smelting & Refining Co. relinquished its option on this property at Superior.

YAVAPAI COUNTY

General Development Co.—This company has taken a two years' option on the property of the Bagdad Copper Co., aggregating 3000 acres. It is reported that there is a reserve of 4,000,000 tons of 2%-copper ore. Unless this tonnage can be materially increased the option will probably not be exercised.

California

PLACER COUNTY

Despite the scarcity of water on the Forrest Hill, Iowa Hill and Ralston divides in the last season there has been a large amount of development and extraction. The Sierra Nevada Development Co. is continuing the development of the Pat Goggins mine on Ralston divide. This mine is reported to have produced \$17,000 last year and is still producing. The Red Star mine on Duncan ridge is being developed by Savage and Ray. A 150-ft. tunnel and crosscuts have been driven, developing high-grade gravel between andesite and granite. A new tunnel has been started at the Buckeye on the Iowa Hill divide by I. H. and W. W. Rodehaver, of Auburn. It is estimated that the tunnel will be driven 350 ft. and tap the gravel at 15 ft. below the channel. Rich gravel is reported by Moss and Young at a depth of 80 ft. in the channel between Succor Flat and Indian Cañon.

PLUMAS COUNTY

Gold Mountain Hydraulic & Dredging Co.—The reservoir and pipe line are practically completed. Buildings and machinery are in course of construction. It is expected to begin hydraulic operations in the spring. The property is in the vicinity of Willow Creek.

Gold Leaf—Development will be carried on during the winter. A 900-ft. tunnel is contemplated to tap the vein at a depth of about 200 ft. The property has been bonded by Sacramento men. It is situated in the Squirrel Creek region, east of Quincy. W. D. Stone, Charles Penman and J. P. Dutre, of Quincy, are owners.

Heath—This old mine, adjoining the Gold Leaf in the Squirrel Creek region, near Quincy, is being re-opened by Byron Turner, of Quincy. The old tunnel, 300 ft. long, is in as good condition as when abandoned several years ago, with the exception of a cave-in at the portal.

Sunyside—Rich gravel carrying heavy gold has been tapped in the 800-ft. tunnel in this mine in the Seneca district. Harry Merrill and others, of Greenville, are lessees.

RIVERSIDE COUNTY

Hemet Belle—Development of this mine in the San Jacinto mountains, about 35 miles southeasterly from Hemet, has been in progress for about a year. The shaft is about 200 ft. deep. A drift from the 100-ft. level for a length of 300 ft. is in high-grade ore. A 2000-ft. aerial tramway carries the ore to a five-stamp mill. Water is furnished from a reservoir holding 50,000 gal., supplied by a spring and carried to the mill through a pipe line one mile long. Irvin Carl and C. W. Hernandez, of Los Angeles, are the principal owners. The mine is operated under the name of the Golden Beauty Mining & Milling Co.

SAN BERNARDINO COUNTY

G. B.—This mine in the Stringer district has recently been leased to C. G. Illingworth, R. Roschl and J. P. Burns. Pay ore has been disclosed in a 30-ft. drift from the 165-ft. level. A gasoline hoist has been installed. The mine produced medium-grade ore in the earlier working. D. J. McCormick, of Randsburg, is owner.

Merced—A 12-in. vein of good ore on the 235-ft. level is being followed; 25 tons of ore is on the dump, which is being hauled to the Sunshine mill. The mine is in the Stringer district. Thomas Atkinson, of Randsburg, is owner.

SISKIYOU COUNTY

Final proof of title to the townsite of Sawyers Bar, one of the oldest mining towns in California, was made on Sept. 23 by Judge James F. Lodge before the county clerk at Yreka. There was too much mining in the early days of Sawyers

Bar to allow interest to develop in the making of proof of title to the townsite. About three years ago the town was included in the U. S. forest reserve, and proceedings were begun by asking that 110 acres, including the townsite be exempted.

Homestake—This mine is near Snowden. The vein is about four feet wide and has been developed for a length of 200 ft. in the 500-ft. adit. The five-stamp mill to be installed will be operated by a water-power plant with a capacity of 100 hp. to be developed from a ½-mile ditch. It is an old mine that was a producer in early days. R. S. Taylor, of Etna, is owner. J. F. Boyle, of Etna, is superintendent.

Big Cliff—Two good pay shoots have been disclosed in a large vein. The successful development of the last season has induced the owners, H. B. Wintering and Mr. Osgood, to prepare for the installation of a small stamp mill in the spring.

VENTURA COUNTY

Russell Borate Co.—The demand for borax is reported to be the inducement for the company to endeavor to secure eight or ten 10- to 14-animal teams for hauling the product from the mines on the line of Ventura and Kern Counties near Stauffer to Bakersfield, a distance of 59 miles. The round trip will require seven days, including one day lay-over at Bakersfield. Recently the product has been hauled to Lancaster in Antelope Valley, a distance of 61 miles, but the roads have not been kept in condition. W. S. Russell, of Stauffer, is superintendent.

Colorado

LAKE COUNTY—LEADVILLE

Garbutt—From this mine on Breece Hill 60 tons daily is being shipped which comes from the lower level at a depth of 1000 ft. It is proposed to sink the shaft to the Cambrian quartzite.

Yak Tunnel—Four miles in from the portal, a winze is being sunk, from which, when it has been sunk 160 ft. drifts will be run to a known orebody found by prospecting in Resurrection ground. This work will be done at a depth of 1100 ft. below the surface toward the head of Big Evans Gulch.

Silent Friend—From the 600 level lessees on this mine in South Evans gulch are shipping 60 tons per month of gold-bearing sulphide ore.

Columbia Shaft—Lessees on this property, in California Gulch, have opened 30 to 35% zinc ore, and will begin shipping shortly. A new hoisting plant has just been installed.

Jolly—The lessees are shipping 20 tons of iron ore daily. They are also

driving for a known shoot of zinc ore.

La Plata—A good grade of zinc-carbonate ore is being shipped steadily by lessees on this mine, on Rock Hill, who are also doing considerable prospecting.

Baby Shaft—Regular shipments of good-grade zinc-carbonate ore are being made by lessees on this mine, in California Gulch, and from the Pagent mine, just south of it, a good grade of iron ore is going out.

Ella Beeler—Shipments of high-grade silver-lead ore will be resumed by lessees of the Ella Beeler tunnel, Iowa Gulch, as the orebody which had pinched has come in again as big as ever.

Stone Shaft—The old stopes from the Stone shaft in California Gulch have now been worked for more than a year by lessees and much ore has been taken out. In addition much dead work is being done for development. At the St. Louis tunnel, Breece Hill, a shaft is being sunk from the tunnel level, when drifting north and south will be started. The new Golden Gate shaft, East Tennessee Gulch, is being sunk by H. Hanson. The Winthrop Mining Co., Birdseye Gulch, will drive the Crescent tunnel, now in 1300 ft., during the winter. The Great Western shaft, Tennessee Pass, will be sunk to 100 ft. by Maupin brothers, who will then start drifting. The Nevada shaft, East Breece Hill, has been unwatered below the 100 level and the drifts at this level are being carried forward. Lessees on the Rockefeller group, at the head of Big Evans Gulch, have driven a tunnel 150 ft., and will continue driving through the winter.

TELLER COUNTY—CRIPPLE CREEK

Cresson Consolidated—Oreshoots at the 1200 level are proving up to all expectations and the production for September was about 1500 tons. As soon as it is known that the water has receded 100 ft. below the 1200, another lift will be sunk.

Mary McKinney—Frank Costello, president of the company, says the water in the main shaft has receded 260 ft. since the completion of the deep-drainage tunnel. The output of the mine for September was 33 carloads. The ninth level will be reached about Nov. 1. The water recession is now four to six inches per day.

Portland—An oreshoot is reported as having been opened on the 1600-ft. level of No. 2 shaft, which is stated to be 14 ft. wide, and worth over \$100 per ton.

El Paso—The September production was 109 carloads, of which lessees shipped 39 cars.

Gold King—Lessees Boarig & Marson have opened ore on the 500 level. Several carloads have been shipped.

Free Coinage—The Pinto or main shaft was shut down last month to permit the installation of a new hoist. This is now completed and shipments will be resumed shortly as the stopes are filled with broken ore. There are five machine drills working on ore.

Vindicator Estate—A big strike by John Sharpe, lessee, is reported in the Hull City shaft, and the output for September will approximate 30 carloads.

Henry Adney Estate—This estate owns 46 acres on Beacon Hill and the output from two shafts, the Adney and Maid of Orleans, is about eight carloads per month.

