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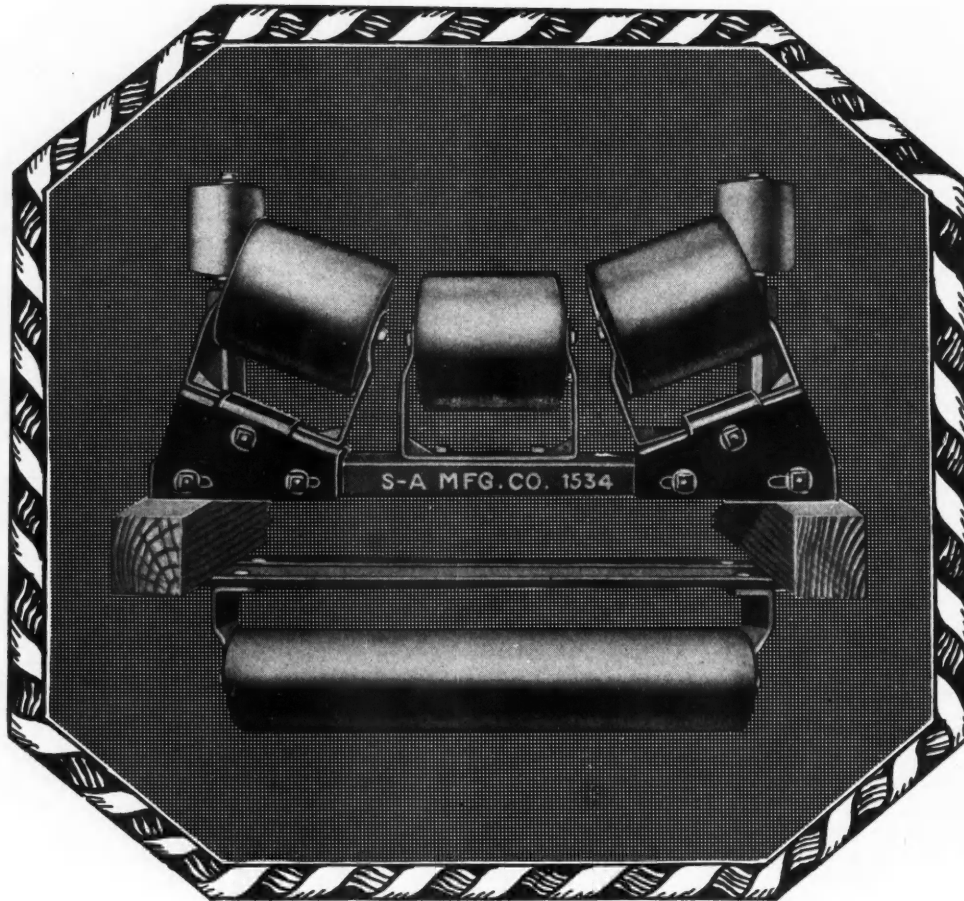
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PETROLEUM

Volume 109

New York, June 26, 1920

Number 26

The First Citizen of America

CURIOSLY enough, the scant attention paid to Hoover at the Republican Convention only serves, after the tumult has died away, to bring out his personality and character in stronger relief. With all respect to Senator Harding as an honest, typical American citizen, how gigantic does the record of Hoover loom up against this background, and against the background of the convention, with its uncertain and timorous swaying!

We do not condemn the selection of the nominees at Chicago. They were not the sport of chance, as would appear at first glance. They are the result of logical and deep-seated causes. We have before alluded editorially to the unusual powers given to the President of the United States—powers which, in our opinion, are excessive; especially as there is no provision for the removal of a President by a recall plebiscite during his stated term, but only by judicial procedure. And with a dominating nature in the Presidential chair, the opportunity for dictatorship, even nominally within the limits of the Constitution, becomes all too evident, and repugnant to the American spirit. As this unfortunate feature of our Constitution is fixed, the palpable remedy is to elect a President who is not and does not conceive himself to be a phenomenal leader—a man who knows the right path better than the people and Congress know it.

The country is sick of dictatorship and the paralyzing of its business by a deadlock between an ailing and stubborn President and Congress; therefore, no dominant or outstanding man was wanted. Congress yearns to be "constitutional," not "plebiscitary"; and the people yearn for the return of a representative government. Therefore, the convention avoided Hoover, and other national figures; and frankly sought "a man of the McKinley type," who believes in Congress ruling and has no undue appreciation of his own excellent qualities.

The convention which worked out this solution was itself by no means an example of representative government. The primaries gave no warrant whatever for the nomination of Harding. It will never be possible to think of him as the choice of the people for President. He is not even the choice of their delegates, whose final decision was controlled by professional politicians.

Who is the choice of the people—the man of all Americans to whom the nation turns as the strongest, safest, wisest, and most practical in the country? Of that there can be no doubt. The preliminary poll of the *Literary Digest*, the vote of the primaries, the votes at various universities, opinion as voiced in newspapers, our contact with men and women of all sections of all degrees, leave no doubt that one man stands so far in advance of the rest of us that there

is no comparison. Without political position or influence, how vast looms the simple figure of HERBERT HOOVER, THE FIRST CITIZEN OF THE REPUBLIC! Not only America, but the world, so recognizes him.

This is not a sentimental distinction. There is nothing sentimental or even magnetic about Hoover. He is intensely practical, quiet, and unambitious. But even the Democratic leaders have recently joined in the testimony that he occupies the position stated. They are frank in saying that on that account Hoover could have had the Democratic nomination for President had he not announced himself as a Progressive Republican. It is reported that the Michigan delegation will cast their first vote in San Francisco solidly for Hoover, in deference to the vote of the people at the primaries. But he will not be nominated there, although it is rumored that Tammany is considering him to beat McAdoo. He has ranged himself otherwise.

To what characteristics are due this acknowledged primacy among a nation of strong individualists? Bryan was long styled the Great Commoner. Hoover bears no resemblance to him. Bryan's greatness was in his eloquence, his dialectic wit, and in his magnetic leadership—not in his works. Hoover is no orator—he is disappointing. He has no taste for debate. He listens and considers—silent. He does not stir an audience. His appearances before the public are not the excuses for temporary warming of the blood. Yet no man of this generation, except Roosevelt, has occupied such a position in the estimation of the people. Roosevelt had trained himself to be a politician: Hoover is not a politician. The politicians point out that if Hoover had understood the first principles of politics he would not have stated his party preference. In that case, they say, the Republicans would have nominated him to prevent the Democrats from doing so; but once he had declared for Republicanism, they felt they could safely shelve him.

What then? Hoover is a doer; and in this we discern the affinity between him and Roosevelt. He is an artist of accomplishment. He is the greatest "deliverer of goods" that the world has seen in our time—a time that has brought out all that there is in men. He thinks deeply; but is almost inarticulate. Only in his record stand out the clear philosophy and the unspoken altruistic ideals of his character. The execution of his work is swift and sure. It checks, as the work of an engineer should check; and the world has marveled at the smooth precision of it. And because of the confidence that his work and his character inspire, he has proved a great and even phenomenal leader of men.

Hoover will not be the next President; and we have become reconciled to it. But the wealth of the nation that counts him as a simple citizen is such as to pardon us for indulging in national pride. He will always

find work ready to his hand. Conceivably, we may see him next year in the Presidential Cabinet. What a Secretary of State he would make!

A Fresh Supply of Mine Labor

THE immigration pendulum has begun to swing the other way. Before the war, new arrivals to these shores amounted to about 150,000 monthly. During the period of hostilities immigration practically ceased, and after the armistice an alarming exodus of foreign-born laborers began. Now, however, the tide of immigration has begun to flow in the other direction, immigration officials informing us that about 40,000 immigrants are being brought to the United States every month.

This is a welcome bit of news to the mining industry. For the last six years the labor situation at the various mining centers in the country has been anything but satisfactory, and the history of most camps during that period is replete with a succession of strikes, or is a recital of industrial unrest sufficient drastically to disturb the efficiency and steadiness of production. Statistics have frequently been advanced showing that labor's efficiency has decreased with an increase in wages, and many complaints have been made of the dearth of unskilled labor in the country. The latter condition should be appeased by the inflow of foreign labor, as a considerable proportion of it will find its way to the mines—both coal and metal. Indirectly, the new immigration will serve to help reduce the high cost of living—a further reason for welcoming the present tide.

A peculiar feature of the immigration is its occurrence earlier than predicted. The many departures that took place after the war arose from the desire of some of the foreign-born element to return to their native land, assist in the rebuilding of their own country, and obtain first-hand knowledge of conditions and opportunities. Existing exchange rates greatly facilitated executing their wishes, as their American war wealth was easily converted into undreamed-of sums of depreciated European currency. The emigrants soon discovered, however, on their arrival home, that living conditions were not as favorable as painted; oppressive taxation, uncertain political and industrial developments, and the distressing lack of the ordinary essentials of life, such as food and clothing, combined to make them turn their faces back to the land where such chaotic conditions were unknown. A portion of the immigration consists of this class of people, but much of it is new.

The premium on the dollar is a serious handicap to the immigrants who are arriving. Although their funds may have been adequate in their own country, conversion into United States dollars cuts deeply into their capital. Despite this serious difficulty, these immigrants are evidently undaunted in their desire to get away from their unsettled lot in Europe and to obtain a fresh start here.

No doubt there will be agitation to stem the incoming tide of immigration, on the ground that the influx is inimical to the best interests of labor, but let us hope that opposition will be directed more to the class of immigrants we are receiving than to their numbers. Those of anarchistic proclivities should find no welcome here, but those whose earnest wish it is to make homes in this country, free from the oppression and restric-

tions so common in Europe, should be allowed to assist in the industrial progress of the nation.

Some mining camps in the United States pride themselves upon being "white men's" camps, and in them the foreigner is not permitted to work. However, the largest mining districts in the country have for so long a time been sadly in need of labor, skilled and unskilled, that such distinction is not feasible nor practicable. It is here that the incoming immigration will be most welcomed.

Diversified Industry and the Abandoned Camp

THE importance of an industry lies in the usefulness of its product and in the support that it gives the communities dependent on it, rather than in the dividends it may pay to those in control. It would be interesting to know how many people today are deriving their livelihood, the best perhaps that they have known in years, despite high prices, from mines the owners of which are not receiving an adequate return. What is true of mining is equally true of all branches of industry, but in the former we are especially interested.

Gold mining is most conspicuous in this respect. Communities in the Black Hills of South Dakota, Cripple Creek, Grass Valley, and elsewhere are obtaining their support largely from the operations of mines like the Homestake, North Star, and Vindicator, although the economic position of these properties has steadily become worse. It is said that the mines of Cripple Creek face the possibility of a shutdown unless the gold situation improves.

The West is dotted with abandoned camps and with others that are on their last legs. Leadville today is but a mockery of the boom camp of years ago. Abandonment is the fate awaiting the community that exists by one industry alone, when that industry fails. In diversified industry lies longevity and permanence. In South Africa, last year the question was debated, "Will Johannesburg last?" Will that modern city endure when the great gold mines of the Rand that have contributed to its growth and prosperity are exhausted and only the more remote ones are producing?

The mining companies of the Michigan copper country are faced with a problem that, as far as diversity of industry is concerned, has points of similarity. The mines give the community its living, even when dividends are suspended. Thousands are employed, many of whom, and their fathers before them, have made their homes there. But the companies are hampered by labor shortage, and a contributing cause is the continual drifting away, one by one, of the old employees, drawn to the big cities because they are unable in the northern peninsula to find work for their sons and daughters. Boys cannot work in the mines except in rare instances, our correspondent points out, and girls cannot work there at all.

Recently in an address before the Houghton Chamber of Commerce, James MacNaughton, general manager of the Calumet & Hecla, said that the copper companies of Michigan would suspend operations today if their financial interest were the only question involved, and that an improvement in the copper market will find the companies unable to profit from it because of the existing scarcity of labor. The business men were told that they must co-operate with the mining companies, to the end that diversified manufacturing industries may be

established in northern Michigan, which would otherwise cease to prosper.

The life of many of these mines seems limited only by the depth to which operations are economically possible. But an adequate labor supply is as necessary as sufficient ore reserves, for it is not to be hoped that before the millennium mechanical devices will entirely supplant the workman. And it would only make the situation worse were the companies to pattern after some landlords and stipulate "no children allowed" when hiring men. New industries for the Michigan copper country will insure its future for years to come, and with it the happiness and welfare of thousands.

What Is a Living Wage?

STATISTICS are tricky things. The recent bulletin of the Mining and Metallurgical Society calls attention to the demand of Mr. Lauck, representing the railroad employees, upon the United States Labor Board for a minimum annual wage of \$2,500, on the ground that the United States Commissioner of Labor Statistics has stated that a family of five needs \$2,533 upon which to live. The bulletin comments in part:

"Contemporaneously, the workers for the Boston Electrical Ry. Co. are demanding \$2,300 per annum. In a hearing of this case the director of the state income tax department was called upon to testify. He stated that out of 1,183,000 males working for or receiving compensation, about 173,000, or approximately 1½ per cent, have an annual income of \$2,000 or more. This led a member of the board of arbitrators to remark that he saw no reason for the people paying trolley men larger wages than the greater number among themselves enjoy."

The statistics noted may apply to the average annual income in Massachusetts, or they may well apply to the study of how many pay their proper income tax in Massachusetts. Before we know this, we must not take the next step in argument.

The bulletin further comments:

"A fallacy of Mr. Lauck is this: The estimated requirement of \$2,500 per annum is for a *family* of five. In 1916, there were about 40,000,000 *workers* and 20,000,000 *families*. In the average the family comprises two workers for wages."

According to these statistics, the minimum wage per worker would be not \$2,500 but \$1,250. The reply to a man with a wife and three babies, who demanded a raise above \$1,250, would be to refer to statistics and point out that either the wife or one of the babies should be earning \$1,250 also. Another method to conform with the statistics would be to have only grown-up children, and refuse to accept the immature. If this be not practicable as not according to nature, two husbands to one wife, or two wives to one husband would straighten out the economic difficulty, provided the number of infant children were reduced to two. As for the man with an aged mother and a father-in-law, a wife, four children, and two sets of twins, he is not statistical, ethical, or socially possible, and should be ruled out of court.

Mining Methods in the Oil Field

SHAFT-SINKING METHODS have long been used to obtain petroleum, although the practice has been, to a great extent, discontinued since the introduction of the methods now in general use. The earlier attempts

to procure oil by means of shallow pits were confined to localities where it was accessible near the surface, and as these areas became exhausted hand-dug wells were adopted, extending to greater depths than had been attempted by earlier processes. These are still used to a slight extent in certain oil fields. They are small in cross-section and extend to depths varying from 100 to 1,000 ft. At Pechelbroun, Alsace, there is extensive working of petroleum deposits by means of shafts, and it is stated that three shafts, from which extend 13,000 ft. of underground galleries, are producing more than 25,000 tons of crude petroleum a year.

In this issue we publish an abstract on an article by A. H. Fay dealing with probabilities of a more general application of shaft-sinking and underground mining methods to petroleum fields. To such methods there will be, as Mr. Fay has pointed out, several serious objections, but in the light of available information concerning the shortage of petroleum supplies, the suggestion merits serious consideration.

It is well to bear in mind that the annual petroleum production is procured from a number of sources. The gusher well, although a heavy producer, is irregular, and this type of production can be depended upon only so long as new discoveries are made. In the long run the "gallon wells," as they are called in the Pennsylvanian fields, offer more stability and a longer period of existence.

Another consideration, and perhaps the greatest argument for petroleum "mining" by shaft and underground processes, is that a greater extraction is obtainable, for the reason that the strata are better exposed and a greater volume of the oil-bearing sand can be obtained for treatment.

There are, of course, the inherent dangers connected with the adoption of underground methods, and these may be complicated by others at present unknown. Gas presents a problem, the sudden inflow of water requires special safeguarding and handling, and runs of sand introduce a danger that must be reckoned with in mining work. But all of these obstacles have been overcome in metal and coal mining. If oil mining presents problems that require different treatment from that generally accepted in the industry, we may feel confident that they will be solved by the engineer.

Efficiency Questions

DOING things in orderly sequence, performing each task as it comes, is system. Power to visualize as well as to remember the dissected parts of a subject, and to direct operations in accordance with the mental analysis which necessarily must precede action, can be cultivated intensively. Manager, superintendent, foreman, and miner, each in his separate allocation of duties, must, to be successful, apply the principles of order and efficiency. His success and the outcome of the work depend upon the thoroughness with which he conforms to an established system. To manager or superintendent the task is of greater difficulty than to the foreman or miner, for he must touch upon every detail covering the operations of the mine within his charge.

In this issue, Edwin H. Higgins presents an article which is well worth the study of managers and superintendents, for it presents an analysis in the form of a series of questions which cover many important points bearing upon safe and economical operation.

WHAT OTHERS THINK

The Resolutions Committee of the American Mining Congress

Permit me to thank you for the splendid editorial concerning the convention of the American Mining Congress which appeared in the June 5 issue of the *Engineering and Mining Journal*.

I am particularly pleased with the criticism of the plan by which the members of the resolutions committee of our annual conventions are selected, because of the helpful spirit which it embodies, and will be grateful for such consideration of this subject as will either lead to a justification of our plan or such changes in it as will make it more thoroughly accomplish the purposes of our conventions.

Primarily, mining is the most important basic industry. The war has brought a complete recognition of its importance to the industrial and commercial, as well as the political, life of the nation. Admitting the vast importance of mineral production to the nation's industries concedes the importance of the nation's industries to mining. No permanent benefit can be gained for the mining industry which is not of general advantage to the nation as a whole.

The American Mining Congress has sought to be broadly representative of the mining industry, but at all times recognizes that benefits must be reciprocal, and it has therefore in its conventions sought to secure the advice and co-operation of industry as a whole, that its conclusions might be based upon the interests of the nation, the prosperity of which is essential to the mining industry.

To accomplish this, officials representing the political divisions of our Government, as well as commercial and mining organizations, have been invited to send delegates to our conventions, and these have been given power in the making up of our resolutions committee equal to that accorded the members of our organization. In doing this, each state has been allowed one member of the resolutions committee, selected by the representatives from that state (members and delegates) present at the convention.

The governing body of the American Mining Congress has left this selection entirely in the hands of the state delegations, without effort to influence their action in any way.

The American Mining Congress, like the Government of the United States, after which it is patterned, believes in representative government and that those who speak for it should be thoroughly representative not of the highest or lowest but of the average thought of the constituencies represented.

In again looking over the resolutions committee of the St. Louis convention, I believe that its membership is a justification of the system, even though it could have been improved in a few instances, but it is important to know whether the improvement which might have been secured by a little supervision would not be more than offset by the fact that delegates to the convention might have been to an extent deprived of their right

to occupy an equal place in the convention with our members.

Notwithstanding the broad privileges which have been extended to the delegates to our conventions, and admitting that mistakes have been made, we still believe that the plan pursued has thus far justified itself. However, I feel sure that our directors would consider very carefully any suggestion for a change which would more completely embody the best thought of the nation and the mining industry upon the intricate problems which it presents for consideration.

We shall therefore welcome further discussion, believing that through constructive criticism only can we hope to profit by mistakes which every aggressive organization is bound to make. J. F. CALLBREATH.

Washington, D. C.

The Distribution of Commercial Information

The editorial and the letters published under "What Others Think" in the issue of the *Engineering and Mining Journal* of June 5, in regard to the distribution of commercial information collected by the Bureau of Foreign and Domestic Commerce, have just come to my attention, and I hasten to correct any erroneous impression which your readers may have gained as a result of these statements.

Material distributed by this bureau falls roughly into three general classes:

1. Printed or mimeographed bulletins and periodicals and special publications containing information of a more or less general character.
2. So-called confidential material, which may be either printed, mimeographed, or typewritten, and which relates primarily to current opportunities for the sale of American goods abroad.
3. Lists of importers and merchants in foreign countries.

Definite rules have been adopted for the distribution of the confidential material coming within the second class. This particular information is of primary value to business men, i.e., firms and individuals actually engaged in foreign trade, and it has been the bureau's policy therefore to attempt to distribute this information direct to actual consumers. Experience has shown that it is inadvisable to permit the secondary distribution of these confidential data. This practice is not based upon any discriminatory distinction, but has been developed through experience as the most logical and efficient method of circulating this particular kind of commercial information, which relates primarily to current opportunities for the sale of American goods abroad.

Similar rules cover the distribution of trade lists to American firms and individuals.

The statements in your journal refer specifically to Far Eastern Circular No. 130. This circular contains general information on copper mines in western Manchuria, and our policy certainly does not contemplate the withholding of material of this character from responsible American engineers. On the contrary, we recog-

nize the usefulness of information of this kind to the mining and metallurgical profession, and it follows that in carrying out our wish to distribute our information efficiently, we would naturally desire to see this particular circular brought to the attention of representative American mining interests.

The unfortunate circumstances connected with the particular correspondence printed in your journal arose from the fact that this circular, when mimeographed, improperly carried the heading "confidential circular." It is our practice to designate statements of this kind, which are intended for more or less general distribution, as "special circulars." As this particular circular went out from the bureau as a "confidential bulletin," our district office managers handled it in accordance with the definite rules governing the distribution of confidential information.

I think that I should add that in taking up investigations of technical subjects similar to that being carried on by Trade Commissioners Clements and DeKalb, the bureau has consistently followed the policy of conferring with appropriate technical Government organizations before taking up these studies definitely. We recognize the importance of the closest co-operation with other Government agencies in matters of this kind, and it is our aim to continue to develop this particular phase of our relations with the other departments which may have a special interest in our investigations abroad.

R. S. MACELWEE,
Acting Director.

Washington, D. C.

Conserving Paper

On my way home the other evening I was handed, by a very energetic youngster, a small manila card, twice folded, each section being about the size of a postcard. (In fact, close inspection showed that one of the sections was intended to be used for mailing purposes, for it was neatly perforated and addressed on one side, with the usual rectangle pleading for a one-cent stamp, and provided with suitable spaces for an address on the reverse side.) On the outside cover—the designation of three sections is immaterial, however—I read "This Is Your Opportunity" (in red), and underneath is a reproduction of the photograph of a beautiful Indian maiden, one Sarah Rector.

Immediately my sense of chivalry was aroused. Am I to be asked for a donation to further the education of the Indians? That and other questions gallop through my mind. One's inquisitiveness is further excited by the inscription "\$35,000 per month." Surely, then, it is no monetary contribution for which Sarah is asking. With curiosity at high pitch, I opened the folded card, and there, in bold, brazen headlines, I read that there are "Tremendous Profits Being Made in Oil."

Where have we heard this before? Then follow a number of statements such as are included in the usual siren song of the glib promoter. We read of how Mr. Rockefeller laid the foundation of his fortune, how a shoe clerk in Kansas City climbed on the band wagon of the big income-tax payers, and we also learn that Sarah of the buckskin kimono is in the *nouveau riche* class with a mere pittance of \$35,000 a month. All of the above fortunes have been made in oil.

We have been hearing much of late regarding the shortage of paper, and reports indicate that the publishing business is far from being "out of the woods" in that respect. The public insists on being fooled; at

any rate a part of it does, part of the time, according to P. T. Barnum. Legislation, state and Federal, has put somewhat a curb on fake stock promotions of the type mentioned, but the pernicious practices still continue, and probably will so long as printing presses will accept such commissions and the supply of paper holds out.

Various schemes have been suggested for the conservation of paper. As I give a final look at Sarah, and passing up my "golden opportunity" to learn further of this alluring swindle, pitch it into a waste-paper can, I am struck with the thought—having in mind a number of other tracts on the same subject—that all promoters of fake schemes would win the approbation of the public if only they could adopt some plan whereby their glittering arguments could be condensed or coded. Certainly deciphering a Bedford-McNeil code would be educative to the sucker, and think of the saving of paper!

EDWARD THOMPSON.

New York.

South Africa's Hat in the Ring

I am pleased indeed to see that you have recognized, in your issue of May 15 the splendid work done by the gangs of shaft sinkers in South Africa and the United States in their endeavors to show what real energy is still capable of accomplishing in this most important branch of mining development work.

I am anxious that our men on the Rand should not be handicapped as competitors in this contest by their distance from you, and therefore would ask you to send me as soon as possible the rules you are drawing up for the competition and if you will set a date for the commencement, which will enable them to work for the record as soon as any gang in the United States or elsewhere.

Again my congratulations to you in your enterprise in giving this stimulus to proficiency in mining industry.

HUGH L. MARRIOTT.

London, England.

