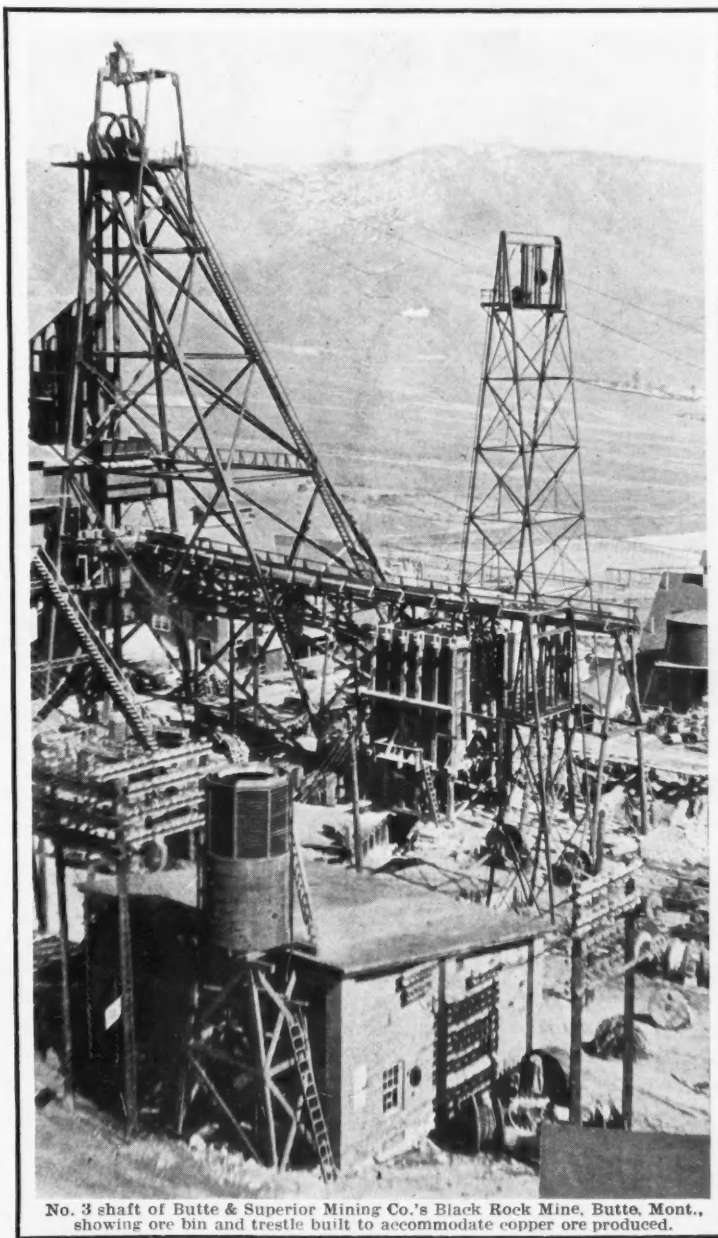


NOV 27 1922

ENGINEERING & MINING JOURNAL-PRESS

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Engineering and Mining Journal-Press does not sell its front covers to advertisers. In uniting Engineering and Mining Journal with Mining and Scientific Press, however, the combined journal has respected existing advertising contracts. Some of these made with the Mining and Scientific Press were for its front covers. Through the courtesy of these advertisers such obligations have been released. The front cover this week has been released by the kindness of Hyatt Roller Bearing Company, whose advertisement will be found on page eighteen.



No. 3 shaft of Butte & Superior Mining Co.'s Black Rock Mine, Butte, Mont., showing ore bin and trestle built to accommodate copper ore produced.

The Geological Institute of Mexico City

By Alberto Terrones Benitez

Duties and Privileges of Technical Journalism

By T. A. Rickard

Metal Mine Fires

By D. Harrington, B. O. Pickard and H. M. Wolfen

Sampling Spotty Gold Ores

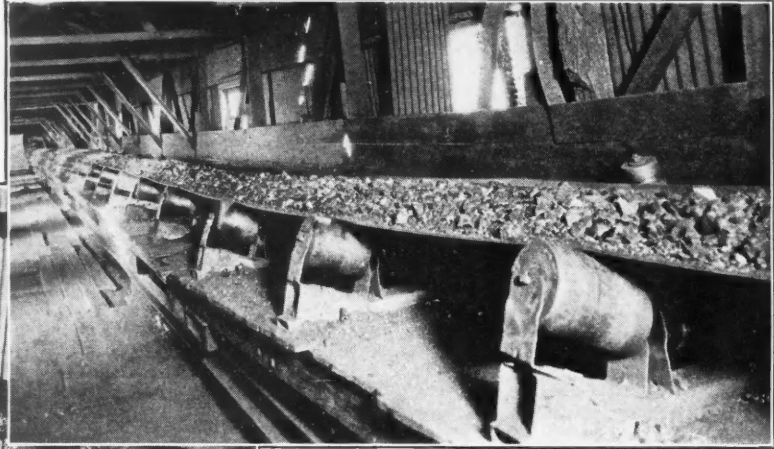
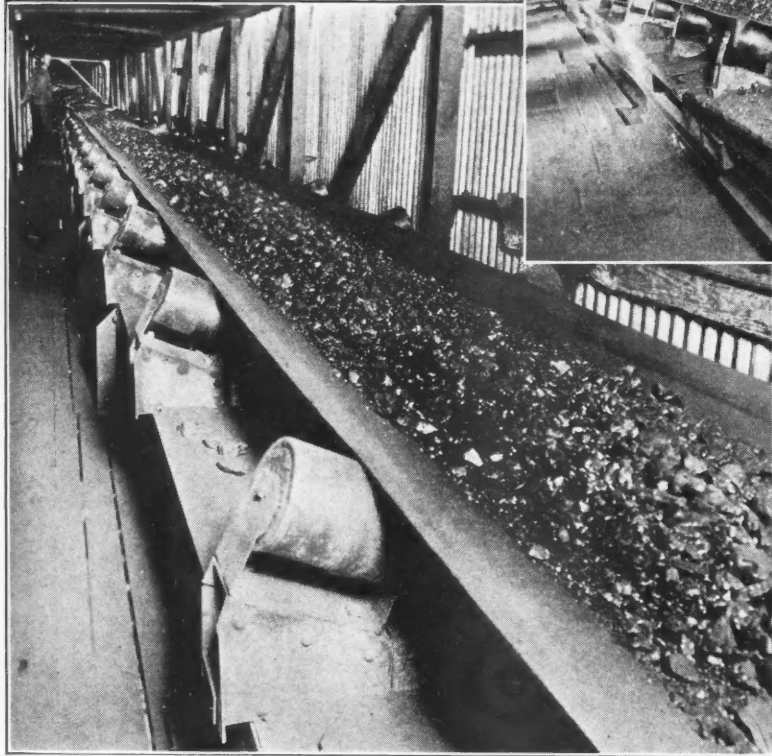
By Charles D. Demond and A. C. Halferdahl

Biography of H. Lipson Hancock

A WEEKLY JOURNAL REPRESENTING THE WORLD'S MINING AND METAL INDUSTRIES

November 25, 1922

S-A Unit Carriers in re-screening plant of Orient No. 1 Mine of C. W. & F. Coal Co., Orient, Ill.



S-A Unit Carriers in tipple of Zeigler No. 1 Mine of Bell & Zoller Mining Co., Zeigler, Ill.

S-A UNIT CARRIERS Carrying the World's Record Run of Coal

The Labor Saver

a monthly bulletin of developments in economical material handling, is published just to keep you in touch with the field.

If your name is not on our mailing list, we will be pleased to see that you receive "The Labor Saver" regularly. Without charge, of course.

Last March, when, in a production contest, the Zeigler No. 1 Mine of the Bell & Zoller Mining Co., and the Orient No. 1 Mine of the Chicago, Wilmington & Franklin Coal Co. produced the astonishing total of 326,124 tons of coal in 27 working days of 8 hours each, S-A Unit Carriers were used in both mines.

The fact that both these great mines went into a production contest with full confidence in the S-A Unit Carriers which both had been using for years, and the fact that after years of service these S-A Unit Carriers justified that confidence by their performance under the unusual strain imposed upon them for a month, combine to furnish an impressive commentary on their worth.

Metal mining men will do well to give particular notice to this incident even though it be only characteristic of S-A performance. For what S-A Unit Conveyors will do in the coal fields they will do equally well in the metal mines.

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New York, November 25, 1922

Number 22

Immigration and Mining

THE PROBLEMS of the mining industry include labor shortage, a condition felt all over the country; and one of the main factors of labor shortage is restricted immigration. Due to the fact that so many of the inhabitants of the United States have graduated from the primary classes of labor, or have elected to avoid labor and engage in barter, and due to the lack of fresh supplies, through immigration at the bottom of the scale, there is much competitive bidding for both unskilled and skilled workmen. Great irregularities in pay in different trades and in different sections of the country are thereby established. The labor unions help in preventing the flowage of labor so as to establish an approximately uniform level of wage. Thus, while a plasterer in New York is getting twelve or twenty dollars a day, the metal miner in the West is getting four or five dollars a day, and the coal miner in Pennsylvania seven and a half.

The labor unions are in favor of labor shortage; they are opposed to immigration. Managers and directors of great manufacturing companies—the great industries of the United States—need more hands to run their mills to meet the public demand for their products; they want freer immigration, in order that they may not need to raise wages to secure labor in competition with other needy industries. The great public's interests are partly on one side, partly on the other, according to whether those constituting the mass of the people are primarily manual workers or primarily buyers.

While labor is at a premium, education is at a discount. There is a surplus of high school and college graduates. The relative rates of earning of former times are reversed. Should these classes follow the wily tactics of the manual workers, they would limit the number of graduates, say of mining engineering schools, as the carpenters and bricklayers' trades limit the number of apprentices. Colleges are more and more turning toward the preparation for a life of trade, in response to an insistent demand that education should prepare for life—for where the fattest modern opportunities lie. Manual labor or the production of wealth, and trade, or the distribution of wealth, offer the readiest market nowadays to the young man.

As for the country at large, the restricted labor supply and consequent high wages, while apparently spelling greater comfort for the average manual worker, increases the difficulty of American industries competing in the world markets. More and more, we must, according to this, forego foreign trade; more and more our industrial economic life becomes a closed circle. And that means the elevation of all prices—of the cost of living—commensurate with the high wages, which therefore fail in procuring opulence.

The immigration laws do not apply to the western hemisphere. Mexicans may come in any number into the United States, except they may not come under contract. But in general there is little immigration

from one zone of latitude to another. The natural flow of immigration is east and west, not north and south, so that, except near the Mexican border, there is little relief in this for the mine-labor problem. And, moreover, there is little immigration from the new countries, the countries which pour forth their inhabitants being those which are overloaded with population, or near it.

Protection for Copper?

A HIGH PROTECTIVE TARIFF has been placed upon hundreds of commodities, weak and strong alike, with exceedingly few exceptions—but one of them copper. The red metal neither asked for nor received a tariff. This may seem strange to the uninitiated, as not only does the American copper industry compete with cheap labor abroad, from the blacks in the heart of Africa to the native laborers of Chile and Peru, but it also receives heavy importations of this "cheap" foreign metal every month. Yet agitation for a protective tariff has seldom entered the heads of the copper producers, although we recall last January, at the *Engineering and Mining Journal* staff and correspondents' dinner, that the representative of a large copper company pointed out these facts and asked, "Why not a tariff on copper?" Recently the *Boston News Bureau* discussed the "Copper Import Problem," and seems to think that some form of protection is due the American copper industry.

What would happen if we had a tariff on copper? One of two things—foreign metal arriving in the United States to be refined would either be deflected to other countries, probably abroad, where refineries could be built to handle it, or the metal would still be refined in bond in this country. The domestic refinery capacity is roughly 2,700,000,000 lb., or more than enough to refine the production of American mines, whose output has never been above 1,927,000,000 lb. per year. The refineries were built with a view to handling foreign metal, and without that supply they would represent poor investments.

American copper producers know that their great industry has, and must have, the world for its market. Prices are not controlled by any one group or by any country, but are set by the universal free play of supply and demand. Copper producers therefore naturally have taken an international viewpoint and are quick to gage the importance of any European developments which would influence the demand for their product. The United States produces more copper than it can use, and must have an export market for its surplus. It would do no good to divert copper imports from our shores only to have them compete with American copper abroad. A similar condition exists in the wheat market, but it is a fact which the wheat growers of the United States have failed to realize. The price of wheat, as of copper, is set in a world market. By excluding Canadian wheat they expected to do away with competition

in the domestic market, never thinking that this same Canadian wheat would compete abroad and affect the world price.

Another important reason for the apparent lack of interest in or demand among copper producers for a tariff is the fact that some of the largest foreign copper deposits are owned by Americans. It is mostly "American" copper coming into the United States. In August, the last month for which detailed statistics are available, about 12,000,000 lb. of copper came from Chile (mostly Braden and Chile copper), more than 7,000,000 lb. from Canada (partly Granby), 5,000,000 from Peru (partly Cerro de Pasco), and 6,000,000 from Cuba (partly American Metal Co.). Doing anything to hurt these foreign enterprises—and a tariff would be a passing injury at best—would adversely affect American stockholders' pocketbooks, whereas it would not aid the copper industry. If copper imports are heavy—and they have been exceptionally heavy of late—the way to reduce them is for the American producers to decrease foreign production voluntarily, but to do so in the case of the huge South American mines would mean producing higher-cost copper. Although in August 57,000,000 lb. of copper was imported in various forms, against an export of 63,400,000 lb., leaving an export balance of only 6,400,000 lb., and though other months have also made a poor showing, this condition is probably only transitory and awaits a clarification of the European political chaos.

Domestic and Foreign Supply of Nitrate

MUCH HAS BEEN WRITTEN on the subject of the synthetic manufacture of nitrate from the air, but little on the reserves of nitrate-bearing caliche that are known to exist in the United States. The Great War emphasized a national need and prompted exhaustive investigation of the deposits in Death Valley, Calif., which were considered by many to be of commercial value. The work was undertaken by the U. S. Geological Survey and directed by Mr. Hoyt S. Gale. Almost all the known deposits reported were examined, but the results were disappointing. In the summary of conclusions at the end of an extensive report, published recently in bulletin form by the Survey, it is stated that the nitrate, averaging less than 2½ per cent, occurs as a blanket deposit in a layer of caliche about 5 in. thick and 9 in. below the ground. As compared with the residue dumps on the Chilean pampa, the domestic deposits are probably about one five-hundredth of the gross weight at about one-fourth of the nitrate content. The most promising region in the United States, if exploited, would yield less than 2,000 tons of refined nitrate.

Mr. Huntington Adams, who will be remembered in connection with the introduction of continuous agitation in Pachuca vats in Mexico and who is one of the few American mining engineers who has been associated during recent years with the nitrate industry of Chile, submitted to the Army authorities early in 1918 a report on the Californian deposits. In this he showed that the cost of recovering the 10,000 tons of nitrate known to be in reserve in Death Valley would be inordinate. He expressed the opinion that it was not good policy to ignore the cheapness of the Chilean product and produce nitrate uneconomically for no other reason than because a small quantity of low-grade raw material existed in this country. Further

work was then abandoned on this nitrate enterprise.

So much for the domestic deposits, as determined after extensive exploration. On the subject of the production of synthetic nitrogen products, the editor of the *Saturday Evening Post*, in the issue of Oct. 21, says, "with our coal and water power there seems to be no reason why we should not develop self-sufficiency in nitrogenous fertilizers at a price comparable with the price of the imported natural material." To discuss such a statement in all its aspects would take too much space, but the futility of single-track reasoning is apparent when a broader conception of the problem forces a realization of the fact that the price paid by the consumer bears no relation whatsoever to the price at which Chilean nitrate could be sold if active competition were established. The nitrate industry is of more importance to Chile than is the export tax that brings so much to its treasury; if the hopes and anticipations of the editor of the *Post* be realized, as is probable, the prices of natural and synthetic products would not remain long comparable. Chile would begin to lop the export tax; and he would be an optimist who would predict the manufacture of artificial fertilizer of quality equivalent to the imported article at a price comparable to that at which Chilean nitrate could be sold to provide only a fair profit to the producers and no direct income to the government. This lopping process would constitute the initial step toward retaining control; subsequently or concurrently would come the cheapening of production consequent on the adoption of modern, large-scale methods—an inevitable step that will automatically increase the reserves of caliche in Chile and insure the re-treatment of valuable and extensive residue dumps.

The foregoing considerations will suffice to show that the body known as the Federated American Engineering Societies, which is to make an investigation into the question of the development of the Muscle Shoals project, will do well to realize that the subject must be considered from the economic as well as from the technical and financial standpoint; hence the need for expert counsel from those who are conversant with affairs in Chile and with the technology of nitrate production there. A sharp differentiation must be drawn between provision against war emergency in time of crisis and the purchase of nitrate for industrial purposes in time of peace. Any "red-herring" talk about cheap fertilizer should be scrutinized carefully, for cheapness is a comparative term that is often used to mislead. Mr. Ford's offer will doubtless be examined impartially; for many objectors, foreseeing that the industry may be operated economically and on a business basis, have emulated the attitude of certain banking interests last year, when the industrial wizard of Detroit went outside his recognized sphere of activity and showed that he needed no expert financial help.

It is humiliating and dangerous that the United States should be dependent on two foreign countries, Chile and Great Britain, for the supply of an essential in time of war; and adequate provision should be made to prevent a recurrence of such dependence by placing the synthetic nitrate plants in a condition to be able to meet all possible contingencies. At the same time it should be recognized that an attempt to compete with Chile on a commercial basis in peace time is likely to result in the raising of prices and to add yet another hazard to farming. Germany's re-entry into the market as a purchaser of Chilean nitrate is significant, and

the action should not be ignored, especially by those who fail to distinguish between national necessity in time of war and commercial sagacity in time of peace. The Chilean pampa offers unprecedented opportunities for American initiative and technical methods, for American capital and American equipment on a large scale. It seems probable that a process for the manufacture of synthetic fertilizer, even if technically perfect, will be economically successful only when the prospect of cheap nitrate from Chile can be discounted because of the exhaustion of the reserves of caliche. European interest in South America has waned since the war because of financial stringency. As with the development of Chilean copper mines, expansion in the nitrate industry on an adequate scale depends to a large extent on the United States.

Reversible Mine Fans

SHOULD mine-ventilating equipment be reversible or not? Recently the opinion has frequently been heard that the loss of life at the Argonaut mine could have been averted had the direction of the ventilating current been reversed, either by reversing or stopping the fan. Some are likely to jump to the conclusion, therefore, that a fan that can be reversed when desired is in general the proper machine to install. At the recent Cleveland convention of the American Mining Congress, however, ten of the twelve members of the committee on metal-mining ventilating equipment and practices concurred in the committee's annual report which states: "For general mine use, so-called 'reversible' fans are not recommended, as such installations are not considered safe for general practice." The installation of "reversible" fans in a mine in which they cannot be used to advantage constitutes a real danger, the committee holds, as at times of excitement some one may hastily give an order to reverse the air currents and endanger the lives of everyone in the mine. In defining "reversible" the report explains that additional doors are built in the fan housing and in the ducts leading to and from the fan, and that by opening these and closing others which are in use, the air currents in the mine are reversed without making any change in the operation of the fan.

Charles A. Mitke is chairman of this committee, and among the members are A. C. Stoddard, chief engineer of the Inspiration Consolidated Copper Co.; W. C. Browning, general manager of the Magma Copper Co.; W. A. Rowe, chief engineer of the American Blower Co.; C. E. Legrand, consulting mechanical engineer of the Phelps Dodge Corporation; and E. B. Williams, who is manager of the mine-fan department of the B. F. Sturtevant Co.

In its report of 1921, the committee recommended tentatively that "all fans should be reversible." It now feels, however, that decisions regarding the installation of "reversible" equipment must be based on local conditions, the various considerations carefully weighed, and great caution exercised before a so-called "reversible" fan is installed.

The two members who differed with the rest of the committee were A. S. Richardson, chief of the ventilating department of the Anaconda Copper Mining Co., and D. Harrington, supervising engineer of the U. S. Bureau of Mines. As is well known, the Anaconda company has definitely committed itself to the installation of reversible ventilating equipment. It has spent a large

sum on such equipment and probably feels sure of its ground.

It will doubtless seem to many a not impossible task to guard against the improper reversal of a mine fan by an unqualified person in a moment of panic. It is apparently on this point that the entire matter hinges. With reversible equipment accidents may occasionally happen, due to panic and resulting in loss of life. But so, also, lives may be lost through the impossibility of reversing a "non-reversible" fan, except after considerable time, necessary to make the change, has elapsed. The report of the committee should evoke interesting discussion.

Mexico's Geological Survey

IT IS WITH PECULIAR PLEASURE that we publish in this issue an interview by one of our correspondents in Mexico with Mr. Leopoldo Salinas, the Director of the Geological Survey of Mexico, and that we present at the same time photographs of the beautiful building which has been built for the Mexican Geological Survey—photographs showing both the harmony of the exterior building and the tasteful interior.

Several impressive reflections are suggested in addition to the interesting and concise information supplied by Mr. Salinas. First comes the comprehension of the vision of the Mexican Government in initiating and supporting an institution of pure and applied science, the beneficent effects of which should well repay the national investment. Surely a country that segregates out from its not too abundant revenues the appropriation for so considerable a staff of geologists gives thereby indications of taking the right road toward stability and progress.

Our last impression is an envious one. We envy Mexico her Geological Survey building. There it stands, the realization of the futile dream which American geologists so long have dreamed. Most able and devoted government geologists in Washington, chambered inconspicuously and compressively in certain aisles in the great and severe Interior Department Building in Washington, whom an earlier generation of politicians and statesmen rightly valued and respected, but a newer shirt-sleeves type classifies and treats as clerks—most able geologists, we repeat—look at these pictures and weep. The graft that is being joyously dispensed for bogus war mineral claims would have built a noble and monumental building for geology and mining, like this one, or as much grander as the mineral industries of the United States should require.

The Geological Survey of Mexico is doing good work, part of which is reflected in bulletins and monographs of general scientific value.

A Mining Engineer Ambassador

THE APPOINTMENT of Gaelasio Caetani as Italian Ambassador to the United States was a happy thought on the part of the new Italian Premier. The mining fraternity knows him as plain "Caetani," until the World War of the firm of Burch, Caetani & Hershey, of San Francisco. Burch was the mining engineer, Caetani the metallurgical engineer, Hershey the geologist of the "outfit." The newspapers advise his old colleagues that he is "Prince" Caetani, but we know that Italy will be represented in Washington not only by an Italian patriot but at the same time by a good American.

The Duties and Privileges of Technical Journalism*

BY T. A. RICKARD

THE duty comes before the privilege: the performance of the duty earns the bestowal of the privilege. The first duty of technical journalism is to be interesting; unless the technical journal is interesting it will not be read; unless it is read it is without a business basis; and without that it can not subsist.

Technical journalism stands on a foundation that is firm and clean; its basic purpose is to publish matter to be read by those that buy the things offered on the advertising pages. The advertiser himself may not read the journal in which he advertises, but he expects it to be read by those to whom he makes his appeal as a seller of supplies or as a manufacturer of machinery. The technical journal brings the buyer to the seller. For this service it is paid more by the seller—who is the advertiser—than by the buyer—who is the subscriber. The cost of publication is shared by both, but it falls chiefly on the advertiser. The subscription to a technical journal represents only about 30% of the mechanical cost—paper, printing, and postage—and only about 10% of the total cost of publication and distribution. Without the revenue derived from the advertising pages it would be unprofitable, and therefore impracticable, to print the reading pages. And if the reading pages are not read the advertising pages will be neglected—they will fail to fulfill their purpose. A scrutiny of the body of the journal leads to an examination of its advertisements. The habit of reading the journal causes the advertising pages to be used for purposes of business when the addresses of manufacturers and other information concerning them and their products are needed. That is the foundation of the business. The fact that a person subscribes to a technical journal is less important than the fact that he reads it, because until he reads it no communication is likely to ensue between him and the advertiser. If anyone desired to injure the publisher of a technical journal, and if money were no object, he could subscribe for a thousand copies and throw them into the sea. The publisher would lose twice as much as his enemy—as a matter of fact, he would decline to sell the thousand copies unless he knew the use that was to be made of them. A reader that does not subscribe is more valuable than a subscriber that does not read. Publishers frequently fool themselves and their clients by counting the number of subscribers, because that is the simplest method of ascertaining the extent of the service they are supposed to be performing, but it is obvious that the only effective unit is the man that reads the journal and is led thereby to transact business with those who advertise in it. One copy that is read by half a dozen persons of whom five are not subscribers may be many times more effective in accomplishing the desired purpose than six copies sent to six subscribers that lack the time or the inclination to read them.

The commercial basis has been defined and emphasized in order to indicate how it favors the independence of the editor of the technical journal. Those for whom

he writes do not advertise; those who advertise do not read; the financial support of the publication does not depend upon printing articles that are pleasing to the advertiser but on making the reading pages interesting to those whom the advertiser wishes to be interested, as a means of catching their eye when he has something to say about himself in his advertisement. I have known an advertiser to object to something said in the editorial columns; for example, a Republican manufacturer objected to my humorous criticism of Mr. Harding's speech of acceptance on his nomination to the presidency. In reply I told the manufacturer to "keep off the grass," that my duty was to interest—not necessarily to please—those to whom he desired to sell his products, and that so long as I wrote nothing offensive or improper it was not for him to object, because he had no status as a reader. A Republican merchant would not refuse to advertise in the New York 'Times' any more than a Democratic merchant would decline to avail himself of the publicity offered by the New York 'Tribune'. The merchant would select the newspaper that reached the clientele he desired to attract.

Occasionally an advertiser will ask the editor, or the publisher by whom the editor is employed, to publish some of the advertiser's own writing or an article prepared by his agent for the purpose of making complimentary references to his own products. When he does this he is undermining the foundation of the business in which he and the publisher have a common interest; he is lessening the value of the medium of publicity that he is using and thereby frustrating his own purpose—which is to be convincing to the clientele that the publisher and his editor share with him. The publication of such matter in false guise undermines the confidence of the reader and thereby checks his inclination to continue to read the publication, because the annoyance or disgust that the reader feels at finding a puff, or write-up, as it is called, masquerading as a technical article or as unbiased information will cause the discriminating reader—the very man whom the advertiser desires to reach—to throw the offending journal into the waste-paper basket. A write-up is a poor thing in any event; it is like the recommendation the office-boy brought from his mother—interesting to the family, but not convincing. Good faith is essential in this as in any other genuine business; the editor and the advertiser that conspire even tacitly to deceive the reader by indirection will forfeit his confidence—after which the chance of doing business is at an end.

Unless the technical journal is read it is futile; to be read it must be interesting; to be interesting it must be truthful. A man habitually truthful may seem interesting the first time he tells a lie, but the performance has only a morbid interest and will not bear repetition. A habitual liar is a mere nuisance. Some newspapers have the habit of stating things that are not true, but the public in its ignorance is not aware of the fact and continues to read these newspapers in the belief that what it reads is true. A technical paper, which deals chiefly with the application of science to industry and is read by intelligent men and women, must be

*An address delivered before the Canadian Institute of Mining and Metallurgy at Vancouver on Nov. 16, 1922.

scientific in its truthfulness. In science untruth is a crime.

Besides being truthful the technical journal must be informing. The statement of things that are true is not enough—they must be more than truisms. An element of novelty is needed, and of usefulness. Information that is new is useful. The readers of a technical journal expect to be kept informed concerning the progress of the art to which the journal is devoted—for example, mining. They have a right to expect not only news concerning the latest discoveries of ore in various districts, but also concerning the invention or application of new methods of mining the ore and of treating it metallurgically after it has been won from the crust of the earth. The duty of the technical journal is to meet that want, to gather the latest information on such matters and to purvey it in a style that is attractive. This means that the medium by which the information is transmitted—namely, the writing—must be clear and convincing. It must have a literary manner that will cause it to be read not only understandingly but with ease and pleasure. Therefore a technical journal must be well edited. To be well edited it requires the service of men that are not only good writers themselves and well informed on the subjects to be discussed in their journal, but they must know how to enlist the services of other good writers, and, above all, how to revise and correct the writings of the less skilful of their contributors so that their readers will have no trouble in understanding what is printed and therefore will enjoy what they read.

The hardest work that a conscientious editor does is the editing of the manuscript of others, and not many editors are willing to perform the drudgery involved in such correction and emendation. The lack of painstaking revision is a serious defect in the modern business of publishing. The Greek word for editor, *suntaktēs*, means 'he that assembles'; the English word means 'one who gives out'; the French, *redacteur*, means 'one who draws up or prepares'; it is derived from the Latin *redigo*, *redactus*, the primary meaning of which is 'to drive back'; but *redacteur*, the French word for editor, carries the secondary meaning of its root, namely, 'to get together', 'call in', or 'collect'. Thus the French *redacteur* is a synonym of the Greek *suntaktēs*—he that assembles the material of a newspaper, magazine, or book. To that definition I like to add the thought of collecting ideas as well as manuscripts, of bringing together people as well as printed pages. It is curious that none of these synonyms for 'editor' carry the meaning of revision, although the primary meaning of the verb 'to edit' is to prepare or supervise manuscript previous to publication. To edit manuscript is tedious; to write editorials is pleasant; I regret that one of the primary functions of an editor is usually held in abeyance, for to this neglect we owe the poor quality of so much that we read in books, magazines, and newspapers.