SAN JUAN REGION

The shipments of ore from Ouray, both crude and concentrates, since Jan. 1, amount to 13,500 tons. This is exclusive of the gold bullion from the Camp Bird, and the ores of Red Mountain district, which go to Silverton.

A strike of importance is reported in the Terra del Fuego group, on the northwest slope of Mt. Sneffles, where only one mine of note, the Blaine, has yet been found. For many years rich float has been found on the Dallas, and it is believed by M. Regan, the owner of this new discovery, that he has the extension of the Smuggler vein, which is the longest and most continuous in the San Juan region. He reports 7 ft. of ore, of an average assay value of \$23.

Cliff Group—This group comprises three claims in the Hydraulic district, of Paradox Valley, and A. M. Wilson, of Telluride, has so far this year shipped 305 tons of high-grade carnotite. This ore is bought by New York men.

Primos Chemical Co.—Ninety-one sacks of vanadium ore were shipped recently from Telluride to Primos, Penn.

Idaho

COEUR D'ALENE DISTRICT

Bunker Hill & Sullivan—Fire broke out anew in the workings of this mine after it had apparently been brought under control, and threatened to exceed its former proportions. Five helmeted rescuers were caught on the 1200-ft. level, but by using their supply of oxygen managed to escape through a tunnel.

Green Hill-Cleveland Mining Co.—This company has been organized by William R. Leonard, the estate of James Leonard, of Denver, J. M. Jamieson and C. L. Matthews, of Spokane, and the Federal Mining & Smelting Co. The Green Hill claim of nearly 20 acres holds a continuation of the Mammoth vein from which much ore has been taken since it was purchased by the Leonards and Wilson & McKay for \$2,500,000. Never having been on the shipping list, the new property is to send out ore in carload

quantities at once, production being now under way. The orebody exposed is 10 ft. wide, of which three feet is solid, marketable silver-lead ore, the remainder being concentrating ore. Harry L. Day is president; William R. Leonard, vice-president, and Francis H. Brownell and C. L. Matthews are directors. The Standard-Mammoth mill of the Federal company, having a daily capacity of 600 tons, has been leased by this company.

Idaho-Continental—The wagon road from Porthill to the mine is now completed to within three miles of the camp. Conservative estimates place the cost at \$65,000, more than \$3000 per mile. The road is being built with a view to operating large capacity motor trucks for transporting ore to the railway at Porthill, and it is believed that eventually it will be utilized for a railway line, as the maximum grade is less than 2%. The company has plans and specifications for a 300-ton concentrating plant.

Tamarack & Custer Consolidated Mining Co.—This company, successor to the Tamarack & Chesapeake and Custer Mining companies, and which recently leased the old Rex mill and tram, has a force of 75 men at work remodelling the plant, transferring the tram and clearing the Custer tunnel preparatory to beginning operations on an extensive scale. The tram line is being connected with the mill from the Custer tunnel, the right of way having been cleared last week, and rails for a horse-car line are being laid from the tunnel portal to the face of the drift. A 500-ft. raise connects the Tamarack workings with the Custer bore, through which the ore from both properties will be removed.

IDAHO COUNTY

American Eagle—The station in the No. 2 tunnel, where the new 500-ft. shaft will be sunk, is nearly completed and the raise will be begun soon. The raise will be put through to the surface, coming out at the portal of the No. 1 tunnel, where the hoist will be stationed.

Rio Tinto—A shoot of ore four feet wide, assaying \$25 per ton, was recently cut in the lower tunnel.

Dixie Chief Gold Mining Co.—The No. 1 tunnel has been driven 300 ft. on the Blue Bucket vein and has cut the ore-shoot. The pan shows four feet of good ore.

Brown Bear—A new tunnel has been started on the east side of Red River, approximately 100 ft. lower than the old tunnel. The company expects to increase its force soon and resume work on the west side of the river.

Majestic Gold & Silver Mining Co.—Stockholders from Washington, D. C., accompanied by an engineer, recently visited the property to make plans for increasing the force and continuing the development work during the winter.

Michigan

IRON

Tully—A 6x7-ft. concrete conduit for pipes and wires is being built from the engine house to the shaft. The old temporary engine house has been torn down.

Bengal—At this new Pickands, Mather & Co. mine, a brick engine house is being built. Shaft sinking is still in progress; about 50 ft. more remains to be sunk before drifting is started.

Berkshire—Stockpile shipping is in progress at this mine, of Oglebay, Norton & Co. The ore runs about 54% iron, which is high grade for the Iron River district.

McPherson Exploring Co.—This company has begun exploratory work on the Greenhoot lands, Section 7, 42-34, south of the DeGrasse property of the Verona Mining Co. This is at the extreme southern end of the Iron River district, as so far proven. The work is being done for John T. Spencer and H. A. Martin, of Ironton, Ohio.

Kloman—It is reported that the option on the mine, at Republic, has been relinquished, and that, for the time at least, experimenting with the Jones step furnace will be discontinued. The machinery and furnace equipment will be left at the mine for the present. The main reason for the failure of the Jones furnace to date is attributed to the fact that it has been impossible to find material for lining that will resist the action in the furnace for more than four hours at a time.

Imperial—This mine, at Michigamme, leased from the Michigan Land & Iron Co. by the Cleveland-Cliffs Iron Co., is to be reopened, after being closed for a year. The lease expires in 1920. About 100 men will be given employment. This mine, producing a yellow ochre or low-grade iron, high phosphorus and high moisture, has never been very profitable. It is the only mine in the Michigamme district to be operated during the winter. The steel has arrived for the new steel headframe and crusher plant.

Cascade Mining Co.—Diamond drilling still continues under the direction of L. D. Cooper, of the Longyear company. One of the drills has been moved westward near the Starwest line.

Cortland—The spur from the Chicago & Northwestern Ry. is nearly completed to the mine, and is being hurried as much as possible, as the company desires to ship 20,000 tons before the season closes.

Davidson—At this mine, in the Iron River district, the stockpile has been cleaned up. Preparations are being made to erect additional dwelling houses for the employees.

Minnesota

CUYUNA RANGE

Barrows Iron Co.—At a recent meeting it was decided to proceed at once with development work on the property near Barrows. Several drills will be started in a short time.

MESABI RANGE

J. H. Hearing, assistant general manager of the Oliver Iron Mining Co., is quoted to the effect that iron-ore shipments from the Head of the Lakes will probably total 46,000,000 tons for the season, the highest previous record being 44,000,000 tons. He states that the rumors of there being an "ore famine" at the Pittsburgh furnaces before shipping is resumed next spring are not warranted.

St. Louis County iron-mine owners are protesting to the state tax commission against a threatened raise in assessment. The change also includes a new scheme of classification. A raise of about 5% is proposed by the tax commission in the case of about 100 iron properties, including a number of the Great Northern ore properties. The proposed change in classification, the protestants claimed, also adds to their assessment. The total assessment as returned on the iron properties in St. Louis and adjacent counties is about \$287,000,000, a slight increase over two years ago.

Oliver Iron Mining Co.—At this company's Genoa mine, at Gilbert, the 1,000,000-ton mark in ore output was recently passed, and it is expected that before the season closes, 1,250,000 tons will have been shipped from the shaft and open pit. This is the largest production for any season that has been made from this mine.

Montana

BUTTE DISTRICT

Bullwhacker—Construction work has been started upon the leaching plant at this mine, east of the East Butte company's Pittsmtont property. The buildings will be ready for the solution tanks and crushers in about one month, and will be in operation about the first of the year. The initial capacity will be about 50 tons per day, but crushers of 300 tons capacity will be installed. Miners are now operating the mine under lease, and shipping about 150 tons of ore weekly to the East Butte and Washoe smelters. As soon as the plant is completed they will increase their output to 50 tons per day. It is at present the intention of the company to allow the lessees to continue the operation of the mine on a royalty basis after the leaching plant is completed. There is a wide vein of low-grade carbonate ore in the property, and if the leaching scheme proves practicable, the

output will eventually be increased to at least 300 tons of ore daily.