The Tin of the Ancient Egyptians

Last winter a friend asked me where the ancient Egyptians obtained the tin with which to make the bronze that they used. I suggested the Belgian Congo, South Africa, and Cornwall. He said they were too far off, and that Egypt made bronze before the time of the Phœnicians. In investigating the subject, I found in Series 2, Vol. 10, p. 245 of the Hakluyt Society that south of the big bend of the Blue Nile in Abyssinia a Portuguese priest by the name of Bermudez writes in 1541-1543 that mines of copper, tin, and lead are found in Amara and Vedremudro. I cannot find these names on any map, but the position is about Lat. 10 deg. N. and Lon. 38 deg. East.

This tin location is three or four hundred miles from the White Nile and about the same from the Gulf of Aden, and in a mountainous country, making it a flying machine prospect! But some day the boys may want a good hard prospecting trip.

In the article on tin appearing in *Engineering and Mining Journal* of May 1 an addition might be made that a mile or two north of Gaffney, N. C., forty or fifty tons of cassiterite was shipped to Wales, fifteen or twenty years ago, from a placer.

Philadelphia, Pa.

RICHARD H. SAUNDERS.

How Shall We Get Mining Efficiency?

Queries Designed To Facilitate Superintendent's or Manager's Inquiry Into Efficiency of Mine Operation—Labor, Mining Methods, Drilling, Explosives, Ore Handling, Hoisting, Compressed Air, Stores and Supplies, Fire Prevention

BY EDWIN H. HIGGINS

Written for *Engineering and Mining Journal*¹

TO OPERATE at maximum efficiency, a mine must have not only suitable equipment and proper methods, but laborers who return an honest day's work for the wages paid to them. In metal mining from 60 to 70 per cent of the total cost of production is chargeable to labor, and labor performances will inevitably be reflected in the cost sheet. Matters requiring systematic attention on the part of mine managers and superintendents are here set down for convenience in numerical order, and approved methods of efficient and systematic observation and administration are noted:

ORGANIZATION AND LABOR

- 1—Do officials and bosses work in harmony and with a strong pull in only one direction?
- 2—Is there strict regard for the principle that "Responsibility and authority must lie together"?
- 3—Do the bosses know that *safety promotes efficiency*?
- 4—Does reasonable cause exist for dissatisfaction among workmen?
- 5—Are they receiving a square deal in every way?
- 6—Are they reasonably well housed and fed?
- 7—Are there any trouble-makers in the crew?
- 8—Is any attempt made to secure the co-operation of men and bosses, or to bring out their dormant knowledge by the use of suggestion boxes or meetings of bosses?
- 9—Is improvement or betterment possible in housing, educational work, quality of drinking water, safety, sanitation, social and religious advantages, change houses, amusements?
- 10—Is anything being overlooked that would attract high-class workmen?

"How can I secure better co-operation on the part of my workmen?" is often asked by mine officials. In the last two or three years, during which period the efficiency of labor has decreased to a marked extent, this question has been more and more frequently propounded. The answer is to be found in the fact that the degree of loyalty in a workman is a direct measure of his value to his employer. The higher the degree of loyalty, the more valuable the man. Therefore, to secure the best results it is necessary that workmen be accorded such treatment as will assure their loyalty. To accomplish this, there is no better method known than the policy of the square deal and humane treatment. The truth of this statement has been demonstrated by thousands of employers.

It is true that some dividend-paying mines are in charge of men who have little or no regard for the human element. It is equally true that many of such mines are not operating at maximum efficiency, although they appear to be, because they are paying dividends. Where the ore is of a low grade, and every device must be used to squeeze out a profit, the successful operator will be the man who is surrounded by a crew of loyal workers.

¹Includes a short excerpt from a paper previously published by the author.

The application of the principle of the square deal and humane treatment must of necessity originate with the manager, superintendent, or man in charge, whatever his title may be. For brevity he will be referred to herein as the chief. The development of loyalty and a spirit of co-operation within the organization should be one of the most important concerns of the chief. If he has a natural disposition to deal fairly and humanely with his employees, his task is not a complicated one. Lacking a natural bent in this direction, it may not be a difficult matter to correct the fault.

RELATIONS OF OFFICIALS AND BOSSES

It is not only important that officers and bosses be fitted for the positions that they hold; they should be men who can and do work together as a harmonious unit. The spirit of co-operation should be strong, with every man doing his share to get results. It is unnecessary to point out the disastrous results which inevitably ensue when men in an organization begin pulling in the wrong direction.

The method of bringing about harmony and co-operation depends largely on the personality of the chief. He may find it necessary, to remedy troublesome conditions, to shift his men about. He may have in his organization men who are efficient workers, but who are inclined to cause trouble. Ordinarily, it is worth considerable effort to change the point of view of such men, but if they cannot be converted, the organization is better off without them.

One of the commonest causes of discord and discontent is the disregard, on the part of the chief, of the basic principle that responsibility and authority must lie together. No mistake can be made if this principle is followed throughout the organization. Trouble is inevitable when it is ignored.

One simple remedy may be regarded as almost a sure preventive, as well as a cure, for discord in the organization: regular meetings of officials and bosses. At such meetings operating troubles may be discussed and suggestions for betterment made. An opportunity is presented for the men to get closer together and to familiarize themselves with one another's difficulties.

TREATMENT OF THE WORKING CREW

The average man will respond to humane treatment and the square deal. In putting this policy into effect, it is important that as little noise as possible be made about things done for the men. Some companies are today nullifying the results of their work by shouting from the housetops about their philanthropy toward the working man. This procedure breeds resentment and can result in little good.

The aim of the management should be to remove reasonable cause for dissatisfaction, make such improvements as will attract a high class of labor, and

so to regulate relations with the men as to win their loyalty and respect. In working toward these ends it is essential that the chief set the proper example by his attitude; and he must see to it that his officials and bosses reflect this attitude and policy.

In looking for causes of dissatisfaction or opportunities for betterment, attention should be directed to the following: Relations with the men, housing, feeding, sanitation, recreation and amusements, education, safety, and social and religious affairs. The relative importance of the factors noted depends largely on the class of labor, size of the operation, and situation of the camp (isolated or otherwise). At a small camp or town it might be desirable and practicable to do only a part of the things indicated; at larger operations many other social and industrial matters should be given consideration. Efforts of this nature are generally referred to as welfare work. This term is ill chosen, for it is too suggestive of charity, which working men do not want.

MINING METHODS

- 11—Is the mining method in use the one best suited to the nature of the orebody and the walls?
- 12—Does it provide for maximum extraction and safety?
- 13—Is the ore being diluted by too much waste?
- 14—Is it possible to increase production per man?
- 15—How do costs of mining and production per man compare with those of similar mines in the district?
- 16—Does the cycle of operation in drifts, crosscuts, raises, and stopes make for the greatest efficiency?

No comment is necessary on the desirability of employing a mining method that is best suited to the orebody and the walls, and that will provide for maximum extraction and safety. Improvement in details and lowering of costs sometimes can be affected by co-operation with officials of neighboring mines. Interchange of visits by the chiefs and even of the bosses is of value, especially if the mines of the district have similar orebodies and general conditions.

A study of the cycle of operations, especially in drifting, crosscutting, raising, and shaft sinking, is of great value. Ventilation plays an important part in this connection. In poorly ventilated headings it has been found possible to make greater headway with two shifts than with three.

MACHINE DRILLS

- 17—Are drills of suitable type for the ground?
- 18—Is drill equipment standardized as far as possible?
- 19—Are facilities for drill repair so systematized that it is unnecessary for miners to go to surface to secure parts or to have repairs made?
- 20—As a preventive of lost time, are miners at the face well supplied with gaskets for drill connections, good wedges and foot blocks, oil cans or cadgers, an empty box for the storage of tools and extras?
- 21—Are a few extra water tubes kept on every working level?
- 22—As a time saver, have miners tried carrying with them an ordinary hat pin for dislodging obstructions in the water tube?
- 23—Is the jackscrew nut (of the column bar) supplied with grease at intervals?
- 24—Is 1-in. air hose used with Turbro, Leyner, and DR-6 machines? (Three-quarter-inch hose is too small.)
- 25—Are 3½-in. columns used with modern water-hammer drills? (The old 4-in. or 4½-in. bars should be discarded, on account of their weight.)
- 26—Do miners realize the importance of properly lubricating machine drills? (Grease for the chuck end and castor oil or liquid grease for the rear lubricators.)

27—Are miners allowed to attempt repair work on machines?

28—Is it realized that for 1½-in. round hollow steel the shank length should be 3½ in., and for ¾- and 1-in. hexagon steel the shank length should be 3¼ in.? (The water hammer drill of today has a short piston travel. Hence, when lugs or collars become badly worn; they allow the steel to enter the machine too far, thereby "short-stroking" the hammer. Likewise, when the end of the shank becomes worn shorter through constant use, it does not enter the machine the proper distance, and the hammer cannot deliver its full blow. In both cases efficiency is greatly impaired. Hammers and anvil blocks will soon be destroyed if the bearing surface of the shank end of the drill is allowed to become badly battered or chipped.)

29—Are side rods on machines kept uniformly tight?

30—Is improvement possible in the number, pointing or depth of drill holes?

31—Is sufficient air pressure maintained at the drill?

32—Is there undue breakage of drill steel?

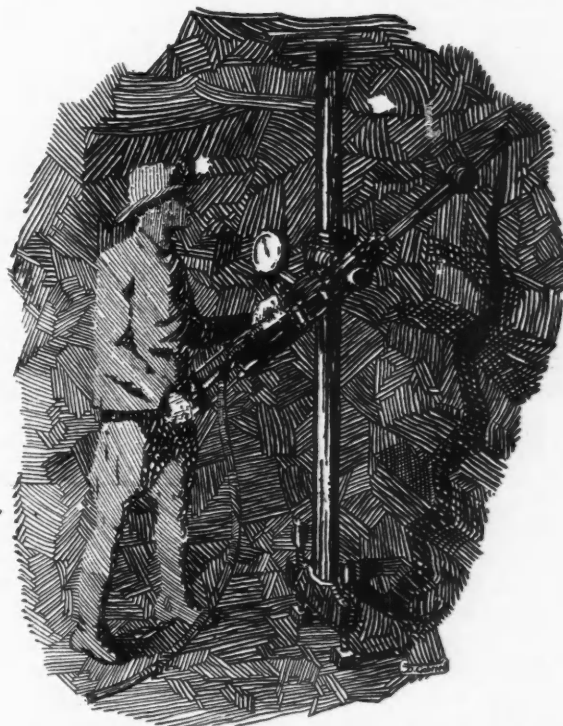
33—Is proper type of bit used for ground drilled?

34—Are sharpening and tempering satisfactorily done?

35—Is there a man especially qualified to repair drills?

DRILLING (Queries 17 to 35)

Type of Drill—One of the first requisites for efficient drilling is the selection of the type of drill best suited to the ground. At some large mines, where the ground is variable in character, it has been found profitable to employ different types of drills. In an investigation of



Is Sufficient Air Pressure Maintained at Drill

the driving of ten crosscuts in hard greenstone in California mines, it was brought out that solid-steel piston drills required an average of 1.81 shifts to drill one round of holes, water-hammer drills requiring 1.14 shifts to perform the same work. The average advance per drill shift was 3.10 ft. for the piston drills and 4.07 ft. for the water-hammer drills; cost per foot in labor and explosives being \$5 and \$3.66, respectively.

After determining the proper drill equipment, it is economical to standardize as far as possible so as to obviate a great number of repair parts.

Repair Work—Drill repair work should be systematized. A great amount of time may be lost if miners are compelled to hunt for repair parts and supplies. Where the operation is large enough, it is a good plan to have a special repair man. Time may be saved if the miner at the face is supplied with plenty of gaskets, wedges, and foot-blocks, and with a box for holding such supplies. Where water-hammer drills are used it is advantageous to keep a few extra water tubes on each level. In some mines, where speed is desired in drifting or crosscutting, it has been found profitable to keep complete duplicate drill equipment within easy reach of the face. An inefficient blacksmith can spoil the work of the best machine by poor tempering, improper gaging, and other similar evils. To get the best work out of the water-hammer type drill, it is essential that the proper shank length be maintained in the steel.

Carr Bit—The type of bit has an important bearing on the speed of drilling. In California mines, investigation has proved that the maximum speed can be obtained in hard ground with the Carr bit. In one particular mine it developed that a change from 1½-in. hollow, round steel, with cross bit, to 1-in. hollow hexagonal steel with Carr bit, increased drilling speed 30 per cent. In some mines the Carr bit has been tried and pronounced unsatisfactory. In one instance investigation proved that the trouble was in the preparation of the bit and in its use with 1½-in. steel. Further experiments with ¾-in. and 1-in. steel, together with careful gaging, demonstrated the superiority of the Carr bit. At a Michigan mine, where the Carr bit was adopted after much experimenting, the bit sizes vary in gage by ⅛ in., and are used on different lengths of steel as follows:

Length of Steel	Bit Gage	Length of Steel	Bit Gage
3 ft. 4 in.	1 ⅜ in.	10 ft. 4 in.	1 ⅜ in.
4 ft. 10 in.	1 ⅜ in.	12 ft. 2 in.	1 ⅜ in.
6 ft. 8 in.	1 ⅜ in.	14 ft.	1 ⅜ in.
8 ft. 6 in.	1 ⅜ in.		

The angle of the cutting edge is 100 deg., and the side clearance angle is 85 deg. The thickness of the head varies with the size of the bits, and has an almost constant relation to it as follows: 1½-in. bit, ⅜ in. thick; 1⅜-in. bit, ⅜-in. thick; 1¼-in. bit, ⅜ in. thick.

Air Pressure—Sufficient air pressure should be maintained at the drill. That this may be done, compressors should be kept in efficient working condition, and leaky air lines should not be tolerated. In the use of water-hammer drills, ¾-in. air hose is not sufficiently large; only 1-in. hose should be used.

Lubrication—The importance of properly lubricating machine drills is usually realized, but in practice it is difficult of accomplishment. The ordinary oil cadger is of flimsy construction and soon becomes mashed; also, the stopper is easily lost. The "Donnelley" oil cadger appears to be one of the best on the market, embodying sturdy construction and a non-removable stopper.

EXPLOSIVES

- 36—Are explosives properly stored and handled?
 37—Is there any check on the quantity of dynamite used?
 38—Have experiments been conducted to determine the proper strength and quantity of dynamite for blasting? (This is particularly important if there is variation in hardness of mine rock.)
 39—Has the use of tamping material been tried as a means of saving dynamite?

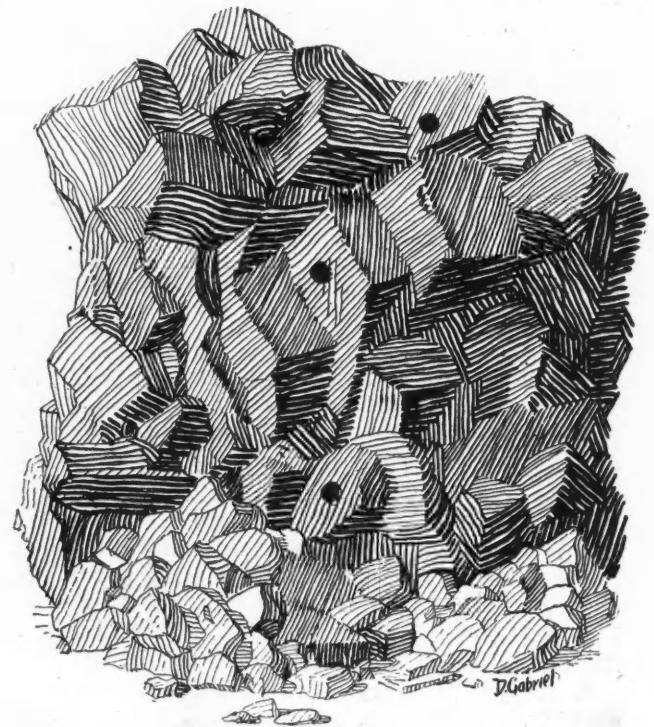
40—Do misfires exceed 1 per cent?

41—Is the use of oil or grease prohibited for waterproofing fuse? (Only an approved trade waterproofing compound, or ordinary roofing paint, should be permitted.)

42—Is the method of making up the primer one that involves minimum bending of fuse?

To get the best results from explosives, care must be exercised in their storage and handling. Practice has demonstrated that a saving of approximately 25 per cent can be made by checking the quantity of explosives allowed to miners, as compared with the practice of allowing miners to secure from the magazine whatever quantity they may wish to take.

Misfires—The importance of the prevention of misfires cannot be emphasized too strongly. When the cut-



Do Misfires Exceed One Per Cent.

holes in a drift or crosscut fail to explode, the result is most unsatisfactory, and not infrequently the cause of the loss of a day's work at the face, plus the dynamite used to blast it. Furthermore, it is necessary to exercise great care in handling misfired holes. The same holds true for the key-holes in a stope; a clean break is not usually secured if they fail to explode. It is important that a record of misfires be kept. When they exceed one per cent of the holes fired, an investigation should be made into the cause. Misfires may be reduced by following the procedure outlined below:

Use only the type of fuse best suited to conditions in the mine. Store fuse in a cool, dry place (45 deg. F. minimum, 75 deg. maximum.) Chilling or excessive heating causes uneven speed of burning. Dampness retards the burning speed, in extreme cases as much as 45 per cent.

Avoid using fuse that is kinked or bent, and be sure that it is not handled in such a manner as to cause crushing or bruising. Cut the fuse square off with a sharp instrument before inserting in detonator. Use detonators of sufficient strength. Do not blow in detonator to remove foreign matter. Insert the freshly cut fuse to full depth of the detonator.

The fuse end should not be shaken or brushed. Failure to push the fuse home in the detonator is responsible for many misfires. An air space, or gap, left in the detonator becomes filled with gas as the fuse burns. This gas, containing much carbon dioxide, will not support combustion, and prevents ignition of the fulminate. Use only a broad jaw crimper.

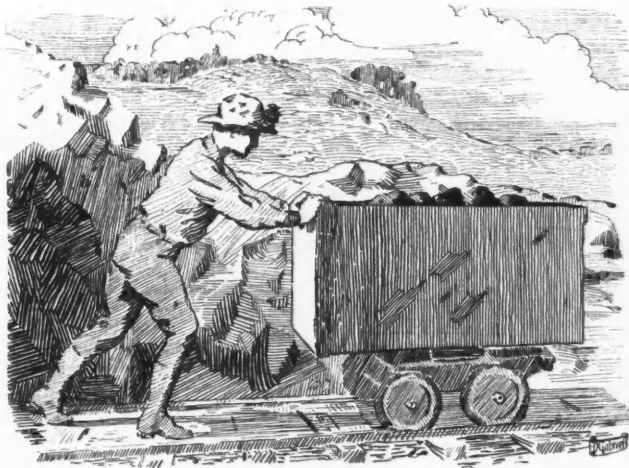
Use no oil, grease, or turpentine-varnish for waterproofing. The best compounds for this purpose are P B roofing paint (with asphaltum base), pine tar, and Celakap. Fuse should not be suspended in the waterproofing compound; dipping is most satisfactory.

Make primer properly. Lacing the fuse through the dynamite cartridge, or the use of any method that necessitates sharp bending of the fuse, will cause misfires. Space drill holes properly. Use no tamping material containing sharp particles. Be sure that all fuses in the round are ignited.

ORE HANDLING—HAULAGE

- 43—Does all rock take the most direct route possible from the ground to the surface?
- 44—Is trouble experienced with boulders in stopes? If so, has it been determined whether it is more economical to place holes closer together, charge them more heavily, or to break the boulders in the stope or chute?
- 45—Are rock chutes so placed as to cause a minimum of shoveling and handling?
- 46—For speedy loading, are permanent chutes equipped with rack and pinion gates, or other control equally good?
- 47—Is haulage system (man, animal, or mechanical power) best adapted to existing conditions?
- 48—Are car wheels thoroughly lubricated at all times?
- 49—Are tracks properly graded and kept in such condition as to cause a minimum of delay from wrecks and derailed cars? (Proper rail weight, ballast, tight fish plate, and bolts.)

The desirability of having all rock take the most direct route from underground to surface is exemplified by the practice of a superintendent who had greatly reduced his cost of production. On being asked what changes he had made, he stated, among other things, that he had been able to get his ore to the surface



Are You Wearing Your Ore Out by Riding it Around the Mine

without wearing it out riding it around the mine. This had been done by means of a few additional raises and a slight rearrangement of the haulage system.

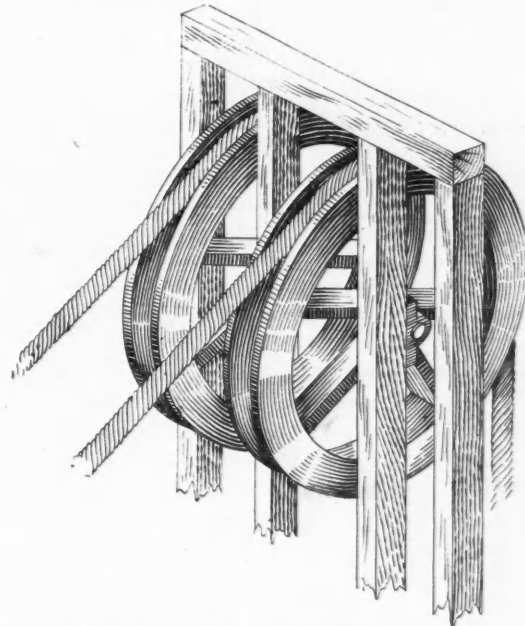
Tracks—It is a well-known fact that loaded cars will run more easily down-grade than up-grade. In many mines this fact is apparently overlooked. It is of considerable importance. Rails that are too light for the

duty imposed upon them, together with poor track construction, lead to wrecks and the derailment of cars. A little care in this respect will greatly facilitate the handling of ore.

HOISTING

- 50—Is pocket capacity sufficient for tonnage handled?
- 51—Is there the necessary control to prevent overloading of skips?
- 52—Is hoisting engine equipped with over-wind device for the prevention of checks?
- 53—Is shaft inspected at proper intervals?
- 54—Is cable inspected, and cut off at intervals?
- 55—Is cable oiled internally as well as externally?

Where hoisting operations are conducted on a sufficiently large scale, it is desirable to install an over-



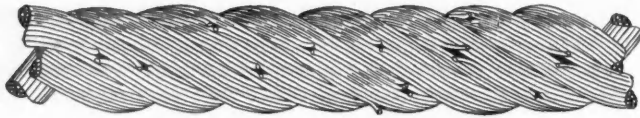
Weak Places on Hoisting Ropes are Points of Tangency

wind device for the prevention of wrecks. Such equipment should embody the ability to control the speed of the skip or cage at all points in the shaft. Several varieties of over-wind devices are on the market. Overloading of skips is another cause of accidents and wrecks in the shaft. This may be avoided by the use of measuring hoppers below station pockets.

Hoisting-Cables—In transferring new cables from the coil or reel to the drums, kinks or twists are likely to occur that might seriously affect the life of the cable. Makers recommend that new cable received in coil be rolled out on the ground and then carefully transferred to the drum. New cable on the reel should be watched when installed to guard against twists.

Recent experiments carried on with regard to breakage of cables show that weak places are formed in the cable at the tangent point just below the sheave wheel, and that breakage frequently occurs at such weak points. Obviously, there is more likelihood of the development of weakness at the tangent point of the cable corresponding to the horizons at which the cage or skip most frequently stops. A cable should not be used for hoisting men when the number of breaks in any running foot exceeds 10 per cent of the total number of wires composing the rope, or when the wires on the crown of the strand are worn down to less than 60 per cent of their original cross-section.

Corrosion of hoisting-cables presents a serious danger. It is not so easy to detect this danger as to notice wear or broken strands. A cable that is apparently in first-class condition may be badly corroded inside, and dangerous. The best preventive of corrosion is thorough internal lubrication of the cable. Both the oil and the cable should be heated above the boiling point of water. A method used in Montana is to pass the cable through a trough containing the lubricant, the latter being heated by live steam. Probably the simplest and most effective method of internal lubrication



Are 10 Per Cent. of Wires in a Running Foot Broken?

tion is described in an article entitled "Oiling Mine Cables in Place," on p. 735 of the *Mining and Scientific Press* of May 31, 1919.

Following are important considerations in connection with hoisting-cables: 1—Use care in installing new cable, to prevent twists and kinks. 2—Inspect cable carefully at least once a week for broken strands and worn crown. 3—Lubricate cable internally at least once every six months, and externally more frequently, as appearance of cable dictates. 4—Cut off about five feet of cable at skip every three or four months, to avoid the development of tangent weakness, and for the purpose of examining cable for crystallization, corrosion, and breaks.