The editor is directly responsible for the policy and the contents of his publication; he not only assembles but peptonizes and assimilates the reading matter so as to render it mentally digestible to his readers; it is his duty to save them from headaches by revising and correcting the text of the articles he prints, and if he himself should suffer from an occasional headache, caused by the effort to edit the manuscript of others, it is all in the day's work. It is better that one man should have a headache than a thousand. Again, the

personal responsibility of the editor is such that he should not allow his editorial columns to be the echo of another's opinions, nor should those columns be used by anybody not on his staff. The practice, adopted by the American Institute of Mining and Metallurgical Engineers, of publishing signed editorials in its magazine written by gentlemen not on its staff is contrary to established practice and opposed to good policy. The editorial columns ought to have character; they should express the moral strength and the continuity of purpose that mark the individual rather than the group, for in the last resort the editor is a trustee for his readers; they look to him to protect them from deception; they expect him to keep a firm hand on the rudder that steers his craft amid the shallows of pretence and the cross-currents of competitive interests. Character can not be syndicated.

I have dwelt on the duties of technical journalism so as to strengthen my position when I venture to assert the corresponding privileges that accrue in consequence of a faithful performance of those duties. The first privilege is to have the support of the profession and the class to which the technical journal is addressed and in whose interest it functions. Technical journalism is a phase of class journalism—the journalism that is meant to hold the interest of a group of people possessed of similar tastes and engaged in similar activities. Those who constitute the clientele of a technical journal have many interests in common, but not all of their interests are technical or industrial; on the contrary, the readers are citizens to whom the welfare of the nation and the administration of its affairs are matters of immediate concern. The technical journal eschews politics in a narrow sense, for it is non-partisan, but it must not ignore the great issues of its day and generation. Such subjects it will discuss occasionally, perhaps less skilfully than the best of the great newspapers, but its discussions of such subjects will be more acceptable than the utterances of the daily press because they are written by one belonging to the class to which they are addressed and by one therefore sharing a point of view that is similar because it has behind it a similar background of education and experience—in short, sympathy. To establish this relation it is customary, and desirable, that the editor and his associates shall belong to the class to whom the publication is addressed, or, to put it in terms of business, the people whom the advertiser seeks to exploit. For example, the editors of the only successful mining journals have been recruited from the ranks of the mining engineering profession, not from the offices of the daily press. This tradition, I feel confident, will be maintained, because it is in harmony with the basic idea of class journalism, namely, the printing of writings prepared in sympathetic understanding of the point of view and the best interests of a given class. No journalist, however clever, can hold the attention of the class that is concerned with a particular department of social and industrial activity unless he understands the technique of the work done by that class and appreciates the purpose of the work—in short, a sympathetic understanding is essential to the maintenance of a mutually stimulating relationship.

After this explanation I revert confidently to my statement that, in return for the accomplishment of this and other duties, the technical journal is entitled to the privilege of cordial support from the profession and the class that it serves sincerely. In life generally

we accept a service with the intention of being reciprocal; we recognize the force of obligation. Therefore the independent technical press, which strives honestly to perform its proper functions in behalf of the profession of mining engineers, metallurgists, and geologists, and in behalf of those engaged in the operation of mines and metallurgical plants, should be immune from attack by means of publications issued by professional organizations of its clients, more particularly such organizations as are formed primarily for social and fraternal purposes. To be specific: the independent technical press in Canada and the United States is entitled, so long as it performs its duties efficiently and honorably, to be immune from commercial competition on the part of publications issued by the Mining Institutes in the two countries. I speak as a mining engineer and an editor, as one familiar with the purposes and the performances of the technical journals and of the technical societies. The time has come for a frank facing of facts, for a just appreciation of a condition that threatens to develop acute animosity between two agencies both of which have done good service for the mining industry and both of which depend upon the support of the same class—the class represented so well by the audience that I am now addressing.

I shall be frank, as a man is frank with his friends. The independent technical press has dwindled in number recently. A paper more than 60 years old has gone out of business partly in consequence of the invasion of its field by the subsidised journalism of a social organization; to be specific, the 'Mining and Scientific Press', founded in 1860, ceased publication in 1922 because, among other reasons, the American Institute of Mining and Metallurgical Engineers has chosen to engage in the publishing of a periodical magazine meant to cover the same field. Again, the 'Canadian Mining Journal' has been reduced to a mere simulacrum of itself by reason of the commercial competition established successfully by the monthly magazine issued by the Canadian Institute. These are facts, not distempered suppositions. Whither are we drifting? I think I know. You—the mining profession—are killing independent technical journalism for the sake—or with the result—of substituting something altogether different; you are developing a subsidised technical press controlled by a coterie. It does not sound attractive, but the sound of it is a faithful expression of its real character. I have had a good deal of experience in these matters. Permit me to refer to my personal experience in so far as it throws light on the subject. Twenty years ago when I was editor of the 'Engineering and Mining Journal' I had an opportunity of steering the ownership of that journal into the hands of the mining profession. For a time the control was exercised by a committee of mining engineers. I was able to test the idea of running a technical paper by a directorate of engineers. It looks attractive, but the attractiveness is an illusion, for a simple reason: it is human to use power in one's own behalf; it is natural for a group of engineers when in control of a paper to use the paper for their own purposes, not necessarily in a nefarious or illegal manner, but for personal advantage. The members of a directorate in control of a technical paper will wish certain subjects to be discussed in a certain way; they will object to the adverse criticism of operations in which any one of them is engaged; they will look for favorable com-

ment on activities in which they are participating—in brief, they are intensely human. It is essential that those in control—editors, directors, publishers—shall be detached from the affairs on which unbiased comment and criticism are to be made in a technical journal. That essential is lacking under the conditions that obtain when a group of engineers—however honorable in character—controls a mining publication. I need not tell you that whether you have twelve or twenty-four directors of an Institute, the actual working control is exercised by four or five men, the men that are near headquarters and are able regularly to attend the meetings of the directorate. The technical journal that is independent, and that therefore can perform its duties properly, is tied to nobody engaged in mining; its publishers and editors take no part in mining operations; it is free to perform its function fearlessly. The issue must be faced: is the mining profession and the mining public to be served by an independent press or by subsidised organs? As one familiar with the conditions, and speaking with complete sincerity, I venture to say that if the mining profession and the mining public, both of which are included in the membership of the Institutes, must choose between the two, it will be wise in choosing to retain an independent technical journalism—the technical journals that did much to promote and develop the organizations that are now engaged in an unfair competition against them. I appeal to your sense of fair play. There is scope for both; there is room for the useful activities of both the technical journal and the technical society. *Ne sutor supra crepidam*; if each performs the work for which it was intended, and for which it is fitted, it will contribute best toward the development of the industry and the welfare of those engaged in that industry. It is a pleasure to me to submit the issue to you, because I know many of you sufficiently well to feel confident that you will weigh the matter in a spirit of justice and for the best interests of the parties to the controversy. You will agree with me that in a democracy, such as yours and ours, the first aid to good government—to a peaceful and orderly dispensation—is the creation and maintenance of an intelligent public opinion. Without such support the government of a country is feeble and the administration of its laws ineffectual. For the guidance of public opinion it is necessary to have an independent press, both lay and technical, in a position to speak fearlessly on all important matters. The fact that journals and newspapers of the independent type have decreased in number during recent years on account of the intensive commercialization of such enterprises is all the more reason why you as engineers and operators engaged in mining should take pains not to kill the only kind of journalism that is worthy of your support. Subsidised journalism belongs to the category of a broker's circular. As a musical instrument it ranks with the mouth-organ.

The magazine of the American Institute is the expression chiefly of a desire to maintain a medium of publicity on the part of a small group in New York. To a less degree it is the consequence of an effort to enlarge the bureaucratic activities of the Institute's headquarters in the hope of commercial gain. Thus the magazine is partly the mouthpiece of a clique, partly the outcome of that desire for bigness which is the curse of our day. I hope the Canadian Institute will not follow a bad example. I beg to remind you that the mining

engineering societies were founded, developed, and sustained by the technical press, which is now the victim of their unfair tactics. The American Institute of Mining Engineers was the child of the editors of the Engineering and Mining Journal, and an editor of that paper—Rossiter W. Raymond—became its presiding genius. The two organizations worked together loyally at a time when the Institute most needed that loyal support. Now, in the mistaken notion that its finances can be strengthened by an incursion into the field of commercial journalism, the Institute has committed itself to the publication of a magazine that half of its members consign to the waste-paper basket as soon as it arrives. A metallurgist of high rank volunteers the statement: "As a magazine it is not worth anything". However, that is a matter of opinion. Mine is not in conflict with his. Besides its magazine, the Institute publishes excessively voluminous Transactions, badly edited and needlessly bulky; it fails to realize that most of its financial troubles arise from mere bigness, from recruiting a nondescript membership and from printing a redundancy of half-baked stuff, including a brochure for a small coterie at headquarters, instead of attending to its major functions, which are to promote the solidarity of the profession and to stimulate a discussion of technical matters at the meetings of its members. The fact is overlooked by many that the informal conversations that take place when men foregather are worth much more than the matter that gets into print. The printed discussions are vitiated by matter a large part of which is suspect because it comes from prejudiced sources, notably the agents of manufacturers. Why they should be members of the Institute, I fail to see. They are not mining engineers, metallurgists, or geologists; they may have been; they are functioning now as sales agents. I return to my point: that the most valuable function of an Institute is to promote professional solidarity, to facilitate acquaintance, to give opportunities for the personal exchange of ideas and experience, and to stimulate the observance of a high code of professional conduct. How can this last be done when the American Institute itself is careless of its honor? Its advertising agents go about asserting that it has over 10,000 subscribers for its magazine, when it has no subscribers.

The members do not subscribe for the magazine; it is wished on them. A subscription price, of, let us say, \$3 per annum, would demonstrate the difference between a 'subscriber' and a 'member' in an unmistakable manner. The mere allocation of a part of a member's dues as a contribution to the cost of the magazine may circumvent the regulations of the Post-Office department, but it does not constitute a paid subscription on the part of a member. Indeed the placing of a subscription price on the magazine would be a proper procedure; it would relieve those who do not want the magazine, and it would place that periodical publication on a more nearly fair basis of competition with the technical press—but only a "more nearly fair basis," because another dishonorable method of solicitation would survive. I allude to the fact that the advertising agents of the Institute when soliciting business from a manufacturer use the names of directors that are at the head of the big mining and smelting companies, suggesting that these prominent members of the Institute will be pleased to see the manufacturer's advertisement in the Institute magazine. This is a natural consequence of the kind of business that the

Institute is doing; it is not anything for which any individual director can be held responsible, it is the inevitable result of a vicious system. A professional society has gone into business in competition with its own members. Why should not the Institute start an ore-testing laboratory or an assay-office? These are as much within its proper scope as is commercial journalism. Your sympathies would go out to the ore-testing metallurgist and to the assayer; mine go to the publisher of the technical journal and to his editorial staff. It makes all the difference whose ox is gored. As Kipling said:

"The toad beneath the harrow knows
Each quivering tooth-point where it goes;
The butterfly beside the road
Preaches contentment to that toad."

Several of these butterflies, residing in New York, have preached contentment to me, but in vain; I see a glaring injustice and a wrong practice, and I assail it *con molto gusto*. It is my confident belief that there are many who will say, as a friend of mine said recently to the president of the American Institute: "Anything that hurts my technical paper, hurts me". The Institute has no greater claim to the loyalty of the profession than the 'Engineering and Mining Journal-Press'. Membership in the Institute means no more than subscriptionship in the 'Journal-Press'. The idea that membership in the Institute connotes professional standing provokes a smile among the well informed; which of you would consider proof of membership as a reason for employing a man to run your mine or to value a mine that you were thinking of buying? You would base your appraisal of the man's fitness on evidence of his character and experience; when selecting an engineer for your own technical operations you would accept the suffix of A.I.M. & M.E. as of no more practical significance than the iridescent tail of F.R.G.S. or R.S.V.P. or even P.D.Q. The letters A.I.M. & M.E. you would accept merely as evidence of an interest in mining affairs, and in so far as it indicated such interest you would rate it as equivalent to a statement that the applicant for the appointment or job was a constant reader of the 'Journal-Press' or the 'Canadian Mining Journal'.

It is my aim to remedy what seems to me a scandalous state of affairs. To that end I made the suggestion of putting a subscription price on the Institute magazine. Permit me to make another suggestion—applicable also as between your Institute and the 'Canadian Mining Journal': As there is now only one technical mining paper in the United States, why should it not set aside two or four pages gratuitously in each issue for the use of the secretary of the Institute, for recording notices of forthcoming meetings, the names of candidates to membership, and other items of news such as need to be given periodically to the members of the Institute? This suggestion I make without any authority, simply on my own initiative. It appears to me to be one way out of an intolerable position, and a step advantageous to both parties. A similar arrangement could be made with other mining papers, if their publishers desired to do so. The publication of Institute news and notices in any technical journal would have to be gratuitous, because such matters would appear in the reading pages. No reading space is purchasable, no advertising space is gratuitous, according to the code of clean journalism.

I shall conclude in a less controversial temper. The duty and the privilege of journalism is criticism, constructive for what is good and destructive of what is bad. Literature is a criticism of life; class journalism is a criticism of the life of a particular class, meaning thereby not a stratum of society but a group of people engaged in similar pursuits. The idea of restricting technical journalism to technology is out of date; it has been rejected, among other reasons, because it provides no basis for an honorable subsistence—a purely technological publication would not pay its way and therefore could not be independent. Dependence is the bugbear of honest journalism. Moreover, man does not live on bread alone, least of all can he sustain his mental life on the dry gravel of technical data; he asks for something more palatable, something more nutritious. He expects from his class journal not only information but stimulus, not only statistics but philosophy—the philosophy of the life that he shares with others of his class, and with the editor. The mining engineer notably has awakened in recent years to the larger life of the community; the Great War drew him into the service of the nation, and with him went many of his comrades, the mining men. At the present time there is a call for engineers to participate in civic affairs; the engineer has learned that he is a citizen as well as a technician, and that it is his prerogative to take part in the business of government, local or national as may be. During the War everybody—everybody with brains—learned to think on subjects beyond his former mental horizon, because the focal length of his vision was extended by the impulse of great and stirring events.

The War was a brutal teacher, but it drove us from our harbor moorings into the open sea of tempestuous action and taught us forcibly the elements of political geography, international commerce, and human relationships in their worldwide aspect; in consequence, the technical press as spokesman for its class felt called upon to discuss non-technical matters, recognizing that the problems of a great crisis in civilization were more pressing, for example, than the petty details of mining and metallurgy. This broadening of the scope of technical journalism, in response to the stimulus of a heroic period, was, unconsciously perhaps, in accord with its underlying commercial purpose of making itself interesting to a class. During the critical years of the War the journalism of the trade and of the profession came to a realization of its essential purpose and its true destiny: to minister to the thought of a class—and in that realization it awoke to a larger aim and a finer achievement. The readers to whom the technical press makes its periodical appeal are not mere specialists in technique and industry, they are men responsive to the tides of human thought and citizens responsible for playing their part in the affairs of a commonwealth. On every side we see a demand for information on the complex questions underlying that art of living which we call civilization; the frontiers of human thought have been shifted; no intelligent man is content today to think of himself as a shipwrecked mariner or of his community as an island in terrestrial space. Even the lonely prospector in the hills feels a larger kinship because he reads his mining paper, and through it he feels the pulse of the world and the vibrations of human endeavor far beyond his physical horizon. The development of democracy, or, more truly, the growth of democratic feeling between men, tends to remove the

artificial stratifications of society; it stimulates the solidarity that is founded on similarities of work and aim. The democratic idea may promote international rather than national sympathies, but I am one of those who believe that true internationalism must start from sincere nationalism and that much of the internationalism of today is anti-social in its effect, if not its purpose, and that it still remains true that the best cosmopolitan is the man who loves his own country best. This love of country, if accompanied by respect for other countries, and if joined to such solidarity of a trade or a profession as induces sympathy with those engaged in like trades or professions in other countries, will go far in improving human relationships and in holding civilization from the suicidal madness of another great war.

The community of ideas and feelings that is connoted by class journalism is not of a narrow kind; it does not shrivel the broader generousities; on the contrary, it disregards the narrow barriers of caste and the invisible boundaries of international frontiers. We mining men are anything but parochial; we take the whole earth for our field of activity—and not only its sunlit surface but the dark places underneath—we deal with all sorts and conditions of men, we are a people of catholic tastes and manifold aptitudes. Nothing human is alien to us. Therefore we expect our technical journalism to grow continually to a larger conception of its duties and a wider realization of its functions, and, in return, its supporters, you and others of your fraternity, will be willing, I believe, to accord to it the privileges to which it is entitled, the chief of which, Gentlemen, is fair play.

Winter Work in Portland Canal District of British Columbia

It is expected that work will proceed on twelve or thirteen properties in the Portland Canal district of British Columbia this winter. Nine of these are on the Salmon River, four of which, the B. C. Silver, Indian, Big Missouri, and the Premier, are on the British Columbia side, and the other five of which—the Fish Creek property, operated by the American Mining & Milling Co.; the Titan, the Riverside, the Daly Alaska, and the Alaska Premier—are on the Alaskan side of the boundary. There are six active properties on the Bear River: the Prince John, the Dunwell, the Sunshine, the Mimico, the Mobile, and the Silver Bell. The Idaho, on the Marmot River, also is being worked. Two of those mentioned, and, in addition, the Outsider, the latter being situated on the canal, have been taken over by the Granby Consolidated Mining, Smelting & Power Co. The same company has acquired the George group, on the Bear River, which it is planned to develop extensively.

On most of the properties mentioned, with the exception of the Premier, where about 225 men are employed, the crew numbers about ten men on the average. The American Mining & Milling Co., on Fish Creek, has a larger force engaged, and is looking forward to making regular shipments of high-grade ore over the snow. The activity of the Granby company in the Bear River section has given rise to speculation as to the possibility of opening up the Portland Canal Ry. If a sufficient tonnage of ore were assured to warrant the operation of the railroad, rapid development of many promising prospects would result.

DISCUSSION

Oxidation of Ferrous Salts by Atomized Air in Acid Solution Thought Practicable

THE EDITOR:

Sir—I was interested in Percy R. Middleton's article in your issue of Sept. 9, 1922, as also in the comments by Messrs. Roberts, Tilley, and Ralston, in your issue of Oct. 21.

Roberts, Tilley, and Ralston seem to question Middleton's ability to oxidize ferrous salts to ferric salts in an acid or neutral solution, by injecting the air through a porous membrane. With finely subdivided or atomized air, in a hot solution, and working under pressure, I should think there would be an excellent chance of accomplishing such an oxidation. Copper sulphate, for

ing the gas and liquid under pressure, at least momentarily. This, then, should give considerably better results than the ordinary way of applying the gas.

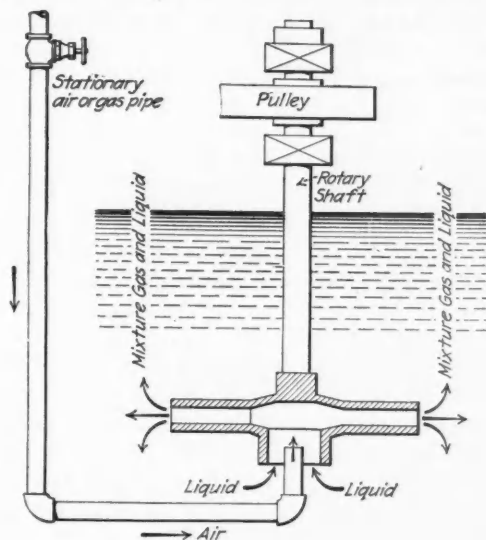
Careful comparative tests between this way of applying the air, and as applied in a Pachuca tank, in the oxidation of ferrous salts, show that the reaction is about four times as rapid.

This would also be indicated by the Cananea tests referred to, for, quoting W. L. Austin's account of those tests: "In order to enhance the efficiency of the oxidizer, perforated disks were submerged in the solution, and heated air from the compressor was forced in at the bottom. The improved oxidizer gave much better results."

The degree of atomization of the air obtainable either by the apparatus above referred to, or with a porous membrane, is incomparably greater than that obtainable with stationary perforated plates.

If, therefore, the rate of oxidation could be increased at least four times that shown by the Cananea tests, it would seem quite possible to bring it within the range of practical application. WILLIAM E. GREENAWALT.

Denver, Colo.



Method of applying gases to liquids

example, is practically unaffected by either sulphur dioxide or carbon monoxide under ordinary conditions, but under heat and pressure the reducing action becomes so intense that the copper in both cases is precipitated as the elemental metal. An oxidizing action should be much the same.

For some years I have used an apparatus for applying gases to liquids: for oxidation, for reduction, and for flotation, as shown in the accompanying sketch. A hollow centrifugal with an opening at its lower extremity and with outwardly arranged discharge passages is journaled in a tank containing the liquid. Air or gas may be introduced into the centrifugal in regulable amounts through a stationary pipe having its outlet in the interior of the centrifugal. When the apparatus is in operation, by regulating the amount of air any desired mixture of air and liquid may be ejected in a finely divided or atomized condition into the surrounding liquid in the tank. The impingement of the gas on the liquid is, of course, much the same as hav-

Prospectors

THE EDITOR:

Sir—Father Time, with relentless justice, has a way of upsetting most of the careless affirmations and hasty generalizations which have misled many people as to many things; yet it is not always wise to remain silent and to leave the whole job to Father Time.

Of late, quite a number of quasi-mining men have undertaken to convince the public that the day of the prospector is gone, and that he is no longer useful or necessary; and that the so-called grass-root mines have all been discovered throughout North America. One of those active individuals, referred to by Mr. Hoffman in his recent letter in the *Journal-Press*, has endeavored to impress a Congressional committee with the idea that our territory has been scraped for possible mines with a fine comb, as it were, and that no further important mines need be sought therein. This latter constitutes a rather unfortunate occurrence, being in itself utterly without basis in fact, and tends to further entangle an innocent and confiding Congress in a labyrinth of misconception which is already of somewhat notable magnitude.

The "fine-combing" of the mineral regions of the United States, by field engineers of the big mining corporations, has been purely perfunctory except as regards particular objectives, since nothing short of an army of experts and a century of time could accomplish the operation suggested. These particular objectives are limited to all the great mines and prospectively great mines, together with more or less limited areas whose geological conditions indicate the possibility of other great mines. Field engineers usually have their time fully occupied in thoroughly examining

the one or two mines of a district which have drawn them thither, and rarely give more than a cursory glance at other local ore deposits; yet the fact that they have spent some time in the heart of any certain district establishes a more or less unwarranted impression that they have seen it all.

To the end that the negative operations of the big companies in any certain district may not be considered as terminating its possibilities of success, it may be called to mind that the big companies make mistakes as do the small ones; further: if they happen to "turn down" any particular mining property, it by no means deprives the property of value, since it is likely that the interest of the big company in that particular property is dependent upon the existence of certain particular conditions, which will fit into the company's immediate requirements; and it is nothing short of axiomatic that no company, however big, could possibly buy all of the properties which are offered to it and which it examines.

Admitting the fact that each new mining discovery diminishes the possible number of mines yet to be found, one finds in this nothing less than a most impressive reason for an increased number of prospectors. In the valuable article above referred to ("Room for Prospectors in Ontario," by R. D. Hoffman, Gowganda, Ont., *Engineering and Mining Journal-Press*, Oct. 14, 1922, p. 665), Mr. Hoffman very definitely and truly states a distinct fact when he says, "There is but one way to locate new mines, and that only by hard work in the field"; and to this we might add the immediate corollary, "and the prospector is the only one capable of doing that hard work in the field." It is true that, in general, his knowledge of geology and mineralogy may be small, and it may take him a year to establish conditions which would be immediately patent to an expert; but he has patience, optimism, and time at his disposal.

Neither court geologists or geologists of the garden variety, nor mining engineers (self-designated or actual), nor mining "experts" of any kind, nor mine superintendents or foremen, are either fitted or apt to undertake the ill-paid, ill-fed lifetime of relentless toil which sums the existence of many prospectors; and the fine persistence alone of these prospectors, which is not staggered by hardships which would quickly tire the expert, has located all of the great mines and most of the small ones. Quite as true is it, also, that the personal experience of no single one of our geologists, mining engineers, or mining agents (expert though he may be in one or two technical lines) fits him to pass judgment upon the vast territory which he has never actually examined, except, perhaps, from a car window or by hearsay. Let it be noted, furthermore, that, if not every day, at least every year, valuable mines are now discovered along old trails over which thousands of travelers have blindly passed for many years. How exceedingly probable is it, then, that the countless more remote and inaccessible areas will be one day found rich in minerals, as a result of careful examination?

Mr. Hoffman suggests the increasing mineralogical knowledge of the prospector, and also his knowledge of certain salient geological conditions favorable to ore deposits; and he is not only right for Ontario but for the prospector in the United States. He is also supremely right in his concept of the vast mineral wealth of unexplored Canada.

One may inadvertently grin at, while he sympathizes with, the ordinary, typical prospector, in consideration of his meager general equipment, his patient negotiation of limited life-comforts, and existence in more or less pathless and waterless wilds, all nobly set off by his almost invariable optimism; and one may even feel disposed to encourage him in some of his favored enterprises, though to the town dweller they may seem hopeless. Yet today one need not be surprised if any one of these old boys should evidence a knowledge of the appearance and habit of valuable minerals which, a few years ago, were practically unknown.

It may be that there are fewer prospectors in the field now than formerly. If so, it is by no means due to the fact that his function in the mining world has become less, but it is much more likely to be due to the fact that recent years have seen the seeming death of mining affairs in general; where failing or extinct metal prices, exorbitant freight and smelter rates have so deeply impoverished the mining fraternity, as well as many lines of business more or less directly connected with and dependent upon mining, that even the small stipend necessary to "grub stake" the prospector cannot easily be found.

Unless we are inclined to believe in the hopeless twaddle of the exhaustion of our mineral riches, and are also inclined to discredit Ruskin's valuation of "the recognition of human worth," the most elementary good sense would prompt us to encourage the prospector.

Chloride, Ariz.

F. C. SMITH.

Fire Prevention in the Sunday Lake Mine

THE EDITOR:

Sir—In reference to correspondence which has been appearing regarding the Argonaut mine disaster, a device which was in use at the Sunday Lake and Mikado mines, on the Gogebic Range, for a number of years, is easily applied in any shaft containing a water discharge column from the underground pumps.

A brief description of the installation at the Sunday Lake mine may be of interest. The Sunday Lake shaft is inclined, the upper 300 ft. being at an angle of approximately 60 deg., and the lower 1,200 ft. being at an angle of about 71 deg. The shaft was formerly timbered throughout and in its upper sections was quite dry. A simple system of fire protection was installed, consisting of a series of Jenkins stop cocks connected to nozzles pointing toward the hanging wall at intervals of approximately 50 ft. These valves were connected to the water column by a light wire rope, which passed over idler pulleys to two levers which were installed at the shaft collar. There were two ropes, one to each of the levers, the upper section of the shaft being on one rope and the lower being on the other. The ropes were provided with counterweights at their bottom ends, so arranged that the valves, when opened, would be self-closing upon the release of the levers. In case of fire all that it was necessary to do was to pull one or both levers at the top of the shaft, and at once the entire shaft or the section desired would be flooded from top to bottom with a high-pressure flood of water. The nozzles were directed into the hanging of the shaft, and the interval between the nozzles was so spaced that the entire shaft would be wet down.

Instructions were given that in case of fire the pumps, which were steam driven, should be left running. As long as the water column was kept filled, the shaft would be flooded. The mine averaged about 300 gal.

per minute, the sumps were of generous size, and the pumps had a capacity of approximately 1,000 gal. per minute. The result was that a heavy flow of water could be maintained in the shaft for a period of time sufficient to drown out almost any blaze imaginable. I happened to be in the shaft at one time when this device was tested and can personally testify that it was the wettest five minutes of a lifetime.

For mines which pump a sufficient amount of water through a discharge column in a shaft, this system is inexpensive and easily installed.

If a mine does not make a large flow of water, and the pumps are of small capacity, the system could easily be supplemented by a storage tank in the discharge end of the water column, which would provide a reserve to operate the system. For shafts carrying steam lines, which are likely to run to very high temperatures, it would seem that there would be difficulty in applying the fusible plug type of automatic sprinkler. If the device described had been available in the Argonaut, the shift boss could have pulled a lever when he made his trip to the top of the shaft, and the probabilities would seem good that the fire would have been extinguished, or so deadened that the men could have been hoisted safely. I have not seen any statement as to whether there was a discharge column in the Argonaut shaft, without which, of course, the system would not be possible.

This device was worked out and installed under the direction of W. J. Davies, superintendent, and was regularly operated for sprinkling purposes at both the Sunday Lake and Mikado mines. No fires occurred to test its efficiency, but to one who has seen it in operation it seems impossible that any fire could long withstand the force and volume of water flow obtainable in this way.

STEPHEN ROYCE.

Crystal Falls, Mich.

Wet and Dry Grinding in Conical Mills

THE EDITOR:

Sir—W. H. Landers, in his discussion under the subject of "Recent Developments in Feldspar Dressing" in your Oct. 21 issue, says that there is a vast difference between wet grinding and dry grinding in the capacity per horsepower. Under the operating conditions which he had at the plant of the Clinchfield Products Corporation, his statement is in line with our observations.

The point I would like to bring out here is that ordinarily with conical mills of the new design—namely, where means are provided to allow free entrance and discharge of the material—no such variation exists. As a matter of fact, I have found the capacities for wet grinding in any mill to be only 15 to 25 per cent greater than dry. As for repairs or maintenance, I have found that in dry grinding the pebble and lining consumption is much less than when grinding wet.

Taking an average of grinding wet and dry in the conical pebble mill, I have found that the life of the siliceous lining in a conical mill when grinding wet averages from six months to a year, and when grinding dry between two and five years. Many linings have been in constant operation for as long as eight years. As for the pebble consumption, when grinding wet this averages about 3 to 5 lb. per ton, and when grinding dry 1 to 2 lb. per ton, when grinding with Danish flint pebbles.

I agree with Mr. Landers that the dust loss is high, and particularly in a feldspar mill it is advantageous

to keep the dust as low as possible, as it is injurious to the workmen. The only dust that occurs in wet grinding is in the coarse-crushing department.