Davis-Daly—A good body of ore, heretofore overlooked, has been opened on the 1200-ft. level of the Colorado mine. It was believed that this portion of the mine had been completely worked out, but recently the management decided to drift on a small stringer of ore showing in the crosscut. After following it about 100 ft. in a westerly direction, the ore widened suddenly and a diagonal drift through it showed a width of 12 ft. of ore, averaging about 5% copper. On the 1900-ft. level development work is going on with good results. A vein was recently cut, which is being driven upon; occasional bunches of ore being mined and hoisted. The crosscut is being continued to intersect a second vein, which is believed will be reached in about 30 days. Lessees working the Silver King claim on the western end of the property, are sinking a winze from the 300-ft. level on the orebody recently opened there, in order to determine its extent. Steady but slow progress is being made upon the crosscut being driven on the 1900-ft. level of the Gagnon mine of the Anaconda company into the western part of the Davis-Daly

BEAVERHEAD COUNTY

Penobscott Mining Co.—This new company is a reorganization of the old Elkhorn Copper Mining Co., which abandoned the Elkhorn mine after working it for several years. The new company has purchased the old Hecla mine, which has been worked only by lessees during the last 10 years. The mine is 16 miles west of Melrose at an elevation of 9000 ft. Many improvements will be made, the first of which will be a 3000-ft. tunnel to get under the orebodies at a low level. No ore will be taken out until the latter part of next year. Engineers are already surveying for the tunnel, and estimating the quality and quantity of the ore now in sight. There are three incline shafts on the vein. Manager J. Bowden leaves for the East in a few days to purchase new machinery and supplies. The machinery will be operated by electricity supplied from the Butte Electric & Power Co. plant on the Big Hole River.

FERGUS COUNTY

Gold Acres Mining Co.—This company has been incorporated to operate a group of claims adjoining the New York property. The incorporators, most of whom are interested in the Rheingold Mining Co., operating the New Year mine, are A. B. Knowlson, John A. Goode, Archibald McDonnell, Thomas Friant, and P. W. O'Connor, of Grand Rapids, Mich., and Josiah McRoberts, and William Burry, of Chicago. During the last year a mill was built at the New Year mine and it will be used to treat ore from the Gold Acres property.

GRANITE COUNTY

Royal Mining & Milling Co.—This company, which is operating a copper property at Maxville, has completed a leaching plant similar to the one being built at the Bullwhacker mine in Butte. It has been in operation for two or three weeks and is giving entire satisfaction, according to a statement of John D. Fields, chief engineer of the company. The crushed ore is placed in tanks and brought into solution under constant agitation, as copper sulphate. It is then passed through a refining cell 10 ft. long, under the action of a 3000-amp. current, at five volts. The cell contains 360 sq. ft. of both anode and cathode surfaces, 30 cathodes in the cell, which collect a total of 300 lb. of electrolytic copper per 24 hr. The company is now installing two additional cells, which will triple the present daily output.

Nevada

COMSTOCK LODGE

Ophir—The new cyanide plant, built to treat 30,000 tons of accumulated tailings has been started, and is giving satisfactory service. Exploration work continues on the 2500 level of the mine.

Mexican—The second tube mill has been installed at the mill. On the 2500 level of the mine, the ground has been cut out for sheaves for the electric hoist for the new incline winze in the vein, and the winze has been timbered. Sinking will be resumed soon. The ore recovery from the mine last week was 576 tons, of a gross assay value of \$27,023.

Union Consolidated—A west crosscut has been started on the 2500 level at a point close to the north boundary line, from the north drift, to determine if the rich ore uncovered in Sierra Nevada extends southward into Union ground. On the surface, No. 1 air compressor is being overhauled preparatory to pumping out the joint winze with Sierra Nevada, for the purpose of carrying on work below the 2500 level.

Sierra Nevada—An important ore development has been made in driving north on the 2500 level, the drift being the continuation of the exploration northerly through Union Consolidated ground from the Mexican stope. About 60 ft. north of the south boundary line, the drift cut across a vein having the same northeasterly course as the east vein and dipping 70° east. Included in the vein is a rich streak, and the whole vein, from two to three feet wide, inclusive of the high grade, will average between \$40 and \$50 per ton. This ore is believed to be in the Mexican ore channel on the same level. The strike is important, as it is farther north and east than where such high-grade ore has heretofore

been discovered on the Comstock, and is 600 ft. east of any former workings. The crosscut will be turned to follow the vein.

EUREKA COUNTY

Buckhorn Mining Co.—A few men are at work in the property of this company. The ground is soft and much trouble from caving is experienced. Plans are being made for building a mill in the spring.

Mineral Hill Mining Co.—This company is operating its mill on ore from the old dump. The capacity of the mill is 200 tons per day.

LANDER COUNTY

Jersey Valley Mines Co.—At this company's mine, 40 miles from Battle Mountain, an exploratory tunnel is being driven. A small prospecting gasoline-driven compressor of sufficient size to operate one 2¼-in. rock drill was recently installed; W. M. Pinkham, superintendent.

Hilltop Mine Co.—This property at Kimberly, 20 miles from Battle Mountain, is operating the mill one shift, treating about 25 tons of ore per day; J. G. Smith, general manager.

Pittsburgh-Red Top Mines Co.—The mill at this property, at Maysville, has been in operation for two months, and is treating about 35 tons of ore per day. Operations are being hindered on account of the scarcity of water; W. J. Grindle, general manager.

LYON COUNTY

Mason Valley—From Oct. 7 to 14 a total of 8155 tons of charge was treated, of which 7289 tons was ore. From this resulting in a total production as matte resulting in a total production in matte of 449,438 lb. of copper. An average of 1019 tons of charge was treated per day, resulting in a daily average of 66.3 tons of matte containing 42.32% copper. Of the total tonnage treated, about 3000 tons was Mason Valley ore. The company recently posted a notice of a voluntary increase in wages to miners of 25c. per day, which took effect Oct. 1, this price to apply during the high quotations for copper.

NYE COUNTY

Shipments in tons from Tonopah mines to date and for the week ended Oct. 12, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3,450	137,419
Tonopah Belmont	3,173	98,104
Montana-Tonopah	1,016	42,385
Tonopah Extension	1,071	41,007
West End	900	31,022
Midway	100	670
MacNamara	455	15,074
North Star	48	218
Mizpah Extension	300	40
Jim Butler	300	2,500
Totals	10,513	368,439
Estimated value	\$262,725	

Tonopah-Belmont—The report for September, states that 12,405 tons of ore was

milled, producing 3499 oz. of gold and 352,742 oz. of silver, yielding a net profit of \$170,496.

Halifax—Ore is being developed on the 1000 and 1400-ft. levels; it is spotty and of irregular width.

WHITE PINE COUNTY

The strikers in the Ely district are in an ugly mood, the state police having been called out to control the situation; two strikers were shot on Oct. 17 by deputies.

Oregon

MARION COUNTY

Savage—A one-stamp mill will be built at this mine at once, and it is said more machinery will be added next summer. E. Maund and Thomas Winters, of Gates, are interested.

Mayflower—A light two-stamp mill is in operation on high-grade free-milling gold ore. It is reported that the ore in the new shaft is improving; R. J. Monroe, of Gates, proprietor.

Portland—Don Smith and Mack Clery, of Gates, owners of this mine, expect to build a two-stamp mill in the spring. A vein of free-milling gold ore about seven inches wide has been uncovered.

BAKER COUNTY

Old Gem—This mine is to be reopened. Pumping machinery will be purchased. Frank and Edward Geiser, of Sparta, are the owners.

Utah

BEAVER COUNTY

Moscow—The main shaft is 500 ft. deep, with an incline of about 250 ft. on the limestone bedding. Zinc ore has recently been opened, and shipments to Kansas City are being made.

Hub—Driving has been done southwest from the shaft on the 500-ft. level, and ore carrying lead, with some silver and gold, was cut at about 150 feet.

Atlas—A shaft is being sunk on this property by Park City operators, to reach some carbonate ore opened by lessees from the bottom of the 400-ft. inclined shaft.

St. Mary—A small force of men is being employed by Duluth men, and a tunnel is being driven. Several shipments of copper ore have recently been made.

South Star—Assessment work is being done on this group of eight claims, and 2½ ft. of ore, carrying copper, gold and silver, has been cut in the short tunnel.

Majestic—According to an official of the company, shipments are covering all expenses and giving a surplus for the first time. Operations have been on a profitable basis, since the beginning of July, and 136 cars have been shipped. Besides

silver-lead ore, some copper ore, running about 2½% copper, with an excess of iron, is being shipped.

Beaver Bonanza—It is reported that this company and others near the Sheep Rock are considering the erection of a mill, capable of handling 200 tons of ore daily.

Beaver Butte—A shaft has been sunk 75 ft. on a vein, which can be traced for 600 ft. along the surface. Cross-cutting will be started at 100 ft. The vein is mineralized throughout as far as opened.

Sheep Rock—This mine is closed down, the Robinson brothers' lease having terminated Sept. 20. Another lease will probably be given on the property.

South Utah—This mine has closed down, owing to a strike for higher wages

IRON COUNTY

Bull Valley Gold Mines—A tunnel is in 85 ft. at this property, 70 miles south from Modena. A 4-ft. face of ore, running well in gold and silver, is reported. High assays of free gold have been found on another claim in the neighborhood.

JUAB COUNTY

Tintic shipments for the week ended Oct. 11 amounted to 193 cars.