MINE WATER

- 56—Are sumps of sufficient capacity to take care of surplus water in case of breakdown of pumps or temporary stoppage of power?
- 57—Are dams, if used underground, of sufficient strength for the duty imposed?
- 58—Is water and grit kept off of tracks in haulageways?
- 59—Is water carried off in ditches in working drifts and crosscuts?
- 60—Is the maximum of falling water diverted from shafts?
- 61—Are pumps placed as near as convenient to the level of the water to be raised?
- 62—Is end of suction hose in mud?
- 63—Are pumps kept in good repair?

Water should be kept off the floor of working drifts and crosscuts. This is sometimes difficult in old, reclaimed workings. In new work, however, care in the matter of grades will provide for proper drainage. Water in the main haulageways is not only inconvenient, but the grit usually carried by the water is the cause of excessive rail wear.

Dams should be inspected frequently, especially where a number of men are working at levels below them. Ample sump capacity is an important consideration, especially in mines that make a great quantity of water. It is most essential to have a pump-man who thoroughly understands his job, especially in wet mines.

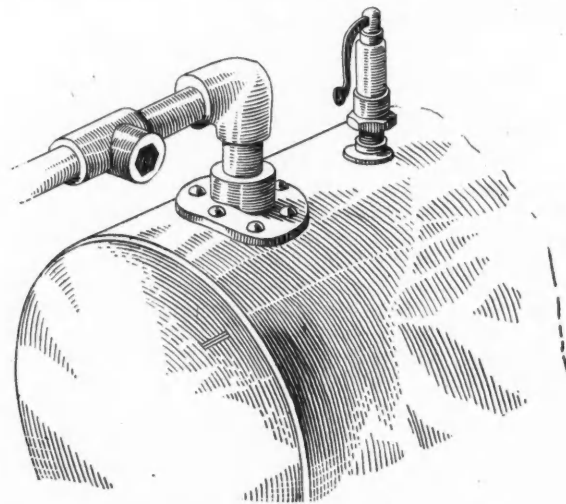
ELECTRICAL EQUIPMENT

- 64—Do electrical power costs compare favorably with those of other properties in the neighborhood?
- 65—Is a capable man in charge of electrical work?
- 66—Is all electrical equipment inspected frequently and kept in proper repair?
- 67—Are frames and bed plates of underground transformers, compensators, rheostats, and motors effectively grounded? (Connection must be wet or damp to be effective.)

- 68—Are high-voltage wires sufficiently protected to prevent personal injury or danger from fire?
- 69—Are transformer installations of fire-proof construction, well lighted and properly guarded?
- 70—Are men allowed to work on live wires?
- 71—Are loose motor bearings promptly cared for, to assure that a minimum of power may be required for operation?
- 72—Are motor ends (rear passageways) screened to prevent tools or pipe being accidentally thrust into them?
- 73—Are open switches in use? (Danger of personal injury or fire from short circuit.)
- 74—Is a sufficient supply of fuse cartridges kept on hand, so that it is unnecessary to use open fuses or wire?
- 75—Is trolley wire and electrical wiring generally protected from dripping water?
- 76—Is trolley wire protected at low points and at ore chutes? Does sag of trolley wire exceed 3 in. between supports?
- 77—Is track bonding in proper condition? Is it sufficiently heavy?
- 78—Are dry sand or tetrachloride fire extinguishers kept available about electrical installations? (Care should be observed to avoid fumes of tetrachloride extinguishers in poorly ventilated places.)

Excessive losses frequently are caused by improperly installed electrical equipment, or through failure to keep such equipment in first-class repair. Chief among these losses are low efficiency, high repair bills, rapid deterioration and damage by fire.

The necessity for care of electrical equipment is set forth in the first paragraph under this heading in the queries. Though all the queries hereunder are more or less important, those on the following features are deserving of special consideration: Comparison of power costs with other operations in the district; neces-



Are Safety Valves in Good Order?

sity for a capable man in charge of electrical work; proper repair of equipment; care of track bonding; fire protection and safety.

COMPRESSED AIR

- 79—Are compressor cards taken for the purpose of analyzing performance?
- 80—Is the intercooler cleaned at intervals?
- 81—Is carbon removed with sufficient frequency?
- 82—Is proper quantity and quality of oil used for lubrication?
- 83—Does sufficient water pass through the jacket?
- 84—Are loose bearings repaired promptly?
- 85—Is compressor intake free from moisture and dirt?
- 86—Is unloader device in good operating condition?

- 87—Is a fusible plug in the compressor or in the air receiver?
 88—Is air receiver in such position that an explosion would cause no damage to compressor or housing?
 89—Is receiver in safe condition for the pressure carried?
 90—Is receiver cleaned at proper intervals?
 91—Is receiver equipped with a reliable safety valve?
 92—Is the air line to the mine, as well as the various branches, of proper size?
 93—Are leaky air pipes given prompt attention?
 94—Are a sufficient number of hose connections provided as branch air lines are extended?

Poor compressor performance and inadequate and leaky air lines are causes of loss of power and inefficiency in drilling. Compressors should be tested to check their performance. The use of the proper quality and quantity of oil is important. Carbon should be removed and the intercooler cleaned at proper intervals. Loose bearings should be adjusted promptly. It is also of importance that sufficient water pass through the jacket and that the compressor intake be free from moisture and dirt. The unloading device should be kept in good working order.

Though explosions of air receivers are relatively infrequent, there have been many such occurrences,



Is Fire Fighting Equipment Ready
to Use

some of which were accompanied by loss of life and destruction of plant. The latest noted is the explosion of two receivers at Hammonton, Cal., where two men were killed and a \$50,000 plant was burned. Though such explosions are attributed to a variety of causes, it is probable that most of them have been caused primarily by overheating of the air in the compressor. This condition, coupled with a receiver containing an accumulation of oil in the bottom, will cause an explosion in the following manner: Aided by the heating, an oily vapor is produced in the receiver, and it is possible for this vapor to combine with the compressed air so as to form an explosive mixture. An incandescent particle of carbon, or air from the receiver, heated to the critical temperature, completes the cycle. Aside from frequent removal of carbon, probably one of the most important features in preventing such explosions is a fusible plug placed somewhere in the compressor or in the air line leading to the receiver. This plug should be so constructed that it will blow out long before the air temperature reaches the dangerous point,

following which the device gives out a shrill whistling sound as an alarm.

Overheating of air can be prevented by care of the compressor, as before suggested. Regarding the receiver, it should be placed, if convenient, in such position that an explosion will cause no damage to the compressor or housing. It should be tested to determine if it can safely carry the pressure of air required. The safety valve should be of adequate size and should be kept in proper working order. The receiver should be blown out every day to remove accumulations of oil.

Air lines are extended as the mine develops, and, as a result, many mines are operating with main air columns that are too small, thus causing considerable loss of air pressure. Air efficiency can be increased by the use of the proper sized pipes throughout the line.

STORES AND SUPPLIES

- 95—Is it possible to determine readily when supplies are low, so that they may be ordered well in advance?
 96—Are tools and supplies standardized as far as possible?
 97—Are supplies checked in and out of the storeroom?
 98—Are unused and discarded tools listed and stored, so that they may be used if occasion demands?
 99—Is there means of determining quickly the location of any piece of machinery on the works?
 100—Is there provision for keeping tools in places where they may be readily found when wanted?

Inadequate storage space and laxity in the matter of handling tools and supplies are the cause of much waste and lost time. Next to having a suitable place for segregating and storing supplies, it is of importance that the system used readily indicate when certain supplies are low. The ordinary method of accomplishing this is through the use of a card system. The cards usually show, under "Material Received," the order number, from whom received, date, quantity, and value; under "Material Delivered," the date, requisition number, account number, quantity, and value; under "Balance on Hand," the quantity and value. Such a card system is good, but, like many other things, its success depends largely on the human element. The system must be kept up to date and material on hand checked at intervals with the cards.

Standardization—It is not always possible fully to standardize tools and supplies, but this may be done to a considerable extent, and will simplify the handling of stores and reduce the amount of material that must be kept on hand.

Checking In and Out—Under the card system referred to, all material coming into the storeroom is entered, as is also material that goes out. It is essential that no laxity be allowed in the matter of securing material from the storeroom. Requisitions should invariably be used. The average workman who knows that he can drop into the storeroom and get new tools whenever he wants them is likely to be careless in their use. Thus two evils result from laxity in this respect: (1) Extravagance in the use of tools; (2) carelessness in keeping tools where they belong, which frequently entails costly delays.

Discarded Tools—At many mines and plants there is a litter of old machinery and tools. Obviously, a great economy can be affected if every article of hardware and machinery of this nature is stored and cataloged for possible future use. The removal of the litter alone is advantageous, as it allows for more freedom of movement for workmen.

Locating Machinery—Confusion and loss of time often result from lack of knowledge of the location on the works of a certain piece of machinery. In some Michigan mines a novel system has been introduced to avoid this contingency. In the superintendent's or the master mechanic's office is placed what is called a "dispatcher's board," about 48 in. long and 24 in. high. The board is divided into squares of any desired size, each square representing a certain portion of the works, such as the pumping plant, Mine A, mill, open pit, shop, and other buildings. Stretched longitudinally across the board, and 2 in. apart, are wires on which tags are hung. Each piece of machinery, such as motors, pumps, compressors, locomotives, and other operating equipment, has a numbered tag attached. A duplicate of this tag is hung in its proper square on the wire of the dispatcher's board. Thus, when it becomes necessary to locate a motor or other piece of machinery, the position of the tag on the board will show where it is immediately. In connection with the board, a card record is kept, showing the changes in location of each machine and the time and repairs while in the shop. A separate board is used at some mines for keeping track of machine drills only.

FIRE PREVENTION AND PROTECTION

SURFACE BUILDINGS

- 101—Are wooden buildings inspected at intervals for the detection of fire hazards?
- 102—What is the condition of electrical equipment and wiring as related to fire hazard?
- 103—Is the storage of oils, grease, or other inflammable matter in wooden structures permitted?
- 104—Are buildings kept clear of accumulations of inflammable rubbish?
- 105—Is oily waste kept in covered metal receptacles?
- 106—Are cupboards and lockers ventilated and kept clear of material that might ignite through spontaneous combustion?
- 107—Is fire-fighting equipment adequate for quickly controlling incipient fires, as well as for fighting fires that have gained headway?
- 108—Is each fire extinguisher supplied with a tag showing date when last filled? Is other fire equipment kept in proper condition?
- 109—Is the water supply ample and of sufficient head for fire fighting?
- 110—Are fire hydrants protected from freezing?
- 111—Is there a fire-fighting organization which holds monthly drills?
- 112—Is there a fire-alarm system?
- 113—From a standpoint of fire protection and saving on insurance premium, has consideration been given to a sprinkler system for large inflammable structures?
- 114—Is adequate fire insurance carried on valuable inflammable structures? Is periodic attention given to this matter, so that premiums may not be allowed to lapse?

UNDERGROUND

- 115—Is any inflammable material stored or kept in or near timbered workings?
- 116—Are candles permitted in dry timbered workings?
- 117—Are shaft rollers and machinery kept well oiled?
- 118—Is the continuity of timbering (if dry) broken from pump station to shaft?
- 119—Are dry timbered shafts wet down frequently?
- 120—Is smoking permitted in dry timbered workings?
- 121—Are electrical equipment and wiring inspected frequently?
- 122—Is there sufficient fire-fighting equipment at shaft stations and in dry timbered places?
- 123—Do a sufficient number of men understand the use of the fire-fighting equipment?

124—Is each fire extinguisher supplied with a tag showing date when last filled? Is other equipment inspected frequently?

125—Is it convenient and desirable to make the air line convertible into a water line for fire fighting?

126—Are fire doors needed?

127—Is there a prearranged plan of action in case of fire, both for fighting the fire and removing men from the mine?

The first step in fire-prevention work should be careful investigation of the mine and plant and removal of all fire hazards. Such hazards are indicated in the queries under this heading, both for underground and on surface. A fire-protective system should be designed for controlling incipient fires quickly, as well as for fighting fires that have gained headway.

Assuming that the proper equipment is installed, it is necessary that it be kept in condition and that the proper men be instructed in its use. There is no better guarantee for the upkeep of equipment than the organization of a fire department and the holding of regular fire drills. This is warranted even at small plants. The truth of this statement may be demonstrated easily by observing the first few fire drills, and comparing results with those obtained after the crew becomes proficient.

A sprinkler system for wooden surface building is one of the best means of fire protection. For such structures, it is not necessary to go to the expense of installing the automatic type; in fact, this system is objectionable in cold countries. A system whereby each building or structure can be flooded by the turning of one main valve is probably the most satisfactory. Aside from the protection afforded, reduction of insurance premiums to the extent of 50 per cent may be secured by the installation of the sprinkler system.

A sprinkler system is also of value about the shaft collar, where there is much woodwork. Also, it will serve a double purpose if installed in the shaft; namely, for wetting down shaft timbers, thus preserving their life, and as a protection against fire. Several installations of this nature have been made on the following general plan: At intervals of 50 ft., the shaft is encircled with 1-in. perforated pipe. This pipe is connected to the water column, the water flow being controlled by a stop cock, governed by a 6-in. handle. This system was seen in operation in a shaft 1,000 ft. deep. In this case a $\frac{3}{4}$ -in. cable was attached to all of the stop-cock handles. Near the shaft collar this cable was attached to the short arm (1 ft.) of a lever, the long arm of which was 4 ft. One man could operate the mechanism, opening all of the stop cocks at the same time. Where the pressure in the water column is too great, it may be necessary to make use of pressure-reducing valves.

FIRE EXTINGUISHERS

Water barrels with buckets are useful as fire extinguishers. The conditions under which they may be used, however, are limited; moreover, there is always trouble in keeping the barrels full of water and preventing the use of the water for other purposes. Chemical fire extinguishers have a far wider range, but care is necessary in keeping them in working order and instructing men in their use. There have been many instances, particularly in underground mines, where men have passed by chemical extinguishers to secure a bucket of water for fighting fire.

In a mine where chemical extinguishers had been

installed underground, a test was conducted to determine what percentage of the men understood the use of the extinguishers. Not one out of ten miners or muckers knew how to operate them. A hoisting engineer at an underground station was asked, "What is that shiny piece of apparatus?" (referring to a Pyrene extinguisher). He replied, "Why, that's a fire extinguisher." He was then asked if he knew how to use it, and replied, "I should say not!" This illustrates the importance of instructing men carefully in the use of chemical extinguishers.

Chemical Fire Extinguishers—Chemical fire extinguishers are of three general types: (1) Soda-acid, (2) carbon tetrachloride, and (3) foam extinguishers.

Soda-acid extinguishers usually employ a solution of bicarbonate of soda and, in a separate container, sulphuric acid of about 58 deg. Bé. The combination of the acid and soda forms a gas which has been found to be most useful in extinguishing fires. Such extinguishers are particularly valuable in fighting fires where there is little draft or wind.

Carbon tetrachloride, at a temperature of about 200 deg. F., is transformed into a heavy gas. This gas has the effect of smothering a fire. It is useful chiefly in reaching fires in confined places and loses its efficiency considerably if the fire is exposed to a wind or strong draft. This extinguisher is particularly efficacious in electrical fires, as carbon tetrachloride is a non-conductor of electricity. Care should be observed in confined places underground, so that the user may not be exposed to the gas that is formed.

Foam extinguishers usually contain bicarbonate of soda, aluminum-sulphate, and a small percentage of extract of licorice. The combination of the solutions forms carbonic-acid gas, inclosed in bubbles. These bubbles, when the extinguisher is in use, cover the burning surface, and so smother the fire. The volume of the foam produced is about eight times the volume of the solutions used. Though foam is of value under practically all conditions, its best use is in extinguishing oil fires.

It has been generally believed that the foam is a conductor of electricity. A recent report by the manufacturers of "Foamite" describes tests conducted with potentials up to 13,000 volts, using a 2½-gal. extinguisher. A live plate was placed 5 ft. from the nozzle of the extinguisher, and in no test was the current conducted back through the stream of foam. This is explained by the fact that the foam is broken up and becomes non-contiguous. It is also claimed that an oil circuit breaker surrounded by burning oil was quickly extinguished without the operator of the extinguisher receiving a shock. Though the above statements are doubtless true, on account of a lack of first-hand information I am not prepared to state that the foam is an absolute non-conductor of electrical current.

MISCELLANEOUS

- 128—Are company contracts inspected and studied at regular periods to guard against overlooking some important details?
- 129—Are shaft stations and other working places properly illuminated?
- 130—Is outside night work sufficiently illuminated?
- 131—Are conditions underground satisfactory as to temperature and humidity, and the quantity and quality of air supplied?
- 132—Is sufficient attention given to the ply and size of drive belts?
- 133—Are records kept of belt performance, to determine the most economical kind?
- 134—Is belting inspected and kept soft and pliable?
- 135—Is the highest coefficient of friction obtained on all belt drives?
- 136—Is new rope (for rope drives) lubricated? (Graphite grease will prolong the life of such rope.)
- 137—Does the system of accounting provide for ready information as to the cost of each major piece of work in progress?
- 138—Are sampling and assaying properly correlated, so that results are obtained with a minimum of delay?

VENTILATION (Query 131)

It is only during the last few years that metal-mine operators have come to recognize the fact that ventilation has a direct bearing on the working capacity of miners. Gassy or vitiated air, together with high heat and humidity, will often cut down working efficiency to one-half of normal. Much money has been spent by operators of large mines to insure adequate ventilation. Proper control of ventilation has been recognized also as an important feature in fighting mine fires.

Studying Conditions in the Mine—It is a simple matter to determine whether sufficient air is being carried to various parts of the mine. The apparatus necessary are a Haldane black-damp tester, for the determination of the percentage of oxygen in the air, and a sling psychrometer, for the determination of temperature and humidity. A table of humidity readings is necessary in connection with the use of the psychrometer. An anemometer is also useful in determining the amount of air passing at different points in the mine. A half day will suffice to make the necessary preliminary tests, in even a large mine. Should it be found that the oxygen content of the air in working places is as low as 18½ per cent, or the wet-bulb temperature higher than 75 deg. (relative humidity 95 to 100 per cent), steps should be taken to increase the amount of air going to the working places that require it. The trouble may be that an insufficient quantity of air is entering the mine, or that ventilating current is being short-circuited and is not reaching those parts of the mine showing bad atmosphere and temperature conditions.

It may be well to consider first the proper distribution of such air as is available by natural means. It is generally best to carry the ventilating current first directly to the lowest portions of the mine and distribute it thence to the various working places and finally to the up-cast shaft. The placing of doors, for preventing short circuits of air and for deflecting the ventilating current to best advantage, is a most important factor. If sufficient air cannot be provided by regulating the course of the air current, it will be necessary to employ mechanical appliances for increasing the supply of air.

Ventilation of Dead Ends—In most metal mines the main openings are usually fairly well ventilated. The greatest trouble is experienced in remote stopes or in dead ends. There are several means of removing foul air from, and carrying fresh air to, places remote from the main air current of the mine.

Where the dead end is directly connected with the surface, many ingenious schemes for ventilation have been evolved. Among these may be mentioned the use of sails, so rigged as to divert a current of air into a pipe leading to the face. Installation of ordinary stovepipe, or galvanized iron pipe, leading from the face

of a tunnel to the portal, and there connected by an elbow to an upright pipe, will cause a slight circulation of air. This circulation may be increased if a stove be added to the outside equipment. The point at which the pipe enters the stove (or hearth) should be of greater elevation than the intake end of the pipe at the face. A long tunnel in a Mexican mine was successfully ventilated by making a drain tunnel in the floor, made air-tight by means of slabs and cement. Considerable water flowed out through the drain pipe, and this served to set up a circulation of air.

In sinking prospect shafts, the use of a stove or charcoal pot, placed on one side of the shaft, or, better still, beneath a stack or pipe leading down the shaft, has proved efficient. If the shaft be of two compartments, with a partition dividing them, the use of a stove in one compartment causes an air circulation.

In ventilating dead ends distant from or not directly connected with the surface, a different problem is presented. In general, it is most efficient to draw the foul air from the face through a pipe placed near the back or roof. Forcing air to the face through a pipe forms eddies, and, in shaft sinking, works directly against the natural tendency of heated air to rise. For carrying the air, there is probably nothing better than ordinary galvanized iron pipe. Its size will depend on the quantity of air it must carry.

Three methods are usually available for forcing the air through, or drawing it out of, the pipe: the use of electrically driven centrifugal fans, or of fans driven by water power, and the employment of the compressed-air jet. Where electrical power is available, it is probable that the electrically operated fan is cheapest and most efficient.

It is a good plan to read over, at regular intervals, contracts to which the company is a party, to insure that no details or obligations are overlooked.

Proper illumination of working places is an important consideration. This subject is worthy of attention where much night work is being done; also in the shops and underground.

The satisfactory performance of drive belts depends on the use of the proper size and ply. This is a matter that is frequently neglected. In the installation of machinery, care should be exercised in placing the various parts so as to insure the greatest coefficient of friction for drive belts. For new rope drives Dixon's graphite grease is recommended to prolong the life of the rope.

Planking Ore-Bins

BY DOUGLAS LAY

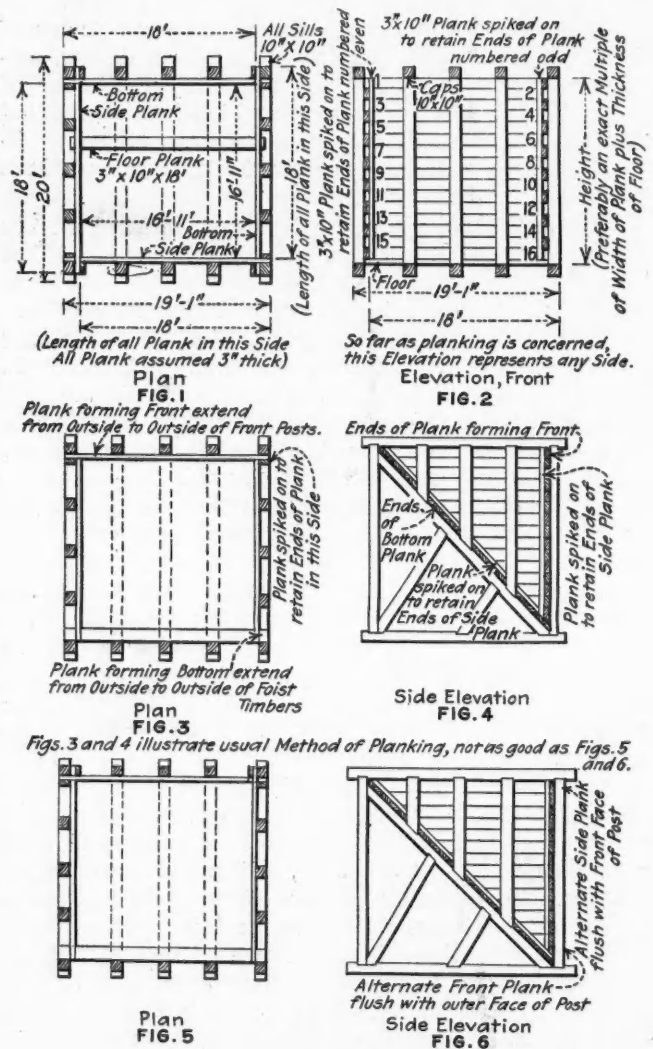
Written for *Engineering and Mining Journal*

BINS should be planked in such a way that the planks serve not only to retain the contents securely, but also tie the bin frames effectually with a minimum amount of lumber. One of the best ways of planking rectangular flat-bottom bins is shown in Figs. 1 and 2. The flooring presents no difficulty, provided sufficient bearing is given on the outside sills. In the case of the sides each plank covers the entire face of one corner post; consequently, each of the latter posts is securely tied—alternate planks tie each post successively.

The usual method of planking sloping-bottom bins is shown in Figs. 3 and 4. The planking of front and floor runs from outside to outside of the timbers forming

the frame. Side planks merely butt up against front planks, and are not tied to corner posts, except that a piece of plank is spiked vertically over the ends of the front plank, the ends of the side plank being spiked to the edge of this vertical plank. With this method of planking, it is evident that any pressure tending to force the front of the bin outward will be resisted by the members of the bin frame.

A better method of planking is shown in Figs. 5 and 6. Alternate side planks are extended flush with the front faces of the corner posts, so that half the planks forming the sides of the bin resist any outward pressure. Alternate front planks are extended flush with the outer



FIGS. 1 TO 6. CONSTRUCTION DETAILS OF FLAT- AND SLOPING-BOTTOM ORE-BINS

face of one corner post, so that both the latter are well tied to resist any lateral pressure.