As far as the character of the product is concerned, it is difficult for me to make any statement, for I have mills grinding both wet and dry on the same material, and as far as I can see there has been no appreciable difference in the product as long as the other conditions are constant. But the moment any other condition is changed, both the physical characteristics and screen analyses of the product change.

Undoubtedly, wet grinding of feldspar will become more and more popular, especially where companies can make the large initial outlay required for wet grinding, for the net operating cost over extended periods may be less.

H. HARDINGE.

New York.

Honesty and Oil Shale

THE EDITOR:

Sir—I have just finished reading Mr. Hoskin's able paper on "What's Wrong With the American Oil-Shale Industry?" and I want to congratulate you both on its publication. It is a concise, logical, straightforward discussion of what is wrong, and I think that anyone who really has the future of the oil-shale industry in this country at heart, and who has a reasonable knowledge of the facts, will indorse most heartily what Mr. Hoskin has to say.

There cannot be the slightest doubt as to the future of the oil-shale industry, but certainly the issue has become considerably beclouded by the plague of "experts," so called, that have sprung up. All that these men care for is to get "theirs" and to get it quick, and, as usual, the public suffers. My only hope is that they will get "theirs" in another sense and get it plenty.

I sincerely wish that all of us who are really trying to further the industry might be able to get together. If we could do this it would not be long before the recognition that is warranted by the unlimited possibilities of oil shale was received.

C. S. CROUSE.

Lexington, Ky.

Survey's Mineral Resource Report

THE EDITOR:

Sir—In your issue of Nov. 4, 1922, on page 819, you call attention to the U. S. Geological Survey's publication, "Mineral Resources of the United States," 1919, Part I. I am very sorry that I am obliged to ask you to correct the statement, if possible, that this publication is obtainable on request. Funds allowed the Geological Survey for printing have been so curtailed that it has been necessary to reduce the number of volumes printed and available for free distribution by the Survey. The Survey can undertake to supply only members of the mineral industry who co-operate in the statistical work of the Survey, and certain libraries, educational institutions, and others whose work is contributory to literature on mineral industries. The Superintendent of Documents, Washington, D. C., has a limited number of 1919 volumes and will also have some 1920 volumes which can be purchased from him at \$1 a volume.

The Geological Survey will continue to distribute, without restriction, the separate chapters of Mineral Resources until the supply of them is exhausted.

Washington, D. C.

PHILIP S. SMITH.
Acting Director.

Mining Engineers of Note

H. LIPSON HANCOCK

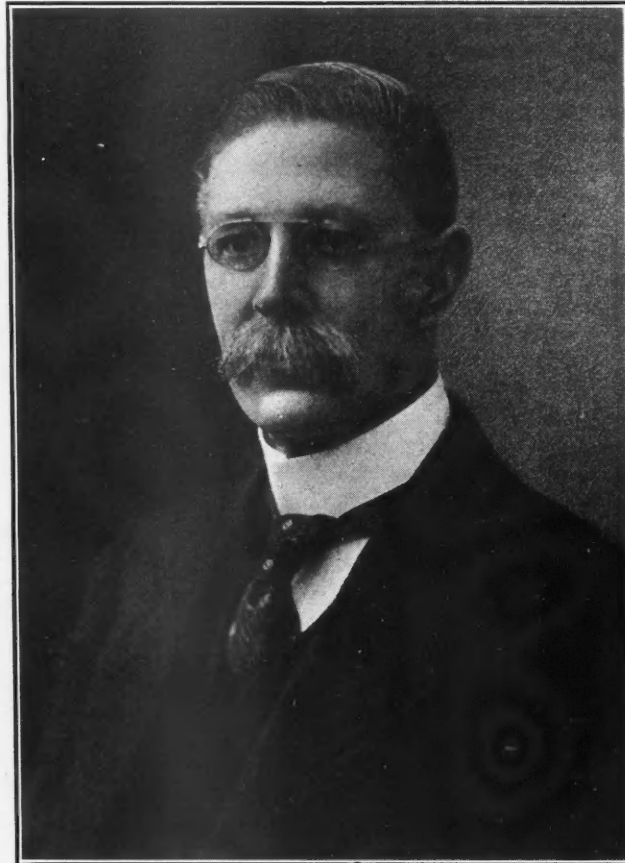
THE retirement of H. Lipson Hancock from the post of general manager of the Wallaroo & Moonta Mining & Smelting Co., Ltd., in South Australia, on July 31, was made the occasion for a fitting tribute paid to him at the last meeting of the board. The directors passed a resolution thanking him for his consistent and whole-hearted attention to the company's welfare and for the capable manner in which he had regulated and carried out the duties pertaining to his responsible trust. The chairman stated that Mr. Hancock had filled his position since 1903 with marked ability and success. Mr. Hancock has been associated with Australian mining from birth; in fact had a prenatal influence in that direction, for his father, Captain Henry Richard Hancock, was superintendent of the Moonta Mines for thirty-four years, and, concurrently, of the Wallaroo Mines for twenty-two years. Mr. Hancock was born at Moonta Mines, on March 5, 1867. He was educated at Prince Alfred College and at the Ballarat School of Mines. He took numerous mining degrees, and in 1888 became engineer

and surveyor of the Wallaroo & Moonta Mines. He was appointed assistant manager in 1893, manager in 1897, and general manager in 1903. American metallurgists will be interested to know that Mr. Hancock and his father invented the Hancock jig, and that the city of Hancock, Mich., therefore, should have no credit whatever for that achievement. They claim to have been the first to concentrate Broken Hill sulphide ores successfully. In 1908, Mr. Hancock went to America and Europe on company business and visited many important mining centers to learn the latest and most approved practice. Again, in the latter part of 1919, he visited the United States for the purpose of investigating the merits of pulverized fuel as applied to smelting and for steam raising, and was a welcome visitor at the *Engineering and Mining Journal* office at that time. As a result of his trip, a coal-pulverizing plant and large reverberatory furnace are now being erected at Wallaroo, which will take the place of the blast furnace. It is understood that an extensive use

of this method of combustion will soon be adopted in connection with the company's operations, which promises a considerable reduction in production costs. Mr. Hancock was given an honorary commission by the South Australian Government to enquire into

educational matters while in the United States, and the report submitted by him on his return was most favorably commented upon by the various Adelaide journals. Mr. Hancock is an enthusiast in Sunday-school work, and established a grade school on novel and highly effective lines in connection with the Methodist church at Moonta Mines. This institution has been inspected and approved by visitors from all parts of the world, and it has been the model upon which many churches throughout the commonwealth have reorganized the equipment of their Sunday schools to bring them up to the standard of efficiency. Mr. Hancock controlled the destinies of the famous peninsula mines through their many vicissitudes—a wonderful achievement—and the conquests of difficulties that he made are indicative of his dominating

will power and genius for mastering details. Sometimes personal success is defined as sheer luck, but this has not been so of Hancock the elder or his brilliant son, for they both made good and won through by grit and endurance. Mr. Hancock's serenity of mind and equanimity of temperament have not been disturbed by failure or success, and during his term of twenty-four years as manager of the company's affairs he always proved himself most human, and displayed a geniality that was spontaneous. Nothing was ever too much for him to do to improve the condition of the company's employees, and among his many activities he directed his efforts in the establishment of tree plantations and a general improvement of the mineral leases, which made the living conditions of the miners more congenial and healthful. The approaches to the peninsula mining towns, with their avenues of trees and parks, which formerly were waste spaces, will be a lasting monument to Mr. Hancock's untiring zeal and energy.



H. LIPSON HANCOCK

Metal-Mine Fires*

A Résumé of Precautions That Should Be Taken to Minimize Fire Risks in Mines and the Selection of Equipment and Training of Employees to Fight Underground Conflagrations

BY D. HARRINGTON†, B. O. PICKARD‡, AND
H. M. WOLFLIN§

ALTHOUGH it is true that metal-mine fires are not of frequent occurrence, they undoubtedly result in greater loss of life and of property than any other extraordinary occurrences in metal mines, such as floods, cave-ins, or magazine explosions. Because many mine fires cause no loss of life, the general public—even the general mining public—rarely hears of them, although the property loss may be hundreds of thousands of dollars. Metal-mining companies ordinarily feel that fires are likely to occur only in coal mines, because coal is combustible, yet even in coal mines the original igniting material generally is timber, and metal mines ordinarily use much more timber than do coal mines. Fires are more likely to occur in critical places in metal mines, such as heavily timbered shafts or stations, than in coal mines.

A tabulation of metal-mine fires in the United States compiled from all sources available to us follows. Many fires which have not occasioned loss of life have gone unrecorded:

Causes	Number of Fires	Number of Men Killed Underground
Candles in connection with timber	30	108
Carbide lamp against timber	3	0
Providing heat for various purposes (warming oil or explosives) (a)	10	21
Spontaneous combustion (b)	15	5
Surface structures asphyxiating underground men or damaging underground workings (c)	11	57
Electrical equipment (d)	8	191
Incendiary	2	13
Revival of old fires	3	3
Explosives (e)	4	5
Unknown (f)	28	130
Total (g)	114	533

(a) Includes fires started by oil lanterns, warming stoves, and fires used to thaw pipes.

(b) Includes spontaneous fires from storing ashes and manure underground, fringing of carbonaceous and pyritiferous shales, and other causes.

(c) Includes fires started in surface structures by lightning, stoves, defective wires, smoking, and other dangerous conditions.

(d) Includes North Butte fire started by contact of open flame of miner's lamp against exposed insulation of 1,200 ft. of lead armored cable, which had fallen down a shaft, no current having passed through the cable.

(e) Includes only instances where fire started in connection with explosives.

(f) Probably includes a number of fires caused by candles.

(g) Does not include mine fires since January, 1922.

The total list of 114 fires, with 533 fatalities, is admittedly incomplete, yet it indicates that fires in metal mines constitute a real problem; moreover, a considerable number of the fires and nearly half of the fatalities have occurred during the last five years, and hence the problem is not one of the past.

The igniting agencies have been candles, carbide lamps, derangement of electrical equipment, carelessness with matches in smoking, spontaneous combustion, flame from fuse or explosive in blasting; overturning

or other derangement of stoves or other devices for heating and thawing, as well as many other causes.

Whereas candles have undoubtedly been responsible for more metal-mine fires than any other one cause, the candle has been practically abandoned; the carbide lamp is much safer, but has caused a few fires. The electric lamp now used extensively in gaseous coal mines should be adopted also in metal mines. With the passing of the candle, electricity has undoubtedly become the chief source of ignition in metal-mine fires, though the tabulation includes comparatively few fires caused by electricity.

Spontaneous combustion ignitions are usually from some carbonaceous material, such as carbonaceous shale or slate, pyritic shale, old hay or manure, old oil-soaked clothing or waste. Only infrequently is there actual fire from spontaneous heating of timber alone, although timber in contact with any of the above-named combustibles ignites readily. Sulphide ores subjected to crushing are likely to fire, especially if the ore is iron or copper sulphides. Many serious metal-mine fires have been caused by fires in surface structures, and some destructive underground fires have been of incendiary origin.

METAL-MINE FIRES HAVE RESULTED IN HEAVY LOSS OF LIFE

Timber is by far the most widespread combustible in metal mines, and under certain conditions will burn whether in place in workings or only piled ready for use, whether wet or dry, whether in form of crushed decaying mat or in solid posts, caps, or girts, whether in an absolutely open space or in an abandoned back-filled stope, and a small amount of burning timber can give off a large quantity of poisonous fumes. Sulphide ores in a finely divided state burn readily, especially if in contact with burning timber; and copper and iron sulphides appear to ignite much more readily than lead and zinc sulphides. A most difficult fire encountered in metal mines is one in a timbered stope back-filled with material containing considerable percentage of finely divided copper or iron sulphides. Other flammable materials which have aided in the starting or extending of metal-mine fires are gasoline, oil, and grease kept in open places underground.

Leaving piles of bark, chips or shavings of timbers in exposed places, or throwing empty explosive boxes, excelsior, sawdust, manure, spoiled hay, oily waste, old clothing and refuse into abandoned workings—all these careless practices have resulted in starting or in aiding the extension of destructive fires.

During the last five years more than 200 lives have been lost in metal-mine fires in the United States, at least 90 per cent through suffocation by gases. Only infrequently do deaths occur from contact with flames. One of the most unfortunate features of these fires is

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that underground workers in one mine are frequently overcome by fumes from a fire in an adjoining mine.

Loss of life and loss of property are not always proportionate; some of the most destructive metal-mine fires have been accompanied by little or no loss of life; on the other hand, there have been fires where by far the greater part of the financial cost to the operating company was due to compensation paid on account of deaths.

Few mine fires which get a good start can be extinguished for less than \$10,000, and frequently the cost is several times that amount. A fire in one mine has been fought continuously for more than thirty years, with loss of several lives and at a cost of several million dollars. Another has been under way for over fifteen years, has cost several million dollars, has tied up many million dollars' worth of ore, and caused the loss of several lives. In some instances the compensation death benefits from mine fires have reached over a hundred thousand dollars.

One of the ill-effects of a mine fire is the "black eye" given to a mine in the minds of miners, many of whom instinctively avoid a mine where there has been a bad fire, the result being difficulty in maintaining a working force when labor becomes scarce.

PRECAUTIONS THAT SHOULD BE TAKEN

At old mines that have flammable surface structures near the entrances, fire doors should be provided to prevent fumes or fire being drawn into the mines. Flammable surface structures should not be closer to a mine opening than 100 ft., and if already at or near the mine opening such structures should be fireproofed by gunite or some other method and thoroughly protected by readily available water lines such as hose, sprinkler system, and fire extinguishers, the equipment to be kept in good working condition by periodical testing. Combustibles should as far as possible be kept out of structures near mine openings, and the use of fires, matches, and smoking materials should be prohibited or restricted.

Intake air shafts are generally dry, and, if timbered, constitute a continual fire hazard. It is noteworthy that a large proportion of fires in metal mines originate at or near shafts. It is desirable that downcast shafts be of concrete construction, and where this is not feasible, timbered shafts and shaft stations should be fireproofed by gunite, slabs, or otherwise, and in the fireproofing process it is desirable to make the shaft lining smooth, as this greatly facilitates the flow of air.

In fireproofing by gunite it is advisable at intervals of about a hundred feet (preferably just above stations) to take out about one set of timbers around the shaft perimeter and concrete back to the rock walls to prevent creep of fire in timber behind the gunite.

Where it is not deemed feasible to fireproof downcast timbered shafts by concreting or guniting, the shafts should be thoroughly protected by sprays or water pipe with fusible plugs or with perforated pipe, and with suitably placed valves, so that in case of fire in the shaft any section may readily be drenched with water. Preferably, the water lines should be controlled from the surface, and there should be suitable pressure-reduction valves and signboards denoting the exact location of control valves. There should be on important shaft stations at least 50 ft. of fire hose connected to water line with nozzle attached and with valve controls near at hand (well designated by signboards), in order that water may be always available for use without delay

on the stations or in the shafts. Care should be taken that water used in shaft fires should be so applied as not to reverse air currents, with resultant loss of life, where the ventilating current is weak.

Timbered upcast shafts which are usually damp or wet, or downcast shafts in which some or all of the timber is damp, may burn readily if fire gets a good start in a dry, heavily timbered station or other adjacent working. Hence, fire protection and fire prevention should not be neglected, even in upcast shafts, or where the timber in a shaft or station is usually damp. Within the last few years, in a Mexican metal mine, a fire started in a station off a wet upcast shaft, and the shaft timbering was burned completely, with a loss of more than fifty lives.

As many fires in timbered shafts are started by electric wires, it is desirable, where feasible, to transmit electric power underground through drill holes. This is done satisfactorily in several places. Where power wires must be taken through dry downcast shafts, it is advisable to fireproof at least that part of the shaft containing the power wires.

Electric trolley wires should not be allowed to be in contact with timber caps; wires carrying current should not be attached to timbers by nails, pieces of rope, and wires; electric motors should not (if it be possible to prevent it) be located close to timbers or in heavily timbered stations or under heavily timbered stopes or raises, and if they must be placed in such places the immediate surroundings should be fireproofed (by gunite, concrete slabs or otherwise). Electric-light globes should not be in contact with timber; fuses should not be bridged by heavy wires; circuit-breakers or no-voltage release compensators should not be locked in place; and the usual slipshod methods of installing mine electrical equipment and of making repairs on it should be supplanted by work of a nature at least as careful as that required in connection with surface work.

ELECTRICAL INSTALLATIONS SHOULD BE OF SPECIAL CONSTRUCTION

Electric switches should be of the inclosed externally operated type of substantial and safe construction, attached to fireproof base, and the region around the base, as well as the region around the wires near the motor, should be fireproofed. Switches should be provided at reasonable intervals on each level to allow of cutting off current without delay, each switch location being suitably designated by colored light or by signboard. Trolley locomotives should be superseded where possible by storage-battery locomotives. Where trolley wires are guarded by wooden trough, occasional sections of the trough should be made of non-combustible material, as fires have been transmitted several hundred feet along trolley guards in a drift otherwise devoid of timber.

Storage of even small quantities of oil, grease, gasoline, or similar flammable materials underground is dangerous, and if necessary should be done under lock and key in a fireproofed place, and isolated from travelway and air currents, instead of allowing these dangerous substances to lie around timbered shaft stations or other workings, as is common practice.

Similarly, explosives should be stored underground in a place isolated from ordinary travel and air currents, the caps and fuse at least 100 ft. distant from the "powder," an attendant issuing these supplies at

certain stated periods. These places should be kept clear of excelsior, paper, empty boxes, parts of boxes, and other refuse. All open lights should be absolutely excluded, the place being lighted either by the ordinary incandescent electric lights properly installed or by small battery lights. It is advisable to have fire patrol of working places immediately after blasting, especially where blasting is done in or close to timber. Where feasible, blasting should be done electrically rather than with fuse, and in blasting timber not more than five or six holes should be fired simultaneously at the same place, and it may be advisable to try out the coal miner's permissible explosives to decrease the fire risk.

Candles should be entirely excluded from mines except for the purpose of occasional testing of oxygen content of air; and the metal miner should learn to carry his carbide lamp in his cap as the coal miner does, the "candle stick" holding carbide lamp to timber post being responsible for several small fires. Notwithstanding the opposition to it, a no-smoking rule should be instituted and rigidly enforced in metal mines, and bosses as well as other underground employees should obey it.

CONTROL OF FIRE AND SAVING OF LIFE IN MINE FIRES

As every metal mine which has timber or other flammable material underground has a fire hazard, every such mine should take precaution to combat fire, and one of the most essential precautions is to have available, not only in shafts and shaft stations, but on important levels, water lines of at least 2-in. diameter and with suitable surface storage and valve control. The practice of converting air lines to water lines is good, but care must be taken that locations of valves to accomplish the change are well marked, with full instructions by signboards at or near the valves. In deep mines where the head could be excessive, suitable pressure-reducing valves or other equipment should be introduced into lines or branches for attachment of hose for fire purposes, to hold pressure to less than 75 lb. per sq.in. at the hose, so that one man may be able to control it.

If a fire can be directly and promptly attacked with an appropriate method, it generally can be extinguished before much damage is done; hence it is important to have available at critical points—important shaft or other stations—emergency equipment such as fire hose and extinguishers, and it is absolutely essential that such equipment be kept in working order by periodical try-out and the instruction of the men in its purpose and use.

There should be at least two openings through either of which men may escape without danger or difficulty when one is not available temporarily; if the mine is deep (say, 500 ft. or over), and employs a considerable number of men (say twenty-five or more underground on one shift), two shafts should be available, each with hoisting equipment to the lowest levels, able to remove the men from the mine with minimum delay.

There should be more than one system of shaft signals, and if feasible there should be a system of signaling from moving cage. Telephones should be installed on important underground shaft stations and at important gathering places in the mine, and if feasible the telephone lines should be brought into the mine through some opening other than the one ordinarily used for handling men. Where it is feasible, air and water lines should be brought into the mine through two openings,

to be available from one in case the lines are destroyed in the other.

Signboards, always kept in good condition, should be placed at comparatively numerous points underground to designate the direction of exits as well as to denote places of danger. New employees should be promptly acquainted by bosses with the location and best methods of reaching the various exits and should be required to use these exits at least once a month.

There should be installed some system of prompt notification of miners at time of fire, and all employees should be informed as to the significance of such signal. Turning compressed air on and off, filling compressed-air lines with water, rapping on pipes, ringing of gongs, flashing of lights, use of telephones and introducing some stench into compressed-air lines are the methods in use. In the opinion of the writers the latter is one of the most efficient.

The establishment and maintenance of a carefully designed, efficient, mechanically controlled ventilation system with (1) air-tight doors so placed as to isolate shafts from mine levels, (2) with air splits held absolutely separate from each other, and (3) with the main man travelway downcast or intake, is probably the best and most effective method of protection of both life and property in case of fire. Positive control of air currents at all times is essential, as even small defects in ventilation arrangements may be costly. Leaky doors which only partly hold air at ordinary times and fire fumes in time of emergency, open levels between main intake and return shafts, or open raises or crosscuts between separate splits—and, in fact, anything which allows short-circuiting of air—is likely to be dangerous. Even the trolley slot in doors or doorways should be made as small as possible. Doors held closed only by air pressure are extremely dangerous, as they will probably open if the direction of the air currents be changed, which is a common occurrence in a fire. Doors which must be closed by personal effort are dangerous, as they probably will not be closed by panic-stricken workers. Hence, doors should be equipped to close automatically by the use of weights and pulleys or other devices attached to the track.

Ventilating one mine through another is not advisable if other circuits are possible, for experience has shown that a fire in either mine may overcome or kill men in both mines. The mine which ordinarily delivers air to its neighbor may at time of fire receive deadly fumes through reversal of air currents. This danger from inter-ventilation of mines is present whether the mines are owned by separate companies or by one company, and it exists to a certain extent where ventilation is mechanically controlled, though not nearly so much as where the ventilation is natural. Where two mines have been stoped along the boundary line, slime or sand filling may be used to make barrier pillars.

FANS SHOULD ALLOW AIR CURRENTS TO BE REVERSED

The main ventilating fan should be in a fireproof housing, and, if possible, be placed on the surface and connected to mine openings by fireproof ducts. It should be equipped with a system of doors, at or near the fan, which will allow of changing direction of air currents with minimum delay. However, at time of fire, the ordinary direction of underground air currents should be reversed only after mature consideration of the effect upon those underground.

Comparatively few men at metal mines understand

methods of inducing or controlling the flow of air at ordinary times, and still fewer know how to handle the gases from a fire. It is a fatal mistake to assume during a mine fire that a man is safe in clear air so long as his carbide light burns. Men who were in air devoid of smoke have been found dead from carbon monoxide with their carbide lights burning brightly beside them. The candle or carbide light burns brightly in air containing enough carbon monoxide to cause death in a fraction of a minute; however, a man can live in air containing too little oxygen to support the flame of a candle or a carbide light. A candle is extinguished when the amount of oxygen falls to below 17 per cent, and the carbide light when the oxygen is below 14 per cent; whereas a man can exist for some time when the oxygen content of the air falls to as low as 10 per cent, if no other harmful gases are present. A canary or a mouse is quickly made unconscious by a percentage of carbon monoxide in which a man can live for a short time; hence when the canary drops, the man should take warning and retreat immediately.

When venturing into air suspected of being impure, if the small animal (canary or mouse) lives and a candle or carbide light burns, a man is safe, and this method of testing should be adopted even in face of the ridicule usually offered when the animal is used. When men are unable to escape to the surface at time of mine fire, they generally can aid materially toward saving themselves if they do not lose their heads and attempt to force their way through the smoke and gases. By retreating to blind workings into which the smoke has not penetrated and tightly sealing off the openings to exclude the gases, using timber posts, boards, plank, canvas, paper, mud, dirt or even clothing to make the seal, men may live for days, especially if they have included within the sealed region one, two, or several hundred feet of fresh air drift and have taken with them a supply of water and such food as they may have, and use food, water, and light sparingly, and move about occasionally to keep the air within the sealed place properly mixed. The moving about is important, as otherwise the air may be locally depleted of oxygen where many men sit or lie still, and they may die for lack of oxygen, although plenty is available twenty or thirty feet distant. In selecting a place to barricade, care must be taken to choose solid ground, as barricades placed in filled or broken ground are likely to admit gases, and at several fires have done so, with the resultant death of the men. Similarly, care must be taken to seal *all* openings and to keep seals tight; in at least one instance men tried to seal themselves, but apparently did not see a raise; later, fumes entered through the raise and suffocated them.

REFUGE CHAMBERS SOMETIMES BUILT

Some mining companies now have underground refuge chambers with air-tight doors. In these chambers are placed barrels of water, compressed-air lines, compressed foods, and telephones. It is suggested that mines with bad fire hazards be equipped with such stations. Mines with only one opening to the surface should be required to have such refuge chambers for use in case of cave-ins and fires in the one opening.

Only too frequently a fire obtains so great a start that it is impossible to be handled directly, or it is in an inaccessible place, or in a place in which falling material prevents actual contact and recourse must be had to other methods of attack. To control such fires, the

most successful and acceptable method is to place seals of clay, sand, boards, canvas, or, preferably, concrete in such manner as to confine the fumes within a comparatively restricted area with minimum leakage of air into the region. As a rule this can be done only after much dangerous effort. Where the seals are made tight and kept so by constant watchfulness, and where the surrounding strata are not broken, the oxygen content of the air is soon depleted below the 5 or 6 per cent necessary to support combustion. If the region is then allowed sufficient time to cool before being opened, fires are generally controlled with minimum expense, though even then the cost may mount into the thousands or even into the hundreds of thousands of dollars.

Where an entire mine must be sealed or where territory with much open space (say 1,000,000 cu.ft. or over) must be sealed, the process of extinguishing a fire by sealing is likely to be long drawn out and may not be feasible. This is especially true when any opportunity for air leakage exists, as through intersecting veins or connecting workings to other mines, or breaks or openings of any kind to the surface. In such circumstances other methods of control must be utilized, though in any event sealing is likely to constitute an important part of the process.

The usual method of overcoming a metal-mine fire where sealing is not effective is to flood it. This method is costly, both in actual performance and in subsequent effects. Sometimes steam is tried for extinguishing a fire, but generally without success. At other fires some inert gas, such as carbon dioxide, is used. Water sometimes is introduced through diamond-drill holes and coursed through the area. One fire of long standing is now being gradually overcome by the introduction of hundreds of thousands of tons of mill tailings through diamond-drill holes and other openings. This process apparently is accomplishing desired results, after sealing and other available methods proved unsuccessful.

CEMENT CAN PLAY AN IMPORTANT ROLE

The cement gun is extremely useful in cementing broken ground to prevent escape of fumes, and also in making bulkheads of timber, rock, and boards air-tight, and even in constructing cement bulkheads.

Where fire is in moving or in heavy ground, rigid bulkheads of cement and rock are inefficient, and bulkheads of timber laid skin to skin can be held tight much more readily than cement and rock. Even with cement and rock bulkheads it is frequently advisable to construct the upper part and possibly the sides of a bulkhead of clay to allow movement being taken up without cracking the bulkhead.

All bosses, surface and underground, as well as clerks, timekeepers, and other employees, should be brought together into an organization to discuss from time to time possible fires, and to determine definitely what each should do in case of fire on the surface or underground. There should be posted in the mine office and kept up to date a list of names and addresses of persons to be notified in case of fire, including mine officials (manager, superintendent, and foreman), safety men, oxygen mine rescue apparatus men, state inspectors, doctors, and ambulances. All bosses, cagers, motormen, drivers, and samplers should be made fully acquainted with location of valves and electrical switches, and thoroughly instructed *and regularly drilled* as to the action to take at time of fire, first toward assuring the safety of the

men, and, second, toward protecting property. Bosses and others familiar with the mine should be trained in the use of oxygen mine rescue apparatus, and bosses, at least, should be familiar with mine fire gases, the danger from them, and methods of detecting them. Above all other things, discipline of the strictest order should be maintained.

It is of extreme importance that material and apparatus on hand for use in case of fire be subjected to periodical inspection, with at least occasional test under conditions approximating those of an emergency. It certainly is exasperating, to say the least, to find that fire extinguishers are out of order, or hose spanners lost, or fire hose broken, or valve wheels displaced, after much dangerous effort has been made to get into position to fight a fire, and it is from delays caused by lack of proper attention to such details that many mine fires get out of hand. It is of particular importance, not only at emergency work on a new fire, but at the more long-drawn-out task of controlling an established fire, that orders respecting the fire fighting be issued by some one person, thus preventing confusion due to duplication of instructions.

PORTABLE FANS HAVE ADVANTAGES

The establishment of an efficient mechanical ventilation system, as previously mentioned, is of great value in fighting a fire, and mechanical ventilation is now being placed at some metal mines, where its chief use is to be in connection with possible fires. In addition to having a large fan to control main air currents, some mines are equipped with small auxiliary fans on mine trucks, with a supply of flexible tubing and other accessories. This permits of controlling the ventilation locally from strategic points near an underground fire. Some mining companies combine ventilation doors with fire doors, and erect concrete jambs with metal doors at points well located to isolate main air courses, if desirable. This permits controlling the flow of air as well as fire or fire fumes. It is desirable that these fire doors be so constructed as to cause the metal door to close against the side of the concrete jamb rather than against a groove in the jamb, in order that settlement of the surrounding area will not prevent the opening or closing of the door. It is equally desirable that the door have a positive latch by which it may be opened from either side. This latch should be of such construction that it will not rust tight or become inoperative.