Opohongo—A dividend of 2c. per share, or \$20,000, was declared Oct. 15. This company paid its first dividend a little more than one year ago, since which time, with the payment of the present dividend, the total amount disbursed will be \$60,000. The ore on the upper levels is holding out well. A drift to the southeast on the 300-ft. level is opening up promising ground, and there is a good showing in the raise from the 600.

Utah Consolidated Mining & Milling Co.—Leases are to be given on parts of this property, where there are small quantities of ore exposed in both old and new workings.

Beck Tunnel—Two cars of ore were shipped during the week ended Oct. 11, most of the ore coming from the Humbug shoot. Driving to the south and crosscutting to the west is being done on this ore.

SALT LAKE COUNTY

Tar Baby—The tunnel is now in 540 ft., with the face in quartzite. Assessment No. 2 has been levied to carry on the work.

Utah Consolidated—Operations were resumed Oct. 9.

Michigan - Utah—During September, lessees shipped 511 tons of ore. The tramway is entirely completed, and in successful operation. One of the leases recently let is on the Grizzly vein, which has produced good ore. Operations will be carried on through the Grizzly tunnel. Another block of ground has been

leased on the Lavinia vein, which parallels the Grizzly. Work will be carried on by the company throughout the winter.

SUMMIT COUNTY

Ontario—The Mines Operating Co., which has a lease on the old stopes at this property, has remodeled the old mill, and started operations, according to a new process. About 80 tons daily are being treated.

TOOELE COUNTY

Cliff—The September output amounted to 30 cars of lead-silver ore; this is a desirable fluxing ore. The month is the best in the history of the company, the new railroad having greatly facilitated the marketing of the ores.

Ophir Hill—The mill, which is being remodeled and brought up to a capacity of 300 tons daily, will be completed shortly.

Washington

FERRY COUNTY

Hope—Construction of the mill will be started about Nov. 1. Plans will be completed this month. O. A. Broyles, Spokane, is secretary.

White Elephant—This company is considering the building of a reduction plant, at Orient.

Gwyne—Plans are being made for sinking a shaft, developing water power, and erecting a mill on this group of claims, owned by the Hall Creek Mining & Milling Co., Republic.

Wisconsin

PLATTEVILLE DISTRICT

Frontier Mining Co.—This company is building a magnetic separating plant at the Optimo mine, at Linden.

Straw Furnace Drilling Co.—This local company has been formed to prospect the Straw land, the site of the old Straw lead furnace, within the city limits of Platteville.

B. M. & B.—This company is developing the Biddick land, at Mifflin.

Mineral Point Zinc Co.—The Ryan land, south of Hazel Green, recently purchased, is being opened up and equipped.

Schreier—This company is removing its milling plant to the old Sally Waters mine, southeast of Benton.

Washburn—This company has proved up a new range of zinc ore north of the old workings.

Wyoming

FREMONT COUNTY

Hidden Hand—The shipment of slightly more than 10 tons of ore made to the Globe smeltery at Denver from this mine, at Lewiston in the South Pass district, has returned \$7438, or \$742 per ton.

Canada

BRITISH COLUMBIA

May Blossom—According to an official report, 22 in. of shipping lead-silver ore has been exposed by a drift in this property, at Ymir. The ore has been left in a block, ready to be broken for shipment. Production will begin as soon as a wagon road is built. G. C. DeHann, of Spokane, is secretary-treasurer.

ONTARIO

Goldfields, Ltd.—Twenty stamps are in operation at this mine at Larder Lake. The electric power plant is running, supplying motive power for the mill and the mine.

Alexo—This nickel mine has shipped 70 cars of ore this year to the Mond Nickel Co., at Victoria. The orebody, which has been stripped for 300 ft., is 12 ft. wide on the surface and in the shaft, at a depth of 47 ft., is 17 ft. wide. The Canadian Copper Co. drilled this property several years ago, but did not take up the option.

Rochester—This company has been reorganized and the former capitalization of \$2,500,000 reduced to \$1,000,000. New stock will be distributed to the shareholders on the basis of one share for every four old, which will leave a block of new stock in the treasury to be sold to provide funds for development. John Poucher is president, Howard Williams, vice-president, and W. E. Douglas, secretary.

ONTARIO—COBALT

Shipments of ore and concentrates, in tons, from Cobalt for the week ended Oct. 18, and for the year to date, were:

Bailey.....	21.57	
Beaver.....	299.38	
Buffalo.....	989.50	
Casey Cobalt.....	30.30	255.15
City of Cobalt.....		887.99
Cobalt Lake.....	23.50	739.55
Cobalt Townsite.....	36.00	1,462.15
Chamb.-Ferland.....		362.33
Coniagas.....		1,673.95
Crown Reserve.....	19.55	388.21
Drummond.....		383.05
Hudson Bay.....	30.85	569.32
Kerr Lake.....		590.77
La Rose.....	67.70	2,875.08
Lost and Found.....	12.80	27.80
McKinley-Darragh.....	101.93	2,138.50
Nipissing.....		1,704.50
O'Brien.....	64.10	560.64
Penn.-Canadian.....	33.75	63.45
Provincial.....		22.22
Right of Way.....		242.82
Timiskaming.....		893.71
Trethewey.....		447.79
Wettlaufer.....		346.45
Colonial.....		63.14
Dominion Reduction Co.....		56.64
Totals.....	420.48	18,065.66

Millerette—At this mine, in the Gowganda district, the new \$50,000 mill has been completed. A disagreement among the owners is likely to result in a temporary suspension of operations.

Bartlett—This property, at Gowganda, is being taken over by the Scottish Nigeria Mining Co. It is stated that \$150,000 is the consideration.

McKinley-Darragh-Savage—This mine has produced this year 3,240,000 oz. of

silver against last years' record of 2,600,000 oz. The mill is being enlarged to handle ore from the Savage.

Lumsden—Pockets of 12,000-oz. ore have been opened in the bottom level.

ONTARIO—PORCUPINE

A contractor doing assessment work on claims owned by G. G. Hyde and F. M. Markey, of Montreal, has brought in some rich gold samples. The specimens were found in a small quartz vein on an island just south of Gold Island, in Nighthawk Lake.

Rea—It is said that this mine will be reopened about the end of the year. A new board of directors is to be elected and arrangements made to finance the property.

Swastika—The mill has been completed in readiness for the machinery, which has been delayed in delivery. Underground work has been suspended meantime.

Newfoundland

Cape Copper Co.—During September, 522 tons of 3¼% copper ore was produced from the East mine; 340 tons of tons of 7¼% ore from the West Bluff 3¾% ore from the South Lode and 100 mines, at Tilt Cove.

Mexico

MEXICO

Esperanza—During September, the mill was in operation 27 days, crushing 7891 tons of ore; 11,402 tons of tailings were treated. The estimated return was \$115,168; the net profit, £4835.

El Oro Mining & Railway Co.—During September the mill was in operation 29 days, crushing 19,210 tons of ore, and treating 15,910 tons of tailings, from which bullion worth \$168,530 was recovered. The total net profit was \$53,880.

SONORA

Lucky Tiger-Combination Gold Mining Co.—It is reported that the bullion stolen several weeks ago by rebels under Inez Salazar, has been recovered.

Australia

TASMANIA

A dispatch from Hobart states that the North Mt. Lyell mine caught fire, Oct. 12, by the blowing out of a motor fuse and that 89 men are entombed; 76 men who had been working on the 700-ft. level escaped to the surface, where one died immediately from the effects of smoke and heat. Rescuers succeeded in reaching the 500-ft. level, but were driven back. A diving gear is being rigged, with which it is thought that the entombed men can be reached and ultimately be rescued.

The Market Report

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

COAL TRADE REVIEW

New York, Oct. 23—Conditions in the coal markets show practically no change. In the West demand is strong and supplies limited by slow transportation. The rush of the closing weeks in the Lake trade is taking some coal off the general markets.

In the seaboard bituminous trade supplies are rather better and conditions a little easier, but the trade is still rushing and prices are high.

The anthracite trade is still behindhand and consumers find it hard to get supplies promptly. The putting in of stocks ahead is out of the question at present, and probably will be until the coastwise trade is satisfied and the shoalwater ports get their winter supplies.

Coal and coke carried over all lines of the Pennsylvania R.R. east of Pittsburgh and Erie, nine months ended Sept. 30, short tons:

	1911	1912	Changes
Anthracite.....	8,489,450	7,387,837	D. 1,101,613
Bituminous.....	30,504,343	34,114,059	I. 3,609,716
Coke.....	7,880,607	9,671,343	I. 1,790,736
Total.....	46,874,400	51,173,239	I. 4,298,839

The total increase this year over 1911 was 9.2%, anthracite alone showing a decrease.