The design of a bin should indicate a size such that planks need not be wastefully cut. A few inches in size may make all the difference, either way, as plank are sold cut to even foot-lengths. Referring to the rectangular flat-bottom bin of Figs. 1 and 2, a length of 16 ft. 11 in. and the same width, dimensions in the clear, make it practicable to use 18-ft. plank without cutting. The height of a bin is not of the same importance, but it is best to make the height an exact multiple of the width of plank to be used plus the thickness of the floor.

Photographs From Underground

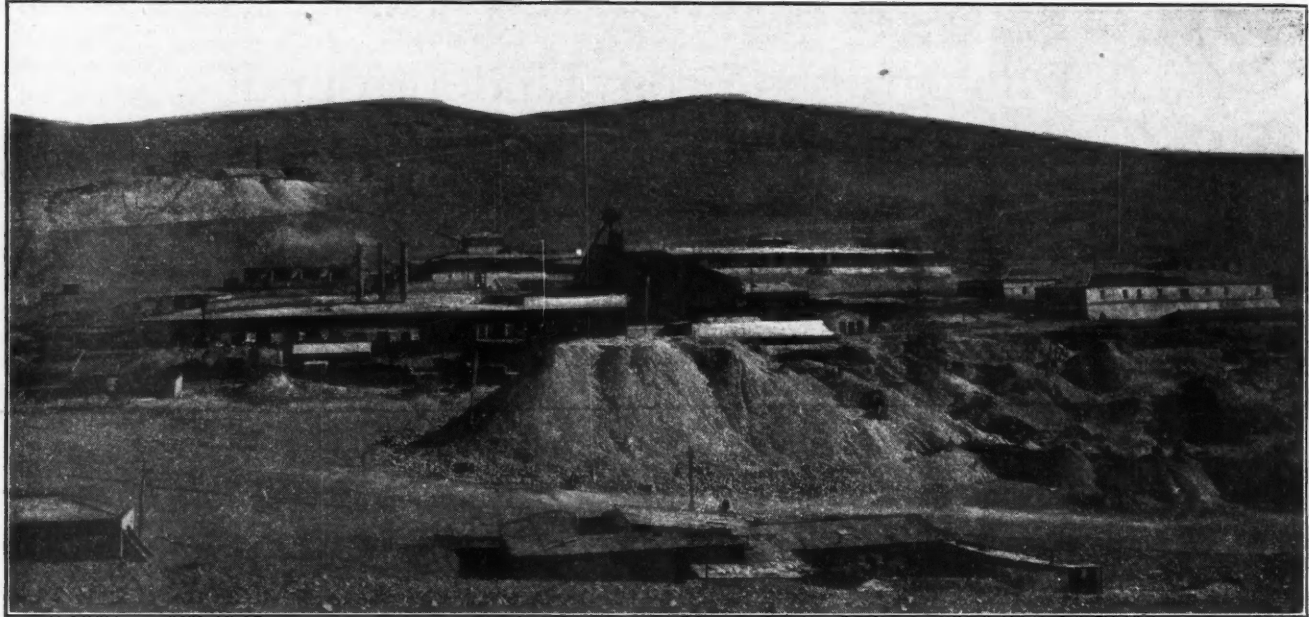


STOPE IN HIDDEN CREEK MINE OF GRANBY CONSOLIDATED MINING, SMELTING & POWER CO., ANYOX, B. C.



STOPPING AT THE DAVIS-DALY MINE AT BUTTE, MONT.

The photograph shows a self-rotating stoper drill boring a downward hole with the point of the feed piston appearing over the operator's left shoulder and braced against the rock on the other side of the stope. His right hand holds the drill steady by the handle while his left hand controls the strength of feed by means of the feed brake.



PODEROSA MINING CO., CHILE. ALTITUDE 15,000 FT.

A Mining Engineer in South America

From Rio de Janeiro to Buenos Aires—Over the Andes—Valparaiso, Antofagasta, La Paz—
Personal Experiences and Reminiscences in Out-of-the-Way
Corners and Distant Countries

BY PAUL T. BRUHL

Written for *Engineering and Mining Journal*

HAVING received an appointment in Chile, my recollections were naturally centered on the South American continent. The trip out by way of France, Spain, and Portugal was full of interest. The first port of call after leaving Europe was Rio de Janeiro, capital of Brazil. The city lies on a harbor of world-wide reputation for beauty which is indeed well-deserved. Ornate buildings grace the principal streets. The residential district of the well-to-do class has been laid out with an eye to an effect that is altogether pleasing. Whatever criticism may be leveled at South American cities in general, it cannot be said that the capitals have not been built artistically, and they will bear comparison with any of the Old World cities.

The Latin-American is not afraid of painting his house the color that most appeals to him, and, though a thoroughfare of freshly painted dwellings may be a chromatic riot, time gradually softens the violent contrasts, and the subdued colors save the streets from the monotonous drabness that is unfortunately characteristic of so many Anglo-Saxon communities. It seems to me that a land blessed with plenty of sunshine revels more in bright colors than one that is not so favored. Whether this is due to the psychological effect of good weather, or to a consideration of cost, I do not know.

The Brazilian fleet, as my steamer entered the harbor, lay at anchor. The story runs that on the occasion when the latest Brazilian battleship was delivered by an English crew, the local authorities were so eager to assume control that they did not stop to learn the operation of the complicated machinery. As a consequence,

when they wished to anchor, there was no one on board competent to stop the ship. It is said that it continued to circle the harbor until the steam-pressure fell and an anchor could be cast without fear of tearing the bottom out of the bay.

From Rio I went down the coast to Montevideo, capital of Uruguay. Our vessel berthed alongside the British cruiser "Glasgow," which some years later got on the wrong side of Von Spee's squadron off Coronel. The British navy had the satisfaction, however, of returning the compliment at the Falkland Islands.

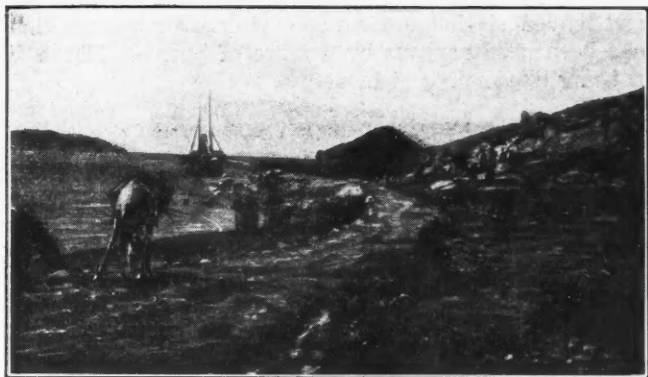
MONTEVIDEO TO BUENOS AIRES

From Monte Video the traveler ascends the Rio de la Plata to Buenos Aires by a palatial river steamer. These boats appear to be much in favor with the hard-working business man who has to spend a few hours at the bedside of a sick friend or who is obliged, perhaps, to remain overtime at the office working on the books. I was in Buenos Aires a few hours only, but long enough to be convinced that the numberless cambios or money exchanges were a serious menace to one's pocketbook. It is best to go to the banks, where at least a little pity is shown the stranger within the gates of the city.

At the depot an official interpreter was good enough to help me with my transportation and other difficulties. His refusal of a tip is one of my happiest recollections of the Argentine. Perhaps he was a partner in the cambio that exchanged my crisp Bank of England notes for the bills which hung together solely through the adhesiveness of several feet of gummed paper, and thought that I had been trimmed sufficiently.

The journey across the republic westward holds little that is of interest. It is interminable pampa, sparsely inhabited. The traveler is glad to arrive at Mendoza, on the eastern slope of the Andes, where in season luscious grapes can be had for the taking.

The trip over the Andes is one of great beauty. In fact, for majestic grandeur I have not seen the equal. Let the Himalayas and Rockies look to their laurels. The strata appear to have been touched with a master painter's brush, and all around Nature has carved great battlements and sculptured gigantic monuments of surpassing loveliness. One regrets the advent of darkness,



A CORNER OF LAKE TITICACA, BOLIVIA.
ALTITUDE 14,000 FT.

and yet, in a way, one has had for the time a surfeit of the rugged splendor.

At Los Andes the passenger submits to the customs examination, and unless he wishes to lose the connection he would be wise to apply some "palm oil" to the receptive hand of the aduanero. The customs service in Chile, I should imagine, must be a popular one. At 11 at night I arrived at Valparaiso, the principal seaport of Chile. I had been led to believe—a belief which was not based, I found soon enough, on any substantial foundation—that the South Americans were not on the topmost rung of the ladder of civilization. Curiously enough, just as I stepped off the train a "snatch-purse" tried to get away with a lady's handbag, but was pursued by a gallant army officer and cut down with the flat of his sabre. The thief surrendered the purse to the officer, who politely handed it to the lady, and the incident was closed.

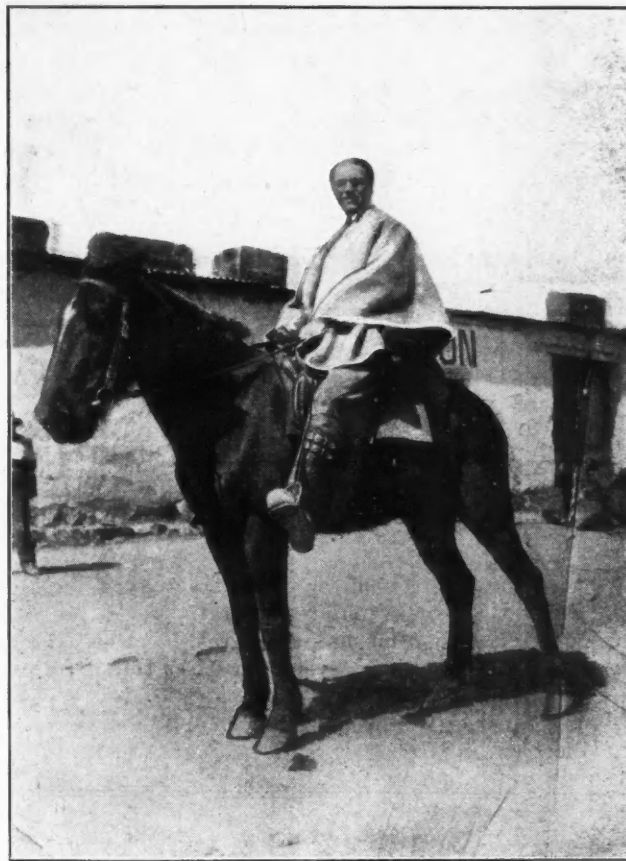
The sea trip to Antofagasta was rendered enjoyable by the companionship of a gentleman from Ohio, one of the first Americans I had met. The originality of his thinking was as stimulating as his broad grasp of world affairs. I was sorry when our ways parted. Antofagasta is a fairly large town, with an open roadstead. It is by no means attractive to the eye, and in places it is offensive to the nose. It is the center of supply distribution to the oficinas and the large copper mines.

From Antofagasta one takes the International train, which runs northward as far as La Paz. I left the main line at Ollagüe, the customs station on the Bolivian frontier. It is as desolate and windy a spot as one would wish to avoid. The hotel (God save the mark!) has no conveniences. The mozo asks, "Tea or coffee?" If you say "Tea," well and good. If you say "Coffee," he replies "There isn't any," and the choice is up to you again. I was glad to get up to the mines, though the altitude of 16,000 ft. gave me a serious headache, which

necessitated my departure to Oruro, Bolivia, 12,000 ft. altitude, for two weeks.

A description of the mines has already appeared in *Engineering and Mining Journal* under my name. The scenery is bleak, and there is practically no vegetation. There is no diversion except what one makes for oneself. The shooting is limited, duck and rabbit principally, though an occasional vicuña might be included in the bag of a lucky hunter. The evenings, as in all desert country, are beautiful, and the worries of the day can be lost in the vivid glory of a sunset, and the elusive feeling of loneliness is in reality an added charm.

To rest from the strain of the high altitude (the heart beats at 96) we went to either one or the other of two oases. One was uninhabited, and in it stood a ten-stamp battery which had been used for milling silver ores. Apparently, the venture had not been a profitable one. I was never able to find ore assaying better than fourteen ounces, and, so far as my limited observations went, the average content of the orebody



PAUL T. BRUHL

was two ounces. A lead ore brought me for assay from Bolivia showed 60 per cent Pb and 200 oz. of silver. I asked the owner casually where the vein was, and he replied as casually that he had forgotten.

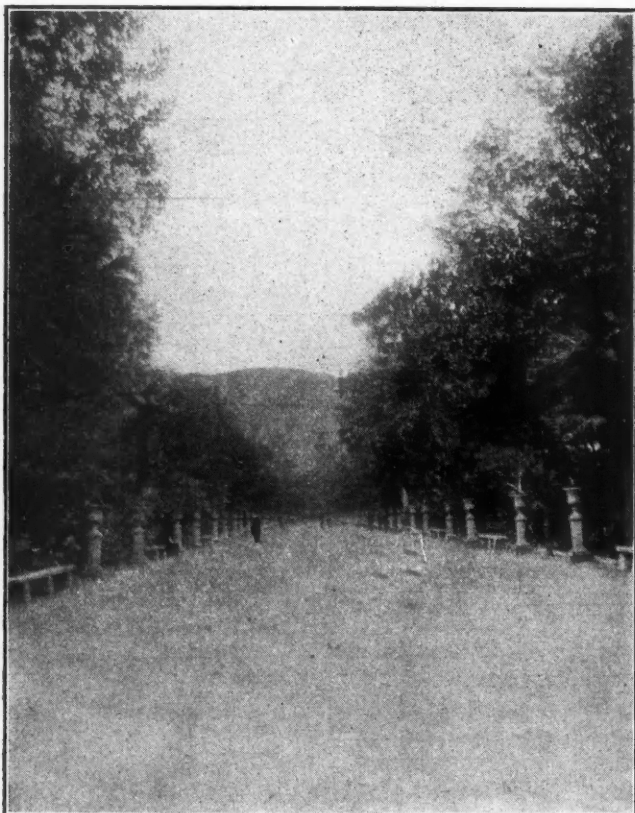
A VISIT TO AN OASIS

The second oasis was fifty miles away, and was a welcome sight after several hours in the saddle across a rough country. About half-way down to the oasis there were the "remains" of a venture in copper. There is a huge infantile mortality in mines in all parts of the world. The hundred or two hundred inhabitants of this oasis make a comfortable living, inasmuch as they

make both ends meet. Agriculture is the sole endeavor. Water for the gardens is supplied from a community reservoir, and there is a community oven for baking bread. I wonder whether Lenine was ever there. The people are kindly, hard-working, and honest, and even though their world is closely hemmed in by frowning mountains, their lives are by no means barren. There is a little chapel, well patronized by the women. The cura or priest was removed by the community long ago for not limiting his activities to spiritual matters.

AN EARTHQUAKE IN THE HIGH MOUNTAINS

On arriving at the oasis on one occasion my mule came to a sudden halt and showed every sign of uneasiness. A few seconds later a gust of wind swept by me that was accompanied by reports like heavy charges of



AVENIDA PRINCIPAL, LIMA, PERU

dynamite. On looking up at the ridge which towered hundreds of feet above the village I saw that the top-most strata were obscured by clouds and spurts of dust. It was an earthquake.

Up an adjacent valley was a bathing pool cut into the bank that was much frequented by the villagers on account of the medicinal properties attributed to the water. The water emitted a slight odor of sulphureted hydrogen, and one could see a bubble of gas rising now and then to the surface. In another place there was a pool the water of which contained borax salts derived by a stream running from the base of a recently extinct volcano. The water was quite warm, and one could swim in perfect comfort with the thermometer standing below zero. The radiation was powerful, and if there is no wind blowing one can dress at leisure in the coldest weather.

The principal dance of the inhabitants was the "Cueca chilena." The orchestra consisted of a player who sings

to the accompaniment of a guitar. Usually both musician and singer are very mediocre performers. The partners do not touch each other. The idea conveyed by the dance is that the woman coquettes with the man, advancing toward him and then retiring upon his animated and hopeful approach. Each dancer waves a handkerchief over the head. The movement is graceful. At the end of each dance, which lasts a minute or two, depending on the interest of the orchestra, glasses of wine are passed around. A sip only is taken, for it can be readily seen that if all the contents were emptied the quick succession of dances would soon place the guests "hors de danse." The glasses are then collected and refilled, so that in time one drinks from a glass that has been used perhaps by a score of people. There is nothing like feeling at home.

EARLY MORNING IN THE DESERT

The best time to start out on a ride in desert country is immediately before sunrise. The canyons are scarcely in light, and as the sun rises it illuminates the cliff tops with rays that are reflected in delicate blue and rose and salmon tints. Little by little the sunshine creeps down the mountain sides, driving from the summit the soft play of colors and gradually bathing the trail with a generous flood of warmth.

Many of the Bolivian women have a decided Mongolian cast of countenance, especially with respect to the eyes. They are fond of bright shawls and skirts. Indeed, so fond are they of their skirts that they do not seem ever to discard one—the new one being slipped on over the old. The men are willing workers, addicted to coca, and easily led, especially into a saloon, where they drink and gamble to an extent that often leads to trouble. This reminds me of the gambler who shot a player for presuming to hold four aces when he had just dealt them to himself.

THE RETURN TRIP

After fifteen months I decided to make a change, and left for the United States. On the way out one can spend a few hours at Lima, the capital of Peru. It is a fine city, and, like Spanish towns, it has its Avenida Principal, where the men and women of fashion take the air in the cool of the evening. I proposed a visit to the bull ring, but the cocheró demurred, as there was no bull fight and there *had* to be one, he said, to render the visitor oblivious of the army of fleas which swarmed over the arena and the seats.

The next port on the return journey was Panama. Here I had the interesting experience of passing through the canal. There is a curious feeling when one sees a battleship steaming over what was not long ago a well-wooded valley. Panama is a pleasant enough city, over which the deeds of the old adventurers have thrown an abiding glamour. The municipality seems to run a perpetual lottery, and the unwary stranger should be careful not to purchase tickets for a lottery that already has been held.

If I remember correctly, the social custom which prevails in so many South American cities prevails here also. When the band plays girls take the inner side of the paved walk and stroll in one direction while men take the outer edge and walk in the opposite direction. I suppose that in order to see one's inamorata often enough the sensible thing to do would be to ride round on a motor cycle.

Vertical Extent of Copper Ore Minerals in the Junction Mine, Warren District, Arizona

Both Secondary and Primary Chalcocite Occur, the Latter Only in Depth, Where It Is Associated With Primary Chalcocite and Bornite—Native Copper Present in All Stopes

BY GRAHAM JOHN MITCHELL, PH.D.

Written for *Engineering and Mining Journal*

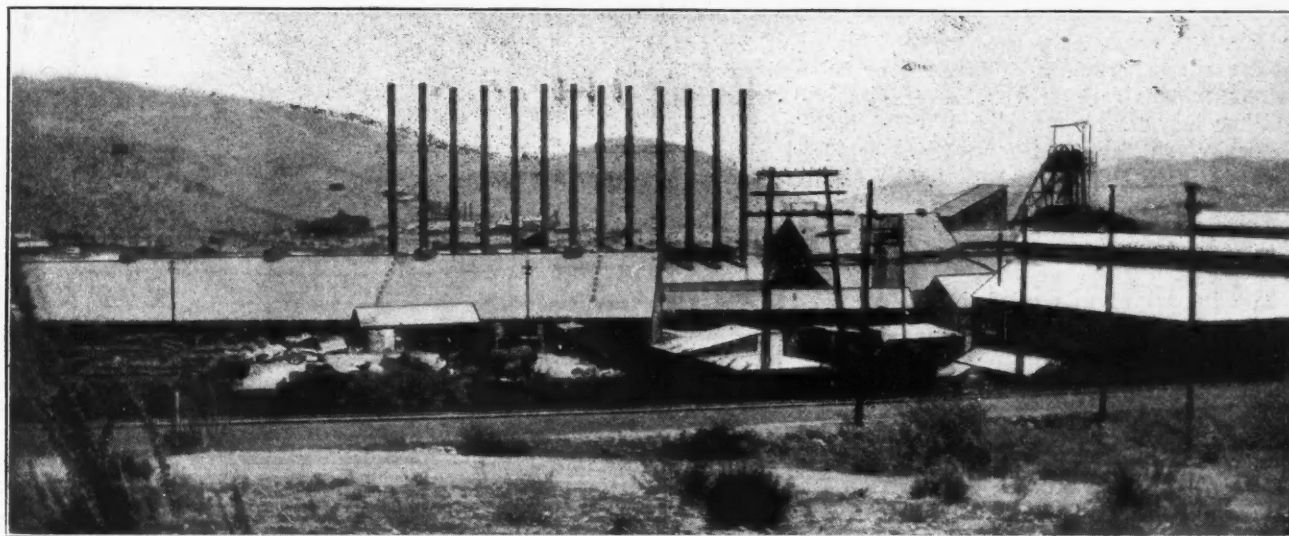
THE Junction mine of the Calumet & Arizona Mining Co., at Bisbee, Ariz., with developed ore from the 770- to the 1,800-ft. level, affords an opportunity to study the association, mode of occurrence and vertical range of the copper ore minerals and their metallic associates. Pyrite is the most extensively developed sulphide mineral. It ranges from the highest to the lowest level, and is widely distributed horizontally throughout the developed and prospected areas. Bedded deposits of this mineral replacing limestone are common, the beds being several feet thick. The replacement may be complete, with none of the limestone remaining, or only partial, with remnants of the replaced rock present in the ore.

Strong silicification in which silica has taken the place of the lime carbonate is characteristic of some of these

Chalcopyrite is the source of much of the secondary "sooty" chalcocite. Thin sections show the alteration of the copper-iron sulphide to chalcocite. The alteration has proceeded along fractures working irregularly through the mass. Some sections show a network of chalcocite veinlets; in others the larger portion of the field is occupied by the secondary sulphide with included remnants of chalcopyrite.

SECONDARY AND PRIMARY CHALCOCITE

Chalcocite, both "sooty" and "steely," is strongly developed in different orebodies throughout the mine. The former is associated with the enriched pyrite-chalcopyrite ore, where it is present as the familiar black powdery material. As stated, it has been formed from chalcopyrite during secondary enrichment processes.



JUNCTION MINE, CALUMET & ARIZONA MINING CO., BISBEE, ARIZ.

deposits. The copper values in such orebodies are in finely disseminated chalcopyrite. Where ore of this nature has been fractured and subjected to downward circulating waters, enrichment has taken place in the form of "sooty" chalcocite. Much of the pyrite is fine-grained granular. This is especially true in the heavily bedded orebodies. Considerable pyrite is also found along faults in the gouge and breccia, crystals with dimensions of one-half inch or more being present.

Chalcopyrite, the most widely distributed copper sulphide, has the same vertical range as the pyrite. Although its lateral distribution is as wide as the pyrite, its occurrence is not so extensive. The intimate association of these two minerals is a significant factor in determining the grade of much of the sulphide ore. The chalcopyrite occurs disseminated through the pyrite bodies, in places uniformly, and again in knots or bunches. Poorly formed crystals over one-quarter of an inch in diameter occur, but these are not common.

Orebodies in which this mineral is present always show fracturing and faulting. "Sooty" chalcocite is found from the 770- to the 1,700-ft. level, but is most extensive between the 1,200 and 1,600. Its lateral distribution is not so great as that of chalcopyrite.

Massive sectile (steely) chalcocite is best developed between the 1,400 and 1,600 levels, although it is present on all levels from just above the 1,400 to the 1,800. It is closely associated with chalcopyrite, bornite, sphalerite and galena. Specimens from ore just below the 1,500 contain the first three minerals, the bornite and chalcocite being intimately intergrown, forming a ground-mass in which are set sphalerite and chalcopyrite crystals. All of these minerals are free from secondary alteration. Other instances have been noted where lenses of "steely" chalcocite two by four inches occur along the bedding planes of limestone. The chalcocite has replaced the limestone, in one instance a core of lime remaining within the lens of sulphide. On the

1,800 level fractures have been mineralized with bornite, chalcopyrite, "steely" chalcocite, sphalerite, galena, and pyrite. No secondary alteration of the minerals is evident, and the inclosing rock is fresh and unoxidized. Such occurrences of this much-discussed copper sulphide are believed to be primary, and the field evidence supports that conclusion.