Each mine should have always available a supply of canvas fire hose, with nozzle, to fit surface or underground water pipe; possibly a small fan with canvas tubing, and at least a dozen three-cell electric flashlights with plenty of batteries and a number of readily portable fire extinguishers. A large mine should have at least five sets of up-to-date oxygen mine rescue apparatus, with supply of oxygen and regenerators, but no mine should purchase or have on the property for use underground any type of gas mask, as these masks are dangerous in underground atmospheres during or after fires. Smaller mines or mines at which oxygen apparatus may not be available can secure the apparatus as well as supplies and the advisory services of men accustomed to fighting fires by applying to the nearest U. S. Bureau of Mines Safety Car, and if its location is not known, quick action can be had by wiring for help to the Director, U. S. Bureau of Mines, Washington, D. C., who will promptly notify the nearest available safety car.

Aerial Tramway Systems and Advantages

In an article in a recent issue of *The Mining Journal*, on aerial ropeways, the following advantages of this method of ore transportation are summarized:

1. Low initial cost as compared with any alternative method of mechanical transport.
2. Low operating and maintenance charges.
3. Minimum power required for working.
4. Takes the shortest route to its objective, despite all natural obstacles.
5. Can work in all weathers.
6. Does not encumber the ground over which it passes.
7. Lends itself admirably to loading and unloading systems at the end terminals.

There are two fundamental ropeway systems, the monocable and the bicable. In the former a single endless traveling rope is used both to support and transport the load, whereas in the latter fixed rope tracks are used, along which the loads are hauled by means of a second endless moving rope.

The monocable, although cheaper in first cost, is not usually suitable for capacities above sixty tons per hour, and if angles have to be encountered in the line, cannot be made so easily automatic in working as the bicable, which will carry tonnages up to 250 tons per hour up a gradient of 45 deg.

There is a third system, known as the jig-back, which is really a bicable line, on which the loads are hauled alternately to and fro instead of going outward on one line and returning on the other, as in the bicable system proper. This type is used for short distances, or for low tonnages, and also for passenger-carrying work, in which it is essential to have reliable safety devices. Excessive gradients are easily overcome by this type of line, however, and for short-distance work its low cost often makes it attractive.

Latin-American Handbooks

During the last two years the U. S. Bureau of Foreign and Domestic Commerce has published commercial handbooks on several countries of South America. Each book gives detailed information regarding the natural resources of the country, its commercial and industrial development, and trade conditions and trade methods found there. The reception given these handbooks has encouraged the Bureau to continue its work, and it hopes eventually to cover all of the countries or trade regions in Latin America. The studies on Bolivia, Colombia, Paraguay, and Venezuela have already been published, and material is now in course of preparation for handbooks on Argentina, Brazil, Central America, Chile, Mexico, Peru, and the West Indies.

According to *Commerce Reports* the Bureau will soon announce the release of the new edition of its Commercial Travelers' Guide to Latin America, by E. B. Filsinger. The first edition was published in 1917, primarily to meet the needs of commercial salesmen. It contains detailed information as to steamship service and fares, travel routes, distances, and time required; lists of cities and towns of commercial importance and the methods of reaching them; and much other material that is of value to the traveler in that region.

The Geological Institute of Mexico City

An Interview With Leopoldo Salazar Salinas, Director,
in Which the Work and Plans of the
Organization Are Described

BY ALBERTO TERRONES BENITEZ

RECENTLY, when the opportunity presented itself, I sought an interview with Señor Leopoldo Salazar Salinas, who has filled the office of Director of the Geological Institute of Mexico City for the last four and a half years. The nature of the information sought as to the activities, aims, and organization of the Institute, and the description of its purposes and achievements kindly accorded me by Señor Salinas, are set forth in the following transcript:

Mr. Terrones—Can you give us any historical information about the Geological Institute of Mexico City, since its foundation to the present?

The Geological Survey in Mexico was established in 1888 upon the initiative of Mr. Antonio del Castillo, Engineer of Mines. A few years later, by special enactment of the Federal Congress, the Geological Institute of Mexico was founded as a department under the supervision of the Secretary of Fomento. In 1917 the Institute was placed under the Industry Secretary.

T.—What is the organization of the Institute?

The Institute is divided in the following sections or departments: Exploration, Geology Applied to Mining, Geology Applied to Oil, Hydrology, Surveying, Seismology and Vulcanology, Administration, Petrology, Museum and Collection, Chemistry and Experimental Research. Besides these, we have a group devoted to special studies, composed of a mineralogist, a paleontologist and stratigrapher, an engineer of mines, and a publication manager.

T.—What program has been undertaken in the Institute, what work has been done, and what are your projects for the future?

Our aim is to follow the remarkable development of geology. We endeavor to emerge from the speculative clouds of mere theories. To make geology popular is our motto. We are conducting our investigations toward a practical end. In olden times the geologist was a man fond of an outdoor life, and he would without tiring look for mineral, rock and fossil specimens, which he assiduously studied and classified. Now, each geologist has his own specialty. Geology has become a practical science at the service of a more practical activity, like mining. Mining geology, economic geology, applied geology, or useful geology, as it has been termed by the Director of the U. S. Geological Survey, have not for their object merely to indulge in theoretical descriptions and statistics; but with the aid of physiography, stratigraphy, mineralogy, chemistry, and physics, they investigate the genesis of orebodies, establish the relation between the country rock and the mineral deposits, study the laws of mineralization in depth and along the strike of the deposits, and finally undertake all such research as will enable the miner to do his work more profitably. To popularize geology along the lines mentioned is our main purpose.

We have started the publication of *La Industria Minera de México* ("The Mining Industry in Mexico"), which has for its object the encouragement of mining

activities in this country. The production of the most abundant metals in Mexico, such as silver, gold, copper, lead and zinc, has also been tabulated for the purpose of keeping a continuous record. We have begun a careful study of the distribution of mineralization in Mexico, and our investigations have been directed especially toward the persistence of mineralization in depth, for which we are gathering much statistical information.

Much of our time is devoted to the building up of large collections of minerals, rocks, and fossils for study in the schools and for a number of foreign exhibitions. Since April 1, 1918, we have studied and classified 1,303 mineral specimens and 1,707 rock specimens; and we have made 1,051 assays, comprising water, minerals, rocks, gases, and petroleum samples.

A catalog of all the meteorites found in Mexico is being compiled. Likewise all the minerals found in the republic have been tabulated in a catalog which will soon be printed.

A computation and classification of meteorological observations all over the republic has been made as a basis for hydrological studies and surveys; hydrological surveys have been undertaken in the states of Hidalgo, Querétaro, Puebla, Michoacan, Tlaxcala, Jalisco, Colima, Aguascalientes, Zacatecas, and Mexico, the Federal District, and will soon be started in the State of Durango. Reports of these surveys have been delivered to the Agricultural Department.

A geological survey is in progress all over the republic, to such extent that a detailed geological map of the country will soon be published, as well as partial maps of various states. The geology of some mining camps, such as El Oro and Tlapujahua, has been studied; also the occurrence of faults. A considerable number of important publications on geological subjects has been issued. Something has also been done in seismology and vulcanology. Earthquake maps comprising the zones of maximum intensity and the volcanic regions have been made. The country around Popocatepetl has received special attention. An observatory has been established in Tlamacas close to the volcano.

Flotation experiments have been made with silver, molybdenum, and antimony ores. An investigation of the diatomaceous earth has been conducted in this country, as well as of the *tequezquite* of the Texcoco Lake.

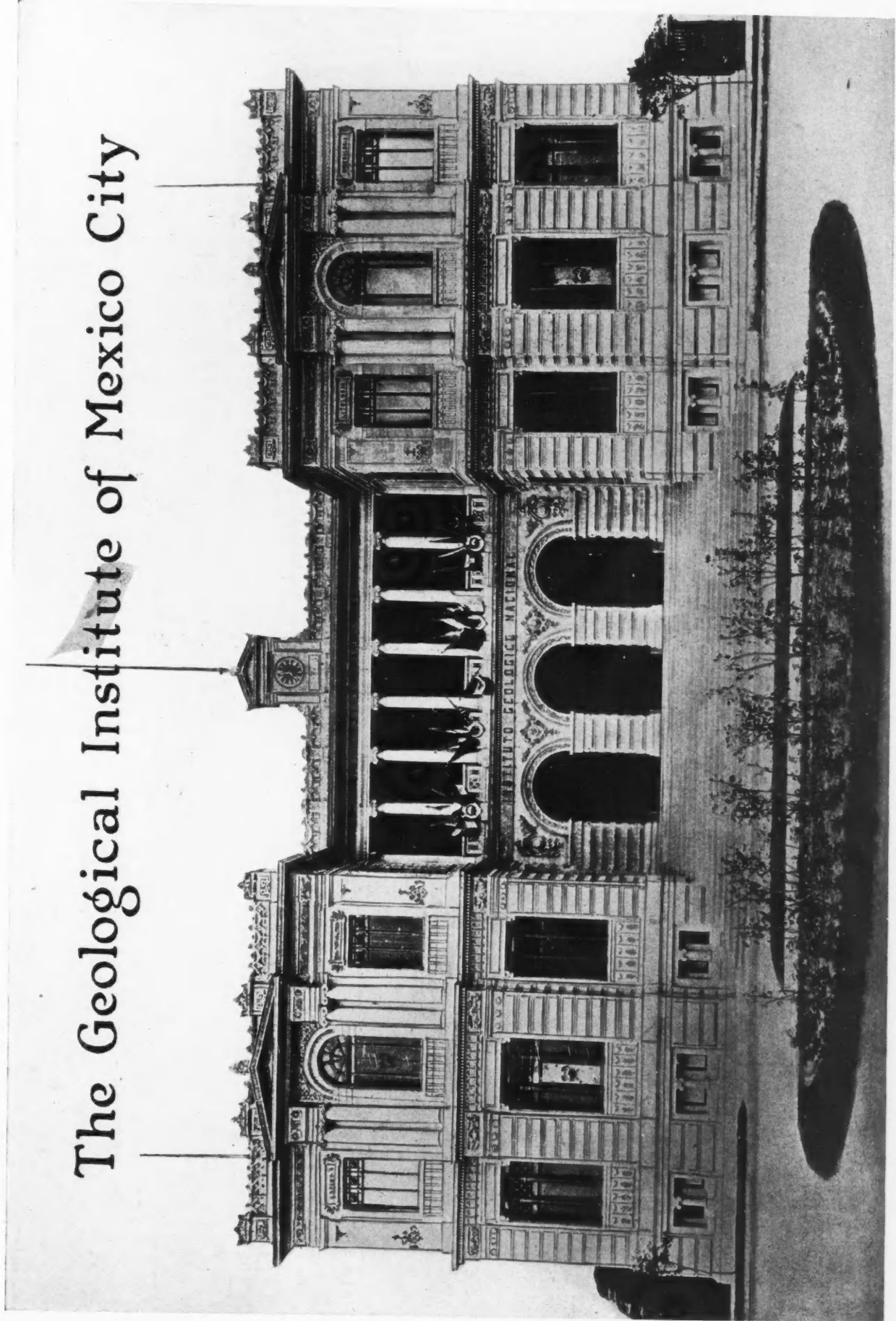
Oil prospecting has been undertaken in the State of Colima, around the Chapala Lake, in Jalisco and Michoacán; in a zone of Oaxaca, between Salina Cruz and Puerto Angel, in southern Lower California, and in the states of Chiapas and Tabasco.

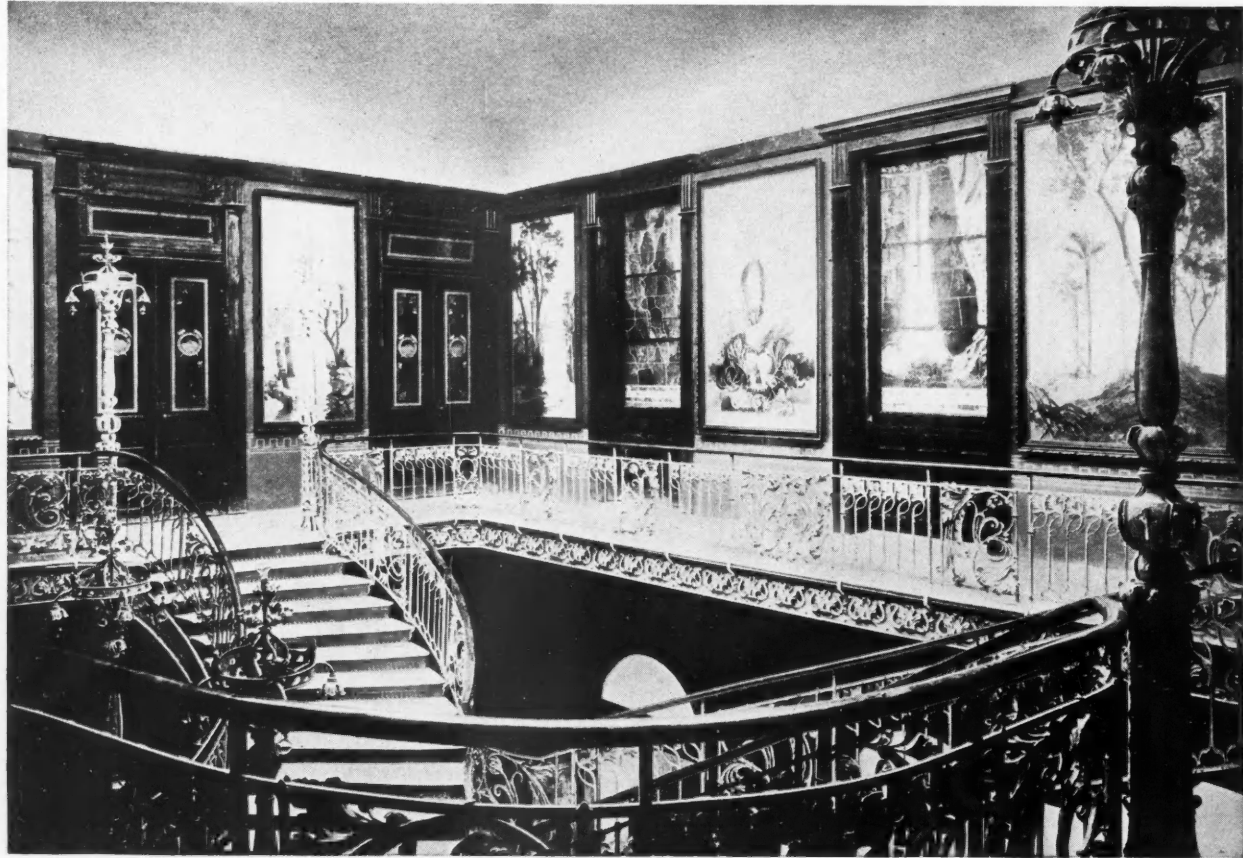
Our program for the future is to intensify the work of the Institute, for which purpose we are arranging to have on our staff specialists in every branch of geology.

T.—Has the Institute made any investigations on the subject of rare minerals?

We have compiled a catalog of the rare minerals found in Mexico, and a complete mineralogical study of most of them has been made.

The Geological Institute of Mexico City

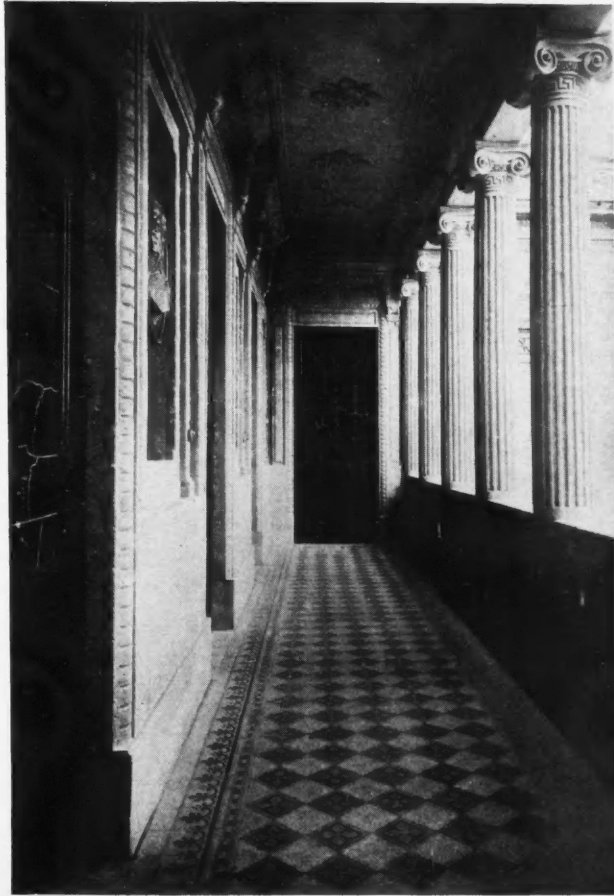




Above—Stairway, Geological Institute of Mexico City. Below—Central Museum



*At right—A passageway,
Geological Institute
of Mexico City*

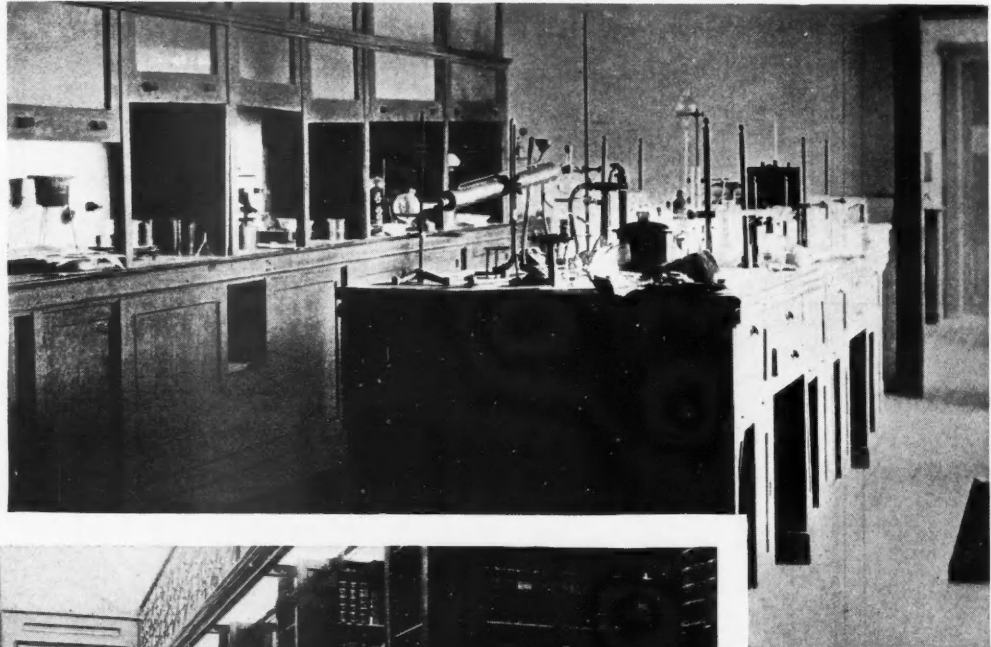


*Below — Views in the
Central Museum of
the Institute*

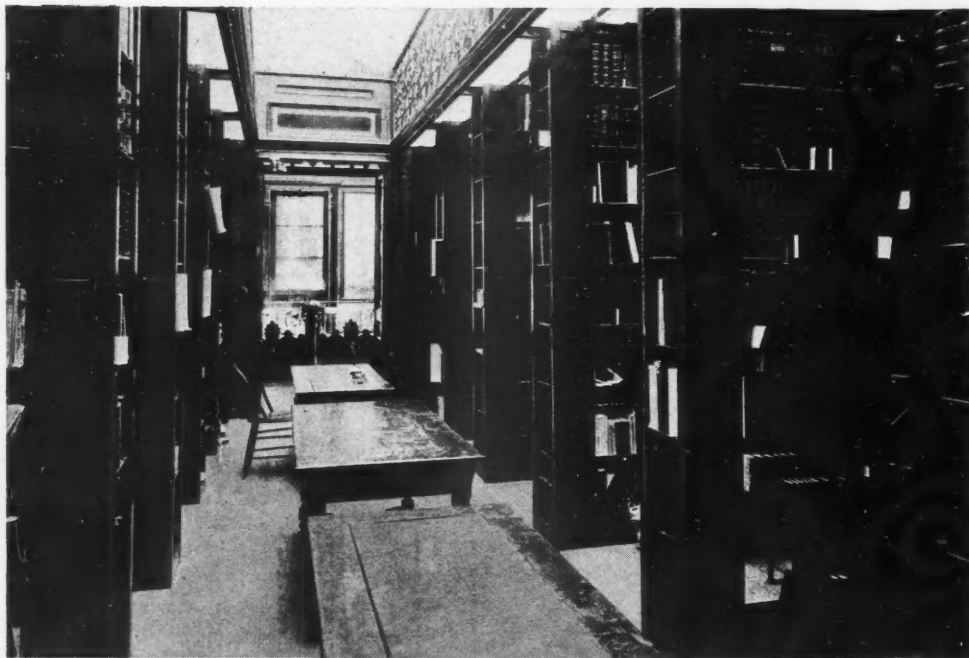




*At left—Drafting
room,
Geological Institute
of Mexico City*



*At right—Chemical
laboratory*



*At left—Library
of
Geological Institute*

T.—In which of the states has the Institute been most active, and to which states do you intend to devote your attention now?

We have in mind no preference; all our exploration work has been done on the same scale throughout Mexico; but, owing to special circumstances, we are now interested in the study of oil formations in the states of Colima, Jalisco, Michoacán, Coahuila, Tamaulipas, Oaxaca, Tabasco, and Lower California. As regards exploratory geological surveys, we have preferred to confine our activity to the states of Sonora and Sinaloa and to Lower California. As to mineral resources, we are giving most consideration to the states of Mexico, Michoacán, and Durango. We have undertaken hydrological surveys over nearly all of the area of the republic, and will continue doing so, taking in consideration the necessities of each region, especially for agricultural purposes. The large valleys of the Central Plateau are now the object of special geological surveys.

T.—What is your opinion about oil and the future of oil production in Mexico?

The peculiar geology of Mexico complicates our oil problems to a large extent; but in all probability we have paying zones in various regions around the Mexican Gulf, besides those now under exploitation, which are exceptionally rich. As already stated, we have undertaken several surveys for oil in some parts of the republic.

T.—Does the Institute entertain any friendly relations with similar organizations abroad?

The Geological Institute of Mexico has friendly relations with nearly all the similar organizations of the world. In particular, since 1919, we have had active intercourse with American organizations, both because of their well-known progress in geology, and because the geological structure of our country is more or less like that of North America. Particularly we keep in close touch with the U. S. Geological Survey, the Smithsonian Institution, the Ontario Museum, the Geological and Mineralogical Office of California, and the universities of California, Yale, Chicago, and other schools of learning.

T.—Would you be willing to keep in constant touch with the "Engineering and Mining Journal-Press," concerning an exchange of impressions as regards matters of mineralogy and geology?

The *Engineering and Mining Journal-Press* forms an essential part of our library, and it would be a great pleasure for us to entertain friendly and closer relations with such publication, especially now that its Editor in Chief is a geologist of world-wide reputation.

T.—On what date were you placed in charge of the Institute, and what work had you done prior to that date?

I took charge of the Institute on March 15, 1918. Before this time I was engaged in my profession of geologist and mining engineer. In 1913 and 1914 I was superintendent of the exploration department and chief engineer of the Dos Estrellas Co.; also I was in charge of the geological department of the same company until 1916. In 1917 I was manager of the El Oro & Talpujahuá Exploration Co., and also consulting engineer of the Dos Estrellas Co. Before 1913 I worked in my capacity of mining engineer in the camps of Pachuca, Guanajuato, Taxco, Pánuco de Coronado, El Chico, and Talpujahuá, among others.

Lead and Zinc Mining in China

Lead and zinc are still mined by native methods in the Province of Hunan, China, except at the Shui Kou Shan mine, which has been equipped with modern machinery under the supervision of the Hunan Mining Board. For the present, native methods of mining suffice, as there are not enough smelters in the province to take care of the output of the mines, says Gordon L. Burke, writing in *Commerce Reports*.

Production since 1896 has been 88,753 tons of lead ore and 236,571 tons of zinc ore, aggregating in value about \$7,000,000. Although labor is extremely cheap, costs are excessive, chiefly on account of many unnecessary officials, administration comprising 36 per cent of the total cost.

About fifty tons a day of sorted ore is the maximum future production unless development is carried ahead of stopes. With intelligent development this capacity can be doubled and the cost per ton reduced. The character and size of past orebodies leads to the belief that much additional ore exists and justifies development.

Only two smelters are in operation—the Hunan Lead Smelting Works, at Changsha, and the Sumpeh Zinc Smelting Works, at Sumpeh, which is about three miles from the Shui Kou Shan lead and zinc mines. Both plants are under the control of the Hunan Board of Mines, which is a government institution.

The Hunan Lead Smelting Works is a modern plant, consisting of two reverberatory roasting furnaces, one blast furnace, one refining plant, and one retorting and cupelling plant. The Parkes process is used for desilverization. On account of the high cost of fuel and repairs, the reverberatory furnaces for roasting were abandoned in 1920 and pot roasting was adopted. In the same year the blast-furnace plant was enlarged by the addition of one more blast furnace. The Sumpeh Zinc Smelting Works is an old, native-type smelting plant. The Hunan Board of Mines intends to build a modern zinc-smelting plant.

About 500 tons of lead ore, composed of both lump ore and concentrates, are smelted in the Hunan Lead Smelting Works every month, producing approximately 250 tons of refined lead about 99.90 per cent pure and 10,000 oz. of silver of 99 per cent fineness. The refined lead is sold to the native shops and foreign firms. It is shipped to Shanghai, Hankow and Japan.

Feldspar in New Hampshire

One of the important recent developments in the feldspar industry has been the rapid rise of New Hampshire as a feldspar producing state. The unusual size and purity of the deposit now being worked near Keene, and the improved methods of mining and milling used, have been responsible for this situation. The orebody stands nearly vertical between walls of mica schist. Between the feldspar body and the schist walls on each side occurs the mica for which the deposit was opened. The width of the pegmatite dike varies from 40 to about 200 ft. The total depth has not been proved, but mica workings to a depth of more than 200 ft. showed no apparent change in the nature of the deposit. Mica workings have also been extended over a length of 750 to 1,000 ft. along the vein, with no change in the deposit indicated. Thus a large tonnage of ore seems reasonably assured. A description of feldspar mining and milling methods used in this district is contained in U. S. Bureau of Mines Serial 2396, by Raymond B. Ladoo.

Sampling Spotty Gold Ores

Supplementary Data on Experiments Demonstrating Feasibility of Accurate Results If Work Is Properly Done

BY CHARLES D. DEMOND AND A. C. HALFERDAHL

A RECENT PAPER¹ gave some experiences in sampling certain typical copper ores, and showed that the results are consistently in accord with the idea expressed in the equation $W = kD^a$ where W is weight (pounds), D is the diameter of the largest particles (inches), while k and a are constants. This article presents significant conclusions from work on a very spotty gold ore carrying 20 to 30 per cent of pyrite in a quartz gangue, but containing no metallics.

A 31-ton lot was crushed successively to 2.3, 1.8, 0.80, and 0.29 in.; and 19 per cent cuts were taken at each stage. The lot was run through the mill three times; and each final mechanical sample was reduced to 10 lb. with a quartering shovel. On the second run a duplicate 10-lb. sample was taken, and on the third run the 64-lb. shovel discard was all ground to 30 mesh (0.02 in.) and riffled to 8 lb. On the third run the 320-lb. discard of the last mechanical sampler was ground to 14 mesh (0.05 in.) and riffled to 75 lb. Each of these special samples was ground to a size, before further cutting, which the final conclusions showed would give an error not exceeding 0.02 oz. gold in 90 to 95 per cent of all cases. The assay results on these samples follow:

Sample	Gold Assay, Ounces
First run, regular	0.24
Second run, regular	0.48
Second run, duplicate	0.24
Third run, regular	0.25
Third run, discard from regular	0.42
Third run, discard from last machine	0.76
Average	0.40

The deviations indicate that the average may be in error by 0.08 oz. In other words, the correct assay may be anywhere between 0.32 and 0.48 oz. per ton.

Some years ago a certain gold quartz ore was frequently sampled, in 30-ton lots, by coning and quartering after crushing to 2 in., 1 in., ½ in., etc., at the different stages. Some of the lots were sampled three times, taking four final samples each time; but the twelve results often ranged from 1.50 to 2.50 oz. per ton, though there were no metallics.

Such experiences have often led to the conclusion which we believe to be wrong, that "spotty gold ores cannot be accurately sampled." To determine the real trouble in such sampling, an investigation was made of the first ore mentioned above, by the method outlined in the former paper. From the 0.80-in. discard, sixteen special cuts were riffled out, which averaged 59½ lb. dry weight. These were each crushed to thirty mesh (0.02 in.), riffled to 7.5 lb., and then prepared through 200 mesh for assay. They showed:

Oz.	Oz.	Oz.
0.200	0.330	0.370
1.015	0.350	0.530
0.385	0.385	0.730
1.225	0.370	1.800
0.470	0.285	.....
1.120	0.475	.....
Average	.....	0.628

The usual or expected deviation² from the average is 0.426 oz. This is the deviation most likely to occur in the case of further samples taken as above; but we wish to know the weight necessary to give a precision or deviation of 0.01 oz. The laws of probability show that deviations are inversely as the square root of the quantity of ore taken. Hence, if W is the required weight,

$$\sqrt{\frac{W}{59.25}} = \frac{0.426}{0.01}$$

and the weight is, therefore, 108,000 lb. With this weight the precision will be 0.01 oz. in half the cases; but there will often be greater deviations. However, it can be shown that, if 2.8 times this last weight is taken, the deviations will be 0.01 oz. or less in 90 to 95 per cent of all cases; which gives 301,000 lb.