British Coal Trade—Exports of fuel from Great Britain, with coal furnished to steamships in foreign trade, nine months ended Sept. 30, in long tons:

	1911	1912	Changes
Coal.....	47,618,690	45,750,423	D. 1,868,267
Coke.....	711,697	680,713	D. 30,984
Briquettes.....	1,236,582	1,115,631	D. 120,951
Total exports... ..	49,566,969	47,546,767	D. 2,020,202
Steamer coal.....	14,346,947	13,202,091	D. 1,144,856
Total.....	63,913,916	60,748,858	D. 3,165,058

Imports for the nine months were 16,738 tons in 1911, and 183,197 tons this year.

IRON TRADE REVIEW

New York, Oct. 23—The iron and steel markets continue generally active. There has been a definite decrease in contracting for some important steel products, notably bars, plates and shapes, because the mills are already practically sold up for the first half of the new year. Indeed, it is now said that if specifications keep up some of the business closed for second-quarter will result in deliveries in the third quarter. Mills are seriously considering further means for curbing the buying tendency.

Specifications against this year's contracts show no abatement, but have in-

creased in some cases, notably in sheets, in which branch specifications thus far this month have been far in excess of shipments. Tinplate for next season is looking up, but is not especially active.

Price advances in the regular steel products appear to be about over, according to the attitude of the mills at present. The concern is to preserve the present very favorable conditions. Without any further price advances, profits next year will be much larger than this year, for it is still largely low-priced business which the mills are delivering. In the majority of lines, mills will carry over Jan. 1 specifications for from two to three months of work, which, of course, will be lower priced than the regular contracting basis for first quarter.

It is now generally realized that the demand for iron and steel products has grown up to the capacity, and has even overshot it. After the panic of October, 1907, the common remark was that a period of years would be required for demand to grow up to capacity, being increased as it was then by the erection of many additional plants. That new capacity came in, but relatively little in addition, and five years intervening would be amply sufficient, according to the rate of growth observed in the past, to take up all the slack. One theory of the present pressure upon the mills is that it is merely a case of growth having taken place, and finding the steel industry with insufficient rather than excess capacity. Another theory, of course, is that the pressure upon the mills at the present time is due to buyers specifying their full tonnages under low-priced contracts made long ago, when mills did not expect the full contract tonnages to be taken out.

Pig iron continues in active demand, and the advances in price generally made do not seem to check the business. The production continues to be limited by the coke supply. No more pig iron is being made than three years ago, and coke-making capacity has been increased, particularly by the erection of two plants in Alabama, one at South Bethlehem and one at Gary, with an extension to the Joliet plant; but the supply of coke is no larger, and the divergence is attributed to scarcity of labor in practically all coke-making fields.

Baltimore

Oct. 21—Exports for the week included 3,051,581 lb. billets and sheet

bars to Liverpool; 1,360,815 lb. steel plates to Rotterdam; 1,294,300 lb. steel billets and 999,490 lb. steel skelp to Glasgow; 7,761,754 lb. structural steel, and 2,113,894 lb. miscellaneous iron and steel to Panama. Imports included 23,500 tons iron ore from Cuba.

Birmingham

Oct. 21—There is still much activity in the Southern pig-iron market. The minimum price at which pig iron is selling is \$14 per ton, No. 2 foundry, with business for delivery during the second quarter of 1913 not being urged by the manufacturers, who are confident that \$15 per ton will be the price. The outward movement and the home consumption are larger than the production. It was expected that by this time the make in the Southern territory would have been increased by at least 500 tons a day, but there have been some delays and the make for the month of October will show but little increase. The home consumption is steady, the cast-iron pipe plants in particular requiring a large quantity of iron. There is a healthy movement of pig iron to the Middle West and a little to the East and Northwest.

There is a steady operation at machine shops and foundries, with the greater portion of the labor troubles in this district settled. Charcoal iron holds at \$22 @ 22.50 per ton, with the make about equal to the demand.

Announcement that the visit of a committee of preferred stockholders of the Alabama Consolidated Coal & Iron Co., from Baltimore to the Birmingham district, will probably result in the reorganization of that company and the relieving of the company from its trusteeship, is received with much interest here. The trustee has one blast furnace in operation with coal and ore mines sufficient to supply raw materials. Only \$1,500,000 would be necessary to arrange the floating indebtedness and provide working capital.

The Tennessee Coal, Iron & Railroad Co. has received from the Louisville & Nashville R.R. Co., orders for 90,000 tons of rails, and from the Atlantic Coast Line an order for 19,740 tons.

Chicago

Oct. 22—There are no great changes in the iron market from the conditions noted last week. Pig iron continues to be in steady demand, most sales being of

small lots, but one local concern has taken 5000 tons, for first-half delivery, and a few other sales go over the 1000-ton mark. The melters are in the market generally for first-half requirements; a few for last-quarter needs. There is no difference in price for the two deliveries, on foundry irons, except that Lake Superior charcoal iron commands about 50c. more for first-quarter, the last-quarter price being about \$19, Chicago delivery. No. 2 Northern foundry iron sells for \$17.50, furnace, which means about \$18 delivered. Southern No. 2 foundry iron brings \$14 Birmingham, or \$18.35 Chicago, with a range above or below this price of 25 or 50c. on exceptional sales. Some Southern interests hold out firmly for \$14.50, but there is apparently a desire now for tonnage on the part of the furnace interests, which may sag prices a little.

The demand for iron and steel products continues large in all lines. Railroad buying is especially heavy, the companies apparently having come to the point where they hesitate no longer about the future; they are placing orders very generally for first-half deliveries of rails and track fastenings. Steel bars are in heavy demand and iron bars also find a large sale, prices being 1.58c. for soft-steel bars and 1.40c. for iron bars. Structural material shows a continuation of the demand, from a large territory, that has existed for several weeks and a pressure on manufacturers for deliveries, which already for the first half are difficult to obtain. Sheets and plates show a like pressure and in every minor line there is eagerness to obtain materials, by manufacturers and dealers. For all producers of iron and steel it is a strong market.

Cleveland

Oct. 21—Short supply of cars continues to delay ore shipments to furnaces.

Pig Iron—The market is a little quieter, but prices are firm, and demand strong. For Cleveland delivery bessemer pig is quoted at \$17.90; No. 2 foundry, \$16.75; Lake Superior charcoal, \$19.25@19.75 per ton.

Finished Material—Demand continues heavy and prices are firm, with a decided upward tendency. Plates, bars and shapes are all called for; in sheets the mills are overcrowded and have hard work to keep up deliveries wanted.

Philadelphia

Oct. 23—Heavy buying of pig iron from all over Eastern territory, which partially subsided a few days ago, has been followed by quite a number of inquiries from all over the East, the total of which is estimated today as upward of 40,000 tons of all kinds of iron. Many of these inquiries are for rather small

lots, considering the magnitude of the concern. Some of them expect a recession in prices, owing to a promise of increased output and the fairly well supplied conditions of so many buyers. The furnace opinion is that not only all current quotations will be maintained, but further advances are inevitable. They point to higher ore and higher coke, and to the enlarging requirements of consumer. The situation is a little cloudy among larger consumers all over the East, but it is very clear from the standpoint of the furnace people, who have no thought of yielding until they are brought face to face with conditions which buyers imagine will develop. The confidence of makers in their opinion is shown in recent advances for No. 2 X foundry, and for pipe iron. For the time being, buying will be confined to small lots. No. 2 X foundry is quoted at \$17.75 for Northern. Gray forge is \$17, basic nominally \$17, and low-phosphorus \$22.50 per ton.

Steel Billets—Basic openhearth billets are nominally \$30, delivered, and forging billets \$34, at mill. There is a demand for all the mills are in a position to deliver.

Bars—The bar mills are sold up into January and are therefore holding prices at 1.60c., excepting in large lots. Store quotations have also been advanced under an unusually active demand. Common iron is particularly active and car-building requirements constitute an important feature. Premium prices are frequently paid and quotations for accommodation deliveries are 1.65@1.75c. on steel bars.

Sheets—Under an unusual offering for forward delivery, sheets have moved up at least \$1 a ton, and where premium prices are paid, which are frequent, the advance is \$2 per ton.

Pipes and Tubes—The activity in tubes threatens a further advance in prices and quite a number of small concerns are endeavoring to arrange with the mills for deliveries extending over three or four months, which will protect them from upward fluctuations.

Plates—The heavy ordering of steel cars and underframes has brought out a rush of inquiries, which has caused an advance that promises to become permanent. There is an immense amount of business awaiting acceptance.