PRIMARY BORNITE MINERALIZATION

Bornite occurs as irregular pockets or bunches several feet in diameter within portions of the pyrite-chalcopyrite ore. These bunches are located along fractures and faults and represent a period of mineralization closely following the formation of the main pyrite-chalcopyrite replacement. Associated with the bornite are sphalerite, galena, "steely" chalcocite, and covellite. The galena and sphalerite are present as scattered crystals in the massive bornite and chalcocite. Covellite is disseminated through the mass, as is also some sphalerite. Other occurrences of bornite are in the form of disseminated particles in bodies of pyrite and chalcopyrite. Bornite ranges from the 1,600 to the 1,800 level, with the strongest showing between the 1,500 and 1,600.

A small amount of covellite is associated with bornite below the 1,500 level. It holds an inferior position to the other sulphides as an ore mineral.

GALENA AND SPHALERITE

Galena and sphalerite are present in some of the orebodies as small pockets or bunches or intermixed with copper minerals in mineralized faults and fractures. Neither has a wide distribution and both are limited vertically, as far as the present workings show, to levels between the 1,000 and 1,800 and 1,200 and 1,800 respectively.

OXIDIZED ORES AND NATIVE COPPER

The important minerals comprising the "oxide" ore are cuprite, malachite, azurite, and native copper. All the "oxide" stopes contain these minerals in varying amounts. Cuprite, azurite, and malachite have the same vertical range occurring from the 770 to the 1,600. Native copper has been found from the 900 to the 1,800. The principal zone of the "oxides," however, is above the 1,400 level, the largest stopes of this class of ore being between the 1,200 and 1,400 levels.

Cuprite occurs both crystalline and massive. The crystals are chiefly cubes modified by dodecahedrons, with simple dodecahedrons also present. Combinations of cube and octahedon occur as well as the acicular variety known as chalcotrichite. Large masses of cuprite and native copper have been found just below the 1,200-ft. level.

Malachite is found chiefly in massive form and in many cases is derived from cuprite and azurite, the crystals of azurite showing partial and also complete replacement to malachite. Malachite in bunches of needle-like monoclinic crystals is found filling cavities in the oxidized ore.

Azurite occurs both crystalline and massive. Crystals an inch or more long have been found. They are modified monoclinic forms, none showing complete development of faces. The massive material is found replacing limestone, with the azurite partially altered to malachite.

Native copper is present in practically all the "oxide" stopes. It generally occurs as disseminated particles, but masses of crystalline material have been found in

which the rudely formed crystals are twinned, forming pieces weighing several pounds. Thin slabs of crystalline native copper occur along the bedding planes in mineralized limestone in the "oxide" stopes and along fractures in quartzite. A specimen of native copper and limonite from a fault on the 1,600 level shows the native copper forming a nucleus for radiating growths of limonite. The nuclei of native copper range from the size of a pinhead to one-eighth of an inch in

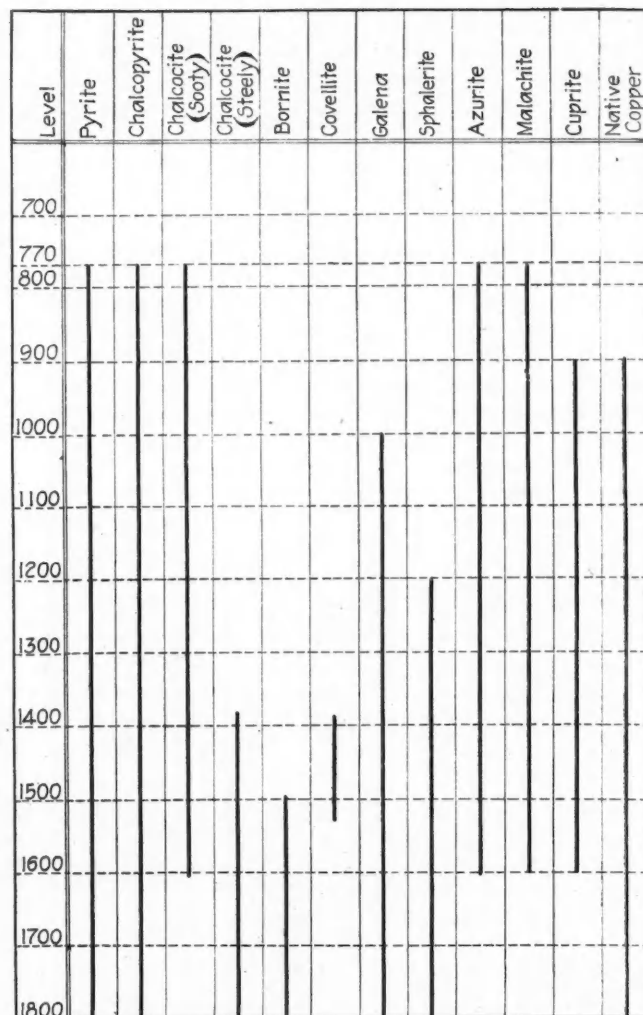


TABLE SHOWING THE VERTICAL RANGE OF THE COPPER ORE MINERALS IN THE JUNCTION MINE, CALUMET & ARIZONA MINING CO., BISBEE, ARIZ.

diameter. Crystals showing alteration to cuprite occur just below the 1,200 level.

From the data at present obtainable the following predictions as to the mineralogical character of the ore to be encountered at lower levels in the Junction mine may be made:

The principal orebodies will be pyrite-chalcopyrite replacements in limestone. Bodies of bornite and "steely" chalcocite can be expected along pre-mineralization faults and fractures cutting these pyrite-chalcopyrite masses. Some disseminated bornite and "steely" chalcocite will be present, together with galena and sphalerite.

The 1,400 level limits the main zone of oxidized ore, although some ore of this character will occur at deeper levels where strong post-mineralization faults cut primary ore.

A High-Temperature Oil-Fired Laboratory Furnace

By H. K. NAJARIAN

Written for *Engineering and Mining Journal*

IN THE March 27, 1920, issue of *Engineering and Mining Journal*, in a communication under the title "Unsolved Problems of Metallurgy," information is sought concerning high-temperature furnaces adaptable to laboratory use. I have had experience with the design and operation of several types of industrial furnaces, and am of the opinion that the oil-burning furnace illustrated in the accompanying sketches can be put to laboratory use in many operations requiring high temperatures. This furnace has been successfully used for the melting and refining of nickel, and, by proper manipulation, furnace temperatures up to 1,700 to 1,800 deg. C. can be obtained.

Fig. 1 is a working drawing of the furnace proper, showing the brickwork in detail. The furnace should be inclosed in cast-iron or steel plates, bottom and all four sides; heavily ironed with rails and buckstays; and tied with tie-rods similar to the ones used in larger furnaces of the reverberatory type, such as copper-refining furnaces. Erecting the furnace on brick piers keeps the bottom cool and prevents burning out. Good draft is essential for proper operation, and for this particular furnace the draft produced by a 50-ft. stack has been found ample.

The oil burner is of the pan type and similar to one designed originally by H. F. E. Gamm, of Rutherford, N. J. It is radically different in design from many other types of burners, in that the oil is not atomized by mechanical means before it is ignited. The design

air passage between the oil pan and the cover, over the pool of oil, and another between the bottom of the oil pan and the drip pan. The drip pan serves the purpose of catching any drippings of oil in case of excessive boiling. A cast-iron damper is used on top

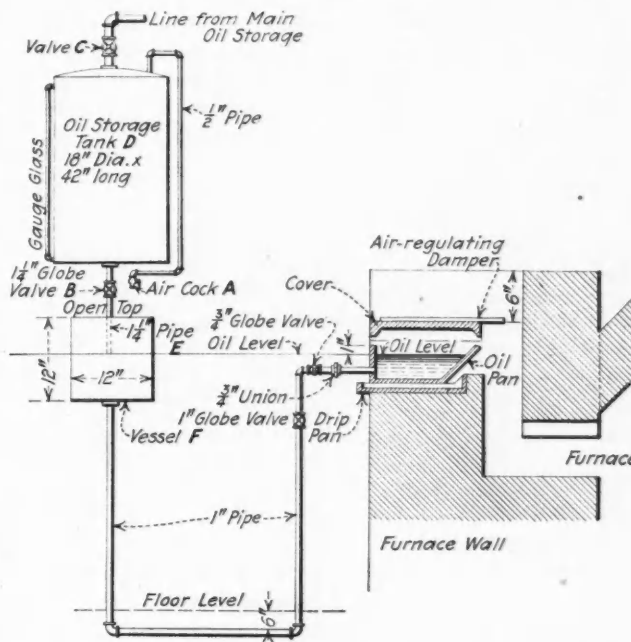


FIG. 2. ARRANGEMENT OF GAMM TYPE OF PAN OIL BURNER

of the cover to regulate the supply of air to the furnace and the length of the flame.

To start the oil burner, a small piece of waste is thrown on top of the pool of oil and ignited. The heat of the burning oil soon begins to vaporize part of the oil in the pan, and as these vapors burn, the oil pool begins to boil and produces a uniform, continuous flame. The length and intensity of the flame are regulated by the air dampers; and it is possible, by manipulating the dampers, to make the hottest part of the flame play on any point along the length of the furnace. From the construction of the burner, it is essential for the oil level to remain stationary in order to allow the oil to burn at a uniform rate. This is accomplished by means of the oil-regulating tanks shown in Fig. 2. When the burner is operating, valve C and an air cock, A, are closed, and valve B is left open. As the oil level is lowered in the oil pan, and consequently in vessel F, the open end of pipe E is exposed to the atmosphere, and some air rises into the tank D, letting oil flow into the vessel F until the level of oil comes higher and again seals the end of pipe E. To fill tank D, close valve B and open air cock A and valve C until the tank is full and oil appears at air cock A. When filling tank D, valve B should be opened occasionally to keep the oil level at its normal position, so as not to interfere with the operation of the burner.

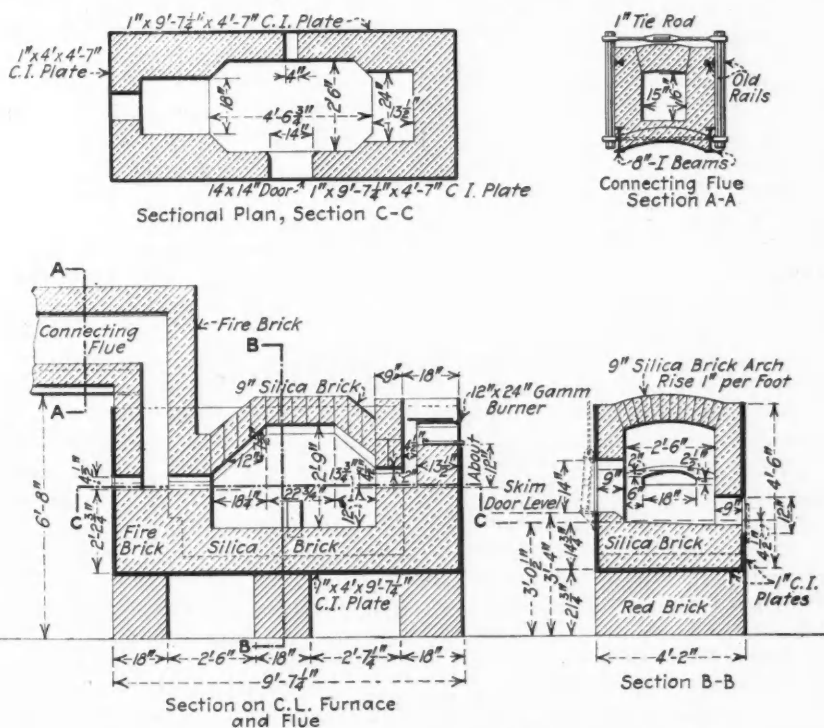


FIG. 1. DETAILS OF FURNACE CONSTRUCTION

and operation of this burner can be readily understood by referring to Fig. 2, which shows the burner assembled. The burner consists of three castings, an oil pan, a cover, and a drip pan. The design provides for an

Leaders in Metallurgical Practice

C. Harry Benedict

THE Lake Linden youngsters for years had regarded the sprawling sand pile, which increased each season in size, as the biggest thing in the world. Everybody said that some time someone would be able to figure out a way to recover the lost copper that was buried in it, but still it stood there. When Harry Benedict came along from Cornell and took his job as metallurgist the folks in the old town didn't know what the word metallurgist meant. Moreover, it seemed ridiculous that a boy fresh from college could show the old mill hands how to do new tricks. And today the most wonderful thing, to the old timers, about Mr. Benedict's performance at Lake Linden is not the fact that the sand pile production was the richest paying part of the Calumet & Hecla's operations last year, nor the millions that his processes have wrought from apparently worthless sands, but the fact that he accomplished all this with the co-operation, the enthusiastic help and backing of every man working about the mill plant. He continues to be the metallurgist for the Calumet & Hecla, and it is generally conceded that Benedict has done more to promote intelligent metallurgical practice than any other man who ever came into the Michigan copper district.

The human element is everywhere present about the plant. Every one of Mr. Benedict's men is willing to fight for him at the drop of a hat, for they are associates and personal friends in the great work of sand reclamation.

In the early days so many men were working about the plant that they were always getting in the way of the machinery. It is stated that now it is necessary to ring a bell in the mill to find them. As one enters the main office there is the immediate impression of neatness, of order, and this is characteristic of each department as the visitor is shown the various stages of operation. One fact remains firmly fixed in the mind of the sight-seer—if there is copper getting away from the Calumet & Hecla rock these days it has to be rather speedy in its exit.

C. H. Benedict was born in Pittsburgh in 1876 and

was graduated from Cornell University with the degree of Bachelor of Science in 1897. After teaching chemistry there for one year, he entered the employ of the Calumet & Hecla Mining Co. as a chemist. He has continued with this company, first as chemist and later

as metallurgist in charge of concentration. During this time the metallurgy of the Michigan copper district has been revolutionized, owing partly to the introduction of machinery invented by outsiders, but largely due to processes originating within the Calumet & Hecla company. For many years efforts had been directed to find a leaching method that would recover the copper commercially, and finally, in 1912, an ammonia process was invented by Mr. Benedict which solved the problem and made available for commercial exploitation many millions of tons of ores that would otherwise have no value. The leaching plant has now been in operation four years, and has been an entire success. Later, the adoption of the flotation process to the treatment of slimes claimed the attention of Mr. Benedict, and the resulting addition to the flow sheet at the C. & H. mill

completed a combination of concentration, leaching, and flotation that has secured a higher recovery on Michigan copper ores than had been possible previously.

The far too prevalent impression that engineers take little part in public life, being engrossed in their own technical affairs, does not apply to Mr. Benedict. When the Democrats of the Copper Country wanted to put a man on the Federal Reserve Bank Board to succeed John Black, they had to select one who was not associated with a bank. There was just one unanimous expression—it was for Benedict; he had no opposition. The Michigan College of Mines sets great store by those who have assisted in making the district one of the greatest copper regions in the world, and so it is that Harry Benedict—and he probably objects to the title Professor—is included in the list of the faculty as a special lecturer in metallurgy. He has also been a liberal contributor to technical literature, many of his articles having appeared in the *Engineering and Mining Journal* and elsewhere.



C. HARRY BENEDICT

BY THE WAY

The Tiger's Name

James S. Douglas, heretofore very popular in his smelter town on the Verde, below Jerome, Ariz., is reported to have lost prestige there since he persuaded the Postoffice Department to change the name from "Verde" to "Clemenceau." His loyal henchmen are willing to join him in honoring the great French leader, but even riots are said to have been started over the pronunciation of the latter's name. It is accented on any of the three syllables, but the body politic appears to have settled down to "Clem," for short. The irritation, if real, may be caused by smelter smoke, for, after all, the Tiger's name is quite euphonious. In a state where Spanish names are as frequent as the cactus, it seems unlikely that the introduction of one French word would create disturbance. Indeed, we have noticed that most people are proud of what little French they have. There is doubtless something in the theory of irritation caused by sulphur fumes that was recently advanced by the learned judge in Salt Lake City.

In the Field

A farmer in Washington living near the Last Chance property, in Stevens County, is said to have uncovered a six-foot ledge of zinc ore under four feet of wash, after having been disturbed for years by the presence of high-grade float on his land. If we could find a few nuggets or pieces of this or that in our back yard it would not disturb us a bit. Here in New York, the faith and zeal of a prospector or specimen hunter go for naught. A few glacial scratches and other trite odds and ends, together with much drift, are about all that reward long search. Indeed, that Washington farmer does not realize how fortunate he is.

Wicked Arizona

The Arizona Supreme Court has sustained a decision of the Pinal County court awarding the Protestant Episcopal Church Corporation of Arizona judgment for \$910.50 damages for the appropriation of a part of the church lot at Ray by the Arizona Hercules Copper Co. The company needed the ground for a railroad track to its ore bins, which are immediately behind the church. When the church complained of the noise, dirt, and general disorder thus caused, answer was made to the effect that the principal industry of the region was mining, not religion.

Mexico's Silver

"In Mexico lies the future hope of silver," says a headline in a financial daily—and lies and lies and lies, we might add, as far as hope of \$1.50 an ounce is concerned. The prospect of greatly increased production from this source will not improve the price.

The Almost Perfect Fertilizer

Speaking of the achievements in Morocco of General Hubert Lyautey, of the French Army, who is to be given a marshal's baton on Bastille Day next month, "La Marquise de Fontenoy" said in the *Evening Sun*:

As administrator of this dependency he has accomplished so much in its commercial and industrial development and in the exploitation of its vast latent wealth that

it bids fair to play the leading part in restoring the finances of France—finances so terribly strained by the costliness of the recent war. It is but the other day that I called attention in these letters to the recent discovery by mining engineers of vast and hitherto unsuspected beds of potash of the richest quality and highest grade known to the world, the mineral containing over 80 per cent of phosphate; the beds already in sight being estimated at considerably over a thousand million tons, equivalent at market rates to twenty billions of dollars.

No mention is made of nitrate contained in these deposits. But, as it is, France has an asset to be envied.

Accommodating

The White House at Montezuma, Col., caters to the comfort of transients. The genial host, a man built up on honest dealings, also specializes in field work and sampling, and in mine investments and management. He advertises on his letterhead that properties of non-residents are cared for, and urges the reader to write, wire, cable or phone for his 100 per cent service.

A Bible Scholar

An engineer relates this anecdote about Rossiter W. Raymond: It appears that at a certain mine in Ontario a considerable quantity of large-sized crystals of mica occurred. The company made no effort to dispose of this, and as a consequence it was sold by the miners from time to time. Dr. Raymond, when he noticed the men carrying the mica out of the mine, said: "Mica is one of the minor profits, I see."

Unlocking the Ore Pulp

"The extraction of oils and metals from shale will no doubt develop into a monstrous industry," optimistically remarks the bulletin of a Denver company professing to manufacture the American Continuous Retort. This retort, as might be expected, is the last word in ore reduction. In it by the process employed "an artificial oxidation is produced in a few minutes which has taken Nature ages to accomplish, transforming the most base or refractory ores to a free milling or oxidized state, the result being substantially the same." Quoting further:

The metallic elements contained in the ore are held in bond by sulphur or semi-sulphur crystals. We break this bond by replacement (not burn) by moving the sulphur one point, which requires four parts of oxygen to replace one part of sulphur. Thus the sulphur is liberated without flaming in the form of sulphurous fumes or gas; which leaves behind the metallic elements clean. The sulphurous fumes pass through a battery of acid stills and are discharged in the form of commercial sulphuric acid. By this procedure, we have transformed the *ides* to *ates* and have unlocked the ore pulp for a complete separation of the metallic values.

After unlocking, continues the prospectus, the gold, silver and lead are in the metallic state, and copper and zinc as sulphates. Iron is "transformed by the first impulse to a sulphate or copperas, as the second impulse takes it to a magnetic oxide and is recovered by a magnetic separator." Tungsten, chrome, and manganese "clean themselves by expansion" and may be concentrated. Antimony may be removed as a chloride or an oxide. Potash is rendered soluble, and the platinum is also in a state to be leached and precipitated. Uranium, vanadium, molybdenum, and all the rest, of course, may also be recovered successfully.

But best of all is the durability of the mechanism. "The sweeps and roller bearings are made of cast iron, and will last for years, normal wear and tear accepted."

CONSULTATION

Uses of Fluorspar

"Will you kindly give me some information on the commercial use of fluorite, and the approximate demand? How does the present quotation on this material compare with its value in normal times, and how is it graded?"

Fluorspar, or fluorite as it is occasionally called, finds application mainly in metallurgical work, as a flux in smelting practice; in the electrolytic refining of antimony and lead, and in the production of aluminum. It is also useful in the manufacture of opalescent glass, sanitary and enameled ware, and in the chemical manufacture of hydro-fluoric acid and allied chemicals. Minor uses are as a bond for constituents of emery wheels, for carbon electrodes to increase their lighting efficiency, in the manufacture of potash from feldspar, and in the manufacture of portland cement. Its uses depend on its chemical composition, fluxing properties, phosphorescent qualities when heated, and on its optical and gemlike properties.

Three general grades of fluorspar are on the market: "American Lump No. 1," "American Lump No. 2," and "gravel spar."

The highest and purest grade, called "American Lump No. 1," runs less than 1 per cent in silica and is white or clear pale blue or green. It is sold for use in the glass, enameling and chemical industries. The second grade, "American Lump No. 2," is used in metallurgical operations such as the manufacture of steel and ferro alloys, as a flux to increase the fluidity of the slag. This material may run as high as 4 per cent in silica, though a 3 per cent guarantee is generally maintained. The lowest grade, "gravel spar," includes fluorspar that contains more than 4 per cent of silica and other impurities, such as calcite. It also finds use in steel manufacture as a flux, its use operating to carry phosphorus, sulphur, and other impurities into the slag. The U. S. Geological Survey estimates that about 80 per cent of the domestic output of fluorspar is consumed as gravel spar.

Specifications for fluorspar for metallurgical purposes generally require a content of not less than 85 per cent Ca F_2 , and not more than 5 per cent silica, and freedom from sulphides and sulphates. Fluorspar for chemical manufacturers should contain upward of 95 per cent Ca F_2 . More than 1 per cent of calcium carbonate is prohibitive in acid manufacture.*

The average pre-war prices of fluorspar, all grades, were between \$5.50 and \$6.50 per short ton. Ground spar commanded the highest price during the war, \$10.75 to \$13.15; lump spar brought from \$6.90 to \$13, and gravel spar from \$4.85 to \$10 a ton. During 1918, prices were erratic, and ranged around \$22 for the fluxing grade and \$40 for the ground. Prices in 1919 were between \$25 and \$30 per ton. The demand is chiefly in the basic openhearth steel process, although its use in electro-metallurgical industries is increasing.

High-grade fluorspar is finding an increased demand in the chemical industries. The demand for optical fluorite is limited, but the material is worth about \$1 per lb.

The quotation in the *Engineering and Mining Journal* represents the ordinary gravel grade, which finds the widest application. As most fluorspar is used in the basic openhearth steel manufacture, the demand will fluctuate with any variation in the production of that grade of steel.

Flotation Litigation

"Will you please tell me if it is necessary to pay a patent royalty to the Minerals Separation Co. or to anyone else if I should install a small flotation mill using Callow cells? I have read some of what you have published about the litigation and have the impression that some companies are not required to pay the royalty. I don't suppose anyone would object if I should buy a small machine for testing purposes, anyway."

If we could answer your question correctly and definitely we would not be sitting here doing it, but would be retained by some big mining company, at a fabulous salary, for our wisdom. The question is still very actively before the courts. Apparently, if you used oil to the extent of more than 1 per cent of the weight of the ore treated, you would come without the scope of the Minerals Separation patents. If you do not use oil, and refrain from "violent agitation," whatever that may turn out to mean, your case is debatable. The decision in the Magma case, now before the courts, will throw some light on the subject under those conditions. If you use a fraction of 1 per cent of oil in a mechanically agitated machine, you would certainly be infringing the M. S. patents unless you had a license from that company, according to court decisions to date.

You mention using Callow cells. These, also, are protected by patents, and the manufacturers require a fee for the privilege of using them. Should you build your own cells, you would be likely also to infringe one or more of the principles or mechanical details already covered by others.

You would hardly be molested for using a test machine, and you would probably not be disturbed if you operated a small mill, until some of the big cases now before the courts are decided. You would doubtless be put on the "useless and juiceless" list by Minerals Separation. Should the important cases now before the courts ever be finally decided in favor of the patent exploiting company, however, you might be required to pay dearly for your lack of discernment.

If the subject is still somewhat cloudy in your mind we will consider that we have explained the matter perfectly.

Copper Terms

"Will you please tell me the difference between the expressions 'pig copper' and 'casting copper'?"

Both these terms refer to marketable grades of copper. Pig copper is metal produced from ores that do not contain sufficient silver to make refining necessary. Casting copper is made from old copper scrap or scrap and ore and is comparatively impure, usually commanding a price of 0.1 to 0.3c. less per pound than electrolytic.