A liberal amount of ore was ground through 150 mesh (0.004 in.). Taking one assay-ton (0.064 lb.), this gave the following assay results:

Oz.	Oz.	Oz.
0.25	0.24	0.23
0.23	0.25	0.23
0.25	0.25	0.24
0.23	0.25	.....
0.23	0.21	.....
Average	.....	0.238

The deviation to be expected is 0.0119 oz. If the 0.21-oz. assay is omitted, the expected deviation is 0.0091; and 0.064 lb. will give a precision of 0.01 oz. in 90 to 95 per cent of all cases.

Thus the necessary weight at two sizes is known to be:

301,000 lb. at 0.80 in.
0.064 lb. at 0.004 in.

Substituting these values in the general equation, $W = kD^a$, and solving, it is established that $k = 576,000$ lb. and $a = 2.90$. From these values the following weights are found necessary for the ore in question:

Size, Inches	Weight, Pounds
1/64	3.3
1/16	186.0
1/4	10,300.0
1	576,000.0

The mill was not equipped for finer grinding of so much as 10,300 lb. of ¼-in. ore, but the above-noted results show that the real difficulty is simply a question of quantity. Though samplers generally take more of such ore than they do of ores more easily sampled, they often fail to take enough, perhaps principally on account of the trouble and expense. No ore is so spotty but that it can be accurately sampled.

The example stated is an extreme case, and calls for more care than many ores that are really spotty. The weights shown by the last set of figures are for a precision of 0.01 oz., which denoted a splitting limit of 0.02 oz. If double this splitting limit is used, the weights need be only one-quarter as much as shown above; and with three times the limit the weights would be only one-ninth of those shown.

² $\sqrt{\frac{\Sigma z^2}{n}}$ where d is the deviation of individual results from the average, Σ is the usual sign for summation, and n is the number of observations.

¹ "Mechanical Sampling of Ore," *Engineering and Mining Journal-Press*, Aug. 12, 1922, p. 280.

CONSULTATION

Several Methods Used for Separation of Mica From Feldspar

"In a feldspar mine which I am operating I have not been able to obtain as pure a product as I wish, because there is right smart lot of mica in the rock. Can you suggest methods by which I might purify the product? I find that not a few producers hold up all information about their processes, although some have been willing to give a little helpful advice."

Mica impurities in feldspar may occur either as muscovite or biotite. Muscovite, the white mica, is a common constituent of pegmatites, and may occur in sizes varying from small flakes microscopic in character to the large sizes several feet in diameter known as "books." Biotite, or black mica, is also a common associate of pegmatites, but its mode of occurrence has this distinction from that of muscovite: Biotite mica is usually the principal constituent of feldspathic pegmatites or is found in such small quantities that it may be considered practically absent.

Hand cobbing is an important method employed to separate mica from feldspar, and is generally used successfully where the mica particles are larger than 1 in. It is more important to make a cleaner sorting of biotite than muscovite mica, as the muscovite has greater elasticity and does not become a powder under subsequent crushing as easily as the biotite. As muscovite mica can be separated in screening operations better than biotite, it is imperative that greater care be taken in the removal of the biotite.

Frequently, biotite mica occurs in masses so closely matted together with crystals of feldspar that it would not pay to attempt hand cleaning, in which event it is best to leave the mass alone. It is one of the peculiarities of the occurrence of biotite that the masses which may not justify sorting by hand may be found with others free from this impurity. Hence the fact that a deposit contains large crystals may not necessarily prevent it from being economically worked.

The thoroughness with which mica must be separated from feldspar depends largely upon the use to which the mineral is to be put. For white-burning feldspar to be used in pottery manufacture mica is objectionable, but when the ground feldspar is to be used in the manufacture of scouring soaps or for other purposes in which it is not essential to have a white-burning material, a greater proportion of mica may be retained.

In the old so-called "standard" method of treating feldspar, the mineral was crushed dry by buhrstone—large granite rollers resembling a Chilean mill—and some of the mica was removed in screening the product of the mills. Screens of the revolving and shaking type have been used. It has been reported that the shaking screens encourage the wedging of the mica particles in the mesh of the screen, and that trommels are better suited for the purpose, as their revolutions tend to help the mica particles fall loose from the feldspar. Recent practice in the North Carolina field seems to incline to

wet grinding and to the use of magnetic vibrating screens, which effect a cheap separation of the two minerals. Wet processes in the treatment of feldspar also permit the removal, by the use of concentrating tables, garnet and other impurities that are undesirable constituents of the final product.

After preliminary crushing to 10 mesh, the mica is generally in the form of small flakes separated from the feldspar to which it adhered, whereas the feldspar has a granular appearance. Advantage is taken of this condition in using an air blast or water flotation to float the mica particles.

Definitions of Metallurgical Extraction

"Will you kindly advise what is the general acceptance of the following terms:

"Apparent extraction

"Indicated extraction

"Estimated extraction?"

Suppose, for the purpose of illustration, we take a concrete case such as one representing New Cornelia results which was given in the *Transactions* of the A.I.M.E., Vol. 60, page 25, as follows:

		Per Cent
Total pounds of copper to process.....	43,847,000	100
Total pounds of copper produced.....	32,392,565	73.88
Total pounds of copper in solution end of first year.....	1,902,768	4.34
Total pounds of copper unrecovered		
In tailing as insoluble copper.....	6,381,242	14.55
In tailing as water-soluble copper.....	2,110,332	4.81
Unaccounted for.....	1,060,907	2.42

In this case both the apparent and indicated extraction would seem to be the same, or 73.88 per cent, and the term estimated extraction would not apply. Probably the terms are only significant when used in connection with experimental work. Then apparent extraction might mean the amount of copper actually plated or recovered as cement copper, compared with the amount of copper in the ores leached as determined by assay. Indicated extraction might include also the amount of copper remaining in solutions and would be by that amount greater than the apparent extraction. Estimated extraction might refer to the extraction that could properly be expected in a commercial plant. The terms have no generally accepted meaning, and if used should be defined. We would not, however, encourage the use of terms that require defining. An indicated extraction or an estimated extraction must be obtained by some method or analysis or assay; the term theoretical extraction is better. Actual recovery represents the amount or proportion of metal obtained in weighable form.

In the example given above, the theoretical extraction (based upon the amount of copper in heads and tails, according to assay) is 35,355,426 lb. [43,847,000 — (6,381,242 + 2,110,332)] divided by 43,847,000 lb., or 80.6 per cent. The actual recovery was 73.88 per cent (32,392,565 lb. out of 43,837,000 lb.). The difference between theoretical extraction and actual recovery was made up (1) by absorption in plant, 4.34 per cent, and (2) by unaccountable loss, 2.42 per cent.

THE PETROLEUM INDUSTRY

Development of Petroleum at Cold Bay, Alaska

Standard Oil and General Petroleum Companies of California First to Enter Field—Pearl Creek Dome To Be Drilled First

BY ARTHUR G. THOMPSON

WITH the landing of four drilling rigs, casing, lumber, and a quantity of miscellaneous supplies on the beach at Kanatak, a little Indian village on the Alaska Peninsula, a new development of petroleum in Alaska has begun. The Standard Oil and the General Petroleum companies of California are the first to enter the field, and it is understood that the Associated Oil and other companies are preparing to follow as soon as machinery and supplies can be assembled at Seattle and transported.

A corps of geologists representing those companies, together with a party from the U. S. Geological Survey, spent the better part of last summer in making an investigation of this field. The uniformly favorable reports, following this investigation, upon the structures, the presence of oil, and the accessibility of the region have evidently offered sufficient attractions to these companies. It is reported that each of the three companies mentioned has voted to spend a large sum in the development work. The work of the geologists has disclosed much evidence of oil in seepages and the presence of large accumulations of residue of a paraffine base saturating the moss and tundra which cover this region. In one place it is estimated that 50,000 bbl. of oil has escaped, leaving a saturated "peat" which will be valuable for fuel in the preliminary stages of the development. Two anticlines have been discovered and traced for a distance of 30 and 40 miles respectively, and several "domes" of almost perfect geologic structure have been located. The first drilling will be done on what is locally known as Pearl Creek dome, which is about 16 miles from the embryo town of Kanatak, where the first stampedeers are gathering. A road has been built from this point, and the machinery and supplies are being hauled by gasoline-driven tractors. The country where the drilling will be done is rugged, but not precipitous, and undulating in general contour. There is no timber along the Alaska Peninsula and little vegetation.

Geological investigations are being carried on at other points along the Alaska Peninsula and Cook's Inlet with a view to locating other possible oil fields. Reports of indications of oil and favorable geological conditions existing along the southerly side of the Alaska Peninsula and along Cook's Inlet for a distance of 800 miles suggest the possibility of this region's future importance. From Aneakshak Bay, 250 miles southwest of Cold Bay, and to the northeast at Kame-shak Bay, Chinitna Bay, Tuxedna Bay, Beluga River, and Anchorage, come reports of oil locations and possible oil structures. At Anchorage, the head of navigation on Cook's Inlet, and at the juncture of the main line

and the coal branch of the government railroad, seepages of oil and gas have been found near the town, and some drilling has been undertaken in a small way by a local company. Analysis of the Anchorage seepage oil gives 62 per cent kerosene, 21 per cent lubricating, and 3 per cent volatile constituents.

Core Drilling Requires Care

Careful manipulation is a prime requisite with all types of core drills, according to J. E. Elliott and F. C. Merritt in a recent report of the California State Mining Bureau. After the barrel has been run into the hole it should be rotated slowly, just off bottom, and the pumps should be started and allowed to operate briskly for about fifteen minutes. This is for the purpose of rotating the heavy mud out of the bottom of the hole, where it will naturally be after the hole has been idle for a few hours. Following this the barrel should be raised and lowered sharply two or three times for the purpose of dislodging any heavy mud that may have settled in the barrel on its way down the hole. Better results are obtained with a thin mud than with a thick mud, particularly when sticky shale is encountered. Naturally, it is impractical to spud while taking a core, and if the circulation holes become completely plugged, coring must be discontinued and the pipe pulled, with a consequent "wet job," which is at all times to be avoided because of the resulting damage to the hole. Unfortunately, it is not always possible to thin the mud, and the core driller must do the best he can, which means he must core slowly and watch the pumps carefully. Premature plugging of the core barrel is usually due to inexperience or carelessness of the operator.

The next step is for the driller to feel his way down carefully until the bottom of the hole is reached. The core barrel is then rotated slowly and given very little weight. When a noticeable slowing in cutting of core warns the driller that the teeth are worn out, or when a sufficient advance has been made to fill the core barrel, the pumps are slowed down and considerable weight is given to the pipe. In the operation of a single-barrel core drill, this weight bends the teeth in and usually closes the bottom of the core barrel, so that the material contained in it will not be lost out. In operating a double-barrel core drill this additional weight tends to plug the opening and aids in retaining the core within the inner barrel.

After withdrawal of the core barrel from the hole, the next step in the process is to extract the core from the barrel. The usual procedure in using a single-barrel drill is to cut the barrel with an acetylene torch into semi-cylindrical parts. The inner barrels of some styles of double-barrel core drills have to be cut in the same manner to gain access to the core. In others the core can be pushed out by means of a hydraulic jack, and from still others the core can be extracted by merely shoving a wooden plunger through the barrel. Cutting the barrel with an oxy-acetylene flame has the disadvantage of taking time and of slightly burning the core.

Technical Papers

Uranium and Radium—Bulletin 117 of the University of Arizona, Tucson, Ariz. (26 pages; free on request), is devoted to uranium and radium ores and minerals. Consideration is given to mineralogy, tests, geology, production, uses, mining and metallurgy, purchasers, and general marketing conditions. A brief description is given of Arizona deposits.

Canadian Mining—The Industrial and Resources Department of the Canadian National Railways, Toronto, Ont., has published for free distribution a 63-page booklet describing the mineral deposits and mining industries along its lines. References to occurrences are necessarily brief, and few of the operating companies are mentioned by name.

Copper Refining—The furnace refining of electrolytic copper is discussed in the October issue of *The Anode*, the monthly publication of the Anaconda Copper Mining Co., Butte, Mont. The description of the practice at Great Falls covers six pages and is told in elementary language.

Alaskan Minerals—Bulletin 722 of the U. S. Geological Survey, Washington, D. C., 266 pages, obtainable on request, is a report on the progress of investigations into the mineral resources of Alaska during 1920. Much of the text has been published separately and mentioned in these columns.

Canadian Mineral Production—A preliminary report on the mineral production of Canada for the six months ending June 30, 1922, 44 pages, is obtainable from the Dominion Bureau of Statistics, Ottawa, on request.

Pyrite—The Bureau of Topographic and Geologic Survey of Pennsylvania, Harrisburg, Pa., has published a 19-page mimeographed bulletin (No. 48) entitled "Pyrite from Bituminous Coal Mines in Pennsylvania." The report was written in 1918 and describes mode of occurrence, methods of estimating quantity of pyrite available, methods of recovery, cleaning plants, market, occurrence in Pennsylvania, and production and imports.

Mineral Resources—Recent separates issued by the U. S. Geological Survey in the "Mineral Resources" series, obtainable free on request, include: "Secondary Metals in 1921," 16 pages; "Gold, Silver, Copper, Lead, and Zinc in California and Oregon in 1921," 40 pages; "Cobalt, Molybdenum, Nickel, Tantalum, Titanium, Tungsten, Radium, Uranium, and Vanadium in 1921," 27 pages; "Copper in 1921," 46 pages; "Strontium in 1921," 2 pages; and "Sand and Gravel in 1921"; pp. 7.

Transvaal Report—The annual report of the Transvaal Chamber of Mines for 1921, 270 pages, cloth bound, is now available from the Chamber, at Johannesburg.

Foreign Iron Ore—The Imperial Mineral Resources Bureau has published Part 6 of its monograph on the iron-ore resources of the world. This is devoted to Europe and Africa outside of British possessions. The bulletin is of 275 pages, and may be obtained, bound in boards, for 6s. 5 $\frac{1}{2}$ d. from H. M. Stationery Office, Imperial House, Kingsway, London, W. C. 2, England.

New Books

A Truthful Thriller That No One Should Miss

Beasts, Men, and Gods. By Ferdinand Ossendowski, Officier d'Academie Française. E. P. Dutton & Co., New York. \$3.

The most terrible and fascinating book we have ever read; one that should be read by everyone. It is more thrilling than the wildest novel of adventure; the fearful nakedness of humanity grips one with unforgettable lessons. There is no document which is more vital as a contribution to the literature of the present world unrest—anarchism, socialism, bolshevism, capital and labor, autocracy and democracy, militarism, pacifism—than the story of the wanderings and adventures of this Polish scientist, driven by the Russian revolution from Siberia to Mongolia and Thibet in a desperate and heroic long-drawn struggle for his life. There are interesting references to gold mines here and there; and not only those who are coquetting with the idea of mining gold in Asia should read this, but all others.

J. E. SPURR.

Bellasis' Hydraulics Now in Third Edition

Hydraulics With Working Tables. By E. S. Bellasis, Third Edition. E. P. Dutton & Co., New York. \$8.

The commanding feature of this book is its compactness without sacrifice of thoroughness. After a brief introduction and exposition of historical facts and definitions, the author plunges into general principles and formulas. Flows through apertures and in channels, and the movement of solids by a stream, are carefully considered. Orifices, weirs, pipes, open channels, hydraulic observations, unsteady flows, and the dynamic effect of flowing water all receive proportionate attention. The practical aspect of hydraulics is kept constantly in mind, as is indicated by the large number of practical problems and tables included for solving them. Needless long mathematical investigations are avoided. The volume will appeal to the engineer having extensive hydraulic problems to attack. An element which may affect its popularity in the United States is its relatively high cost compared with the numerous other treatises on hydraulics available here.

F. E. WORMSER.

Recent Patents

Electric Furnace—No. 1,428,909. Ivar Rennerfelt, Djursholm, Sweden. An electric furnace with an upper and lower chamber, means being provided for heating the lower chamber by at least two electrodes, forming an arc. Patent No. 1,428,910 covers a method of operating electric furnaces consisting in first supplying two-phase current for heating the charge by means of free-burning arcs, and then supplying three-phase current, heating the charge by means of arcs in contact with the material to be heated.

Screening Device—Canadian patent No. 219,480. H. B. Walling, Salt Lake City, and C. R. Sundberg, Garfield, Utah. A screening device consisting of an oscillating plate with rectangular perforations, under which are agitating plates supported on pivots.

Classifier—No. 1,424,339. J. H. Burgess, Port Angeles, Wash., assignor of one-half to Clara M. Clayton, Seattle, Wash. A method of classification which consists in supplying the material to the higher end of an inclined floor having a surface adapted for collecting and holding the product; the floor is partly submerged with water, and the classification is brought about by wave action.

Reduction of Nickel Ores—No. 1,424,711. L. P. Burrows, Erie, Pa., Crushed nickel ore is treated in a closed chamber with superheated steam for five hours at a red heat.

Electrolytic Process—No. 1,423,069. Hans Bardt, Saritoga, Chile, assignor to Scotland Hidro-Metalurgica, Santiago, Chile. Metal-containing materials are subjected to the action of a solution containing sulphuric and nitric acids in the presence of a catalyzer, and under pressure, the pressure being formed by the electrolyzing of the solution in a closed container.

Precipitating Metals—No. 1,423,070. Hans Bardt, Santiago, Chile, assignor to Hidro-Metalurgica, Santiago, Chile. Metals in solution as salts are treated with organic substances containing poly-saccharides, under pressure, and at a temperature exceeding 100 deg. C., whereby the metals are precipitated. This process was mentioned in the Sept. 2 issue of this journal.

Manufacture of Electrodes—No. 1,423,071. Hans Bardt, Santiago, Chile, assignor to Sociedad Hidro-Metalurgica, Santiago, Chile. A process for the manufacture of electrodes consisting in electrolyzing a solution containing carbonate of manganese and an excess of perchloric acid, and employing anode material inert to perchloric acid, whereby a deposit of a peroxide film is formed upon the anode to serve as the desired electrode.

Classifier—No. 1,423,130. W. C. McCoy, Wilkinsburg, Pa. An ore-carrying table submerged in a tank of water, with means for giving the table oscillating impulses.

SOCIETIES, ADDRESSES, AND REPORTS

Open-Door Membership Policy Advocated at Canadian Institute Convention

Either That or Increase Dues, Says Secretary—Taxation of Mines and Blue-Sky Legislation Discussed—Canada Well Represented

By ROBERT DUNN

FUTURE policy as to the admission of members and the question of the taxation of mines were the two important matters before the Canadian Institute of Mining and Metallurgy on Nov. 15, the opening day of the annual meeting held at Vancouver, B. C. As to the former, there was a wide divergence of opinion. G. C. Mackenzie, general secretary, who was not present in person, had a paper presented by proxy in which he strongly advocated the "open door." The scope of the Institute should be broadened and the principles of democracy should prevail, he believed. Hard and fast rules as to technical or other qualifications should be removed. The test should be respectability and an honest desire to be of service, through the Institute, to the mining industry.

The sweeping radicalism of Mr. Mackenzie was combated by H. G. Nichols, who presented a paper entitled "The Institute Idea," and by J. D. Mackenzie, of the Canadian Geological Survey, Vancouver. Mere numbers, Mr. Mackenzie maintained, were not a source of strength. The adoption of such a policy as suggested would mean loss of character, and the voice of the organization would not have the force or the authority that would come from one formed of technically competent men. He stressed the point that there was no intention to differentiate between the college-trained and others. Knowledge was what was sought, whether it came from the college or from the field of practical experience.

Mr. Mackenzie proposed the classification of members into three groups—namely, full members, associates, and students. The technical qualifications would apply to the former; and associates and students would all be interested in the industry.

The opinion of the meeting appeared to be evenly divided between the advocates of the two policies. In the course of the discussion it developed that the Institute is finding it difficult to finance itself, and that it is necessary either to provide for an increase in the membership, as suggested by the secretary, Mr. J. D. Mackenzie, or to increase the annual dues. The matter will be the subject of ballot at an early date.

"The Duties and Privileges of Tech-

nical Journalism" was the subject of and address by T. A. Rickard, of the *Engineering and Mining Journal-Press*, which is given in full elsewhere in this issue.

"Government Taxation and the Mining Industry" was introduced for consideration by Valentine Quinn, of the Granby Consolidated Mining, Smelting & Power Co. He dealt chiefly with the situation in British Columbia, and proposed that the Income Tax Act be rewritten, allowances being made for the following: Depreciation, to include short-date amortization of war expenditures and obsolescent allowances; depletion; development; and allowance for interest on money borrowed outside of British Columbia.

The subject of depletion came before the meeting in a paper by R. V. Norris, followed by the presentation of the views thereon by Hugh R. Van Wagenen. The latter said that the Canadian Government already recognized the advantage of basing depletion on net earnings instead of on mine valuation and had adopted that procedure. He thought that the province should accept this lead, that the conclusions reached by the Dominion should be taken as basis for provincial taxation, and pointed out that this would eliminate present duplication of departmental machinery and effect a considerable monetary saving. In Canada the gold and silver mines were allowed to deduct 50 per cent of their net earnings for depletion and compute the tax as 10½ per cent of the balance of the net earnings. Copper, lead, and zinc mines were allowed to deduct 25 per cent of the net earnings as an allowance for depletion. For coal mines the allowance was about 10c. a ton. Though this was not a scientific method, Mr. Van Wagenen thought that, with but slight alteration, it might be made satisfactory, and that the province should be urged to bring its methods in conformity with it.

In the ensuing discussion, among those taking part being R. Randolph Bruce, of the Paradise mine, Windermere; H. Mortimer Lamb, secretary of the meeting; and T. W. Bingay, of the Consolidated Mining & Smelting Co., it developed that the Provincial Government had been waited upon with

reference to taxation and that the representations made had been received with sympathy. It was stated that willingness to amend the act in regard to allowances for depletion had been expressed. The question was: What is the most equitable method of arriving at a basis for such allowance? Mr. Bingay put it rather pointedly when he said: "We have got the government moving in the right direction, and now we're up against the solving of a very difficult problem." Mr. Bruce also emphasized the difficulties of the situation. He pointed out that there are a great variety of orebodies under development, that no two are alike, and that each has a character all its own, and said that to reach a common basis for depletion allowance was a nice point that was likely to tax the ingenuity both of mining men and of officials of the taxation department.

On Thursday there were presented papers on "Blue-Sky Legislation in Manitoba," by Prof. R. C. Wallace, of the University of Manitoba; "The Story of Zinc," by Prof. H. N. Thomson, of the University of British Columbia; "The Mineral Industry of British Columbia," by Prof. S. J. Schofield, of the University of British Columbia; "The Ore Deposits of the Coast Range," by William M. Brewer, government mining engineer; "The Premier Mine, Stewart," by Dr. George Hanson, of the Geological Survey, Vancouver; "The Quartz Veins of Barkerville, Cariboo District," by Prof. W. L. Uglow, of the University of British Columbia; and "The Gold and Silver Mining Industries of Ontario and the Asbestos Industry of Quebec," by A. G. Burrows and Harrison H. Hansen, of Ontario.

To Welcome Caetani

A reception and banquet at which Prince Gelasio Caetani, the new Ambassador of Italy to the United States, will be guest of honor, is being planned by the Federated American Engineering Societies. L. W. Wallace, the executive secretary of the organization, has written Ambassador Caetani telling him of the desire of the engineers in this country to pay him this mark of respect. No information has been received as yet at the Italian Embassy as to the time of the new Ambassador's arrival. It is believed, however, that he will be in this country by the first of the year, in which event Mr. Wallace hopes to arrange to have Prince Caetani as the guest of honor at the annual banquet of American Engineering Council. If that is done, arrangements will be made so that all engineers who desire may attend.

MEN YOU SHOULD KNOW ABOUT

F. W. Bradley recently returned from Juneau, Alaska, to San Francisco.

W. Lee Heidenreich is visiting the country around Alice Arm and Stewart, B. C.

P. A. Simon, president of the Simon Silver-Lead Co., has recently been in New York.

J. Gordon Hardy has left for Colombia, South America, on a three months' examination trip.

John T. Fuller, of Bauxite, Ark., recently spent a few days in Pittsburgh and one in New York.

W. T. Tolch, of the Alaska Gastineau Mining Co., at Thane, Alaska, was recently in San Francisco.

Arthur C. James, vice-president of the Phelps Dodge Corporation, is making an inspection of the company's properties in the Southwest.

Dr. J. A. L. Henderson, of London, is visiting American oil fields. He is best known for his work in the oil fields of Trinidad and Nova Scotia.

Arthur E. Pettit, after twenty-six and a half years' service with the Consolidated Gold Fields of South Africa, Ltd., and subsidiary companies, is retiring from active practice at the end of the year.

F. M. Smith, manager of the Bunker Hill smelter at Kellogg, Idaho, and **T. A. Rickard** attended the meeting of the Canadian Mining Institute at Vancouver, B. C.

Melvin Brugger, who has been engaged in exploration work in Portuguese West Africa for the last two years, is now in New York on his way to Oklahoma.

C. W. Purington has returned to Yokohama from an inspection of the properties of the Ayan Corporation, Ltd., in the vicinity of Okhotsk, on the Siberian coast.

Edward P. Scallon, general superintendent of mines for the Clement K. Quinn Co., was elected representative-at-large of the 53d district of the State of Minnesota at the last election.

David White, of the U. S. Geological Survey, is in Virginia to examine the paleontology and stratigraphy of the red shales in the vicinity of Big Stone Gap. He is being assisted by **J. B. Eby**.

A. Mayor, of London, England, has been in Winnemucca, Nev. to examine the affairs and plant of the Silver State Chemical Co. The completion of the plant depends largely upon results of his examination.

F. L. Ransome is continuing his examination of the Oatman district in Arizona. He also will visit Boulder Canyon for further exploration work for the Reclamation Service. **H. A. C. Jenison** will assist Mr. Ransome in the Oatman district work.

F. A. Woodward, present general manager of the Iron Cap Copper Co., has returned to Globe, Ariz., after an extensive trip in the East during which he visited Boston and New York and attended the meeting of the American Mining Congress at Cleveland.

G. J. Hammond, general manager of the million dollar Hydro-Carbon Products Corporation of San Francisco, recently visited Edmonton, Alta., in connection with a project for treating commercially the tar sands of Athabasca.

Charles R. Fettke, associate professor of geology and mineralogy at the Carnegie Institute of Technology, at Pittsburgh, has completed an investigation of the oil resources of the coals and carbonaceous shales of Pennsylvania for the State Bureau of Topographic and Geological Survey.

That the new Italian Premier should have chosen **Gelasio Caetani** as Ambassador to the United States is a matter of great satisfaction to American engineers. Ambassador Caetani has distinguished himself both as a mining and as a civil engineer. He is the fifth son of the Duke of Sarmiento, and despite the prominence of the family in political affairs, insisted on following his bent toward engineering and he completed the course in civil engineering at the University of Rome. Almost immediately after having been graduated from that institution, he came to the United States and entered Columbia University, where he took the complete mining engineering course. He then went to California, where he joined the staff of F. W. Bradley, and specialized on work in the Coeur d'Alene district. He took an important part in working out the problems in the new Bunker Hill mill, in that district. Among other things he invented the Bunker Hill screen, an ore-dressing device which has proved to be of great worth. Later Mr. Caetani formed a partnership with Albert Burch and Oscar Hershey, and was thus engaged when the Great War began. He retired from the partnership and returned to Europe in answer to a call from the Red Cross. He served with that organization until Italy entered the war. He then joined the colors and was assigned to an engineering regiment. His war service was a succession of achievements, the principal two of which were the blasting operation at Col de Lana and the supply of outposts in the high Alps. His success in each of these instances is attributable to his mining experience.

Following the armistice, Mr. Caetani felt that it was his duty to stay at home and help to pull his country through the difficulties of reconstruction, although it was his personal desire to return to the United States and to resume his professional work, which had assumed promising proportions at the time he was forced to leave. With the purpose of providing employment and increasing food production, he directed a large reclamation project and

took an active part in political affairs. As a member of the City Council of Rome, he has had an important hand in the stirring political events of the recent months in Italy.

The new Premier has announced that he will give the country a government, rather than a ministry. The mining engineers of the West know Caetani, and his selection as Italian Ambassador is certain to be applauded in many a mining camp.

Mining and metallurgical engineers visiting New York City last week included: **Tom K. Willett**, of Graham, Tex.; **Hugh M. Roberts**, of Minneapolis; **W. H. Staver**, of Idaho Springs, Colo.; **Leon Feuchère**, of Bisbee, Ariz.; **Richard A. Parker**, of Denver; **H. H. Hasler**, of Cresson, Pa.; **Harry O. Robinson**, of Margarita, Venezuela; and **Henry S. Munroe**, of Litchfield, Conn.

OBITUARY

Michael E. Welch, of Burke, Idaho, who was for more than ten years foreman of the Hercules mine, was accidentally killed in the mine on Nov. 2.

Henry Calvin Brougher, president of the Tonopah Divide Mining Co., died in San Francisco on Nov. 7. Mr. Brougher was one of the best-known mining operators in Nevada. He was active in Tonopah, Goldfield, and Divide.

Captain O. W. Carlson, an Alaskan prospector, died in San Francisco on Nov. 12, after a short illness. He was seventy-seven years old. During the first gold-seekers' rush to Nome, Captain Carlson was in the forefront of the stampede, and he filed on many holdings around which centered some bitter fights for ownership. He later was made agent at Unga for the Alaska Commercial Co., and served in this capacity for many years.

SOCIETY MEETINGS ANNOUNCED

The National Crushed Stone Association will hold the annual convention at Chicago, Jan. 15-17.

The third annual meeting of the American Petroleum Institute will be held at the Statler Hotel, St. Louis, Mo., on Dec. 6, 7 and 8. The annual dinner will be held on Dec. 7.

The thirty-fifth annual meeting of the Geological Society of America will be held Dec. 28-30 at Ann Arbor, Mich., by the invitation of the University of Michigan. The headquarters for registration will be at the University of Michigan Union, and the scientific sessions will be held at the Natural Science Building.