Structural Material—The pressure for structural material, while not so heavy as for plate, is crowding the mills, especially as to early deliveries. An immense amount of new work has been brought to the attention of the mills, but in the main it refers to late deliveries. Prices for shapes have moved up a trifle.

Scrap—Scrap quotations have advanced this week, especially on heavy melting steel, old rails and No. 1 wrought. Quotations on all lines of scrap have advanced and the larger dealers have taken

so much on their shoulders that they are having serious difficulties in carrying out their end of the contracts.

Pittsburgh

Oct. 22—The iron and steel market shows no material change from conditions of a week ago, except that mills have fallen somewhat farther behind in deliveries, and are further restricting sales for next year, being already comfortably filled for the first half in several lines. Unfinished steel has become unquotable, there being practically no offerings. Pig iron is quieter, with prices very well held. Deliveries of tinplate bars are not as good as they were, and some tinplate mills have not been able to operate full in consequence. Orders for merchant pipe, with specifications attached, are running ahead of current shipments, and many of the mills are booking no open contracts at all. Wire is fairly active, and sales made are only in accordance with the recent advance, making nails \$1.75, although some of the producers do not admit that their official prices have been advanced to this basis.

Pig Iron—The market has been quiet as to actual sales, but has lost none of its strength. Furnaces are fairly well sold up and are not anxious to effect further sales in view of the scarcity of coke, which is bringing \$3.75@4 for prompt and spot shipment, and is held at about \$3 for first-half contracts and \$2.75 for contracts over the whole year. In basic and bessemer some furnaces seem to be disposed to hold the market at its present level, avoiding further advances. Foundry iron is quotable 50c. higher, on the basis of asking prices. We quote: Bessemer, \$17; basic, \$16; No. 2 foundry, \$16.50; forge, 16; malleable, \$16, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The contract market is firm at the advanced price of \$61, Baltimore, with prompt at about \$65, Baltimore, freight to Pittsburgh being \$1.95. Prompt material is extremely scarce, and deliveries on contract are understood to be unsatisfactory in many cases.

Steel—There is practically no steel being offered in the form of billets and sheet bars, and the market is quotable as nominal on the basis of last quotations. Mills are making poorer deliveries on contracts, and will have to carry considerable tonnage over Jan. 1, while they show no indication of being able to contract for any deliveries in first quarter. There are many long-term contracts, which nominally cover buyers having them, but there is question whether mills will be able to make full deliveries, as all consumers show a disposition to require the maximum contract tonnages. We quote, nominally: Bessemer billets,

\$23@26.50; bessemer sheet bars, \$26.50 @27; openhearth billets, \$27@27.50; openhearth sheet bars, \$27.50@28; rods, \$29@30, f.o.b. maker's mill, Pittsburgh or Youngstown.

Sheets—Sheet mills have been receiving specifications in the past fortnight at a rate more than 50% in excess of their shipments, and are accordingly falling more rapidly behind in deliveries. There is less contracting for first quarter, as mills willing to take such business are already fairly well filled, with the portion of this year's business they are practically certain to carry over, and there are some mills quite reserved about making contracts, since they have not covered for their steel. Premiums are readily obtained for any early delivery. We quote: Black sheets, 2.25@2.35c.; galvanized, 2.40@2.50c.; blue annealed, 1.60@1.65c.; painted corrugated, 2.35@2.45c.; galvanized corrugated, 3.45@3.50c. per pound.

Bars—Common iron bars have advanced sharply, mill's being well sold up for the next few weeks and being averse to making contracts far ahead. We quote iron bars at 1.60@1.65c., Pittsburgh. Steel bars are held at 1.40c. on contracts, but the large mills are practically filled into next June. Some of the smaller mills, which did not accept any large contracts, are able to offer quick deliveries, and are obtaining 1.60c. up to 1.80c. or higher on single carloads, for delivery within a week.

St. Louis

Oct. 22—While the demand for iron is not as active as several weeks ago, there has been steady buying in small lots. Melter's do not seem to feel that iron at \$14 Birmingham, is a good speculation and, consequently, have dropped back to a more cautious method of buying, which is only for actual requirements. The market is firm at \$14 Birmingham, \$17.75 St. Louis, which price covers practically all deliveries, both present and future. Northern iron is being quoted at \$18@18.25 St. Louis, with demand fair.

The coke market is high and irregular, good foundry bringing \$6@6.25 St. Louis.

Iron Ore Market

It is reported that at least one reservation of Lake Superior ore for next season has been made, and that other inquiries have come in. Sellers of ore are not prepared to do anything yet toward fixing prices for next season, but it is probable there will be advances. This season's prices are, on bessemer ore, base 55% iron and under, 0.45 phosphorus, \$3.75 for Old Range and \$3.50 for Mesabi; on nonbessemer, base 51.5% iron, \$3 for Old Range and \$2.85 for Mesabi; all delivered at Lake Erie ports.

Daiquiri ore from Cuba is now offered to Eastern furnaces at 7¼c. per unit,

f.o.b. dock at Philadelphia; an advance of 0.5c. per unit over the price last spring.

METAL MARKETS

New York, Oct. 23—The metal markets have been comparatively quiet, but generally firm.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
Sept. 1912..	\$ 568,302	\$ 4,200,682 Imp.	\$3,632,380
" 1911..	2,352,861	4,704,096 Imp.	2,351,235
Year 1912..	43,728,274	38,789,793 Exp.	4,938,481
" 1911..	18,263,310	45,177,106 Imp.	26,913,796
Silver			
Sept. 1912..	6,011,221	3,648,883 Exp.	2,362,338
" 1911..	4,940,391	4,161,706 Exp.	778,685
Year 1912..	52,347,946	36,301,752 Exp.	16,046,194
" 1911..	49,527,961	33,696,436 Exp.	15,831,525

Exports from the port of New York, week ended Oct. 19: Gold, \$32,100; silver, \$1,630,671, chiefly to London and Paris. Imports: Gold, \$2,060,124, principally from London; silver, \$318,672, mostly from 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. About \$750,000 was taken in London for India, the balance of the supplies going chiefly to the Bank of England.

Iridium—Prices are still high, \$68@70 per oz. being asked for the metal.

Platinum—The market is rather more active, but prices show no change. Dealers here continue to ask \$45.50 per oz. for refined platinum and \$48 per oz. for hard metal, up to 10% iridium.

Our Russian correspondent writes under date of Oct. 10 that the market is steady. The demand for platinum is better especially for small lots. The speculators are still buying the platinum of the starateli. New-dredges are to be installed on the platinum mines and this will increase considerably the production of platinum. From Ekaterinburg it is reported there is a high demand for iridium but the offer of this metal is insignificant.

The quotations are in St. Petersburg—37,300@37,400 rubles per pood; at Ekaterinburg 9.80 rubles per zolotnik for crude metal, 83% platinum—equivalent to \$36.65 and \$36.85 per oz. respectively.

Palladium—There has been quite a demand for this metal lately. It is now quoted at \$72 per oz., New York.

SILVER AND STERLING EXCHANGE

Oct.	17	18	19	21	22	23
New York ..	63¼	63¼	63¼	63¼	63	63¼
London ..	29½	29½	29½	29½	29½	29½
Sterling Ex	4.8565	4.8575	4.8580	4.8580	4.8610	4.8590

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

Silver—The market has not shown any disposition to advance during the current week. It is doubtful if any great advance is likely now to occur, since it is not probable China will be in position to make large purchases in the near future.

Exports of silver from London to the East, Jan. 1 to Oct. 9, as reported by Messrs. Pixley & Abell:

	1911	1912	Changes
India.....	£5,950,300	£8,124,200	I. £1,173,900
China.....	989,700	993,500	I. 3,800
Total.....	£7,940,000	£9,117,700	I. £1,177,700

India Council bills in London averaged 16.08d. per rupee.

Copper, Tin, Lead and Zinc

NEW YORK

Oct.	Copper		Tin	Lead		Zinc	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.		New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
17	17¼ @17¼	17.30 @17.40	49¾ @5.10	4.87 @4.92	7.40 @7.45	7.40 @7.30	7.25 @7.30
18	17¼ @17¼	17.30 @17.40	50 @5.10	4.87 @4.92	7.40 @7.45	7.40 @7.30	7.25 @7.30
19	17¼ @17¼	17.25 @17.35	50 @5.10	4.87 @4.92	7.40 @7.45	7.40 @7.30	7.25 @7.30
21	17¼ @17¼	17.25 @17.35	50½ @5.10	4.87 @4.90	7.40 @7.45	7.40 @7.30	7.25 @7.30
22	17¼ @17¼	17.20 @17.30	50¼ @5.10	4.87 @4.90	7.40 @7.45	7.40 @7.30	7.25 @7.30
23	17¼ @17¼	17.20 @17.30	50¼ @5.10	4.87 @4.90	7.40 @7.45	7.40 @7.30	7.25 @7.30

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of 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

Oct.	Copper			Tin			Lead, Span- ish	Zinc, Ordi- naries
	Spot	3 Mos	Best Sel'd	Spot	3 Mos			
17	76¼	77½	82	226¼	226	21	27½	
18	76¼	77½	82	228½	227½	21	27½	
19	.....	.....	.....	.....	.....	.....	.....
21	75¼	76¼	81	230½	229¼	20¾	27½	
22	75¼	76¼	80½	229½	228¼	20½	27½	
23	75¼	76¼	81	229½	228¼	19¾	27½	

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 = 2.17¼c.; £15 = 3.26c.; £25 = 5.44c.; £70 = 15.22c. Variations, £1 = * 21¼c.