THE PETROLEUM INDUSTRY

Petroleum in Wyoming

BY CARROLL H. WEGEMANN*

A SHORT PAPER on the oil fields of Wyoming must necessarily be a summary of present knowledge. To one coming from the Wyoming fields to those of the Mid-continent, differences and similarities naturally suggested themselves. The Mid-continent is an area of complicated structural problems, complicated because, as a rule, so few facts can be gathered from surface observation. Wyoming structural geology is much simpler in that the structures at the surface reflect closely those below. There is less left to the imagination, and hence less chance of error. It is pre-eminently an area in which to study oil geology and to work out theories of oil accumulation.

The oil fields of Wyoming, in the approximate order of their importance, are Salt Creek, Big Muddy, Elk Basin, Grass Creek, Rock Creek, Lance Creek, Mule Creek, and probably I should mention Hamilton Dome. Some of my Wyoming friends would suggest others, but, as this is merely a summary, they will be omitted.

Salt Creek is pre-eminently the great field of the state, the area of the productive territory in the upper sand being about five square miles, and in the second sand approximately four times that. The story of Salt Creek is yet to be completed, inasmuch as there are three oil-bearing sands which have been tested by deep drilling.

Big Muddy is probably at its maximum production; Elk Basin and Grass Creek are on the decline. Rock Creek is a new field of large area, which gives promise of large production, though it cannot be considered as comparable with Salt Creek. Lance Creek is a new field which already has a number of large wells. The sands, however, lie at great depth, and the distribution of the oil appears to be erratic and does not closely follow structure. Mule Creek and Hamilton Dome are comparatively small new fields, and I mention them principally because they show the possibilities of sands which have not been highly productive in other fields.

The fields which I have mentioned lie in widely separated localities, Elk Basin, Grass Creek, and Hamilton Dome, in the Big Horn Basin, which lies west of the Big Horn Mountains; Salt Creek, Big Muddy, Lance Creek, and Mule Creek, in the larger basin between the Black Hills on the east and the Big Horn Mountains on the west, and Rock Creek, in a third great basin which is called the Laramie Plains.

All the fields lie on the borders of the basins mentioned, and may be considered as anticlinal waves adjacent to the mountain uplifts. There are innumerable folds of which I make no mention here. Some of them have yielded large gas production or small quantities of oil. A few folds are as yet untested.

The oil sands which yield commercial production or showings of oil are almost as numerous as are the fields, and occur at many horizons in the stratigraphic column. There are oil impregnations in the Madison limestone, which is Mississippian; production in the

Amsden and Embar formations, which are Pennsylvanian; in the Chugwater Red Beds, which are Jura-Trias; in the Sundance formation, which is Jurassic; in the Morrison, probably Jurassic; in the Lakota of the Lower Cretaceous, and in numerous beds of the Upper Cretaceous, the Dakota, Muddy, Mowry, Well Creek or Frontier, and, lastly, the Shannon. The greatest production comes from the Frontier or Wall Creek sands, which are the productive sands in Salt Creek, Elk Basin, Grass Creek, and Big Muddy.

In the Rock Creek field production probably comes from the Muddy sand at the base of the Mowry shale; in the Lance Creek field from the Dakota sand; in the Mule Creek field from the Lakota, and in Hamilton Dome from the Embar. There are several other small fields which obtain heavy oil from the Embar, and I make mention of Hamilton Dome merely because the oil from this field differs from other Embar oil in that it contains more than 25 per cent gasoline.

As I mentioned before, all the really commercial fields are found on closed anticlines. These folds are much more pronounced than are the folds of the Mid-continent field. Dips on the flanks of the folds are seldom below 5 deg., and more frequently range from 10 to 30 deg. and even higher. A small production has been obtained from terraces, but, so far as I am aware, only from formations in which the sands are fine-grained, so that the oil passes through them with difficulty and is therefore trapped on the terraces by friction sufficient in itself to counteract the impelling upward force or combination of forces, whatever these may be.

WYOMING POOLS CONFIRM GEOLOGIC THEORY

The size of an oil pool in Wyoming appears to bear a direct ratio to the area of the sides of the anticline on which it is found; in other words, to the "gathering ground" from which the oil has accumulated toward the crest of the fold. Here I am perhaps speaking of theories as if they were facts, but this particular theory in the Wyoming fields appears to be substantiated. For example, the east limb of the Salt Creek fold, containing the largest oil pool yet discovered between the Mid-continent field and California, is twenty-five miles in length from the crest of the fold to the axis of the syncline on the east. In fact, the rise of the beds is uninterrupted from the axis of the great basin, lying between the Black Hills and the Big Horn Mountains, to the crest of the Salt Creek fold, which is situated on the southwest side of this basin. All the other important fields that I have mentioned have gathering grounds of wide extent. Most of the folds that have been proved by drilling to be barren are cut off from drainage areas by adjoining folds, as described in the report by Lupton and Hewett on the "Anticlines of the Big Horn Basin."

As suggested before, oil accumulations occur on more

*Read before the American Association of Petroleum Geologists at Dallas, Texas, and published in *Engineering and Mining Journal* by special authority of the Council of the Association.

¹Hewett, D. F., and Lupton, C. T., "Anticlines in the Southern Part of the Big Horn Basin, Wyo." U. S. G. S. Bull. 656, 1917.

pronounced folds than do those of the Mid-continent field. Structures of low dip or terraces, which, in the Mid-continent, would carry pools of commercial size, are barren in Wyoming. It would seem that in Wyoming there was not as much oil formed per unit of area as in the Mid-continent field, and that therefore it took a much larger area to supply oil sufficient for a pool of commercial size.

I am indebted to H. W. Lowrie for the suggestion that the great extent and uniform porosity of the sands may be accountable for the fact that oil has been replaced by water on most of the terrace structures.

CHARACTER OF PETROLEUM FORMATIONS

The point to which I am leading in the foregoing statements, and to which some of my friends may take exception, is that, in the Wyoming fields, oil has found its way from shale into sandstone in very minute quantities over broad areas involved in the folding, and has worked its way through the sands for great distances laterally to reach the crest of the folds. I do not think there is any evidence that faulting or jointing is involved in the process. It may well be that the oil was produced at the time of the folding by the slow heat caused by the pressures which produced the folds, combined with the enormous weight of the rock above. It is possible that these pressures had much to do with the forcing of the oil from the shale into the sandstone, inasmuch as the pores of the shale could be reduced by pressure more effectively than could the pores of the adjacent resistant sands. Hence, any fluid which the shale pores contained would be forced out into the sandstone.

That the accumulation of the oil has been a slow process continuing long after the folds were made appears to be shown by conditions in the Shannon pool, which lies about three miles north of Salt Creek. The oil is found in the Shannon sand, which forms the escarpment around the Salt Creek field proper, and the accumulation has taken place against a fault with downthrow to the north, which throws the edge of the Shannon sand against shale and effectually seals it. This fault is one of a system of faults cutting the Salt Creek dome and trending in a direction north 65 deg. east. This direction is fairly constant over the entire area of the field.

The trend of the faults appears to be independent of the shape of the fold and suggests that the faults were not formed simultaneously with the fold. They appear to be related to other faults which are found over a broad area in Wyoming, and were probably produced by regional stresses. In the Salt Creek field the faults appear to be most pronounced near the crest of the fold and to die out on the flanks, which would be the condition were they produced by a slight warping of the whole area after the major folds were formed.

FAULTS FORMED AFTER FOLDING

The faults were therefore, in my opinion, formed subsequent to the time of folding. This point I cannot as yet prove, but I believe that all the facts point to its correctness. The natural conclusion is that as the faults were formed after the folding, and the oil in the Shannon was accumulated against one of the faults, the time of the accumulation of the oil in the Shannon was much more recent than the time of the formation of the Salt Creek fold. If the oil was formed at the time of

the folding, the accumulation has been going on through a long period of time and may possibly even now be taking place.

A most interesting fact demonstrated by the development of the Salt Creek field is that the pool in the second Wall Creek sand, lying about 260 ft. below the base of the first sand, occupies a much greater area than does the pool in the first sand, in fact, an area four times as great. The first sand is 150 ft. thick; the second sand only 40 ft. It is significant to note that the thicknesses of the sands bear the same relation to each other as do their productive areas, but in inverse ratio.

The difference in the size of the pools in the two sands suggests that approximately the same amount of oil has found its way into each sand and that the pool occupies a greater area in the second sand than in the first largely because the second sand is much thinner. Had there been vertical migration between the two sands, it would seem that the greater part of the oil would already have forced its way into the upper and thicker sand.

WALL CREEK SANDS AND SHALES OF FRONTIER AGE

I am of the opinion that the oil which is found in a sandstone has been derived only from a few feet, or possibly a few inches, of the shale adjacent to the sandstone. The first and second Wall Creek sands in Salt Creek are both Frontier in age. The shales adjacent to them are the same in age, and probably carry similar carbonaceous material. The amount of oil which has entered the two sands under the same conditions of folding is therefore largely a function of the area of the shales in contact with the sands. Some may suggest that the oil is derived from shale lenses included in the sands. With this I agree, but I would not limit the shales in which the oil has originated to those included in the sands.

A great question is the origin of gas. If it were possible to determine why it is that gas is formed in one place and oil in another, the knowledge would provide the key to many things. This subject has been discussed in several papers by David White, of the U. S. Geological Survey, and I mention it here merely to suggest one or two lines of thought.

GEOLOGIC HYPOTHESIS

If it be true that gas is produced under conditions of greater pressure and metamorphism than those which produce oil, may it not also be true that the character of the sediments may be largely responsible for these differences? The pressures exerted on shale particles which lie between sand grains will certainly differ from those exerted on shale particles included in the homogeneous shale, under the same stresses, inasmuch as the coarse sand grains necessarily protect to a certain extent the minute particles which lie between them. It may therefore happen that in adjacent fields in which the rocks have undergone practically the same pressures, the degree of metamorphism of the sediments may differ greatly owing to the original character of the sediments. In certain parts of the Mid-continent field there is evidence that the oil pools lie in belts at certain distances from the ancient land masses. Nearer the old shore lines or further from them no oil has been found, and this may be due to the variation in the character of the sediments which I have just postulated and which influences metamorphism, as much as to the

presence or absence of ancient plant life, existing only in water of certain depth and of certain temperature.

Why Montana has produced only gas or very light oil, although the same formations exist there as are present in Wyoming, as in open question. It has often occurred to me that the minute plants from which oil has in all probability been formed lived in the ancient ocean only at certain temperatures. Temperatures in Montana were doubtless different from those in Wyoming, and plant forms of different species may have existed. These possible differences in the ancient plant life may have something to do with the resultant product which is oil in Wyoming and gas in Montana.

These are merely suggestions. I do not put them forward as theories. They are matters which are subject to determination and on which work should be done, but the services of a skilled botanist are essential. I have often regretted that our good friend Mr. Davis, who began the microscopic study of the oil shales of Colorado, is no longer with us to carry on his work.

It is impossible to put too much stress on the necessity for careful microscopic study of the shales adjacent to oil sands. This study must be made before the complete story of the origin of oil is written.

Mining Oil-Bearing Sands*

Adoption of Underground Methods Would Permit a High Percentage Recovery—Presence of Gas An Obstacle to Economical Operations

BY ALBERT H. FAY
Mining Engineer, Tulsa, Okla.

The rapidly increasing consumption of petroleum products in the United States is causing some alarm as to how the demand is to be met in the face of geological data indicating that the best fields have been developed.

Many geologists are confident that the peak of production will be passed within a few years, possibly only three to five years at the most. The peak of consumption will be reached at an indefinite date beyond this, and will be determined by total production, plus the largest amount of oil that can be imported from foreign sources, provided, however, a substitute for motor gasoline is not found that can be produced at a cost less than the cost of gasoline.

The distillation of oil from shale, lignite and low-grade coal offers possibilities for relief, but at a much higher unit cost than the present price of crude oil, possibly from \$6 to \$10 per bbl. Better extraction methods whereby a larger percentage of oil may be recovered also hold some promise, as in the use of the vacuum method, pumping by compressed air, and possibly the utilization of superheated steam or water, as in the Frasch process for extracting sulphur in Louisiana, whereby the heavier oil may be sufficiently warmed to render it more mobile.

Available data do not indicate how much oil remains in the ground when pumping ceases. The porosity of the sands is not definitely known, but may from a few tests, as a basis for estimates, be assumed as about 17½ per cent as available for containing oil.

There is undoubtedly, in many of the so-called exhausted oil fields, a large quantity of saturated sands. On the assumption of a 17½ per cent pore space (and in

many cases much more) there would be at least 7,623 cu.ft. of pore space per acre-foot capable of being thoroughly saturated to the extent of 1,368 bbl. of oil per acre foot. Assuming the specific gravity of the dry sand at 2.65, 1 cu.ft. of oil rock would weigh approximately 165 lb. plus the weight of the oil contained (1½ gal.), say, about 10 lb., making the saturated rock weigh 175 lb. per cu.ft., or the equivalent of 12 cu.ft. per ton. Each ton of sand would contain, on the basis of 17½ per cent porosity, 16 gal. of oil, requiring approximately 2½ tons of sand to produce one barrel of oil, valued today at \$3.50.

In gold mining about 95 per cent of the contained value is extracted, whereas in the oil fields the extraction does not exceed 15 to 40 per cent. The cost of mining, metallurgical processes for extraction, all overhead expenses, and satisfactory dividends for the stockholders are included in the returns from the treatment of low-grade ores. The price of \$10 per bbl. for crude oil would be about the equivalent of \$4 gold ore from the miner's viewpoint. When the price of crude oil passes this mark, there will be an opportunity for the petroleum miner.

Practically none of the oil produced in the United States is from depths that are beyond the limits of practical mining operations. In Rumania hand-dug petroleum wells are said to be 600 to 800 ft. deep and are crudely equipped.

By the employment of Lake Superior iron-mining methods, more than 90 per cent of the oil sand may be brought to the surface, and the remainder would be sufficiently crushed to allow perhaps one-half of the oil to flow out and collect in a sump, from which it could be pumped to the surface. Once the oil sand is mined and brought to the surface it would be given a special treatment similar to that given oil shales, especially if some of the oil is chemically combined with the sand.

Many oil pools have been thoroughly outlined by the campaign of drilling that has been conducted during recent years, and in a general way the risk of not finding oil would be eliminated. In other words, the oil-bearing sands are now developed to about the same extent as the large modern iron and copper mines are developed, by drilling and sampling the drill cuttings before mining actually begins.

The only real physical obstacle in the way of mining petroleum sands is the matter of gas, but by efficient ventilation, the use of permissible explosives, thorough inspection, strict rules, and laws regarding operation it is possible that underground methods could be applied successfully.

As the gas problem is a very serious one in mining operations, much of the gas may be extracted in advance of actual mining by the application of a vacuum through a number of properly spaced drill holes many months or even years in advance of actual mining. The gas will follow the line of least resistance, and would therefore flow toward the low-pressure areas. This movement could be augmented during mining operations by the introduction of air pressure in the mined-out area. The gas thus recovered would contain the lighter hydrocarbons, from which gasoline would be extracted, as is now done in the Healdton field. The dangerous gas would thus be converted into commercial products, leaving the sand still saturated with the heavy oil, to be recovered by mining methods which are found to be most suitable to existing conditions.

*Abstract of an article which appeared in the *Oil and Gas Journal*, May 28, 1920.

NEWS FROM THE OIL FIELDS

Payne Supports Phelan Bill Conservation of Foreign Supplies as Practiced by Other Countries Essential to Nation

Secretary Payne has shown quick appreciation of the need of conserving America's oil resources in his approval of the Phelan bill which authorizes the formation of the United States Oil Corporation for development of oil in foreign countries, according to the *Washington Post*.

"The public's need for an assured supply of oil is so great," said Secretary Payne in a report to the Senate Public Lands Committee, "that the government stands back of the endeavor to develop foreign sources of oil to replace in the future what America has exported in the past."

Pioneering for oil in foreign countries by American capitalists will be sure to help in obtaining the needed oil and in furnishing markets for American manufactures. But the work of conservation at home has been too long delayed already. Restriction of the use of gasoline is intimated. With the growing needs of the army and a rapidly expanding merchant marine, the burning of fuel oil under stationary boilers and in locomotives may be curtailed. The question of priority is already here. The navy and the merchant marine alone in the last year consumed one-third of the total oil output of the United States.

One of the immediate problems is to find other means of generating energy for home industries. First, there must be a greater development of water power.

President Wilson has approved the water-power bill, which was completed in the closing days of the late session of Congress after delays covering a period of twelve years. If the Phelan bill goes through Congress at the next session, as now seems probable with Secretary Payne's support, long strides will have been taken to conserve approximately 7,000,000,000 bbl. of oil now estimated to be in the ground. The 1920 consumption closely approximates 500,000,000 bbl. With the United States consuming more than one-half of the world's oil production, there is within its own borders and in Mexico only one-seventh of the oil left in the world.

Dr. George Otis Smith, director of the U. S. Geological Survey, in a recent report, based on data compiled since the signing of the armistice, reveals how the war drew on the oil supply of the United States. "In those terrible four years," remarked Dr. Smith, "every new machine of destruction on land and sea, in the heavens above and the depths below, depended on American oil wells for its motive power, and the

peace demand for petroleum products has already overtopped the war peak. Ten years ago Mexico was our customer for crude oil as well as for refinery products, but now we are dependent upon Mexican wells. Without the 6,500,000 bbl. imported from Mexico in March our present situation would be indeed critical."

In turning to a policy of conservation of foreign oil resources, such as is contemplated in the Phelan bill, the United States would be following the wise example of other nations.

The Southern Arkansas Field

From Our Special Correspondent

Although many petroleum geologists expressed fear that extensions of the Red River and the Alabama Landing faults precluded the possibility of encountering oil in southern Arkansas, recent developments have shown that the correlative horizons of southern Arkansas and northern Louisiana are productive of oil and gas in Union and Ouachita counties, Ark.

The Constantine well, in Sec. 1, T. 18 S. R. 16 W., came in as a heavy gaser late in April. Steadily increasing amounts of oil have accompanied the gas, and when this well has been put in good mechanical condition, it will be a commercially productive oil well. The Hunter well, near Stephens, Ouachita County, has not been tested but has given sufficient show of oil to warrant the purchase of some 20,000 acres of leases by the Standard Oil Co. of Louisiana. These two wells are undoubtedly in the Nacatosh sand, and presumably roughly outline an anticline extending from southeast of Eldorado, Ark., in a northwesterly direction beyond Stephens. Future drilling will define this anticline to conform in a general way to the topographic high, indicated by the drainage.

The most noticeable topographic features of southern Arkansas are northeast-southwest and northwest-southeast ridges, except where these ridges cross, or intersect, resulting in nearly due east and west ridges. Although these ridges may not be productive throughout their entire length, minor productive structures will be found.

The main topographic feature of eastern Arkansas is Crowley's Ridge, extending from Helena northward into Missouri. There are a few minor saddles or breaks. This ridge is a geological structure and not the result of erosion. Upon the main structures will be found several minor structures, one of which is being drilled by the Forrest Oil Co., St. Francis County, near the town of Colt. Parallel to Crowley's Ridge are evidences of similar though less clearly outlined structures.

Petroleum in British Guiana

From our Special Correspondent

In January, 1917, there was a small boom in oil applications in British Guiana, which probably had its origin in the booms in Trinidad and Venezuela. Everyone with a little spare money was filing applications at the Department of Lands and Mines for oil concessions. The Hon. Nelson Cannon, then Mayor of Georgetown, had a small drill outfit working on his concession in the North West district near the coast and not far from the Venezuelan boundary. However, oil was not found in commercial quantities, and most of the applications were allowed to expire by non-payment of fees.

Later, D. Elliott Alves obtained, through the Colonial Office in London, a permit to explore all unoccupied crown land in British Guiana for oil, and in consideration of a stated sum to be expended on this work he was to receive 2,000 square miles in concession. Mr. Alves is now president of the British Controlled Oil Fields, Ltd.

In January, 1919, Mr. Alves sent George B. Reynolds, M. T. C. E., assisted by P. M. Owen and J. C. Daniels, geologists, to the colony. After several weeks of exploration this party almost lost their lives, and did lose their baggage and equipment, by the burning of their launch in mid-stream, while ascending the Demerara River. The party left the colony in March or April, and it was general gossip that Mr. Reynolds' report would not be a favorable one. However, Mr. Alves does not seem to be discouraged. B. F. Macrorie, assisted by J. A. Bulbrook, oil geologist, arrived in April of this year to carry on the work. They are now at work in the North West district. Mr. Alves' local representative is Matthew French, of Georgetown.

During the latter part of April, 1920, Capt. H. Daley arrived from London, representing the Transvaal Oil Shale, Ltd., which has options on the Nelson Cannon, Evan Wong, and Ernest Farum licences. These licences are in the North West district, cover an area of approximately 140 square miles, and are all that remain in force of the number taken out in 1917. Capt. Daley states he expects Capt. Gasson, chief geologist, and J. B. Faloner, oil expert, who are now in Trinidad in the companies' interest, to come to British Guiana in the near future.

J. A. Fung arrived in Georgetown on May 13 from the Mazaruni district, bringing with him a sample of pitch or asphalt which he said he had found in considerable quantities. He is, of course, anxious to exploit his find. In the past, samples of pitch have been brought from the coast of the North West district.

Texas Pipe Lines Under R.R. Commission

Cox Bill Passes Senate—North Texas and Gulf Coast Fields Continue Large Production

From Our Special Correspondent

The Cox pipe-line bill, placing all pipe lines in the State of Texas under the jurisdiction of the Railroad Commission, was passed June 9 by the Texas Senate. Local distributing companies will still be under the regulation of the municipal authorities, except that the companies may appeal to the Railroad Commission in any dispute regarding rates. The Texas-Oklahoma boundary case has been set for a hearing before the Supreme Court Nov. 15, 1920. This case is of considerable interest, as the area under dispute along the Red River is a producing oil field.

Oil production from Stephens County continues to increase, and during the second week in June was 55,000 bbl. daily. The increase is due largely to the completion of the wells of the Magnolia Petroleum Co., on the Brown tract, just south of Breckenridge. The Ball well of the Roxana Petroleum Co., seven miles northwest of Breckenridge, has struck oil sand, it is reported. This well is in wildcat territory, and if it is a producer will make an important extension of the Breckenridge district. Other producing wells completed recently are the Glenn No. 1A of the Pierce Oil Corporation, between Caddo and Breckenridge, making an initial production of 600 bbl. daily; the Johnson well of Riley & Co., in the northern part of the county; and Peek No. 1 of the Virginia Co., near Breckenridge. Both of the latter wells are reported to be making over 1,000 bbl. daily.

In Wichita County, the Iowa Park district has increased its production to between 3,500 and 4,000 bbl. daily, due to the increase in the Kemp-Munger-Alien field. The whole Burkburnett district produced approximately 100,000 bbl. daily during the week.

West Columbia, as usual, was the largest producing field on the Texas Gulf Coast during the second week in June, making an average of over 19,000 bbl. daily, distributed as follows: Humble Oil & Refining Co., 12,000 bbl.; Texas Co., 5,000 bbl.; Gulf Production Co., 1,200 bbl.; Crown Oil Co., 600 bbl.; Sun Co., 400 bbl. The various fields of the Texas Gulf Coast made a combined production of about 59,000 bbl. daily: West Columbia, 19,200 bbl.; Goose Creek, 15,800 bbl.; Hull, 9,500 bbl.; Sour Lake, 6,100 bbl.; Damon Mound, 3,600 bbl.; Saratoga, 1,750 bbl.; Batson, 1,350 bbl.; Spindle Top, 700 bbl.; miscellaneous, about 900 bbl. The largest well completed during the week was the No. 26 Gaillard of the Gulf Coast and Crown Oil & Refining companies, making over 2,000 bbl. daily from a depth of 3,370 ft.

Wildcat drilling produced no new oil. Gas was struck in two wildcat wells, one at Hockley, the No. 2 Warren of the Texas Exploration Co., at 1,950 ft.,

and in the same company's No. 1 Whitehead well at Pierce Junction, Harris County, at 800 ft. Both of these areas are over known salt domes. Many wildcat wells were forced to stop drilling because of the shortage of material, and many others had to release their holdings, as rigs could not be procured in time to start drilling within the specified period.