THE MINING NEWS

The Mining News of ENGINEERING AND MINING JOURNAL-PRESS is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

Leading Events

DEALERS in radium are offering the element at \$70,000 per gram, compared with recent price of \$120,000. The Belgian Congo is the source of the cheaper product.

Present progress indicates that Star crosscut, in the Coeur d'Alene, will be completed in a year.

The United Verde and U. V. X. companies default tax payments to test legality of Arizona mine tax.

Miami Copper Co. benefits by settlement of flotation litigation.

Leadville (Colo.) companies anticipate mild "boom."

Alaska Juneau made an operating profit in October.

The Mother Lode coalition company has increased the output of its copper mines in Alaska.

The San Luis Potosi smelter, in Mexico, is operating at full blast.

The Park City Mining & Smelting Co., a new Utah merger, declares first dividend.

Calumet & Hecla output in Michigan is now at the rate of 5,000,000 lb. of copper monthly.

In Colorado, the Boulder County and Caribou mines are being reopened.

The Butte & Superior company is making a good current profit on its zinc-silver ore.

Leadville Looks for Mild "Boom" —Zinc Output Increases

Activity throughout the various sections of the Leadville district in Colorado continues to increase, and extensive preparation for enlarged operations seems to indicate a real boom during the coming winter. The new unit of the Western Zinc Oxide Co.'s plant, which was completed in 1918 but was never operated, has been put into operation, and a constantly increasing amount of zinc ore is being lifted from a number of mines. Operations have been renewed at the Mikado shaft, in Graham Park, which has been inactive since 1919. The electrical equipment has been overhauled, and work will be confined for the present to workings above the water level. John Harvey will have charge of the property.

West Shiningtree District Favorably Impresses W. H. Weed

Walter H. Weed, of New York, who has been making an investigation of the West Shiningtree gold area, 60 miles south of Porcupine, in Ontario, Canada, on behalf of some of the companies represented there, reports that he is favorably impressed with the possibilities of the district. His observations after visiting almost all of the gold discoveries confirm the work of the Ontario Bureau of Mines, which showed the geological and mineralogical conditions to be similar to those of Porcupine, and he is confident that underground development is all that is needed to make the district a prosperous camp. The quartz veins are well defined and are persistent for considerable distances. Many of the veins show ore even at the surface.

Gold Bounty Bill Introduced by Senator Oddie

A bill which directs the government to pay a bounty of \$5 per troy ounce for new gold produced in the United States was introduced in the Senate on Nov. 21 by Senator T. L. Oddie, of Nevada. The measure is entitled "A Bill to Conserve the Natural Gold Resources of the Nation." It was referred to the Committee on Banking and Currency.

Calumet & Hecla Is Producing 5,000,000 Lb. per Month

Selective Mining Brings Yield to 40 lb. Per Ton—Labor Shortage Affects Subsidiaries

Calumet & Hecla's daily rock tonnage averages 3,300 tons, the yield being 40 lb. to the ton. In addition the recovery from the reclamation plant is 1,750,000 lb. of refined copper per month, which makes a total of approximately 5,000,000 lb. Keen selection of ground and the mining of backs of rich stopes in some of the conglomerate shafts contribute to the high yield.

Some work will be done in the way of repairs at Osceola during the winter, in preparation for a possible resumption of operations in the spring. The rock house at No. 6 shaft, old Osceola, is to be repaired, and at Kearsarge minor repairs will be given attention. The reopening of Osceola and other subsidiaries of Calumet & Hecla in the spring will depend on the labor situation as well as on the metal market. The present supply of labor is short of requirements, and there is much doubt in mining circles that spring will bring any improvement.

Utah Copper Is Concentrating 19,000 Tons of Ore Per Day

By the first of December the Utah Copper Co.'s Magna plant will be treating 2,000 tons of ore per day, operations having just been resumed for the first time since February, 1919. Two units are being used. Whether additional units will be put into operation later will depend altogether upon the instruction received from the eastern offices of the corporation, according to officials in Salt Lake City.

On July 1 work was begun by the company to convert the Magna mill from a table concentration to a flotation plant. This necessitated the removal of the large number of vanners and their replacement by Magna type Janney oil-flotation machines. No additional work had to be done in the grinding department of the mill, which had already been remodeled.

In present practice the ore is put through rolls and tube mills. Garfield and Wilfley tables are used in the concentration department. The material containing mineral values not recovered by table concentration is conveyed for treatment to the Janney flotation cells.

At present, the Arthur mill is treating about 17,000 tons daily, bringing the total tonnage now handled by the company at both plants up to 19,000 tons.

Before the plant was converted to an oil flotation plant, it had an estimated capacity of 20,000 tons daily.

Transvaal Gold Output

By Cable from Reuters to "Engineering and Mining Journal-Press"

London, Nov. 18.—Production of gold in the Transvaal during October totaled 778,159 oz.

Suspension of Operations by Knight Central Explained

Policy Adopted in 1917 and Adhered to Since, Says Johannesburg Announcement—Ore Exhausted

In connection with the closing down of the Knight Central Gold mine, Rand Mines, Ltd., as secretary to the Knight Central, Ltd., has issued a circular to shareholders, dated at Johannesburg, which says:

In view of the disappointing results obtained in the area south of the Simmer Dyke, the board decided, as far back as the middle of 1917, to suspend all shaft sinking, to limit development to the few points where payable values had been exposed, and to continue milling until it was no longer possible to do so profitably, when operations would be terminated. This policy has remained in force throughout, having been reaffirmed by the board and endorsed by shareholders from time to time.

The fullest information has been given in the published reports year by year regarding the scale and results of development, ore reserves, and the prospective life of the mine. The latest intimation of this kind is to be found in the report of the consulting engineer dated Feb. 11, 1922, which stated that:

"The position as far as it can be seen is that the life of the mine will only be a matter of months. A large area remains undeveloped, but practically all exploratory work has been abandoned owing to the unpromising prospects, as explained by the consulting engineer in his report of the previous year. The grade of ore left in the mine is so low that it could not be worked at a profit with gold at its normal price, while any selective mining is out of the question in view of the very limited number of points of attack available."

Shareholders have also been advised that any scheme for exploring the large undeveloped area owned by the company would necessitate the sinking and equipping of at least one new vertical shaft, which, with the necessary development, would entail the expenditure of a large amount of money, not warranted by the prospects.

Since the termination of the strike at the end of March, the company has continued milling operations at a profit; but the supply of rock that can be milled at a profit has now nearly reached exhaustion, and the directors are satisfied that it will not be possible to earn profits after the end of January next or thereabouts. Operations will in any case be continued until a loss is incurred.

Yellow Pine Resumes Operation of Its Zinc-Lead Mine

The Yellow Pine Mining Co. has resumed mine and mill operations at its property at Goodsprings, Nev., after a shutdown of two years due to the low price of zinc and lead. This company was incorporated in 1902 and has paid fifty-nine dividends aggregating \$2.61 per share or \$2,610,000. Ore reserves are large.

Progress Made in Star Crosscut, in Coeur d'Alene District

Should Be Finished in Another Year—Will Supply Ore to New Bunker Hill Zinc Plant

The 8,926-ft. crosscut from the 2,000 level of the Hecla mine, at Burke, Idaho, which will be the operating outlet for the Star mine, had been extended 5,018 ft. on Nov. 1, leaving 3,908 ft. to go to reach the Star vein. The Hecla management predicts that the crosscut will be completed in another year. The work was started in August, 1920, and it was estimated at the time that it would be completed in two years. Shortage of labor during the present year has delayed the work and it will probably require about three months more than the original estimate.

The Star crosscut is perhaps the most interesting development enterprise in the history of the Coeur d'Alene district, and wide attention was attracted to it through litigation instituted to prevent its being driven. About a year and a half ago the directors of the Hecla Mining Co. and officers of the Bunker Hill & Sullivan company entered into an agreement to purchase and operate the Star mine on a "50-50" basis, and a few months later the crosscut was started from the 2,000 level of the Hecla, to provide a permanent operating outlet for the Star. In the meantime, injunction proceedings were started in the district court at Wallace and in the superior court of Spokane by the late Eugene R. Day, a stockholder in the Hecla, and Mrs. Smith, a Hecla director, to restrain the stockholders of Hecla from ratifying the agreement entered into by the directors with the Bunker Hill & Sullivan; also asking the court to stop work in the crosscut pending the final decision of the court. The courts refused to interfere with the crosscut, and later dismissed the injunction proceedings without hearing the testimony on behalf of Hecla and Bunker Hill.

The Star mine has a large body of low-grade lead-silver and zinc ore, which will be an important source of supply for the electrolytic zinc plant which the Bunker Hill & Sullivan expects to have in operation within the next two years, at which time the Star mine will be in position for production.

Mother Lode Coalition Increases Copper Production

In the first ten months of 1922 the Mother Lode Coalition Mines Co. produced 20,499,325 lb. of copper, compared with total output in 1921 of 18,901,592 lb. The next two months should bring production close to 25,000,000 lb., as operations expand under the new contract with Kennecott Copper Corporation for handling 12,000 tons of ore monthly, compared with 6,000 tons heretofore. As copper market conditions warrant, the Mother Lode company, under the new contract, should be able to produce up to 3,000,000 or 4,000,000 lb. monthly. The present cost is reported as 6.87c. per pound.

Arizona Mine Taxation Methods Will Be Tested

Jerome Companies Fail to Pay; Delinquency Will Bring Question of Appraisal Into Courts

The United Verde Copper Co. and the United Verde Extension Mining Co., the largest two mining companies operating in Yavapai County, Ariz., have failed to pay their 1922 taxes to Frank E. Smith, county treasurer. On Nov. 6, the last day for the payment of taxes, the two companies offered to the treasurer checks for the lower amounts which they claim the tax commission should have assessed against their properties under the state laws. The companies claim that under the state law their tax should have been assessed on the basis of production over a five-year period, but the tax commission varied from this procedure and as a result arrived at a higher figure. The checks for the smaller amount were rejected by the treasurer, and litigation undoubtedly will be started.

Mining companies claim that mines and mining property should be taxed as is other property, on an approximation of their sale value.

James S. Douglas, president, has appraised the United Verde Extension property at \$20,000,000, whereas the tax was based on a valuation of \$32,000,000.

Settlement of Flotation Litigation Helps Miami Copper Co.

The Miami Copper Co. is producing about 6,000,000 lb. of copper a month from its mines in the Globe-Miami district, in Arizona. This is a high record performance for the company, and is all the more remarkable when it is realized that this output is secured from five of six units of its mill.

Greater mill efficiency obtained in part from free and unrestricted use of flotation is a factor assisting in these results. Cost of production is being lowered proportionately. The labor situation is generally satisfactory. One helpful factor is the large amount of Mexican labor available.

Guatemala Ships 1,000 Lb. of Mica Monthly to U. S.

Guatemala, although at present a small producer of mica, may become, as a result of development work now in progress, an important exporter of this mineral, according to a report to the Department of Commerce. As the United States requires four times the mica it produces, Guatemala should readily find in the United States a market for all that it can export in the future. Four mines are now open and operating, all under American control; a fifth mine will be opened within a month or two, and two more mines are expected to be operating before the end of the year. Present production is at the rate of 600 to 1,000 lb. per month, being about 40 per cent cut mica and 60 per cent rough trimmed, all of which is being shipped to the United States.

Butte & Superior Netted \$108,821 in Third Quarter

Zinc-Silver Producer Earns Profit for First Time Since 1920

The Butte & Superior Mining Co. has for some months been earning substantial profits, although the net loss for the first nine months of 1922 was \$142,573, due to the losses incurred before production was resumed.

This illustrates the heavy expense mining companies are compelled to undergo when their properties are closed down. The Butte & Superior mine was shut down from November, 1920, to February of this year. The total cost of this fifteen-month suspension was \$1,210,237, and notwithstanding the zinc market has been steadily advancing since early summer of this year, Butte & Superior in the quarter just ended had to charge "shutdown expense" amounting to \$92,614. This, however, is believed to clean up all these extraordinary expenses.

Due to labor shortage, production of ore fell off to 77,031 tons during the third quarter, resulting in an output of 20,756,117 lb. of zinc. The ore in the first nine months of 1922 averaged 5½ oz. of silver per ton, which on a 95 per cent recovery would mean a production of approximately 1,100,000 oz.

Costs are still high in Butte. Butte & Superior's cost in the September quarter averaged about \$10.50 per ton of ore. This is about \$1 per ton less than in the same period of 1920, but is about \$2 per ton above "normal."

Mining and milling operations are functioning efficiently and it would not be surprising if Butte & Superior earned enough in the final three months of this year to wipe out the first nine months' deficit of \$142,573.

Iron Mine Will Be Operated Through New 4½-Mile Tunnel

Development of the iron deposits at Cogne, in the Val D'Aosta in Italy, by the Anslado company is well under way, according to a report to the Department of Commerce. This was one of the great undertakings begun by Italy under the pressure of war necessities. The principal problem in this connection was that of transporting the ore to Aosta, where electric furnaces were erected. This was solved by driving a tunnel through the intervening mountain. This tunnel, which has a length of 7 km. (4½ miles), has just been completed. The importance of the work involved is demonstrated by the fact that six years have been required for its construction. The iron deposits in question are estimated at not less than 10,000,000 tons, and the mineral is said to be from 62 to 65 per cent pure magnetite, similar to the Swedish deposits, which yield a metal specially malleable. These mines, with their hydro-electric plants, furnaces, and other equipment, are still the property of the old Anslado company, which is understood to be considering offers for their purchase.

Spanish Lead Mine Will Have Electric Power

The Arrayanes lead mine, belonging to the state, in the Linares basin, in Spain, is to be electrified. The necessary material is already to hand, says a message from Reuter. It is hoped to increase the production, which has fallen to a low level, hardly exceeding 2,000 tons a month.

Feldspar Is Produced by Seventy Different Companies

There are approximately seventy producers and grinders of feldspar in the United States of sufficient size to be listed. The principal production is along the Atlantic coastline, from Maine to Georgia, with some production in California and a little in Colorado.

News from Washington

By PAUL WOOTON
Special Correspondent

Radium Now \$70,000 per Gram; Was \$120,000

Mining of Pitchblende Ores in Katanga, Belgian Congo, Responsible for Drop in Price, Says Geological Survey

PRODUCERS of "commercial" radium have recently advertised their product at about \$70,000 per gram (about 15.4 grains) of elemental radium, whereas the former price was \$120,000. The U. S. Geological Survey has explained the reasons for this new price. A considerable reduction had preceded this drop, because several manufacturers had on hand fairly large stocks of radium, which, owing to the present financial conditions, were not sold readily. The recent great drop, however, was not due to this cause; it was due to the discovery in Katanga, in Belgian Congo, of large deposits of rich, easily worked radium ores and to the erection of a plant at Oolen, Belgium, about 40 miles from Antwerp, for producing radium from those ores.

These deposits are at Luiwishi and Kasolo, near Elisabethville, in the extreme southern part of Belgian Congo, and consist of veins on the property of the Union Minière du Haut-Katanga a British-Belgian company operating huge copper-bearing properties in Katanga. The veins carry pitchblende, which is in large part altered to gummite, uranophane, and other uranium minerals. A subsidiary company has been formed to extract the radium, and a considerable quantity of ore carrying many times as much radium as the carnotite ores that have heretofore governed the world's markets has been shipped to Belgium. No data are at hand, however, to show that in the aggregate the newly found deposits will eventually yield as much radium as the deposits in the plateau region of the United States, though a considerable quantity can be produced from the Katanga deposits at a much lower cost, and it is that cost that is ruling the radium market today.

American companies, closing down their own mines, have undertaken to market the African product, and radium is therefore now offered at a price lower than any that has prevailed since it became an object of commerce, and an opportunity is thus given to branches of government, hospitals, doctors, and philanthropists to obtain the precious

material at a minimum expenditure, for it seems probable that the price will go no lower. Eventually the principal source of radium may again be the carnotite deposits of the West, and when that time comes, if not before, the price will again rise.

Graphite Producers Seek Modification Under "Flexible Tariff" Provisions

The cost of producing graphite, which furnished the topic of lively hearings before both House and Senate committees when the tariff bill was under consideration, will probably be reconsidered before the Tariff Commission, as an application for an increase in duty, under the flexible tariff section of the new act, has been filed with the commission.

In the new tariff, amorphous graphite was given a duty of 10 per cent ad valorem; crystalline lump, chip, or dust, 20 per cent; and crystalline flake, 1½c. per lb.

Domestic producers had asked considerably higher duties. Protection of at least 4c. per lb. on the flake was said to be necessary. Under the flexible section, the maximum increase possible, on foreign valuation, would be 50 per cent, and if granted to the maximum this would bring the duties to 15 per cent, 30 per cent and 2½c. per pound for the three classifications. A transfer to the basis of American valuation, which also is possible under the section, would leave the figures unchanged, but would have the effect of approximately doubling the effective duty.

The Tariff Commission has taken no action on the application for higher duties. Vigorous opposition may be expected if hearings on this subject are sanctioned by the commission.

Pittman Act Silver Purchases

Purchases of silver by the Bureau of the Mint during the week ended Nov. 18 amounted to 1,087,000 oz. This brings the total of purchase under the Pittman Act to 141,801,576 oz.

Alaska's Gold Output Grows Production for 1922 Will Exceed That of Any Recent Year, Say Washington Officials

Alaska's gold output for 1922 will exceed to a considerable extent the production in any recent year, according to reports from field officers of the General Land Office. This increase will be due principally to the heavy and prolonged rains. The unusual amount of rainfall has furnished an abundance of water for sluicing purposes, with the result that the placer miners have been able to sluice dumps which have accumulated during the years when there was a lack of sluicing water. Credit also is given to the Alaska Road Commission for the great improvement in transportation that has come with the betterment of roads and trails.

Quartz properties on Happy and Fairbanks creeks are being operated with profit, and a large dredging concern is prospecting several creeks in the Fairbanks district preliminary to dredging the ground.

Importance is attached to the new strike in the Koyukuk district and to the prospective production in the Kan-tishna district. Many prospectors are being attracted to this latter district, it is said. The completion of the Tanana bridge and the initiation of through train service to Fairbanks is expected to aid a number of districts materially, as it will mean a decided lowering of operating costs.

There is renewed activity on Valdez Creek in anticipation of the completion of the new trail connecting that district with the government railroad. The dredges on Fairbanks Creek have had one of the most successful seasons in the history of operations there.

The Land Office is preparing to send an agent to Nome to handle the large number of applications for patent which are expected next year. The consolidation of the most extensive holdings of the old companies is expected to result in large-scale operations, and a large number of new claims have been surveyed.

The Treadwell interests are developing their lode prospects on Nixon Fork, where work will probably continue all winter. There has been a gradual resumption of lode mining in southeastern Alaska. George A. Parks, of the Land Office field division in Alaska, expresses the opinion that the Alaska Juneau mine is mining and milling ore at a lower cost than at any other property in the world. The low-grade operations have been showing a profit since early in the year.

The mines at Jualin are being put in condition for a renewal of operation, and outside capital has been interested in their development. Sizable outputs are expected from Chichagof Island properties next year. Development this year has proved the existence of the veins and a large amount of high-grade free-milling ore has been

blocked out. Encouraging developments are reported from the American side of the boundary at Hyder. The profitable properties thus far have been developed on the Canadian side of the boundary.

War Minerals Relief Commission Continues To Distribute

Subject to the approval of the Secretary of the Interior, the War Minerals Relief Commissioner has recommended the following awards: W. C. Meler, Santa Margarita, Calif., \$940.85; Robert Raffice, Joy, Nev., \$1,250; Wanderer Mining Co., San Rafael, Calif., \$2,360.50; J. J. Cummings & Son, San Francisco, \$2,122.40; John F. Remple,

Pendleton, Ore., \$741; E. D. Hendricks, Yankee Hill, Calif., \$260; Iron Clad Leasing Co., Butte, Mont., \$3,891.93; McKenny & Leonardi, Lotus, Calif., \$1,273.90; J. A. Gillis, Tuttleton, Calif., \$109.84; Joseph A. Pratt, Tuttleton, Calif., \$109.84.

Disallowances were recommended as follows: Huntington & Brockway, Kernan, Calif., not within the act; P. J. Dullivan, Watkins, Ore., not within the act; Wilmot Bowerman, Tuttleton, Calif., loss fully covered in former award; Clifford McClellan, San Francisco, insufficient data upon which to base decision; Watson, Williams & Wadleigh, San Francisco, no ground for award in addition to that already paid.

News by Mining Districts

By Special Correspondents in the Field

London Letter

Crown Mines May Acquire Large Additional Area — Tomboy and City Deep Operations Not Auspicious

BY W. A. DOMAN

London, Nov. 10.—A rumor is in circulation that information beneficial to Crown Mines, Ltd., of the Rand, will soon be published. What form this announcement may take is not clear, but it would not be surprising if it was to the effect that the old Langlaagte Proprietary property, outcrop ground to the west, has been acquired for £50,000, and will, I understand, be divided between Crown Mines and Langlaagte Estate. Further to the south, on the Farm Mooifontein, adjoining Crown Mines to the west, are a number of claims, about 400, belonging to the Rand Mines, Ltd. There is a suggestion that these claims are to be acquired on behalf of Crown Mines. Two substantial additions will therefore be made to the company's area.

According to the policy determined upon five years ago, the Knight Central mine will soon close down. A large area remains undeveloped, and apparently will not be touched, owing to the unpromising results of prospecting work. It is assumed that profitable working will continue until January.

The Colombian Corporation, Ltd., of Colombia, has just issued its second annual report covering the calendar year 1921. The document is rather disappointing, as it consists largely of estimates, which are vague and indefinite. A 300-ton mill has been designed, but no mention is made of when it will be ordered. No figures of ore reserves are given, though it is stated that the tonnage is sufficient for a 300-ton mill for three or four years. Several reasons are given as to why the reserves are not larger, one of them being of a technical nature. The two main veins of the property average 7.94 dwt. over 1,525.6 sq.m. and the general manager estimates on \$8 head values, though he admits it cannot yet be demonstrated that the average of the mine is \$8. He expects an 85 per

cent extraction of the gold value, and suggests costs of \$3, leaving a net yield of \$3.80. To the critic this technical report is not convincing, and as there is competition for labor in Colombia, \$3 a ton or less for operating expenses is a somewhat doubtful figure.

Although the Tomboy Gold Mines during the twelve months ended June 30 crushed a record number of tons, and worked at the lowest rate yet recorded, no distributable profit was earned. The quantity of ore treated was 211,003 tons, as against 197,557 tons in the preceding twelve months, the average yield per ton being \$4.145, or \$3 per ton less than in 1921. The saving in expenses, however, was creditable, for the average fell from \$3.976 to \$3.808. No development work was done in the Argentine group of mines, and in the Virginus orebody, work was of rather disappointing nature, so that the total ore reserves, which, at June 30, 1921, were estimated at 888,000 tons, of which 503,000 tons was broken, have fallen to 802,751 tons, of which 443,000 tons is broken. The ore developed stands in the balance-sheet at £90,495. The mines, says N. S. Kelsey, general manager, are in a much better condition today than they were a year ago. A good deal of dislocation to operations during the year was caused by a fire which destroyed the boiler plant building, the coal bins, and about 250 ft. of the snow shed.

For several years the City Deep, of the Rand, seems to have had enemies of a sort, for despite the fact that developments between the two shafts have proved such a wonderful stretch of high grade ore, the shares never seem to attain the value in the market which certain persons place upon them. Hitherto, the milling return has been helped by ore of high gold content, drawn from the northwestern area of the property. I understand that this rich material is rapidly nearing exhaustion, so that there will be no sweetener for the remainder. The average, however, of the 2,428,300 tons shown as at the end of December last was 8.8 dwt., and the actual extraction of head values was 96.7 per cent last year.

Johannesburg Letter

Transvaal Gold Output Shows Increase in Value for September—Unemployment General—Stock Exchange Active

BY JOHN WATSON

Johannesburg, Oct. 17—The output of gold for the Transvaal for the month of September was declared by the Chamber of Mines on Oct. 10 to have been 747,089 oz. having a value of £3,473,964. September had twenty-six working days, of which five were Saturdays (half days); whereas August had twenty-seven working days, with four Saturdays. The decline in production for September was 5,401 oz., but the realized value of the gold was 1s. per ounce more than in August and hence the value increased £12,510. Taking the individual mines, Modder East showed an increase of 3,260 oz. but the City Deep recorded a decrease of 2,468 oz. and the E. R. P. M. a decrease of 1,364.

The following table shows the detailed figures for September:

Ore Crushed, Tons	Value or Revenue	Estimated Profit	Cost per Ton
Crown mines.....	£ 310,485	£ 95,884	s. d. 19-10
East Rand P. M.	137,859	3,326	20-10
New Modder.....	238,273	144,917	17- 0
City Deep.....	83,500	162,596	25- 7
Modder B.....	61,000	149,519	21- 3
Village Deep.....	58,800	84,057	22- 7
Geldenhuis Deep.....	54,181	61,656	21- 5
Rose Deep.....	53,700	59,981	17- 9
Cons. Main Reef.....	53,300	87,170	18,654
Nourse Mines.....	45,900	68,002	10,598
Ferreira Deep.....	34,700	45,556	11,116
Wolhuter.....	32,900	34,356	3,087
Knight Central.....	32,000	30,202	3,802
Durb. Road. Deep.....	30,700	48,374	6,789
Modder East.....	26,600	68,014	34,067
Robinson G. M.....	18,000	26,780	10,835
New Kleinfontein.....	45,300	52,850	3,152
Government Areas.....	143,500	291,485	167,158
Randfontein Central.....	163,000	217,034	35,367
Van Ryn Deep.....	56,600	132,557	74,988
Langlaagte Estate.....	49,700	74,590	23,009
Cons. Langlaagte.....	47,200	57,081	12,122
Witwatersrand.....	46,300	55,208	16,116
New Primrose.....	21,700	22,219	3,619
New Unified.....	11,500	11,278	1,325
Brakpan.....	62,000	108,462	49,036
Springs.....	46,000	90,026	45,627
Modder Deep.....	43,400	107,701	68,145
Geduld Prop.....	45,000	77,613	33,227
Robinson Deep.....	70,100	.....	35,118
Simmer and Jack.....	61,300	.....	8,271
Sub-Nigel.....	10,000	.....	6,365
Van Ryn Estate.....	34,000	45,598	10,117
West Rand Cons.....	34,000	44,623	4,717
New Goch.....	17,200	17,342	1,356
Meyer and Charlton.....	15,000	39,284	23,531
Aurora West.....	11,900	14,671	2,011

In the Lichtenburg district, diamonds are being found on various farms, three beautiful stones being reported from Twee Buffelr. Harold Harger, diamond mining expert, has arrived in that district, in connection with certain new diamond prospecting and development enterprises.

In a previous letter, reference was made to the discovery of gold reefs on the farms Batavia and Kameelboon. The outcrop reef on Batavia is said to vary from 6 in. to 3 ft. in width. Representative samples taken over 3 ft. are said to average 16 dwt. gold and 5 dwt. silver. One taken over 6 in. returned 60 dwt. gold and 20 dwt. silver. The two farms belong to the government and are to be proclaimed as soon as possible. Speculators are said to be eagerly taking up farms all along the line. Two ten-stamp mills are said to be under consideration. The district is very arid, except for the Marico and Crocodile rivers.

The report of the Johannesburg Government Labor Bureau for September shows that there were 1,827 applicants for employment, of whom 1,248 were men. Work was found for 491 (460 of whom were given relief work). The mining industry had absorbed no more men than is usual. The chamber has agreed to certain mine workers being granted leave on and from January next, where it may suit the management to grant such leave. This step may finally lead to more workers being taken on. In the local engineering works the slump continues. Building is going ahead, and there is a fair demand for competent men. Industries are reported to be at a standstill, with no demand for labor, skilled or unskilled.

On the Stock Exchange, during the last week, business has been active. The advance in prices was due chiefly to buying orders from London.

Crown Mines increased 2s. 6d. during the week, Government areas 3s. 9d., Modder B 2s. 3d. and Modder Deep and New Modder each about 1s. per share.

Melbourne Letter

"Un-Amalgamating" of Bendigo Goldfields; Six Companies, One Management

BY PETER G. TAIT

Melbourne, Oct. 14—P. G. Morgan, Director of the Geological Survey in New Zealand, has recently published the results of his resurvey of the Waihi gold fields, undertaken with the view to ascertaining the persistence at depth below the levels opened up by the mining companies, or laterally outside the country already developed. The general conclusion is that the conditions favor secondary enrichment at depth in the western part of the Waihi mine and also probably in a section of the Waihi Grand Junction. The investigation will in all probability result in further exploration of the ore deposits on the field.

Members of the Amalgamated Society of Engineers have been working under a Commonwealth Arbitration Court award which fixed the hours at forty-four per week. This award was given by Justice Higgins, being one of his last acts as president of the court. Recently the wage rate was reduced by about 20 per cent and now Justice Powers, the president, has granted the application of the employers to increase the hours from forty-four to forty-eight. This decision naturally was not popular with the union, and the members employed by the Mount Lyell Co., Electrolytic Zinc Co., and several other large concerns refused to accept it, notwithstanding the fact that the union officially would not declare a strike. It is expected, however, that the men will soon return to work.

The Bendigo Amalgamated Goldfields, which was a combination of practically the whole of the mines on the Bendigo field, did not succeed to the extent anticipated. A large amount of prospecting work was carried out, but with one or two exceptions the results did not warrant further development, and, as operations became restricted an agitation arose against so much of the country being held by one large company. The Bendigo Amalgamated, therefore, agreed to allow other companies to take up portions of its leases, and one company was formed for this purpose, namely the Bendigo, A1; later the Bendigo Amalgamated reconstructed and refunded capital to shareholders. Now it has been felt that greater public interest would be manifested by the formation of six separate companies, operating six areas, into which the company's leases have been divided, and the shareholders have approved this arrangement. The Bendigo Amalgamated Co. has entered into an agreement with each of the new companies for managerial service, but each company will have two independent members on the board. The new companies will each have a capital of £30,000, of which one-fifth will be issued to the Bendigo Amalgamated Co. in fully paid up shares and the balance among shareholders at the rate of eight shares in each company for every 100 shares held in the Bendigo Amalgamated.