Copper—During the last week business has been almost at a standstill. Of course no sales to Europe could be made under the existing conditions; and domestic manufacturers being fairly well covered (in some cases until the end of this year, and in most cases up to the beginning or middle of December) are not anxious during this time of uncertainty to enter into new commitments. Whether this hesitation is due to the political situation or to other causes will become apparent sooner or later. The largest producing interests maintain the old pegged price and are calmly confident that buyers sooner or later will have to pay them what they ask. Their optimism is no doubt sincere. On the other hand, there are agencies that are willing to sell copper right along for what they can get, being able to cover their sales by purchases of crude material in Chile and elsewhere on terms that leave a handsome profit. The withdrawal of standard copper from the London market for refining here has also been considered. The offerings of electrolytic copper from these quarters at 17½c., delivered, usual terms, and at less, have increased, wherefore the market closes easy. Throughout the week the market for Lake copper has been only nominal and the quotations for it are nominal. At the close, Lake copper is quoted at 17½@17¾c.; electrolytic copper in cakes, wirebars or ingots at 17.20@17.30c. Casting copper is quoted nominally at 17.10@17.20c. as an average for the week.

Transactions in the London standard market assumed fairly large proportions. Its tendency during the latter part of last week remained firm, but became easier at the beginning of this week. On the morning of Oct. 23, the market developed great strength, and quotations ruled at £76 7s. 6d. for spot and £77 5s. for three months, but an attack by bear operators in the afternoon broke the market for spot 10s. and futures 15s., so that the close is £75 17s. 6d. for spot, and £76 10s. for three months.

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

Copper exports from New York for the week were 2390 long tons. Our special correspondent gives the exports from Baltimore at 1422 tons for the week.

Visible stocks of copper in Europe on Oct. 15 are reported as follows: Great Britain, 29,020; France, 8,330; Rotterdam, 500; Hamburg, 2880; afloat from Chile, 1500; afloat from Australia, 4550; total, 46,780 long tons, or 104,787,200 lb. This is a decrease of 1170 tons, as compared with the Sept. 30 report.

Tin—The market has not alone recovered the ground lost during the Bal-

kan scare of last week, but its advance has made considerable progress. The late activity in the tin market is ascribed to operations by a strong bull party led by a large Viennese metal house. There was a tendency manifest in this market on the part of sellers to underquote the prices sent over from London. Business between these dealers and consumers was fairly active, and the market closes at £229 10s. for spot, and £228 5s. for three months in London, and about 50¼c. per lb. for November tin in New York.

Lead—Western sellers are persistent in their efforts to market their production, and have made offers as low as 4.87½, St. Louis. This, naturally, has had an effect on the New York market, where lead for shipment from the West was offered as low as 5.02½. The close is quoted at 4.87½@4.90c., East St. Louis, and 5.02½@5.10c., New York.

The demand in Europe has fallen off considerably, and as stocks are accumulating, there is no longer the scarcity of the last few months. On the contrary, lead is pressed for sale both by dealers and consumers, and closes weak at £19 15s. for Spanish, and 2s. 6d. higher for English lead.

The United Metals Selling Co. has appeared in the market as seller of refined lead, representing the International Smelting & Refining Co.

Spelter—The market has been quiet and unchanged. Business is of a retail character, not much anxiety being shown by consumers to anticipate their future wants. St. Louis is unchanged at 7.25@7.30c., and New York 7.40@7.45 cents.

The London market is slightly easier, good ordinaries being quoted at £27 10s., and specials at £27 15s. per ton.

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

Zinc dust is quoted 7¾c. per lb., New York.

Other Metals

Aluminum—The market is strong and active. No. 1 ingots are quoted at 26½c. per lb. in large lots. Some smaller sales have been made as high as 27@27½c. for immediate shipment.

Antimony—The market is exceedingly strong with good business forward. Prices are strong and advancing. Cookson's is quoted at 10¾@10¾c. per lb.; Hallett's is scarce and 9¾@10c. is asked. For Chinese, Hungarian and other outside brands, 9¾@10c. is named, with little to be had at the lower figure.

Quicksilver—The market is fairly active, and prices are unchanged. New York quotations are \$42 per flask of 75 lb., with 60c. per lb. for retail lots. San Francisco, \$41.50 for domestic orders and

\$39 for export. The London price is £8 per flask, with £7 17s. 6d. quoted from second hands.

Bismuth—The syndicate which controls the European production quotes 7s. 6d.—equal to \$1.80—per lb. in London. In New York a quotation of \$1.72 per lb. is made for metal produced from American ores.

Magnesium—The price of pure metal is \$1.50 per lb. for 100-lb. lots, f.o.b. New York.

Nickel—Shot, blocks, plaquettes bring 40@45c. per lb., according to quality. Electrolytic nickel is 3c. per lb. higher.

Zinc and Lead Ore Markets

Platteville, Wis., Oct. 19—The base price paid for 60% zinc ore declined during the week from \$58 to \$56. The base price paid for 80% lead ore was \$63@64 per ton.

SHIPMENTS WEEK ENDED OCT. 19

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point.....	716,600		
Benton.....	529,500	60,000	670,700
Platteville.....	487,440		220,000
Galena.....	476,600		
Hazel Green.....	210,000		
Shullsburg.....	168,000		
Harker.....	146,130		
Cuba City.....	130,580		112,500
Highland.....	126,400		
Linden.....	118,220	61,940	
Rewey.....	84,600		
Montfort.....	80,000		
Total.....	3,263,670	121,940	1,003,200
Year to date.....	161,791,530	6,663,100	29,332,690

Shipped during week to separating plants, 2,141,970 lb. zinc ore.

Joplin, Mo., Oct. 19—The high price of zinc sulphide ore was \$61, the base, per ton of 60% zinc, \$54@58. Zinc silicate sold on a base of \$31@34 per ton of 40% zinc. The average price for all grades of zinc is \$55.02. A stronger demand at the week-end, while not advancing prices, indicated that the downward course had reached bottom. Lead sold on a base of \$62@64 per ton of 80% lead, with only a few small lots exceeding 80% metal contents. The average price for all grades is \$63.36 per ton.

SHIPMENTS WEEK ENDED OCT. 19

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	4,564,060		780,380	\$152,765
Joplin.....	2,776,140		304,650	90,257
Galena.....	844,970		313,220	33,526
Duenweg.....	937,610		69,410	28,404
Alba-Neck.....	892,350		16,980	26,404
Miami.....	475,860		336,270	22,693
Carl Junction	384,830			11,737
Spurgeon.....	39,660	477,410	39,640	10,890
Oronogo.....	300,950			8,398
Granby.....	130,860	271,630		8,000
Jackson.....	221,250		109,260	9,696
Wentworth.....	252,960			6,829
Carthage.....	122,620			3,310
Aurora.....		126,000		2,270
Sarcoie.....	62,310			1,682
Totals.....	12,006,420	875,040	1,969,810	\$416,861

42 weeks... 450,669,560 28,629,530 75,696,090 \$14,630,191
Blende val. the week, \$338,790; 42 weeks, \$12,028,067
Calamine, the week, 15,663; 42 weeks, 451,706
Lead value, the week, 62,408; 42 weeks, 2,150,418

Outputting conditions continue at the best. Better weather could not be ordered, and every effort is being put forth to produce the limit of ore. An effort is being made to secure miners to go to Bingham, Utah, as strike breakers.

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	.....	40.89	.....	54.72	.....
November.....	45.40	.....	43.25	.....	57.19	.....
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, Oct. 23—The general markets continue active and firm.

Arsenic—Spot supplies are still scarce and prices a shade higher. Spot arsenic is quoted \$5.12½@5.25 per 100 lb., and futures \$5@5.12½. It looks as if the stocks which early in the year brought down prices had been largely used up.