A new shallow oil field has been opened in Zapata County, twenty-two miles south of Aguilares, Webb County, which is on the National of Mexico railroad. Nine wells, from 150 to 160 ft. deep, it is stated, have been placed on the pump, and are now producing from 5 to 7 bbl. each daily. The oil is high-grade lubricating. These wells are owned by the Webb-Zapata Oil Co., which controls an area of 25,000 acres. Several old wells will be cleaned out and pumped from this shallow sand, and a deep test well will be sunk.

In Coleman County, the Pope No. 5 well, three miles southeast of Santa Anna, is making 800 bbl. daily. Other wells in this vicinity are being drilled.

Kentucky Oil Fields

From Our Special Correspondent

The Old Dominion Oil Co. was recently sold to the Superior Oil Corporation, for \$6,000,000. Stockholders will meet July 3 to approve the sale. They will receive \$2 a share, original stockholders having paid 50c. a share.

Peterson and associates have completed four wells on the Motley lease in Warren County, with a total production of 1,200 bbl. a day. A new section in Warren County was proved when No. 1 on the Lem Harris lease, Morgantown Pike, was lately brought in, rated at 180 bbl. daily. This well is nine miles west of Bowling Green.

Dr. Lacey and associates, of Louisville, are moving a rig on the J. B. Sumpter lease in Warren County. Last year a well was found on this lease, and it now stands 300 ft. full of oil. Well No. 1 on the Clarence Wilson farm, near Bowling Green, in the McGinnis pool, has developed from an almost hopeless prospect into a gusher estimated at 500 bbl. a day. No. 1 on the Tarrants lease, Warren County, was put on the pump recently and showed considerable gas and salt water. It also is rated at 500 bbl.

Well No. 3 of the Frantz Corporation, in the Mosby dome of the Cat Creek field, in the north central part of Montana, recently came in with an output which preliminary estimates place at 100 bbl. or more. This well is ten miles southeast of the No. 2, the recent gusher brought in by this corporation, and about three and one-half miles in the same direction from the No. 1, the discovery well. The well drilled by the Ohio Oil Co., a Standard subsidiary, in the Brush creek dome, also in the Cat Creek field, appears to be a "duster," although drilling will be continued, it is believed.

California Oil Developments

Activities in Kern River and Midway Fields—Elk Hills District Showing Good Indications

From Our Special Correspondent

In the Kern River field, May and Richards have commenced drilling on No. 2 well, Sec. 8—29-28, and on the same section the Richard Oil Co. has spudded in well No. 10. The Revenue Oil Co. has started well No. 21 in this field on Sec. 4—29-28. E. A. Clampitt Co. has begun work on well No. 7 in Sec. 25—28-27. On Sec. 16—27-27 the Union has broken ground for well No. 1.

The Standard Oil Co. is moving in large quantities of material and supplies to the Midway field in preparation for well-drilling activities. The Southern Pacific Co. has just let another contract for the construction of two more tanks of 30,000-bbl. capacity. The Helmer-Hagberg Oil Co., a new organization, is reported to be ready to start well No. 1 on the southwest quarter of Sec. 7—11-23. This company has taken over the Johnson property. On account of litigation, work on the Tumbador Oil Co.'s well No. 14, in Sec. 23—31-22, has been held up. The Olig Crude Oil Co. has completed well No. 5 on Sec. 32—31-23 in the Midway field at a depth of 2,900 ft. The well was deepened to 3,100 ft., but nothing was found and it was plugged back to 2,900 ft.

The General Petroleum Corp. is bailing well No. 11 in the Elk Hills district to test for water at 3,474 ft. The Standard Oil Co.'s Tupman well on Sec. 36—32-24, in this district, has increased its flow about 20 per cent and is now yielding 6,000 bbl. daily. Both small and large companies are drilling in the district with encouraging indications.

The United States District Attorney at San Francisco has been instructed by the Attorney General to investigate charges that California companies are rationing oil among domestic consumers while at the same time they are exporting large quantities.

Secretary Payne of the Department of the Interior has decided the Honolulu Consolidated Oil Co. cases. He reversed the decision of the Commissioner of the General Land Office as to the so-called McReynolds locations and affirmed that officer's decision as to the Fox locations. He holds that on the date of the withdrawal order the company was not in diligent prosecution of work leading to a discovery of oil within the terms of the act of Congress. Applications of the company for patent are denied.

With a practical embargo in effect on coal exports, much encouragement has been given to those seeking similar action with regard to fuel oil and other petroleum products. A conference of refiners and representatives of the principal industries that use fuel oil has been suggested by the Secretary of Commerce at Washington.

COURT DECISIONS IN MINING CASES

By Wellington Gustin

Supreme Court Denies North Hubbard Appeal

Tribunal Finds No Conspiracy—North Hubbard Syndicate Charged With Partner's Knowledge

Litigation over the North Hubbard mine, in San Diego County, Cal., has been terminated by refusal of the Supreme Court to hear the appeal of the defendants. Suit was brought by George W. Hazzard, as owner of the properties, against his lessees operating under the firm name of North Hubbard Syndicate, and the trial court found for defendants on their cross-complaint. This judgment has been reversed, in favor of Hazzard, in the Court of Appeals, and that court's decision has been upheld.

In 1914, Hazzard conveyed his interest in the mining property, which he had owned since 1884, to J. M. McHenry, and the latter entered into an agreement with the owners of an adjacent mine purporting to create easements, servitudes, and incumbrances upon the North Hubbard mine and mining claim. In April, 1915, McHenry reconveyed to Hazzard all of his interest in the property. In December, 1915, Hazzard entered into a written contract with the syndicate, composed of McHenry, Johnson, Willard, and Skeats, leasing to them the North Hubbard mine, including various items of machinery, tools, and appliances; also four buildings already on the premises. The lease was to run for three years, with the right to purchase.

Certain extensions were allowed the defendants, and Hazzard finally brought suit to recover sums due under the contract and for the proceeds of cleanups made on the mine, as required by the contract and extensions thereof.

The cross-complaint of defendants Johnson, Willard, and Skeats asked for rescission of the contract, alleging that Hazzard and McHenry conspired to deceive and defraud the cross-complainants. The trial court found the issues for the defendants and Hazzard appealed.

There was no sufficient evidence to sustain the court's finding that McHenry was privately financially interested in the lease and option other than as a member of the partnership.

It was contended that Hazzard never owned the mine, and that the buildings referred to were not on the mine and did not belong to Hazzard. But Hazzard had had possession of the mine since 1884, and the court said might obtain a patent from the United States any time he cared to do so. It also appeared that certain of the buildings were located on an adjoining mine, and that the easements, claimed to be detrimental, did exist. But the court said

McHenry was fully acquainted with the facts concerning the title and condition of the mine and mining property, and, being a partner, the partnership was bound by this knowledge. Further, it was found that the alleged conspiracy did not exist; but that McHenry did not act in good faith with his copartners with reference to the representations and concealments. However, it was not established that Hazzard permitted McHenry to act as his representative at any time or in any manner in the course of these transactions. It was shown that Hazzard had acted in a friendly manner toward McHenry and was willing to give him an opportunity to become interested a second time in this mine, because the mine had been unprofitable to McHenry under his former lease; but the evidence showed Hazzard had no knowledge or notice of any fact informing him that McHenry was not dealing in good faith with his partners.

Therefore judgment against Hazzard and in favor of the mining partners was reversed.

Red Rover Co. Liable for Injuries to Independent Contractor

The Supreme Court of Arizona has denied the motion of the Red Rover Copper Co. for a rehearing on the judgment rendered against it in favor of Edward H. Hillis. A rehearing was asked on the ground that the relation between the litigants was that of parties to a written contract—that is, independent contractors—and not that of master and servant.

The copper company contracted with Hillis and his associates to sink a mining shaft, already down 235 ft., 300 ft. deeper, and it was provided that the copper company would excavate and equip all necessary pumping stations and install pumps and pipe for removing water from the stations. It appears that Hillis was at the pumping station at the 300-ft. level for the purpose of starting it. A No. 5 Cameron pump was installed to handle any water that might be encountered in the shaft, and a station pump was installed at a higher level to handle the water delivered from the Cameron pump. When about to start the station pump, Hillis stepped on a piece of pipe, which threw him, he falling to the bottom of the shaft. The station was without lights, and no guard rails or gates were provided about the shaft.

The court found that Hillis was injured while occupied in the service of the company, the direct result of its failure to furnish him a reasonably safe place in which to render service, and the company was held liable for his injuries.

Court Holds Damages To Be "Net Value"

Alvarado Company Declared Guilty of Willful Trespass in Mining Ore on Claims of George Warnock

The Supreme Court of New Mexico, on rehearing, has affirmed the judgment against the Alvarado Mining & Milling Co. of El Paso, Tex., in the action brought by George Warnock, owner of certain mining claims at Alamogordo, N. M., to recover for copper ore mined and shipped from these claims to the smelter of the American Smelting & Refining Co.

It appears that Warnock had given one Pomeroy a right or option to purchase the claims within a certain time. Pomeroy was to do assessment work for two years. The option was recorded and afterward extended for a period of three months. Subsequently, Pomeroy entered into a lease contract with one Lewis, by which he agreed that Lewis could mine, ship, and sell ore from these claims. This lease contract was assigned to the Alvarado company.

The court found that the only right Pomeroy had and could assign was the option to purchase and to mine ore for the purpose of doing assessment work. Therefore the Alvarado was a willful and intentional trespasser, and the measure of damages was the net value of the ore taken from the premises, and it was not entitled to deduct therefrom the expenses of mining, freight, and smelter charges. Judgment against the defendant Alvarado Mining & Milling Co. was therefore affirmed.

Mine Operator Liable for Nuisance Attractive to Children

California District Court Holds That Great Eastern Co. Must Pay for Death of Minor

Judgment against the Great Eastern Quicksilver Mining Co. has been affirmed in the California District Court of Appeal, and a hearing denied by the Supreme Court, in the action to recover for the death of John Richard Taylor, a minor. This company for more than thirty years has operated a quicksilver mine near Guerneville, in Sonoma County, Cal. The youth fell into an open, unguarded stope in a dark abandoned mining tunnel. This was connected with a new tunnel, with a track for small push cars, left outside of the tunnels, unfastened and uninclosed. Such was held to constitute an attractive nuisance, rendering the mine owner liable for the death of the boy, who was eleven years old, and who fell into the stope and was killed while he was playing on the cars used on the premises for tramping.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

Council Acts on Compensation

Engineering Societies Asked To Indorse Classification and To Discuss Rates Proposed by Engineering Council Committee

The classification and compensation committee of Engineering Council, over the signatures of Arthur S. Tuttle, chairman, and Charles Whiting Baker, secretary, has addressed a letter to the secretaries of each of approximately one hundred national or local engineering and other technical societies, asking formal indorsement by the governing body or by the society as a whole of the classification adopted by Engineering Council, to the end that it may become generally recognized and put into effect. As to the suitability of the scale of compensation and the employment policy tentatively suggested, the committee desires an expression of views both of the societies and of individual members thereof.

Through the medium of their society publications or some other convenient means, the secretaries are requested to urge the members to report to the committee any action taken to increase compensation or to adopt the standard classification. The committee purposes to act as a clearing house for receiving and giving out such information to any group of engineers for use in discussing these matters with authorities who have the responsibility for fixing compensation. "Through co-operative action," the committee states, "the effectiveness of the work done toward increasing compensation can be materially advanced."

Several societies already have taken action in regard to this matter. The Municipal Engineers of the City of New York have indorsed the classification and adopted a schedule providing for compensation at a rate approximately 20 per cent greater than that tentatively suggested by Engineering Council's committee. The classification has been closely followed by the Congressional Joint Commission on Reclassification of Salaries in its recommendations concerning engineers in the Federal service. It was approved on April 13, 1920, by the executive committee of the American Society for Testing Materials.

The Boston Society of Civil Engineers has made the indorsement of the tentative schedule of compensation the subject of a letter ballot by the full membership, which is now being canvassed.

The classification committee has been reorganized and is now made up as follows: Arthur S. Tuttle, chairman, deputy chief engineer, Board of Estimate and Apportionment, 1347 Municipal Building, New York; Charles Whiting Baker, secretary, consulting

engineer, 31 Nassau St., New York; Frederick W. Cappelen, city engineer, City Hall, Minneapolis, Minn.; Philip P. Farley, consulting engineer, Borough Hall, Brooklyn, N. Y.; O. C. Merrill, chief engineer, U. S. Forest Service, Washington, D. C.; C. A. Morse, chief engineer, C. R. I. & P. Railroad, La Salle St. Station, Chicago, Ill.; M. M. O'Shaughnessy, city engineer, City Hall, San Francisco, Cal.; R. S. Parsons, general manager, Erie Railroad, 50 Church St., New York; and Edmund I. Mitchell, assistant secretary, 29 West 39th St., New York.

New Caledonia's Water Power To Be Used in Her Nickel and Chromium Industries

La Société "Le Nickel" states in its annual report that it has secured a majority interest in and thus the control of La Société "Le Chrome," which owns and has begun to develop the greatest water powers in New Caledonia (Nouvel-Calédonie). According to the *Journal du Four Electrique*, "Le Nickel" is thus made independent of the acute question of coal and fuel and anticipates that hydro-electro metallurgy of nickel and chromium in New Caledonia will have a very favorable effect on the production of those elements.

Recent French Aluminum Combine Will Dominate the European Field

The latest phase in the progressive absorption by a few old, strong companies of the electrochemical industries of France is the recent absorption of Société Electrometallurgique Française (Froges) by the Compagnie d'Alais (Péchiney). The capital of the combination will be 130,000,000 francs and will represent more than 90 per cent of the total French aluminum production, and the Compagnie d'Alais now controls extensive aluminum interests in Italy and Norway and has important collateral interests in chemical products, bauxite, coal and electric steel. It is estimated that the combine has a reserve water power of over 200,000 hp., and it now has a total of seven complete aluminum making plants, supplemented by four aluminum fabricating factories. "This new amalgamation," says *Journal du Four Electrique* of June 7, 1920, "thus represents an ensemble that clearly will dominate the aluminum industry in Europe, and is equalled only by the Aluminum Co. of America in the United States." The late Adrien Badin had long dreamed of and striven to bring about the fusion recently accomplished.

Zinc Industry Exhorted To Co-operate

Those Engaged in Various Branches of the Business Urged to Co-ordinate Efforts

A recent number of the Bulletin of the American Zinc Institute publishes the following:

Thomas A. Edison, in a recently authorized interview on "What Life Is," said: "Everything that we can see is a manifestation of community, not of individual, effort."

While many of the men engaged in the zinc business may not agree with Mr. Edison's startling theories regarding life, yet it is difficult to believe that there is one among them who will not admit that Mr. Edison's statement is at least true regarding predominance in the fields of industry and commerce.

Concisely stated, industry is stabilized and commerce is developed by community, not by individual, effort.

Practically every man engaged in the zinc business admires the world's great industrial and commercial examples of community effort. Admiration, however, is only a philosophical affection.

The creators of each of these modern examples of community effort, practicing the principles of co-ordination and co-operation, harmoniously adjusted essential parts and put them collectively to work for the advancement of the interests of the parts as a whole.

Frankly, not until the members of the zinc industry concertedly apply the same principles to their own industry can they expect to reap benefits similar to those which have come to industries whose leaders have concretely recognized the advantages of community effort.

"What men have done can still be done."

Ray Erects Memorial Tablets

Something higher than self-interest or patriotism may, at times, move commercial organizations. True human interest in men and in their thoughts is not only an ideal but good business. It is gratifying to record here the fact that Ray Consolidated Copper Co., of Ray, Ariz., has provided bronze memorial tablets at both Ray and its mill town, Hayden, Ariz., permanently honoring the memory of about 200 men at each place who went into service in the war. Each tablet was dedicated with an appropriate ceremony, and this included addresses by Governor Thomas E. Campbell, the principal speaker. Louis S. Cates, also, who was in direct charge of the two plants during the war, came out from San Francisco to attend these exercises.

Book Reviews

Oil and Gas Industries. By Ralph Arnold, J. L. Darnell, and others. Cloth; 9 x 6 in., pp. 190. John Wiley & Sons, Inc., New York. Price, \$2.50.

This monograph was first issued by the Bureau of Internal Revenue of the Treasury Department in February, 1919, soon after the passage of the Revenue Act of 1910. The original edition was soon exhausted, and the demand for the book has become so great that the present private reprint, bringing certain features up to date, has been decided upon. It is published with the permission of the Bureau of Internal Revenue. The book consists of three parts. Part 1 deals directly with the law and regulations as they relate to the oil and gas industries. Part 2 takes up the question of depreciation, and is included to assist the taxpayer in standardizing his classifications of equipment and to offer a suggestion as to relative rates of depreciation of different types of physical property. Part 3 describes methods of estimating underground oil reserves, especially by means of production curves, and includes tables covering many of the principal oil pools and fields in the United States.

The purpose of the book is to assist the taxpayer in correctly and expeditiously preparing his Federal tax returns on oil and gas properties. The author's endeavor has been to answer all questions that might be asked regarding the law and regulations. To this end the latter have been amplified when this was deemed necessary.

Technical Papers

Petroleum Engineering—Earl W. Wagy, in "The Engineering Aspects of the Petroleum Industry" (U. S. Bur. of Mines, Reports of Investigations), discusses the need of technical assistance and investigation in the development and production of oil lands. The petroleum engineering profession is divided as petroleum production engineer, petroleum construction, refinery, natural gas, and oil-shale engineer, each of these covering some particular phase of the industry. Examples of the specific problems of each and the manner in which they have been handled, together with suggestions for further work, are given.

Oil Conservation—The successful results obtained by co-operation between the Bureau of Mines and certain operators in the Wyoming oil fields in promoting conservation and safeguarding the underground supplies of oil and gas are outlined in "Co-operative Petroleum Work in the Rocky Mountain Fields," by

F. B. Tough (U. S. Bur. of Mines, Reports of Investigations). The Rocky Mountain Petroleum Association, Denver, Col., was formed in May, 1919. It comprises the Midwest Refining Co., the Ohio Oil Co., and the Continental Oil Co. These three companies entered into a co-operative agreement with the Bureau of Mines whereby \$30,000 would be spent under the direction of the Bureau, which agreed to furnish competent men to carry on the work and expend the funds. During the first season, efforts were concentrated chiefly on the Salt Creek, Big Muddy, Lance Creek, and Mule Creek fields.

Oil-Well Pipe and Casing.—Technical Paper 247, "Perforated Casing and Screened Pipe in Oil Wells," by E. W. Wazy, has recently been issued by the Bureau of Mines. This paper describes the various methods of applying the perforation principle and discusses their advantages and disadvantages. Several illustrations are included. The subjects are thoroughly covered and the collection of the data indicates the well-ordered program which the Bureau is pursuing in its investigations for the purpose of preventing waste and improving production in the oil fields.

Glass—The United States glass industry is well covered in Report No. 12 of the Topographic and Geologic Survey of Pennsylvania, Harrisburg, Pa., entitled "Glass Manufacture and the Glass Sand Industry of Pennsylvania." The book contains 278 pages. Silica is the major constituent of glass, and is obtained from certain very pure sandstones among the sedimentary rocks. An attempt has been made on the Pacific Coast to use massive quartz for the purpose, but the expense of crushing was found greater than the cost of importing sand of the proper grade from the East. The necessary purity of the quartz grains varies with the grade of glass made; Fe₂O₃ is one of the least desirable impurities, and for white glass must never exceed 0.5 per cent. The first half of the book contains a description of all materials used in glass making, how they are purified, and how the different kinds of glass and bottles are made—all very interesting, even to one not connected with the industry. The remainder of the book is confined to a report on the numerous and important glass-sand deposits of Pennsylvania.

Foreign Commerce—Those interested in U. S. import and export statistics for 1919 should send 5c. to the Superintendent of Documents, Washington, D. C., for Department of Commerce Bulletin, Miscellaneous Series No. 103. Our export trade for the year ended June 30, 1919, amounted to \$7,233,000,000 and our imports to \$3,096,000,000. Among metals, exports of silver were particularly large. Dabblers in foreign-commerce statistics must remember, however, that a billion dollars may not represent any more goods now than half the amount did in pre-war days, and the figures given should be considered with this fact in mind.

National Safety Council—The proceedings of the National Safety Council during its eighth annual safety congress, held at Cleveland, Ohio, Oct. 1-4, 1919, have been compiled in a paper-covered book of 1,457 pages, and may be secured from headquarters, 168 North Michigan Ave., Chicago. About three hundred pages are devoted to the general proceedings of the meeting and reports of committees, the remainder being given over to the papers read and discussions held by the National Safety Council.

The Ardlethan Tin Field—With respect to tin deposits near Ardlethan, N. S. W., the author of "Geology and Mining Developments of the Ardlethan Tin Field," L. F. Harper, offers the opinion that the mineral contents of the field are attributable to porphyry intrusions in granite which were accompanied by highly charged mineral solutions. The latter impregnated the rock mass within their scope of influence, dissolving and replacing portions of the original constituents with metalliferous deposits. The discovery of the Ardlethan tin field was made in January, 1912, and, at the time of the report (June, 1919), the principal mines were the Carpathia, White Crystal, New Venture, Alluvial Claims, Big Bygones, and Little Bygones. According to returns stated in the annual reports of the Department of Mines, the district produced tin valued at £77,383 in 1918. The report is published by the Geological Survey, Department of Mines, Sydney, N. S. W., (price 2s., postage extra), and is referred to as Mineral Resources No. 29.

Gold in Ontario—Bulletin No. 39, obtainable free of charge from the Ontario Bureau of Mines, Toronto, is devoted to the West Shining Tree gold area. This district is about sixty miles south of Porcupine and twenty-five miles from Westree, the nearest rail point. Several excellent prospects have been located, but poor transportation facilities and lack of capital have retarded development. The deepest shaft on the Wasapika (*pron. Wah-sop'-e-ka*) is down 130 ft. The district has produced some spectacular samples, but, although this pamphlet does not say so, has been retarded in development somewhat by undesirable stock-selling activities.

Rare Earths—The U. S. Tariff Commission has published a 32-page pamphlet on the Incandescent Gas-Mantle Industry, its raw materials and by-products, monazite sand, thorium, and cerium nitrates, pyrophoric alloys, and mesothorium. A list of references is appended. Obtainable from the Superintendent of Documents, Washington, D. C., for 5c.

Belt Lacing—"The Colorado School of Mines Magazine" for May, (Golden, Col., 25c.) has a short practical article on belting and the proper way to lace belts. A table is appended for finding the horsepower of a belt.

MEN YOU SHOULD KNOW ABOUT

F. W. McNair, president of the Michigan College of Mines, was recently in New York City.

W. C. Alden, of the U. S. Geological Survey, is engaged in a reconnaissance in northern Montana.

Adolph Knopf, of Yale University, has been assigned to field work in Nevada, and will spend the entire summer there.

E. T. Hancock, who expected to continue his European trip to Rumania, has been delayed in Paris because of railroad strikes in Italy.

C. K. Wentworth and **J. D. Eby** are doing field work in Wise County, Va., in co-operation with the Virginia Geological Survey.

F. W. Collins, mining engineer, of the firm of Bradley, Bruff & Labarthe, will sail from New York on June 30 for Cerro de Pasco, Peru.

E. F. Pelton, mine superintendent at Tyrone, N. M., for the Phelps Dodge Corporation, will move to New York to enter other lines of work.

W. J. Lloyd, topographer, has resigned from the U. S. Geological Survey to undertake topographic mapping for the San Domingo government.

C. H. Fry, engineer for California Metal & Mineral Producers' Association, is inspecting the mines and dredges belonging to the association.

Clyde A. Heller, president, and **George H. Garry**, consulting geologist, of Tonopah-Belmont Development Co., have been visiting Surf Inlet properties.

W. Rodger Wade, formerly superintendent of mines for the Phelps Dodge Corporation, at Nacozari, Sonora, Mexico, has accepted a position in New York.

L. W. Stephenson, who has been engaged in oil work in Mexico, is expected to return to Washington and resume duty at the Geological Survey before July 1.

Horace A. Scott, of Globe, Ariz., has been appointed to a position in the Missouri School of Mines. Mr. Scott has been teaching in the Globe high school.

D. D. Moffat, consulting engineer of mills for the Jackling properties, with headquarters at Salt Lake City, Utah, has been in Hurley, N. M., on official business.

W. W. Thomas, of New York, treasurer of the United Arizona Extension Mining Co., recently visited Phoenix, Ariz., and the company's property north of that point.

O. B. Hopkins, who has been in central Colombia for some time, probably will return to Washington early in the fall and resume work there with the Geological Survey.

Fred C. Semmek, recently with the Burma Corporation, Ltd. is manager in charge of the Octo Mining Co. property three and one half miles southwest of Lordsburg, N. M.