New Copper-Recovery Process?

Details are awaited with much interest in Queensland of a new metallurgical discovery, called the metallic contact process, for the treatment of low-grade copper ores, recently tested by Dr. Simpson, Government mineralogist and chemist of Western Australia. Laboratory tests are stated to have shown that 5 per cent copper ores of the Phillips River gold field, in that state, can be profitably treated, whereas hitherto it had been possible to handle nothing lower than 8 per cent. If this can be done profitably, it is stated, there would be a great future not only for the Phillips River field, but for many other fields in Australia now closed down. Phillips River sands are valuable in gold contents, some running as high as half an ounce per ton, and Dr. Simpson is satisfied that this quantity of gold as well as the copper can be recovered.

BRITISH COLUMBIA

Salmon River Railway Is Possible
—Premier District Active

Stewart—A. G. Larsen, acting for Spokane interests, has bonded the Torris group of two claims and the Virginia group of five claims for \$75,000 payable over three years. The claims are conveniently situated on the main road to the Premier mine, and about 12 miles from Stewart, all of them being on the Alaskan side of the international boundary. Little work has been done on them. Three lodges have been exposed by trenching, and a short tunnel on one of the lodges has run into some promising silver ore.

E. J. Conway, one of the Granby company's engineers, has made an examination of the Alaska-Daly mine.

Charles F. Caldwell, vice-president of Utica Mines, Ltd., and G. A. Carlson, a railway contractor of Spokane, have made a reconnaissance survey up the Salmon River valley, with a view to finding the opportunities of constructing a railway, and find that the valley offers no insurmountable difficulties. Mr. Caldwell obtained a charter for a railway from the United States government two years ago, but at that time only the Premier mine had advanced beyond the prospect stage, and capitalists did not take kindly to the idea. Now that six promising properties are being developed on the Alaskan side of the international boundary Mr. Caldwell believes he can interest capital.

Smithers—J. F. Duthie, of Seattle, has consolidated a number of claims near Hudson Bay mountain. Mr. Duthie states that he has five tons of bonanza ore sacked that will run \$1,800 per ton and 200 tons of high-grade assaying \$200 per ton. The ore contains a good deal of gray copper, but the principal value is in the silver. Development work will be continued through the winter.

MEXICO

San Luis Potosi Smelter Is
in Full Blast

Mexico City—A meeting of the shareholders of the Dulces Nombres Mining Co. was held in Mexico City on Nov. 10 for the purpose of discussing further plans for a liquidation of the company. The mining properties, which are in the State of Nuevo Leon, together with the machinery and other holdings, are to be offered for sale to satisfy the creditors. J. M. Bellwald is president of this company. Some of the mining properties might be profitably worked with additional development.

San Luis Potosi—Heavy shipments of ore are being received here from various mines in the northern states consigned to the smelter, which is now operating at capacity. A large tonnage of silver-lead ores is coming from the Santa Barbara district, in the State of Chihuahua, where the Cia. Metalurgica Mexicana, owners of the San Luis Potosi smelter, have properties.

Considerable ore is also being received from Sombrerete and other mines in that vicinity, although the bulk continues to come from the San Pedro mines, situated in this state and owned by the smelting company.

The plant was built for the treatment of the ores from the mines situated in the San Pedro district, in the mountains of the same name, about 21 km. from the city of San Luis Potosi. The company now has a lease on the mining properties pertaining to La Victoria Mining Co. It also possesses other mines in various parts of Mexico which contribute to the metal supply for the smelter.

The smelter has nine lead furnaces of 100-ton daily capacity each and two copper furnaces each with 250-ton capacity. When operating in full blast about 800 men are employed at the plant. The strike at the coal mines in the northern part of Coahuila last year caused a suspension of operations for several months, as it cut off the supply of coal and coke. During ten months' operation in 1920, 2,895 tons of lead bullion and 4,354 tons of copper matte were produced and about 3,000 tons of flue dust.

COLORADO

Boulder County and Caribou Mines
Will Be Reopened

Boulder—Arrangements have been completed for resumption of work at the Boulder County and the Caribou group of mines at Cardinal and Caribou. Denver interests have made the initial payment, and work has been commenced on the milling plant at Cardinal and in cleaning out the old tunnel, which is to be extended 15,000 ft. to undercut the Caribou shaft. The mill will be supplied from the Boulder County group already cut by the tunnel and from the Caribou mines which have been steadily operated for the last three years. The Caribou has been making a regular output of high-grade ores, which have been shipped to the Leadville smelter. In driving into new territory and opening up old stopes, large quantities of milling ores are said to have been uncovered. J. G. Clark, of Boulder, will have local charge of the operations.

Breckenridge—Since the first of November the force on the Wellington mine has been rapidly increased and the mill has been put in condition to start the latter part of the month. It is estimated that about 150 men will be on the payroll within the next thirty days. As fast as cars can be procured, the large stock of stored zinc concentrates is being moved to the market.

Leadville—After several months of preparation in the way of installing new machinery, repairing buildings, and cleaning out old workings, actual development has begun in the shaft of the Fortune Mining Co., operating on Little Ella hill. Until present operations, the property has been inactive since 1905.

ALASKA

Fairbanks Scene of Active Churn-Drill
Prospecting

Special Correspondence.

Nome—The Steamship Victoria left Nome recently for Seattle with \$750,000 in gold bullion. This represents the early spring clean-up in the far-northern mining camp. The Hammon Consolidated Goldfields Co. is erecting two wood-steel dredges which are expected to be in operation next spring.

Fairbanks—Despite the fact that the Fairbanks district is enjoying Indian summer weather, most of the open-pit placer mines and sluicing operations are closing down for the winter season. There has been more than usual activity on all the principal creeks this season. A number of properties have started crews at drift mining. These operations will continue throughout the winter, and the gravel mined will be "cleaned-up" next spring.

The Bigelow-Humphries Co., which is supposed to represent one of the large dredging companies, has been active all summer prospecting Engineer and Goldstream creeks. The company is using a Keystone steam outfit and is working two shifts with the expectation of continuing this work through the winter. A local organization is also drilling on Goldstream Creek with a small gasoline outfit.

Quartz mining in the Fairbanks district is not making much headway. There are now five properties operating—all in a small way. Two of these properties have been operating steadily for several years, but the tonnage produced has been small. The ore mined averages from \$20 to \$40 per ton and is treated in adjacent custom mills.

Sitka—The Hirst Chichagoff Mining Co. is operating its gold mine from the lower tunnel, through which ore is delivered directly to the mill. Ten stamps were operated last summer, crushing ten to fifteen tons on a one-shift basis. Equipment at the plant includes a 35-hp. gasoline engine for running the mill, and a 50-hp. engine to run the air compressor and a generator to supply electric current. The ore milled is very high grade, and a fair recovery is effected on amalgamating plates. J. D. Williams is superintendent.

Juneau—The current report states that the Alaska-Juneau Gold Mining Co. in October, 1922, trammed 234,850 tons; rejected as coarse tailings 102,810 tons, and milled 132,140 tons of fines. From the tonnage milled a total recovery of \$132,500 was made—\$1 per ton milled, and \$0.56 per ton trammed. Operating costs were \$45,000 for mining and tramping; \$54,000 for milling; and \$3,000 for general cost, a total of \$102,000. These are equivalent to \$0.77 per ton milled and \$0.43 per ton trammed. The operating profit was \$30,500. Expenditure on capital account was \$8,000; San Francisco expenditures were \$16,000; and total estimated expenditures, \$126,000.

ARIZONA

Tombstone Might Profit from Colorado River Power

Globe—According to a statement made by Charles S. Smith, president of the Arizona Commercial Mining Co. and the Old Dominion Co., the apex suit involving the former company and the Iron Cap Copper Co. will be appealed to the U. S. Supreme Court if other appeals are not successful. The recent decision favored the Iron Cap, the case having been tried in the superior court of Gila County in December, 1921.

The first crosscut driven on the 1,700 level of the Arizona Commercial mine from the Copper Hill shaft has intersected the continuation of the Old Dominion vein. The ore is chalcocite and bornite; it is 14 ft. wide and contains 8 per cent copper.

Mayer—The Blue Bell mine, four miles west of here, owned and operated by the Southwest Metals Co. is producing 250 tons per day of 3 per cent sulphide ore. The entire output is shipped to Humboldt, where the company's mill and smelter are situated.

Tombstone—An average of two cars per day is being maintained in shipments to Douglas and El Paso smelters. Most of this comes from the workings of leasers on the Bunker Hill property of the Phelps Dodge company, where the ore is being mined from relatively old workings of the Bonanza mine above the water level. It is thought that the equally rich ores below the water level may eventually be mined when cheap power is available from the Colorado River projects. A large part of the old Tombstone pumping plant has been moved away, and the Phelps Dodge company manifests no inclination toward ridding the lower levels of water. The mining done by the leasers is mostly confined to rich streaks of silver ore.

Kingman—The new Highland mill has been given an initial test run since the installation of flotation machinery. This property has been under development for about four years, during which time several thousand feet of work has been done.

Oatman—A crosscut from the bottom of the Telluride shaft has cut a water course at a distance of 98 ft. and it is expected to intersect the vein within 30 ft. more. This working will cut the vein at a distance of 150 ft. from the winze, where rich ore was found several months ago. The same vein has been explored in the Tom Reed mine on the 500 level where the ore was from 3 to 5 ft. wide and contained some very rich ore.

Bisbee—The Copper Queen is making 100,000 lb. of copper a year from water from the old Czar shaft, one of the earliest workings in the district and situated close to the company's store. From every 1,000 gal. pumped 5½ lb. of copper is recovered. This water is pumped mainly from the 400 level in an 8-in. steel pipe lined with wood. The

pipes discharge into long wooden troughs, wherein about 78 per cent of the copper is deposited. During the first six months of this year the troughs consumed 155 tons of cans and 47 tons of scrap iron. The Czar is one of the shallowest mines of the Copper Queen, being bottomed in quartzite, and is the only section where acid waters are found.

NEVADA

Brougner Stock in Tonopah-Divide Will Be Held Intact

Tonopah—Bullion shipments from the Tonopah district for the latter half of October totaled about \$300,000, which is normal.

Work was resumed in the California & Tonopah mine, situated in the south-east portion of the Tonopah district, on Nov. 10. The mine has been idle since April, 1921. C. W. Geddes, representing New York interests, has closed negotiations with the Stall Brothers, principal owners of the mine, and has financed future development. The property has produced considerable ore of good grade, but previous operations were not profitable. The main shaft is 750 ft. deep, with some work done from a winze on the 1,000 level.

Goldfield—No settlement has been reached between miners and operators in this district. The Silver Pick men have joined the strikers and all work, except that of leasers, has been stopped. The men are striking for the Tonopah wage scale.

Divide—The crosscut on the 1,200 level of the Tonopah Divide mine encountered vein material at 273 ft. from the shaft and has penetrated the vein about 15 ft., the last 7 ft. showing fair values. The Divide vein is practically vertical to the 1,000 level, but on the 1,200 the dip is 63 deg. to the southwest. The 1,400-level crosscut should reach the projected position of the vein in about 60 ft., and the formation is already showing some mineralization.

As provided in the will of H. C. Brougner, late president of the Tonopah Divide Mining Co., who died on Nov. 7, his stock in the company will be held intact for five years. It is rumored that Clyde A. Heller, president of the Tonopah Belmont Development Co., will be elected president of the Tonopah Divide Mining Co.

Rochester—October production of the Rochester Silver Corporation was \$47,461, with net earnings estimated to be \$9,500, or \$3,000 less than September. Little work has been done on the new vein discovered on the 800 level. The mine is said to have six months' ore in sight.

Hamilton—It is reported that the Treasure Hill Mining and Milling Co. is to start construction on a 100-ton cyanide plant in the near future.

Bellehelen—The Bellehelen Merger Mines Co., with headquarters in Tonopah, has announced its intention to construct a fifty-ton cyanide plant at Bellehelen, Nevada.

CALIFORNIA

Bigelow and Butte Queen Properties Are To Be Reopened

Redding—A patent for the Golinsky group of eight copper claims near Kennett was recently recorded. The group produced copper ore about ten years ago and was bonded to large mining interests which failed to take up the bond. The principal owners are the estate of Bernard Golinsky, W. D. Tillotson, and George Bayha.

The Pittsburg-Comstock Co. recently acquired placer ground on Canyon Creek, between Junction City and Dedrick. F. M. Gibson is superintendent; the ground will be worked as soon as miners can be secured.

A strike of gold ore is reported in the Buckskin mine, near Hayden Hill.

Oroville—The Butte Queen mine is to be reopened by Gordon Graham, a local mining man.

Downieville—The Bigelow mine, near Sierra City, is to be reopened by E. C. Klinker and associates. The machinery and equipment of the Monarch mine has been purchased and will be moved to the Bigelow. By agreement with the Sierra Butte mine, adjoining, the Bigelow property will be developed through the Sierra Butte tunnel No. 9.

Grass Valley—The Walker mine, on the American River, near Alta, has shut down for the winter. Work will be resumed in the spring. A small crew of men will be employed at the Brandy City mines, near Brandy City, getting ready for the winter season. G. F. Taylor is superintendent.

Randsburg—The Randsburg district continues to be the most active of California mining camps. Strikes of minor importance are reported frequently, and the next six months will determine whether outlying properties have any importance as potential producers.

WASHINGTON

Bead Lake Company Starts New Concentrator

Newport—The new concentrator of the Bead Lake Gold & Copper Mining Co. has been started. The new plant is electrically operated and has a capacity of 100 tons per day. The ore, which is galena and chalcopyrite carrying gold and silver, is yielding readily to concentration, according to W. E. Allen, manager.

Keller—The Iron Creek mine has resumed milling operations, having blocked out sufficient ore to keep the plant in operation all winter.

Republic—The Knob Hill mine has resumed shipping after several months of development work which has exposed new ore in the lower levels of the mine.

The Phil Sheridan mine, near Toroda, reports ore beginning to show in the drift on the 400 level, on which a drift is being driven to explore the ground on that level below the McCormick stope, from which high-grade silver was shipped several years ago.

UTAH

Ore Shipments From Tintic Mine Increase Slightly

Park City—Shipments for the week ended Nov. 14 amounted to 3,772 tons. Shippers were: Park City M. & S., 1,480 tons; Silver King Coalition, 1,005; Park-Utah, 867; Ontario, 420.

Eureka—Tintic shipments for the week ended Nov. 14 amounted to 156 cars, compared to 146 cars the week preceding. Shipments were: Chief Consolidated, 60 cars; Tintic Standard, 28; Iron Blossom, 12; Dragon, 10; Colorado, 9; Eagle & Blue Bell, 8; Victoria, 5; Swansea, 5; Centennial-Eureka, 4; Mammoth, 2; American Star, 1; Alaska, 1; Empire Mines, 1.

Bingham—Shipments for the week ended Nov. 14, exclusive of the Utah Copper, which is moving about 250 cars daily, and the Utah Consolidated, shipping 800 tons daily to its Tooele mill, amounted to 83 cars. Shippers were: United States company, 43 cars; Utah Apex, 27; Bingham Mines, 7; Montana Bingham, 6.

IDAHO

Ore From Slate Creek Assays 477 Oz. Silver—Geologists Frowned on District

Wallace—Discovery of high-grade silver ore in what is known as the Slate Creek section of the Coeur d'Alene district seems likely to upset geological opinion of long standing that that section is barren of mineral deposits of value. The discovery was made by A. M. Mundell, a typical prospector, who for many years has braved expert opinion by persisting in the development of his claims. Warned by the snow that he must abandon his work for the winter, he laboriously covered the seventeen miles of mountain trail to Wallace, bringing with him samples from a tunnel which he had driven 125 ft. on the vein. Like all others of his kind, Mundell was confident that an assay of his samples would show substantial values which would enable him to secure financial assistance in the development of his claims, but even his optimistic spirit was not prepared for the result of the assay. One sample which he said represented the entire width of the vein as disclosed in the face of the tunnel carried 477 oz. in silver. Naturally the news of this rich discovery in a tabooed district has attracted much attention, but the snow at that high elevation is a barrier to performing any further development until spring.

The Cedar Creek Mining & Development Co., having developed a large tonnage of lead-silver and zinc ore, is planning to build a mill in the spring. The property is on what is known as the North Side in the Coeur d'Alene district. Electric equipment has just been installed and a sawmill put in which will turn out lumber for the mill this winter. William Becker, of Wallace, is manager.

NEW MEXICO

New Railroad Projected

Lordsburg—The Anita Copper Co. has decided to push development work on the lower levels of the mine, confining all efforts to that end. George Foreman is manager.

Smelter returns to date on 357 tons of copper ores from No. 1 shaft of the Bonney mine show an average of 0.46 oz. gold, 6 oz. silver, and 9.04 per cent copper.

Magdalena—Preparations are being made to develop the property of the Copper Belt Silver & Copper Mining Co. This property is situated on the west side of the Sevilleta Grant and has an extensive showing of copper carbonates on the surface. It is the intention to use core drills for deeper development. H. Bennett is in charge.

Santa Fe—The Colorado, Columbus & Mexican railroad has asked the Interstate Commerce Commission for a "certificate of public necessity and convenience" to build a railroad from Columbus to Farmington, N. M., a distance of 400 miles, with branches extending into Arizona and New Mexico. This road, if built, will furnish transportation to a large and promising mining territory tributary to Mogollon. It will open up a short line from the Gallup coal mines to the southwest, traverse the new oil fields of the San Juan River, and draw ores from the rich Silverton quadrangle, in southwestern Colorado. It will be a low-grade line with moderate construction costs. It is understood that New England capital is interested.

Deming—Exploration work on the Tres Hermanas silver-lead properties is being pushed by Peter Mack.

Two drill holes will be put down on the Waterloo property, the work to begin at once.

GEORGIA

Revival at Dahlonega

Dahlonega—A general revival of gold mining in the district seems imminent. Warfield, Kimber & Allman have purchased the properties of the Crown Mountain (Gold) Mining & Milling Co. They plan to rebuild the Gorge dam, so that they may secure sufficient power to operate the large pumping plant on the Chestatee River. The proposed method of treating the saprolite ore will require enormous quantities of water. In the meantime preparations are being made to work the several placer deposits on the property. About twenty-five men are now employed.

A ten-stamp mill is operating on the Findley Ridge property just east of the Crown Mountain mines. Ore is being taken from several new veins that were uncovered during the summer, and is said to average about \$20 per ton.

F. L. Stone has just made his first clean-up at the Barlowe mine, where he is working some virgin placer ground. He has spent more than a year in perfecting his water supply, and is now in a position to operate without interruption.

MICHIGAN

Copper Range Output for November About 2,600,000 Lb.

Houghton—Copper Range production, which will show a slight increase this month, probably will be 2,600,000 lb. for the three mines, Champion, Baltic, and Trimountain. Development work is not being neglected in any of the shafts despite the shortage of labor, although it is necessary to alternate the work with that of regular mining. Opening operations are particularly vigorous in Champion and Trimountain. There has been no change in average yield.

Ahmeek is shipping better than 2,100 tons of "rock" daily. The yield continues high, averaging 30 lb. to the ton, giving Ahmeek a refined monthly production of approximately 1,600,000 lb. The fissure vein in No. 2 shaft is yielding 60 tons of mass copper per month, but this metal is accumulating at the smelter. Not being smelted it does not appear in output.

Menominee Range

Crystal Falls—Henry Ford has begun to drill for iron ore on Sect. 3, T. 48 N., R. 31 W., in Manfield Township. One drill rig is now at work. The lands to be tested are owned by Ford, having been secured when the holdings of the Michigan Land & Iron Co. were taken over. Some work has been done in this neighborhood, and the prospects for finding ore of good grade are encouraging. At present Ford is operating one mine, the Imperial, on the Marquette Range, but buys most of his ore in the market.

Palmer—The Steel & Tube Co. of America is laying a track to the Old Platte mine, where a diamond drill is now being operated. This territory has never been thoroughly explored. The Maitland pit mine, idle all summer, started to make shipments late in October. This is the only mine in the district where iron carbonate (siderite) is mined. The Richmond has about completed its season's work and will be closed.

Gogebic Range

Ironwood—The total shipments from this range for the season have passed the 5,500,000-ton mark. Weather this fall has been the mildest ever recorded, and shipping could probably be continued for a few weeks. However, most of the mines have filled their orders and got their stockpiles cleaned up.

Work has begun on the construction of a two-mile spur track from the Chicago & Northwestern main line into the Morgan mine a few miles east of Wakefield.

The Berkshire mine, at Mellen, Wis., is shipping its concentrates to the Ashland furnace of the Charcoal Iron Co. of America. The ore is a low-grade magnetite and is now being concentrated magnetically after unsuccessful attempts to wet-concentrate it.

THE MARKET REPORT

Daily Prices of Metals

Nov.	Copper, N. Y., net refinery*		Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.	
16	13.625	35.625	36.50	7.05	6.90@6.925	7.25@7.30	
17	13.625	35.625	36.50	7.00@7.15	6.90	7.20@7.25	
18	13.65	35.625	36.50	7.00@7.15	6.90	7.20	
20	13.65	35.875	36.75	7.00@7.15	6.90	7.15@7.20	
21	13.65	35.75	36.625	7.00@7.20	6.875@6.90	7.10@7.20	
22	13.65	35.50	36.375	7.00@7.20	6.875@6.90	7.05@7.10	

*These prices correspond to the following quotations for copper delivered: Nov. 16 and 17, 13.875c.; 18 to 22 inc., 13.90c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin. Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

The quotations are arrived at by a committee consisting of the market editors of *Engineering and Mining Journal-Press* and a special representative of the Federal bureaus in Washington which are interested in the mining industries.

London

Nov.	Copper			Tin		Lead		Zinc	
	Standard	Electrolytic	Spot	3M	Spot	3M	Spot	3M	
	Spot								3 M
16	63½	64½	70½	178½	179½	26½	24½	39	37
17	63½	64½	70½	177½	178½	26	24½	39	36½
20	63½	64½	70½	178½	179½	26	24½	38½	35½
21	62½	63½	70½	178	178	26½	24½	37½	35
22	62½	63½	70½	177½	178½	26½	25½	36½	35

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Nov.	Sterling Exchange "Checks"	Silver			Nov.	Sterling Exchange "Checks"	Silver		
		New York Domestic Origin	New York Foreign Origin	London			New York Domestic Origin	New York Foreign Origin	London
16	4.46½	99½	63½	32½	20	4.48½	99½	64½	32½
17	4.47½	99½	63½	32½	21	4.49	99½	65	32½
18	4.47½	99½	64½	32½	22	4.48	99½	64½	32½

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command one-quarter of a cent premium.

Metal Markets

New York, Nov. 22, 1922

Most of the metals have been unusually quiet during the last week, though prices have been firm with the exception of zinc.

Copper

Some producers have advanced their quotations from 13½c. to 14c., delivered, but not a great deal of copper has been sold at the higher level. The firmer attitude has had the effect of bringing a fair volume of consumption into the market at the 13½c. price, especially as the quoted price was generally 14c. and producers gave the impression that at the lower figure a special bargain was being offered. Where delivery charges

are high there seems to be no disposition to go under 14c.

Export demand has been steady, though the volume is not nearly so great as would be the fact if exchanges were more stable. The foreign business has in general netted producers slightly more than has been obtained for domestic deliveries.

Producers in general report November business better than for several months and feel that a 14c. level will soon be definitely re-established.

Lead

The official contract price of the American Smelting & Refining Co. continues at 7c., New York.

The lead market has been rather

more quiet than usual during the last week. Although the price of the principal interest is unchanged, and of course, business has been booked at this level, consumers are unable to fill their requirements at this source and premiums continue to be asked by other producers for early shipment. There is no dearth of lead provided buyers are willing to pay the price demanded. In the St. Louis market, business was slow at the 6.90@6.925c. level, so in the last day or two it has been possible to buy lead at 6.875c., though the orders even at that figure have not been large.

Zinc

The market has become decidedly softer, mainly from lack of support by galvanizers and Europe. Today common zinc has been sold even as low as 7.05c. for November-December shipment. Whereas a week ago sales were chiefly made for forward delivery, which commanded a discount under the spot price, sales during the last week have been largely for prompt shipment. The let-up of European purchases indicates an easier position abroad. However, export trade in zinc was not expected to continue indefinitely, as the sale of zinc by American producers is ordinarily confined to the domestic market. The statistical position of zinc is still excellent and relief from the fear of a runaway market rather than alarm is expressed by producers. New York prices continue at 35c. per 100 lb. above those at St. Louis. The price of high-grade zinc remains at 8.25c. with 30c. per 100 lb. freight allowance. High-grade zinc business is splendid.

Tin

The tin market has again been uncertain with few purchases by consumers. The trade is still awaiting tinplate prices to be announced for the new year; these ordinarily appear by the first week in November.

Arrivals of tin, in long tons: Nov. 15th, Straits, 75; 17th, Rotterdam, 15; 18th, China, 55; 20th, Straits, 1,375; China, 100; Java, 25; 21st, Liverpool, 50. Total so far in November, 3,720.

Gold

Gold in London: Nov. 16th, 92s. 4d.; 17th, 91s. 11d.; 20th, 91s. 11d.; 21st, 91s. 6d.; 22d, 91s. 9d.

Foreign Exchange

Violent fluctuations occurred in the foreign exchange market in the last few days. On Tuesday, Nov. 21, francs were 7.135c.; lire, 4.665c.; marks, 0.01½c.; and Canadian dollars, par.

Silver

On Nov. 16 the London price fell to 32½d., which was identical with

the previous low figure for the year, reached on Feb. 28. The New York official on this recent movement dropped to 63½c., which was only ¼c. above the year's previous minimum price.

From Nov. 16 to 21, the price of silver improved, on the strength of purchases by China and India. Short coverings also played a part in this recovery.

At the close the market appears weaker in tone.

Mexican Dollars—Nov. 16th, 48½; 17th, 48½; 18th, 49½; 20th, 49½; 21st, 49½; 22d, 49½.

Other Metals

Quotations cover large wholesale lots unless otherwise specified.

Aluminum—General market for 99 per cent grade, about 21@22c. per lb.

Antimony—Chinese and Japanese brands, 6.60c., quiet. W. C. C., 6.90@7.25c. Cookson's "C" grade, spot, 8½@9c.

Bismuth—\$2.45 per lb.

Cadmium—\$1.15 per lb.

Cobalt—Metal, \$3@3.25 per lb.; black oxide, \$2 per lb. in bbls.

Iridium—\$240@275 per oz.

Nickel—Standard market, ingot and shot, 36c.; electrolytic, 39c. Outside market, 32@34c. per lb.

Osmium—Pure, \$70@80 per oz. troy, in Los Angeles. Strong.

Palladium—\$52@55 per oz.

Platinum—\$108 per oz. Nominal.

Quicksilver—\$70@72 per 75-lb. flask. Market firm. San Francisco wires \$70. Quiet.

Radium—\$70 per milligram of radium content. Price was \$95 until forty-five days ago. Indications are that price will be increased.

Selenium—Black powdered, amorphous, 99.5 per cent pure, \$1.90 per lb.

Tellurium—\$2.50 per lb.

Tungsten—Powder, 75c.@1.05 per lb. of contained tungsten.

The prices of **Molybdenum**, **Monel Metal**, **Rhodium**, and **Thallium** are unchanged from prices given Nov. 4.

Metallic Ores

Chrome Ore—Indian chrome ore, \$18.50 per ton, c.i.f. Atlantic ports. Rhodesian and New Caledonian, \$23 and \$25 per ton. Market quiet.

Iron Ore—Lake Superior ores, per long ton, Lower Lake ports: Old Range bessemer, 55 per cent iron, \$5.95; Mesabi bessemer, 55 per cent iron, \$5.70; Old Range non-bessemer, 51½ per cent iron, \$5.20; Mesabi non-bessemer, 51½ per cent iron, \$5.05.

Magnetite Ore—F.o.b. Port Henry, N. Y.: Old bed 21 furnace, \$5 per long ton; old bed concentrates, 63 per cent, \$5.25; Harmony, cobbled, 63 per cent, \$5.25; new bed low phosphorus, 65 per cent, \$7.50.

Manganese Ore—30c. per long ton unit, seaport, plus duty; equivalent to about 45c. Chemical ore, \$75@80 per gross ton.

Molybdenum Ore—60c. per lb. of MoS, for 85 per cent MoS, concentrates, plus duty; equivalent to 85@90c. per lb.

Tungsten Ore—Chinese ore, \$8 per long ton unit of WO.

Tantalum, Titanium, Uranium, Vanadium, and Zircon ore are unchanged from the quotations published Nov. 4.

Zinc and Lead Ore Markets

Joplin, Mo., Nov. 18.—Zinc blende, per ton, high \$47.10; basis 60 per cent zinc, premium, \$47.50@48; Prime Western, \$45@46; fines and slimes, \$44@42; average settling price, all grades of blende, \$42.12; calamine, basis 40 per cent zinc, \$23@25.

Lead, high, \$93; basis 80 per cent lead, \$91@92.50; average settling price, all grades of lead, \$87.14 per ton.

Shipments for the week: Blende, 12,724; calamine, 59; lead, 2,034 tons. Value, all ores the week, \$713,920.

Platteville, Wis., Nov. 4 (delayed)—Blende, basis 60 per cent zinc, \$47 per ton. Lead, basis 80 per cent lead, \$91 per ton. Shipments for week: Blende, 765 tons; lead ore, none. Shipments for the year: Blende, 21,648; lead, 1,349 tons. Shipped during the week to separating plants, 1,703 tons blende.