Copper Sulphate—Demand is good and the market is steady. Prices are unchanged at \$5.50 per 100 lb. for carload lots, and \$5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Trade is quiet and prices a little easier, 2.55@2.57½ per lb. being asked for both spot and future positions.

Sulphuric Acid Rates—A complaint has been filed with the Interstate Commerce Commission by the Goldfield Consolidated Milling & Transportation Co., of Goldfield, Nev., against the rates on sulphuric acid from San Francisco. The company states that it has been compelled to pay \$2.14 per 100 lb., and at other times a rate of \$1.79, both of which rates are said to be excessive, the reasonable rate being set by the company at 66c. per 100 lb. Reparation of over \$11,700 is asked for from the Southern Pacific R.R. and from the Tonopah & Goldfield R.R., on the basis of collections made for former shipments of acid.

MINING STOCKS

New York, Oct. 23—On Oct. 17, the Exchange was uncertain, with alternate advances and recessions. Mining stocks on the Curb were dull and inclined to recede fractionally.

Oct. 18 the Exchange was quiet and showed no definite tendency. On the Curb coppers were in moderate demand, but prices were irregular. Other mining stocks were dull.

Oct. 19 the Exchange was more active and steadier. The large quantity of stocks offered for sale from Europe has apparently been absorbed, leaving the market free for an upward turn. On the Curb mining stocks were dull and inclined to be easier in tone.

Oct. 21 the Exchange declined under large offerings and closed weak. Mining stocks on the Curb were slow and sold off, except the coppers, which about held their own.

Oct. 22 and 23 there was less pressure on the market and the Exchange showed some recovery. The Curb was quiet and mining stocks were inclined to be dull, but with few changes in quotations.

The Curb admitted to quotation the stocks of the West End Consolidated Mining Co., and of the Puebla Smelting & Refining Co. The West End is a Tonopah issue with 2,000,000 shares of \$5 par authorized, of which 1,298,572 are outstanding. The Puebla Smelting & Refining Co. has 1,000,000 shares authorized, 650,000 outstanding, the par being \$5. There are also \$1,000,000 of 6% debentures.

At auction in New York, Oct. 10, a lot of 7500 shares Round Mountain Sphinx Mining Co., \$1 par, sold for 8c. per share.

Boston, Oct. 22—It has been a week of heavy market prices for copper shares, outside of Cnino, which has made a new high record. It is stated that the directors of this company will meet shortly and declare a dividend at the rate of \$4 per annum. Old Colony and Mayflower show some strength on reports from President Fay, who is at the mines, that the drill cores expose rich copper-bearing veins.

Wolverine has suffered another decline to \$71, the lowest of the year. No news accompanies this last decline. North Butte, is off to \$36.75. Profit taking in U. S. Smelting common has caused a drop to \$46 per share.

Amalgamated maintains a fairly firm tone although it is subject to fluctuations with the heavy liquidation on the New York market. The increase in the dividend rate, the second this year, to a 6% basis, was generally expected. The management of the North Lake mine, a former Dow stock, announces that no assessment is likely to be called for six months.

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	July	August	Sept.
Alaska shipments.....	2,224,441	1,242,886	1,726,715
Anaconda.....	23,000,000	25,250,000	24,500,000
Arizona, Ltd.....	3,200,000	3,260,000	3,340,000
Copper Queen.....	7,708,147	8,040,424	9,103,861
Calumet & Ariz.....	4,748,000	4,514,000	4,462,000
Chino.....	2,945,000	3,437,309	3,372,369
Detroit.....	2,194,090	1,892,289	1,881,668
East Butte.....	1,261,904	1,410,500	1,250,000
Mammoth.....	1,818,738	1,802,590	1,834,937
Mason Valley.....	1,500,000	.....	.....
Nevada Con.....	6,084,274	.....	.....
Ohio.....	617,500	.....	.....
Old Dominion.....	2,543,763	2,597,896	2,204,000
Ray.....	2,985,965	2,888,095	.....
Shannon.....	1,446,000	1,400,000	1,142,000
South Utah.....	142,555	224,855	225,568
United Verde*.....	2,500,000	2,500,000	2,750,000
Utah Copper Co.....	10,602,000	11,248,992	6,616,887
Lake Superior*.....	19,500,000	21,000,000	19,250,000
Non-rep. mines*.....	8,970,000	8,970,000	.....
Total production.....	105,991,687	.....	.....
Imports, bars, etc.....	25,586,735	23,561,161	.....
Total blister.....	131,578,422	.....	.....
Imp. in ore & matte.....	7,748,392	8,544,624	.....
Total American.....	139,326,814	.....	.....
Miami†.....	3,027,710	3,048,750	2,949,150
Brit. Col. Cos.:.....	.....	.....	.....
British Col. Copper	1,026,000	941,364	.....
Granby.....	1,802,753	1,970,388	.....
Mexican Cos.:.....	.....	.....	.....
Boleo†.....	2,386,480	.....	.....
Cananea.....	4,000,000	4,044,000	3,500,000
Moctezuma.....	3,094,016	3,229,839	771,844
Other Foreign:.....	.....	.....	.....
Cape Cop., S. Africa.....	.....	.....	.....
Kyshtim, Russia.....	1,325,000	.....	.....
Spassky, Russia.....	795,200	902,720	.....
Famatina, Argen.....	.....	.....	.....
Tilt Cove, New'd.....	.....	.....	.....
Exports from:.....	.....	.....	.....
Chile.....	8,960,000	8,512,000	6,048,000
Australia.....	8,288,000	8,064,000	7,616,000
Arrivals in Europe†.....	14,114,240	20,200,320	8,518,720

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.
†Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER.

Month	U.S. Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
IX, 1911.....	115,588,950	57,311,584	50,824,011
X.....	118,255,442	64,068,307	60,084,349
XI.....	111,876,601	68,039,776	67,049,279
XII.....	122,896,697	65,988,474	79,238,716
Year.....	1,431,938,338	709,611,605	754,902,233
I, 1912.....	119,337,753	62,343,901	80,167,904
II.....	116,035,809	56,228,368	63,148,096
III.....	125,694,601	67,487,466	58,779,566
IV.....	125,464,644	69,513,846	53,252,326
V.....	126,735,836	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

VISIBLE STOCKS

	United States	Europe	Total
X, 1911.....	140,894,856	191,945,600	332,840,456
XI.....	134,997,642	176,825,600	311,823,242
XII.....	111,785,188	164,281,600	276,066,788
I, 1912.....	89,454,695	158,323,200	247,777,895
II.....	66,280,643	154,851,200	221,131,843
III.....	62,939,988	141,142,400	204,082,387
IV.....	62,367,557	136,819,200	199,186,757
V.....	65,066,025	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
X.....	46,701,374	113,568,000	160,269,374
XI.....	63,065,587	107,408,000	170,473,587

Curb trading has been light, but prices maintain a generally firm tone. Nevada-Douglas touched \$4 and holds just under this mark. Many of the penny stocks continue to change hands at slightly lower levels.

Assessments

Table with columns: Company, Delinq, Sale, Amt. Lists various companies like Best & Belcher, Big Elk, etc.

Monthly Average Prices of Metals

SILVER

Table with columns: Month, New York (1910, 1911, 1912), London (1910, 1911, 1912). Lists monthly price averages for silver.

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

COPPER

Table with columns: NEW YORK (Electrolytic, Lake), London, Standard (1911, 1912). Lists monthly price averages for copper.

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Table with columns: Month, 1911, 1912, Month, 1911, 1912. Lists monthly price averages for tin.

Prices are in cents per pound.

LEAD

Table with columns: Month, New York, St. Louis, London (1911, 1912). Lists monthly price averages for lead.

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Table with columns: Month, New York, St. Louis, London (1911, 1912). Lists monthly price averages for spelter.

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

Table with columns: Bessemer, Basic, No. 2 Foundry (1911, 1912). Lists monthly price averages for pig iron.

STOCK QUOTATIONS

Table with columns: COLO. SPRINGS, SALT LAKE, Name of Comp., Bid. Lists stock quotations for Colorado Springs and Salt Lake.

TORONTO

Table with columns: Name of Comp., Bid. Lists stock quotations for Toronto.

SAN FRANCISCO

Oct. 22

Table with columns: Name of Comp., Clg., Name of Comp., Bid. Lists stock quotations for San Francisco.

N. Y. EXCH.

Table with columns: Name of Comp., Clg., Name of Comp., Clg. Lists stock quotations for New York Exchange.

N. Y. CURB

Table with columns: Name of Comp., Clg. Lists stock quotations for New York Curb.

BOSTON CURB

Table with columns: Name of Comp., Last. Lists stock quotations for Boston Curb.

LONDON

Table with columns: Name of Com., Clg. Lists stock quotations for London.