Non-Metallic Minerals

China Clay—Canadian, in lumps, \$17@18, f.o.b. Quebec. For other grades see issue of Nov. 4.

Feldspar—No. 1 pottery grade, \$6.50@7.50 per long ton; No. 2, \$4@5.50, f.o.b. North Carolina points. No. 1, \$7.50; No. 2, \$6.50, f.o.b. Connecticut points. No. 1, Canadian, \$20 per net ton, f.o.b. mills. In Maine, \$18 per ton, f.o.b. cars. First quality ground \$21; second quality \$16 per short ton, f.o.b. New Hampshire points.

Fluorspar—Fluxing gravel, 85 per cent CaF₂ and not over 5 per cent silica, \$21.50, f.o.b. mines; not over 6 per cent silica, \$21; 80 per cent grade, not over 5 per cent silica, \$20; ground acid grade, \$45 in bulk; ground enameling grade, \$35 in bulk; packages, \$4 extra, all f.o.b. mines, Illinois. No. 1 lump, \$30; No. 2 lump, \$25, f.o.b. Illinois mines.

Magnesite—\$37.50 per ton, f.o.b. cars, California calcined, 90 per cent MgO or better.

Pyrites—Spanish, lump, 11½c. per unit; furnace, 2½ in. diameter, 12½c. per unit; fines, through ½-in. mesh, 11½c. per unit; cinder property of buyer. Material runs from 50 to 51 per cent sulphur. Lump and fines, \$5.75 per long ton; furnace size, \$6.25, f.o.b. Atlantic seaboard.

Market limited to coast plants on account of brimstone competition and high freight rates to interior.

Asbestos, Barytes, Bauxite, Chalk, Emery, Fuller's Earth, Graphite, Gypsum, Limestone, Mica, Monazite, Phosphate, Pumice, Silica, Sulphur, and Talc are unchanged from the prices published Nov. 4.

Mineral Products

Arsenious Oxide (white arsenic)—firm at 11@11½c. per lb.

The demand for arsenic by insecticide manufacturers has been excellent for many weeks and has raised the price gradually to its present level between 11 and 11½c., prices at which perhaps 90 per cent of domestic business has been done. As is usually the case, the present arsenic shortage has enabled some brokers and speculators to ask prices in excess of those we quote.

Copper Sulphate, Potassium Sulphate, and Sodium Sulphate are unchanged from quotations of Nov. 4.

Ferro-Alloys

Ferromanganese—Domestic, 78@82 per cent, \$100 per gross ton, f.o.b. furnace. Spiegeleisen, 19@21 per cent, \$39, f.o.b. furnace; 16@19 per cent, \$38.

Ferrotungsten—Domestic, 70@80 per cent W, 85@95c. per lb. of contained W, f.o.b. works.

Ferrocerium, Ferrochrome, Ferromolybdenum, Ferrosilicon, Ferrotitanium, Ferrouranium, and Ferrovandium are unchanged from the prices published Nov. 4.

Metal Products

Lead Sheets—Full lead sheets, 10.25c.; cut lead sheets, 10.50c. in quantity, mill lots.

Zinc Sheets—\$9.25 per 100 lb., with usual discounts, f.o.b. works.

Copper Sheets, Nickel Silver, and Yellow Metal are unchanged from the prices published Nov. 4.

Refractories

Bauxite Brick, Chrome Brick, Chrome Cement, Magnesite Brick, Magnesite Cement, Silica Brick and Zirkite are unchanged from the prices published Nov. 4.

The Iron Trade

Pittsburgh, Nov. 21, 1922

Production of steel continues at fully the October rate. All, or nearly all, the large producers have sufficient tonnage on books to carry them for two months or more. Following the recent disappearance of delivery premiums on bars, shapes and plates, leaving the market generally on a 2.00c. basis, premiums on black sheets disappeared entirely in the last week, the whole market being back to 3.35c., the price of last summer, with several independents eager to make sales and able to offer very prompt rolling.

Pig Iron—The market remains stagnant, with prices yielding a trifle now and then. Basic and foundry are both down \$1 in the week, to \$28, Valley, bessemer remaining nominal at \$32, Valley.

Connellsville Coke—Furnace coke is a shade firmer in tone, but can still be picked up at \$6.75 to \$7.25 in odd lots. Foundry is off 50c., at \$7.50@8.50 according to brand. Production continues to increase, but operators expect restriction next month on account of winter weather affecting transportation.

German Metal Industry Still Troubled by Exchange

SPECIAL CORRESPONDENCE

Charlottenburg, Nov. 4—In my last letter I outlined the difficulties arising out of the untimely and awkward enactment of the federal government of Germany which interdicted buying and selling of metallic stuffs in terms of foreign currency. Under this provision the metal import trade was simply dead. I have it on good authority that for nearly two weeks the Berlin branch of the American Copper Export Association made no offers at all to German users of copper. This applies also to certain American brands of lead, to selenium, and other products which are sold in the Behrenstrasse. So it came that business there was restricted to non-German consuming centers, especially to Sweden and Hungary, the two countries being busy now for Russian and Jugoslavian account, respectively.

In the meantime smelters and refiners in this country refrained from quoting because they feared lest they might not have raw material on which to work. Lacking offers, prices in the open market soared rapidly to undreamed of heights. Metal for the refineries was not available, particularly because this line of business is going on upon a cash basis. Electrolytic copper was, by the end of October, raised to around 1,440 marks for a kilo in sympathy with the sudden premium on dollar exchange, and is now (Nov. 4) at 2,030 marks at the official Metal Exchange. Also, other refined copper, the so-called *raffinadekupfer*, of which supplies are more plentiful, jumped up to 1,250 and 1,675 marks, respectively. Scrap metal prices also rose proportionately. The well-lubricated machinery of the copper producers became evidently more inefficient, as is seen by the fact that German cathodes of only 99 per cent purity sold as electrolytic copper. The protests of the users of genuine electrolytic copper against such procedure were easily shelved by some refiners who felt their monopolistic power. The endless entanglements involved by the impossibility of importing and dealing with the imported ores and metals in an adequate way were solved at last by another amendment to the law that gives the importer the power to offer to the first home buyers in terms of world money. This resulted in opening the floodgates of legitimate demand, especially for the copper and lead for the cable-making and electrotechnical trades, and for ferro-alloys by tool makers.

It may again be emphasized that the producing capacity of German metal industries is enormous, but they are greatly handicapped by the confusion incident to fuel and exchange difficulties. As a matter of fact, the rush of demand for foreign raw materials, resulting in an excessive demand for foreign currency, caused a fresh bad slump in the mark value, so that the tide turned anew; for the so-called *Metallwirtschaftsbund* (a sort of autonomous metal parliament that is recruiting its members from all metal circles here) is bound not to grant any importation permits unless there exists sufficient chance to bring in remunerative export orders, nor to allow German manufactured metal to be sold unless there is some margin upon imported materials. The exercise of that control has, however, become a difficult matter in the face of the rapid fluctuations of money values on the one hand and the necessity of making up long-sighted contracts with the outward buyer on the other. As things stand, the German metal users have to cover their currency requirements at the instant the metal is ordered, and, at the same time, to stipulate foreign currency terms with their customers. But even the little time spread between the two acts suffices sometimes to involve heavy losses, on account of the exchange vagaries. Therefore, the formula is occurring: Without engagement (*freibleibend*), a phrase that causes many misunderstandings and much displeasure abroad.

The German metal trades, consequently, are beginning to feel the pinch of diminished orders and of poorer earnings. The shrinking of the general bulk of orders has been an outstanding feature among the western German metal manufacturers, even with the big firms, such as Phönix, Rhein Stahl, and Krupp. As for inland trade, the purchas-

ing capacity of the German population is now low. Even cheaper metals, moreover, which were formerly regarded as home made, such as zinc, lead, and aluminum, and, further, some alloys, as brass, German silver, and hard lead, which were cast in respectable proportions here, have become scarce. Zinc is handled by the Syndicate in terms of the inordinately expensive sterling. I learn that the huge amounts of British ammunition brass and bronze which the big metal-merchandising houses, under the lead of the Hirsch concern, sent over to Germany in the last summer have been finally absorbed, and now only negligible supplies are available. The rolling mills' big amalgamation schemes may be traced to this fact. The Vereinigte Nickelwerke, at Schwerte; the Duisburg concern; the Basse und Selve Akt. Ges., and the Wielandwerke, at Ulm, have formed a community of interest for the object of cheap buying of metals and working off their mutual metallic residues in a more efficacious way. In that manner they propose to meet some of the present difficulties.

Non-Ferrous Metals in France

SPECIAL PARIS CORRESPONDENCE

France, whose land is so rich in iron-ore deposits, contains few other metallic ores, bauxite and antimony ore being the only ones of importance. She must therefore import almost the whole of her consumption of non-ferrous metals, and she does so by bringing in either ores or—as is much more frequent—raw metal in pigs. Copper, tin, lead, and zinc are among the metals usually imported in the raw metallic form. The French refiners buy through the medium of officially commissioned brokers, only a few of whom are appointed to the Paris market. These brokers meet every Saturday between 11 and 12 o'clock, to establish the official prices for raw metals for the following week. They base their decisions upon sellers' and purchasers' bids and also upon exchange rates.

The raw metals are purchased by refiners, who, after treatment, sell them in the shape of bars, wire, sheets, tubes, and other forms, to wholesale dealers, who, in their turn, deliver them to consuming interests. Among the principal French refiners of non-ferrous metals are: L'Affinèrie Française; la Cie. de Produits Chimiques et Electro-Métallurgiques d'Alais, Frogès et Camargue, which is treating aluminum; la Société Electro-Métallurgique, de Dives (Calvados); la Société d'Electro-Chimie et d'Electro-Métallurgie; la Société Geoffroy et Delore (cable and wire for electrical use); les Tréfileries et Laminaires du Havre; la Cie. Français des Métaux; la Société le Nickel; la Société des Mines et Fonderies de Pontgibaud; la Société de la Vieille-Montagne (zinc); and la Cie. Royale Asturienne (lead and zinc).

Copper is now being consumed on a moderate scale. Buying at present does not amount to much, however, and orders are expected to be restricted until the end of December, as is the usual rule. From that time on, purchasers will be active, so that they will have sufficient stocks to take care of the spring activity. There is no desire to carry large stocks at the end of the year, for reasons of inventory.

The lead market is also now generally dull. The consumption of soft lead is decreasing slightly. In France, for example, the producers of iron and steel pipe are trying hard to have lead products replaced by their own.

Quite different is the situation as regards zinc, and the activity in the demand for this metal, notably in the devastated areas of France and Belgium, is marked. Stocks are small. Belgium, ordinarily a big producer of zinc, now has an important inland consumption, and is exporting only insufficient supplies. Upper Silesia, which before the war was one of the main sources of supply of the French market, is now sending no zinc to France. The smelting plants there are divided between Poland and Germany; those which remained German are producing normally, but their output is entirely absorbed by the German interior market. As to those that were transferred to Poland, their production is only about one-fourth of what it was under German rule.

COMPANY REPORTS

Trethewey Silver-Cobalt Mine, Ltd. Silver, Ontario

A report of the operations of the Trethewey Silver-Cobalt Mine, Ltd., for the year ended June 30, 1922, shows a deficit of \$1,199,137.50 on June 30. Balance sheet follows:

ASSETS	
Castle-Trethewey Mines, Ltd., (400,000 shares) at par.....	\$400,000.00
Mines Water & Supply Co. stock (4,204 shares) at.....	1.00
Rochester Mines shares (566,503 shares) at.....	1.00
Mining claims and license of occupation.....	2.00
Accounts receivable.....	1.00
Equipment stored at Cobalt at depreciated value.....	1,000.00
Deficit.....	1,199,137.50
	\$1,600,142.50

LIABILITIES	
Capital stock authorized—2,000,000 shares at \$1 par.....	\$2,000,000.00
Issued and outstanding.....	1,599,998.00
Accounts payable.....	144.50
	\$1,600,142.50

DEFICIT ACCOUNT	
Deficit, June 30, 1921.....	\$764,042.59
Adjustment of investment and other accounts following execution of agreement dated Dec. 31, 1921, with Castle-Trethewey Mines, Ltd., Written off:	
1,499,995 shares Castle Mining Co., Ltd.....	\$628,647.29
Development, Gowganda.....	\$254,178.98
Less:	
Paid for in shares of Castle Mining Co., Ltd.....	\$100,000.00
Written off development, June 30, 1921.....	25,057.46
	125,157.46
Plant and equipment, Gowganda.....	\$50,420.12
Less:	
Fire loss collected.....	\$9,540.00
Reserve for depreciation.....	4,757.26
	14,297.26
	36,122.86
	\$793,891.67
Less:	
400,000 shares Castle-Trethewey Mines, Ltd., at par of \$1 each.....	\$400,000.00
Net liability assumed by Castle-Trethewey Mines as per Schedule "A".....	87,124.47
	487,124.47
	306,767.20
Mine and head office expenses for the year as per schedule "B".....	12,920.52
Other assets written down:	
Mining claims at Cobalt to \$1.....	\$11.13
Mining claims No. 657 at Gowganda to \$1.....	99,999.00
Equipment stored at Cobalt to \$1,000.....	14,967.50
Accounts receivable to \$1.....	430.56
	\$115,408.19
Less:	
4,204 shares Mines Water Supply, Ltd., previously written off reinstated for record at.....	1.00
	115,407.19
Deficit, June 30, 1922.....	\$1,199,137.50

SCHEDULE "A"	
Liabilities assumed less assets sold to the Castle-Trethewey Mines, Ltd., under agreement dated Dec. 31, 1921.	
Contingent liability	
Owing Castle Mining Co., Ltd., shareholders (payable only out of net earnings from operations).....	\$53,000.00
Bank overdrafts less cash.....	43,126.19
Accounts payable.....	5,174.09
	\$101,300.28

Less:	
Supplies on hand.....	\$12,966.56
Unexpired insurance.....	1,209.25
	14,175.81
Net liability assumed by Castle-Trethewey Mines, Ltd.....	\$87,124.74

SCHEDULE "B"	
Mine and head office expenses for year ended June 30, 1922:	
Mine expenses.....	\$11,178.92
Head office expense.....	1,493.41
Bank and other interest paid.....	1,183.46
	\$13,855.79
Less:	
Sales of ore residues at smelters.....	\$551.95
Rebate workmen's compensation insurance.....	127.92
Sundry revenues.....	255.40
	935.27
Net expenses.....	\$12,920.52

Wallaroo & Moonta Mining & Smelting Co., Ltd.

Copper; Australia

A report of operations of the Wallaroo & Moonta Mining & Smelting Co., Ltd., for the year ended June 30, 1922, shows a loss of £109,356 7s. 10d. Balance sheet as of June 30 follows:

LIABILITIES						
	£	s	d	£	s	d
To capital—200,000 shares of £2 each.....	400,000	0	0			
Less — 40,000 shares unissued.....	80,000	0	0			
	160,000 shares issued paid up to £2.....			320,000	0	0
Drafts in transit.....	7,500	0	0			
Sundry creditors and unclaimed dividends.....	1,116	4	5			
Wages outstanding.....	520	0	0			
Elder, Smith & Co., Ltd., London (copper account).....	7,132	1	11			
National Bank of Australasia, Limited.....	181,736	7	1			
	518,004			13	5	

ASSETS						
	£	s	d	£	s	d
By mines and smelting works, with buildings, plant, and machinery, as valued in balance sheet as at Dec. 31, 1916.....	195,673	15	8			
Stores, fuel and forage.....	118,857	7	7			
Refined copper, ores, and furnace products.....	51,094	12	10			
Suspense account.....	5,485	3	1			
Melbourne copper consignment account.....	12,516	8	7			
Copper Producers' Association, Pty., Ltd. (copper account).....	3,838	18	4			
Sundry debtors.....	104,480	15	0			
Investments.....	149	11	5			
Miscellaneous.....	25,442	5	11			
Profit and loss account.....	518,004	13	5			

Profit-and-loss account follows:

DEBIT						
	£	s	d	£	s	d
Working expenses.....	221,608	18	2			
Adelaide office expenses.....	3,679	11	9			
Special charges.....	1,898	17	11			
Interest and discount.....	8,771	19	9			
	235,959			7	7	
CREDIT						
Balance of trade accounts.....	126,602	19	9			
Balance carried down.....	109,356	7	10			
	235,959			7	7	
To balance, brought down.....	109,356	7	10			
	109,356			7	10	
Reserve of accumulated profits.....	15,883	6	4			
Special reserve account.....	68,030	15	7			
Balance.....	25,442	5	11			
	109,356			7	10	

The smelting works treated the following tonnage during the last twelve months:

Wallaroo mines ore, tons.....	11,810
Moonta mines ore, tons.....	3,468
Moonta mines precipitate, tons.....	393
Outside ore, tons.....	452
Total, tons.....	16,123

and produced the following metals:

Refined copper, tons.....	1,977
Electrolytic copper (included in above), tons.....	204
Gold (calculated as fir.....	879
Silver (.996 fine), oz.....	821

The production of sulphuric acid was 528 tons.

NEW MACHINERY AND INVENTIONS

A Magnetic Indicator for Drill Steel

It is well known that drill steel, in order to be tempered for the greatest possible toughness and resistance to wear, should be quenched at the lowest possible temperature above the critical point, which is the point of decalescence, or that at which the structure of the steel changes. This point coincides with that at which steel loses its magnetism, and, taking advantage of this coincidence, the Sullivan Machinery Co., Chicago, Ill., has designed a magnetic indicator to assist the blacksmith in quenching his steel at the proper point. As shown in the accompanying illustrations, this indicator consists of a brass or bronze casing having a removable cover, and a common horseshoe magnet hung on a pivot at its point of balance. At the top is an opening or window and an indicator tab painted white, which is so balanced that when the bottom of the magnet is impelled forward the top will strike a lever and throw the indicator into view.

A shelf is provided at the bottom of the casing as a rest for the steel.

The indicator is ordinarily set between the furnace and the quenching bath. When the blacksmith judges by the color of the steel, or by the temperature reading on the pyrometer, that it is approaching the critical range, he withdraws it from the fire and rests the heated end on the shelf at the base of the indicator.

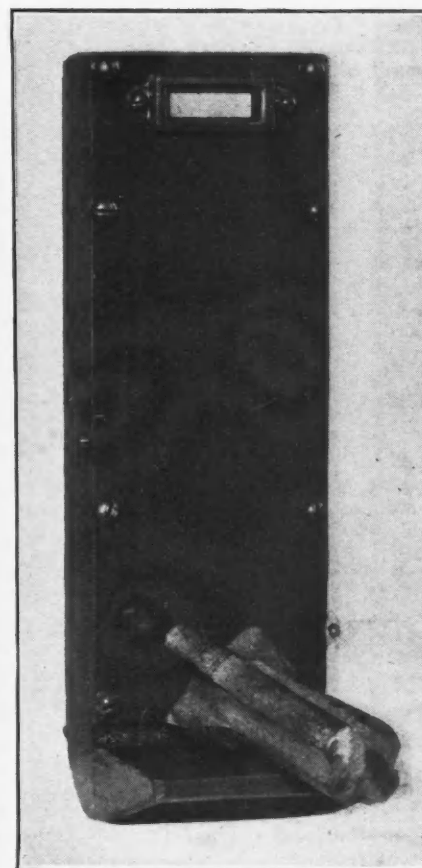
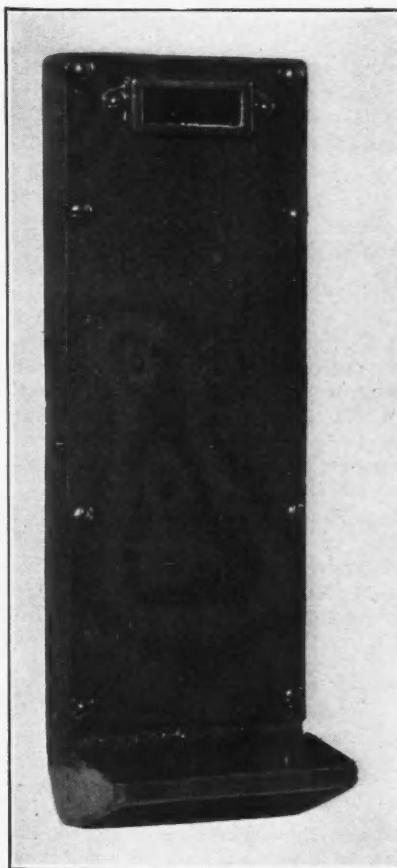
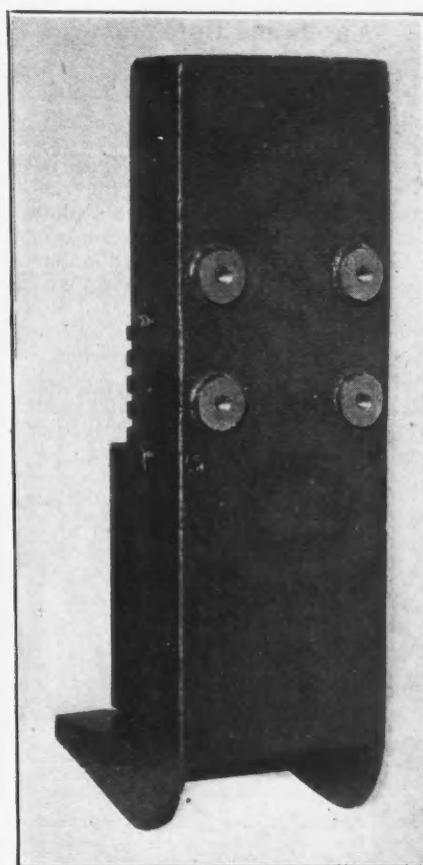
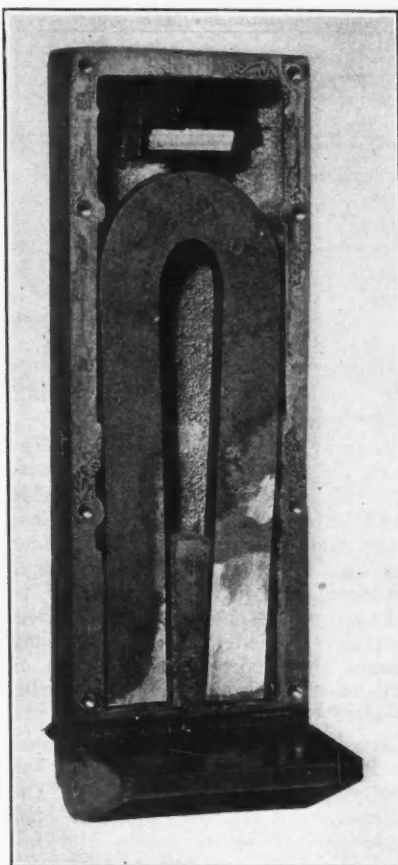
If the tab shows in the opening, he knows that there is still some magnetism left in the steel, and returns it to the furnace for further heating. If the magnet does not show the tab, he knows the steel is ready for quenching.

This indicator is 9 in. long by 3 in. in width and is 1 in. thick. It weighs 4 lb.

Elements of Industrial Heating

In an effort to encourage a broader view of the principles governing the heat treatment of metallurgical, chemical, and ceramic products, and the selection and use of equipment, fuel, or electricity as a means to that end, the W. S. Rockwell Co., 50 Church St., New York, have prepared and issued a 44-p. booklet under the above title.

The views outlined are the result of years of practical experience with a great variety of heating operations and direct contact with actual manufacturing conditions. This has taught the necessity for a better understanding of the underlying principles and purposes of industrial heating operations, the results of which should be measured in terms of quality and cost of finished product—not merely cost of fuel or labor, mere tonnage of output, nor indication of temperature control.



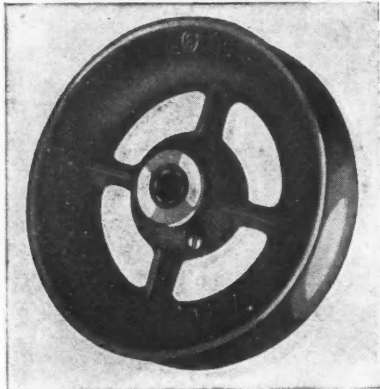
Indicator for testing magnetism in drill steel

In preparing data and information the Rockwell company has produced a worth-while work that is of interest to engineers and at the same time has not destroyed the effect by reference to the company itself, on the assumption that whatever promotes the welfare of the art is of assistance to everyone engaged in it. Charts, diagrams, and tables are included.

Wheels and Harps for Mine Trolleys

Recent tendencies in mine haulage practice are toward the use of larger locomotives which can handle correspondingly heavy trips. This involves of course the use of heavier currents to be collected from the trolley line, and to meet this condition the Ohio Brass Co., of Mansfield, Ohio, has brought out a 6-in. trolley wheel and a 6-in. harp.

The wheel is made of bronze and has a graphite bushing. Around the bushing is a reservoir filled with grease.



Six-inch trolley wheel for mine service

The harp collects the current from the wheel through phosphor-bronze contact springs. The pivot is set forward of the axle so that the harp trails freely.

A self-aligning harp made in both the 4- and 6-in. sizes has also been de-



Six-inch trolley harp

veloped and placed on the market. A spring brings the fork casting into line with the pole head when the wheel is not on the wire. This simplifies the task of replacing the wheel in case of dewirements and also enables the harp to operate through frogs and crossings.

The Black & Decker Manufacturing Co.'s Philadelphia office and service station, has been moved from 318 North Broad St. to 824 North Broad St.

TRADE CATALOGS

Alloys—The Cutler Steel Co., Pittsburgh, Pa., in its bulletin No. 221, gives a general description of "Duraloy," a chromium iron alloy for resistance to oxidation, corrosion, and abrasion. The metal is furnished commercially in practically every form, including castings, rolled or forged bars, sheet, wire, and tubing. The alloy should have a wide application in mining, milling, and metallurgical work.

Conveyor and Elevator Chain—The Brown Hoisting Machinery Co., Cleveland, Ohio, has recently issued Catalog L 1922, "Drop-forged Chain for Conveyors and Elevators." The various sizes and types of chain which have been designed for heavy duty and to withstand severe shocks are illustrated. The claim is made for large wearing surfaces and a proper distribution of metal to stand maximum stress with minimum weight.

Copper Steel—The American Sheet Tin Plate Co., Pittsburgh, Pa., has recently issued a 16-p. booklet, "The Testimony of a Decade," which outlines the results of service tests and advantages of "Keystone" copper steel for sheet and tin mill products. From the evidence collected and shown in the booklet, there can be little question that the addition of 0.10 to 0.50 per cent of copper to sheet steel or iron offers greater resistance to corrosion than do the common sheeting materials.

Steel Belt Conveyors—Sandvik Steel, Inc., New York, in the concern's catalog No. 18-T, has stated the advantages and general uses for Sandvik Steel conveyor belts. This type of belt has been in general use for some time in Europe. The maximum width of belts is 16 in., although the manufacturers are now experimenting on sizes up to 24 in. in width; they vary in length from 250 to 325 ft., and in thickness from 19 to 20 s.w.g. (0.8 to 1.0 mm.). A number of testimonials and illustrations are included in the booklet.

Centrifugal Sand Pumps—A. R. Wilfley & Sons, Denver, Colo., have recently issued a 16-p. booklet descriptive of Model B, Wilfley centrifugal sand pumps. Among the features which will particularly appeal to users of sand pumps is the discharge-keeper, which is used in place of the usual flange connection for releasing the pump case from the discharge line, thus enabling the wearing parts to be easily and quickly changed. These pumps are being extensively used to handle various kinds of gritty materials, such as sand, tailing, middling, concentrate, slime, and froth; also water and solutions which are hot. They operate against low as well as unusually high heads.

Crushing and Grinding Machinery—We have received bulletins Nos. 52, 53, 54 and 57, issued by the Stevenson Co.,

Wellsville, Ohio. No. 52 illustrates and describes a grinding and washing pan which has been developed for washing and crushing and in which water is forced through nozzles upon inclined screen plates placed at such an angle as to wash the rejected particles under rolls traveling on the revolving pan bottom. A washing and separating machine making use of spiral screws is also described in this bulletin. No. 53 illustrates and describes 10-ft., 9-ft., and 5-ft. pans for dry grinding. No. 54 details the company's single roll swinging plate crusher, which is furnished in seven sizes. A reciprocating plate feeder, used for mechanically charging crushers and dry pans, is described in bulletin No. 57.

CONSTRUCTION NEWS

New Gold Mill in Boundary County, Idaho

The Boulder Creek stamp mill, eleven miles east of Naples, Boundary County, Idaho, is practically completed. The machinery was transported over eleven miles of trail to the mine. The plant is designed to treat the gold ore from a 3-ft. vein reported as averaging \$45 per ton. Thomas King and John Peters, of Sandpoint, are the owners of the property.

Crushing Plant for Mesabi Iron Mine

The Oliver Iron Mining Co. will add a crushing unit to the company's present screening plant in the Hull-Rust pit on the Mesabi Range in Minnesota. The material to be handled will now come to the plant over a 40-ft. trestle and be dumped into a receiving bin. From there it will pass over grizzlies with 6-in. openings with the undersize going to the loading pocket and the oversize to a pocket from where it will be taken by a pan conveyor to the jaw crusher. The crushed material will then be elevated to the loading pocket by a belt conveyor. This construction work will be completed for use during the 1923 shipping season.

Britannia Mill Construction in British Columbia Is Progressing

Work in assembling the structural iron for the new mill of the Britannia Mining & Smelting Co., at Howe Sound, B. C., is progressing rapidly. Cranes, hoists and concentrating and screening machinery have arrived. The electric railway has been extended for the transportation of supplies, and the concentrator storage bins, which will hold about 10,000 tons, are finished. New dwellings have been erected for employees and much development work has been done in the mine. The Victoria and Amy adits are new, having been opened for the first time this year.