J. M. Hill has recently started for San Francisco, where he will serve as geologist in the U. S. Geological Survey offices. He is expecting to do considerable field work en route.

Col. M. G. Baker, vice-president of Vanadium Corporation of America, 120 Broadway, New York, N. Y., recently returned to that city from a visit to the company's property in Peru, S. A.

J. H. Winchell, who has been assisting in the mineral resources work at the Denver office of the U. S. Geological Survey, resigned recently to accept a position with the Empire Zinc Co.

A. S. Fuller has returned to Porcupine after an absence of several months in New York. He is taking the leading part in a large deal involving fifteen Porcupine gold mine properties.

James McGregor, senior mine inspector, has been appointed chief mine inspector for British Columbia, succeeding **George Wilkinson**, who resigned recently to accept a managership with Pacific Coast Coal Co.

J. S. Diller, who was taken seriously ill while on a geological reconnaissance in Arizona, has returned to Washington, D. C. He is much improved after spending some weeks at Miami-Inspiration Hospital, Miami, Ariz.

Horace V. Winchell was in Spokane, Wash., recently in connection with the pending litigation between the Hecla and Marsh mines, in the Coeur d'Alene district. He has been retained as chief geologist by the Hecla Mining Co.

Djevad Eyoub, assistant geologist for Phelps Dodge Copper Co., at Tyrone, N. M., was in New York, June 14, on his way to Constantinople, Turkey, his home, where he will set up a mining engineering consulting business. Mr. Eyoub is a graduate of Columbia University.

C. Minot Weld, mining engineer, 66 Broadway, New York City, has returned from a professional trip to Tennessee. **D. M. Liddell**, of Mr. Weld's office was in Joplin, Mo., for two weeks; and **A. W. Newberry**, who is also with Mr. Weld, sailed June 12 for England. He expects to return to New York about Aug. 1.

Robert Davis, formerly general manager of the Butte & Superior Mining Co., and president of the Butte chapter of the American Association of Engineers, is a valuation engineer for the United States Treasury Department. Mr. Davis has been superintendent of the Comet mine, near Basin, Mont., for some time.

Robert T. Hill, mining engineer and geologist, who will be remembered as having worked for many years on the geology of Porto Rico and of Texas, on commissions from Washington and from different states, is now head of

the firm of Hill, Brantley & McFarland, 612 American Exchange Building, Dallas, Tex. This firm is making geological examinations in this country and abroad.

Edward P. Merrill has been appointed general manager of the Dominion Iron & Steel Co. and the Dominion Coal Co., of Sidney, N. S. He has had considerable experience in the development and operation of coal mines in the United States, and spent some years in Mexico engaged in the electrification of mines and construction of reduction plants. **H. J. McCann** has been appointed Assistant General Manager of the Dominion Coal Co.

Harry S. Denny, mining and metallurgical engineer, of the southeastern Rand and Salisbury House, London, is in Canada investigating Quebec mines producing asbestos, magnesite, feldspar, and other minerals, for important British capitalists. Mr. Denny has written on the metallurgy of Witwatersrand ores, and was for some years a chief of the technical staff of General Mining & Finance Corporation, of the Rand. He is head of the oil-refining and cracking section of Scottish American Oil & Transport Co., 34 Lime St., London, and managing director of Denny Chemical Engineering Co., Ltd.

OBITUARY

James F. Parks, superintendent of the Plymouth Consolidated Gold Mines, of Amador County, Cal., and one of the best-known mining men of California, died Wednesday, June 9, in the Sister's Hospital at Sacramento, following an operation for appendicitis. He was buried on Friday at Plymouth. Mr. Parks was the son of the late James F. Parks, formerly manager of the Kennedy Mining Co., and one of the famous mining men of California, and the Parks family has been associated with the history of the Mother Lode of Amador since its discovery. Mrs. Frederick W. Bradley and Mrs. John F. Davis are sisters of Mr. Parks.

John Francis Murphy, general superintendent of mines for John A. Savage & Co., Crosby, Minn., died at his home in Crosby, June 7, following a ten days' illness with pneumonia. Mr. Murphy was forty years old and was graduated from the Minnesota School of Mines in 1906. His first position was as designing engineer with the Carnegie Steel Co., Pittsburgh, Pa. From there he returned to his native state and was employed as mining engineer in the Hibbing and Keewatin districts of the Oliver Iron Mining Co. from 1908 until 1913. He was on the faculty of the Minnesota School of Mines from 1913 to 1918 and associated in a professional capacity with the Minnesota Tax Commission. In 1918 he accepted the position which he held at the time of his death.

THE MINING NEWS

LEADING EVENTS

United Comstock Mines Company Controls Eleven Properties

Hopes To Handle Cheaply Large Tonnage of Low-Grade Ore—
No Interest in North End or Middle Mines

The United Comstock Mines Co., which was recently organized in Nevada with a capitalization of \$5,000,000, holds by purchase or under option the following properties on the Gold Hill section of the Comstock lode: The Alpha, Imperial, Challenge, Confidence, Jacket, Crown Point, Belcher (including Kentuck), Segregated Belcher, Overman, Knickerbocker, and Globe Consolidated.

The properties were first secured and consolidated by H. G. Humphrey, who spent nearly a year and about \$150,000 in development work on the group. A controlling interest has now been transferred to Bulkeley Wells, who will finance the further development and equipment of this property. Mr. Wells, however, is not interested with Mr. Humphrey in the North End or Middle Mines groups.

Present plans, which are subject to change, include the driving of a 9,500-ft. adit tunnel which would give a depth of approximately 500 ft. at the Belcher shaft and 660 ft. under the Imperial ground. This tunnel can be driven from the entrance and through four shafts simultaneously, giving nine possible working faces.

The reports of Mr. Wells' engineers show as of May 1, 1920, 2,240,000 tons of positive and probable ore having a total average content of gold and silver of \$5.63. Completed metallurgical tests indicate a possible recovery of 94 per cent of these combined values by fine grinding and a counter-current cyanidation process. Economic exploitation of this large but low-grade deposit will require mining by the most approved and economical methods, and a milling capacity of at least 1,000 tons per day.

A statement by the company says: "Mr. Wells is not, nor has he been, in any way connected or interested with Mr. Humphrey and Mr. Kendall in the North End or Middle Mines groups of the Comstock Lode at Virginia City, and all reports to that effect are purely surmise and entirely incorrect. Also, Mr. Wingfield has not to our knowledge any connection with or interest in the Gold Hill group controlled by Mr. Wells.

"The present and future operations of the company are based only upon the possibility of handling cheaply large tonnages of low-grade ore. There are no appreciable reserves of \$12 to \$15 ore as stated recently in the press."

WEEKLY RÉSUMÉ

Hayden, Stone & Co. and associates have organized the Shasta Zinc & Copper Co. to work the Bully Hill Mines in California under D. C. Jackling's direction. The U. S. Circuit Court at Philadelphia has, in effect, referred to the master in the contempt proceedings at Wilmington Miami Copper's plea to introduce new evidence in the Minerals Separation case. In the iron country, the acute coal shortage has been temporarily eased and further relief is anticipated. In the Joplin-Miami district, the first step toward remedying the evil of excessive royalties charged has been taken by the Secretary of the Interior in canceling the Welch company's leases. The Metals Extraction Corporation has started its new zinc oxide plant near Joplin.

A spectacular strike of silver ore has been made by the Butte & Jardine company in the old Champion mine in Montana. In Louisiana, the Union Sulphur Co. is seeking a lower assessment by the state and parish for 1919 and testimony has been concluded. In Idaho, the shaft started on the Russell claim by Marsh Mines to prove its apex claims will be continued by the Federal M. & S. Co. At Washington, the Secretary of the Interior has announced plans for developing Alaska's resources with fairness to all.

Bully Hill Mines Taken Over By Hayden, Stone & Co.

D. C. Jackling To Be Managing Director—Zinc Oxide Plant Will Be Erected

Hayden, Stone & Co., associated with San Francisco interests, have just taken over the Bully Hill Mines, located in Shasta County, Cal. They have formed a corporation known as the Shasta Zinc & Copper Co., with a capitalization of 200,000 shares.

Daniel C. Jackling has become managing director of the property, which was purchased on the basis of a report on the mine made by Allen H. Rogers and one on the metallurgy by March F. Chase, formerly of the New Jersey Zinc Co. Mr. Jackling has just returned from the property, where he has laid out plans for the general equipment of the plant. A zinc oxide plant will be constructed under the direction of Mr. Chase.

Butte & Superior Accounting Filed

Complying with Judge Bourquin's edict, the Butte & Superior Mining Co. has filed a complete accounting of its operations for the period commencing with 1911 up to the end of 1919. Accompanying the detailed statements of monthly earnings, costs and other items, was a full record of the country's smelting and selling contracts during the entire period. These data constitute a part of the accounting proceedings in the litigation against the company brought by the Minerals Separation Co.

Miami Copper Co.'s New Evidence To Come Before Master

Counsel Also Heard at Wilmington in Motion To Dismiss Contempt Proceedings in Flotation Case

On June 18 the U. S. Circuit Court of Appeals at Philadelphia filed its order denying the petition of the Miami Copper Co. to reopen the Miami case so as to admit new evidence, said to have been found, which was claimed to be in conflict with Minerals Separation's present contentions. The Circuit Court of Appeals, however, in denying the petition, stated that it expressed no opinion as to the relevancy and competency of the subject matter of the petition on questions arising in the accounting. This evidently leaves the whole matter before the master in the accounting proceedings.

Miami also appeared before the U. S. District Court in Wilmington, Del., on June 15 in its motion to dismiss the petition of Minerals Separation, Ltd., in which the latter seeks to have the Miami Copper Co. punished for contempt of court for continuing to operate its flotation process. The Minerals Separation petition also asks to have the injunction against the Miami company so extended as to cover "the fourth process" and other processes which had not been considered by the Circuit Court of Appeals. That court found the first three processes involved in the suit to be infringing because they had the violent agitation of the Minerals Separation process.

The Miami company's motion to dismiss raises the question as to whether the facts stated in the petition are sufficient upon which to find the company guilty of contempt or to extend the present injunction to cover processes used by that company since the Circuit Court of Appeals decision. Miami claims that, admitting all of the facts stated, there is no more basis for contempt proceedings here than in the Butte & Superior case recently dismissed by Judge Bourquin (*Engineering and Mining Journal*, June 12, 1920, page 1329.)

The Minerals Separation, Ltd., contends that the facts stated plainly show infringement. On the argument it was admitted that the Miami company should have the right to cross-examine the Minerals Separation witnesses, but Minerals Separation urged that the questions involved should not be decided in an accounting proceeding.

Miami, on the other hand, argued that these questions had been raised by Minerals Separation, Ltd., before the master and that most of the testimony

in that accounting proceeding had been in regard to the "processes," which were the subject of the petition for contempt; that the Minerals Separation could not "half litigate" these questions before the master and then ask the court to take up the question before Miami had had opportunity to produce its witnesses. Miami counsel said that since the Judge would probably find it difficult to give sufficient time for so extended a hearing, he would undoubtedly have to appoint some one to take the evidence and suggested that the master who had already taken so much of the evidence concerning the very process enumerated in the petition be permitted to continue.

This motion for dismissal is similar to the proceedings brought by Minerals Separation against the Butte & Superior, Judge Bourquin's dismissal of which is referred to above.

Hurried arguments, owing to limitation of time, were also made with respect to a petition of Minerals Separation to file a supplemental bill having for its purpose the bringing of Minerals Separation North American Corporation into the suit as plaintiff. Objection was made by Miami upon various grounds, such as alleged inconsistency and contradictions within the bill itself and because of the bearing upon the validity of the disclaimer with respect to the claims of the patent which had been declared invalid by the Supreme Court.

Federal Company Will Continue Shaft Started by Marsh Mines on Russell Claim

Quickly following the action of Judge Deitrich, denying the application of the Federal Mining & Smelting Co. to raise from the Hecla workings as a means of proving its apex contention, the Federal and Marsh companies effected an arrangement by which the former assumes the task of sinking the shaft started by the Marsh from the tunnel on the Russell claim. Such a shaft, if continued, is expected to lead to the Hecla East orebody, the bone of contention in the pending suit. The Russell claim, upon which is the alleged apex of the East vein, is owned by the Federal and is under lease to the Marsh until 1926. Although the Federal will sink the shaft, the Marsh reserves the right to mine any ore that may be developed and other working privileges.

Recent conferences between the miners and management of the Grängesberg Bolaget in respect of a new tariff having produced no satisfactory result, fears are expressed that a general strike, affecting the whole of the ore-exporting mines of Sweden, is more than probable unless, at the eleventh hour, some agreement is arrived at. The miners demand 15.50 kroner per shift for underground work. The management offers, instead, 11.25 kroner per shift, or an increase of 10 per cent on present rates. In the meanwhile the Kirunå miners have already struck.

Testimony Completed in Union Sulphur Co.'s Assessment Suit

Testimony in the suit of the Union Sulphur Company vs. the Parish of Calcasieu and State of Louisiana for a reduction in the company's 1919 assessment of \$19,000,000 was recently concluded in the Federal Court. Judge Jack set the second week in October for the argument.

Joseph A. Skinner, of New Orleans, expert accountant, was the last witness placed on the stand by the state. Mr. Skinner gave the annual net profits of the company from 1908 to 1918, inclusive, making no allowance for income taxes, as follows: 1908, \$2,284,480; 1909, \$3,150,000; 1910, \$3,326,480; 1911, \$3,079,765; 1912, \$4,285,792; 1913, \$4,111,092; 1914, \$4,034,846; 1915, \$2,669,712; 1916, \$6,613,842; 1917, \$8,872,146; 1918, \$13,033,265.

W. R. Ingalls, of New York, was one of the witnesses called. The value of the sulphur company's property has been estimated by Mr. Ingalls at \$10,000,000. He stated that he would advise a client to go up to \$12,000,000 if he were particularly anxious for its purchase. Valuations fixed by Mr. Ingalls for the years 1913, 1914 and 1917 were \$21,037,777, \$23,239,194 and \$27,563,492 respectively.

The witness stated that in making his 1919 estimate he had valued the sulphur underground at \$1 per ton, or approximately \$4,000,000 on a net price of \$10 per ton above ground f.o.b. mines.

Under examination by the state, the witness gave a detailed explanation of the term "hazards" in sulphur mines. The percentage of loss to the company from hazards, he said, could not be determined accurately. He stated they had never amounted to a calamity. The filling in of surface depressions caused by sinkage of the sulphur rock, he said, was quite expensive, and the depression now at the mines caused by excessive exploitation in 1918 during the war would cost over a half million dollars to fill.

There are only three mines that have been worked by the Frasch method of mining, said Mr. Ingalls. The Matagorda mine is new, having been operated one year. The Freeport mine has been operated six years. The Calcasieu mine is considered well beyond middle age.

"Large stocks are necessary," said the witness, "to attain a minimum of cost in production. Take 1909, 1910 and 1911, when production was the lowest, the cost per ton was the highest. In 1909, 270,000 tons was produced at a cost of \$4.98; in 1910, 240,000 tons was produced at a cost of \$6.09 per ton; in 1911, 204,000 tons was produced at a cost of \$9.48 per ton; in 1912, 786,000 tons was produced at a cost of \$2.98 per ton. There have been only two years since 1911 that stocks have not continually increased. And there is a possibility that the mine may have to be permanently closed if the burden of taxation is so great as to prohibit the carrying of large stocks.

Court Cancels Welch Company's Leases on Indian Lands

Action Considered Step Toward Correcting Royalty Evil in Oklahoma Zinc-Lead District

Much interest has been aroused in the Joplin-Miami district by the decision of Secretary of the Interior Payne on June 12, when he declared void the first leases of the Welch Mining Co. on about 360 acres of rich mining land owned by Indians in the vicinity of Douthat, Okla. The Welch company obtained the leases six years ago and has sublet the land in tracts to different mining companies. L. C. Church, of Joplin, sold 200 acres of these leases several years ago to the Skelton Mining Co. for \$1,900,000. Church was one of the principal owners of the Welch company. No provision was made by Secretary Payne as to the paying back of any of the royalties that have been received, and it is supposed here that the decision will not be retroactive.

New leases were granted by Secretary Payne to different companies, including the Skelton, and in each case the original Indian owner of the land is given a slightly improved royalty over that paid in the past. The Skelton company's new lease provides for a 7½ per cent royalty to the Indian owners as against 5 per cent previously received. This new lease also is for 10 years from June 12. Indian owners are also given a 7½ per cent royalty from the leases held by the Federal and Fort Worth mining companies.

This decision, taken in connection with the one handed down by Federal Judge Pollock for the eastern district of Oklahoma on May 22, wherein he denied the right of Walter T. Apple and Harry N. Harris in their suit for a slice of the royalties of the Commerce Mining & Royalty Co. on various mining lands, is considered by local mining operators as marking a significant development in this district where high royalties have from the first been a serious handicap to mining development and successful operation.

New Zinc Oxide Plant Started in Joplin District

The zinc oxide plant of the Metals Extraction Corporation, recently completed on the state line about five miles west of Joplin, Mo., has been placed in successful operation. At present only one twin furnace is being operated, but the others will be started in the near future. As the process is a new one, invented by Alfred Schwarz, of Joplin, men have to be trained for a part of the work and progress is slow at the outset.

The plant was started Saturday, June 12, with one shift. A second shift was added June 14, and the third will be put on as soon as competent men can be engaged. Only ore grading 60 per cent metallic zinc and virtually iron free is being used, and about 7,000 lb. of oxide is being made daily.

Only American Capital Invested in Search for Surinam Bauxite

Prospecting and Development of Crown Lands Controlled by Law Passed Last Year

Exploration for bauxite, the chief ore of aluminum, began in Dutch Guiana about 1913 and to date all the capital invested in the industry has been American. On March 27, 1919, an ordinance was passed laying down the conditions under which exploration and development work in Surinam may be conducted.

Those permitted to explore are: Netherlanders and inhabitants of Netherlands or Surinam; and companies established in either country. Concessions for exploitation of bauxite deposits may be obtained only by companies established or represented in either one of the two countries.

Applications for permission to explore for bauxite must be made in accordance with existing law. The Governor, under certain conditions, may reject any application. Permission will not be granted for an area less than 5,000 h.a. or more than 50,000 h.a. nor may an individual secure permission covering more than 50,000 h.a. Such permission is good for one year, but may be extended another year at the Governor's discretion.

Application for concession for exploitation of bauxite must be made in accordance with the ordinance of 1882 as amended by the ordinance of March 18, 1908. A concession for Crown land will not be granted for less than one year or for longer than fifty years. A corporation is limited to an area not more than 125,000 h.a. nor less than 1,000 h.a., unless local conditions prevent such reduction; but concessions may be granted to the same corporation where the total area does not exceed 125,000 h.a.

Payment must be made in advance to the colonial treasury ranging from 10 Dutch cents per h.a. in the first year to one guilder in the fifth year and thereafter. The concessionaire must also pay a royalty of 25c. per metric ton or fraction on all bauxite mined on Crown lands and exported.

The concessionaire must start exploitation within a year after the date of the grant and regularly continue the same; but the Governor may, in special cases, exempt him from this duty. The concessionaire is bound to mine yearly, for five years, starting from the date of his first obtained concessions, at least 20 metric tons each on every 100 h.a. or parts thereof "calculated to the total area of the concession granted." After the fifth year the yearly minimum amount is 10 metric tons per h.a. The Governor after the fifth concession year will fix a minimum total yearly amount of every concession.

A complete digest of the law is given in *Reports of Investigations* of the U. S. Bureau of Mines for May, 1920, which has been prepared by J. W. Thompson, a law examiner of the bureau.

Nova Scotia Steel Official Discusses New Merger

D. H. McDougall, president of the Nova Scotia Steel & Coal Co., Ltd., recommending acceptance of the plan of consolidation into the British Empire Steel Corporation, Ltd., says:

"The new capital will provide for very necessary extensions in mining and steel-making operations. The coal field in Cape Breton and the iron-ore deposit in Newfoundland, in which the properties of your company and of the Dominion Steel Corporation, Ltd., are respectively situated, are in each case essentially one continuous deposit with undersea extensions. Development of these deposits can most effectively be achieved by combined operation, which would make it possible to extract the largest quantity of coal and iron ore over the maximum life of the deposits at minimum cost.

"There has been in the past a certain amount of duplicate capital expenditure caused by conducting independent parallel operations in the submarine fields, and much greater duplication of expenditure can be avoided by combined operation.

"The extraction from the undersea areas, both of the coal and iron ore, will require the additional provision of unusually large mine openings and commensurately large surface plant, but these expenditures can be deferred and ultimately lessened in extent under combined operation. More immediately important, combined operation would enable the working of areas that are not now available because of lease complications, and larger outputs of coal and ore at cheaper production costs are at once made possible.

"The iron and steel plants of the two companies have now reached the stage where extensive development must be proceeded with. Consolidation would avoid much duplicate expenditure and result in economy of operation."

Strong opposition to the ratification of the new half-billion dollar steel merger is being manifested by many of the shareholders of the Dominion Steel Corporation. Six of the fourteen directors of the latter company, namely, George Caverhill, Sir William Mackenzie, William McMaster, J. H. Plummer, E. Dandurand and E. R. Wood, have issued a protest against the ratification until further information has been given to the directors and shareholders. Objection is taken to the balance sheet issued for the British Empire Steel on the ground that the \$25,000,000 which it is proposed to raise by the sale of preferred stock is included as "cash," as well as to the proposal that the balance of \$38,000,000 common stock remaining after the exchanges are made is to be sold to unnamed parties for \$11,400,000 or \$30 per share. After setting forth the terms of exchange of the stock of the Dominion Steel, Nova Scotia Steel and Canada Steamships, the letter goes on to say that the directors have little knowledge of the affairs of Canada Steamships.

Iron Country Coal Situation Improved Somewhat

Fuel Shortage Extremely Acute, However—Relief Expected Through Permit System and Pooling

The coal shortage which has been hampering the operations of the iron mining companies on the Minnesota ranges has been temporarily relieved and for the present work will continue at 60 to 70 per cent capacity. The present shortage, considering dock receipts and supplies for this season and for the corresponding period last year, is estimated at 6,000,000 tons. Iron ore shipments will show another large decrease in June in consequence. The permit system established by the Interstate Commerce Commission and the pooling arrangement at Lake Erie docks are expected to result in a large movement of coal to the Northwest. The present shortage is very acute. Docks at Duluth are said to be practically bare, whereas at this time last year they contained 2,300,000 tons of coal.

Canadian Mining Stock Tax Bill Amended

The provision in the Tax bill now before the Canadian Parliament for a stamp tax on each share of stock transferred, has been amended to provide for a stamp tax of 2 cents on each \$100 face value or fraction thereof on stock transferred. The Finance Minister explained that the change was made because there were so many low-priced mining stocks on the market that a transfer tax of 2 cents per share would be a large percentage of their value.

Recent Production Reports

North Butte produced 892,118 lb. copper in May compared with 1,103,310 lb. in April.

Anaconda produced 9,700,000 lb. of copper in May compared with 15,800,000 in April.

Compagnie du Boleo, Baja California, produced 650,908 lb. copper in May, compared with 1,063,168 in April.

Mohawk produced 803,394 lb. copper in May compared with 1,071,553 in April.

Wolverine's output was 305,603 lb. copper in May against 346,428 in April.

Michigan produced 112,834 lb. copper in May compared with 116,350 in April.

Kennecott's May production (including that of Braden) was 9,311,000 lb. copper compared with 8,319,960 in April.

Calumet & Hecla's May output totaled 8,803,811 lb. compared with 9,532,476 in April. Production by companies was: Ahmeek, 1,652,900; Alouez, 367,100; C. & H., 4,920,786; Centennial, 65,100; Isle Royale, 851,200; La Salle, 22,600; Osceola, 739,500; Superior, 0; and White Pine, 184,625.

Alaska shipments of domestic copper ore, matte, etc., to the United States in May were 10,560 gross tons carrying 7,331,594 lb. copper valued at \$1,384,024.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Water-Power Bill Signed After Congress Adjourns

Some Doubt as to Legality of Procedure—Federal Power Commission Can Now Proceed

Few things have aroused the West more than the announcement that the Water-Power Bill had not received the approval of the President. The disappointment was relieved, in part, however, by the announcement, on June 18, that the President had signed the measure under a special ruling by the Attorney General that the Constitution does not deprive him of the privilege of signing bills within the ten-day period. The Attorney General's opinion pointed out that only in case of disapproval were bills to be returned to Congress before adjournment. Bills which are approved never are returned to Congress but go directly to the State Department for enrollment and filing.

Some fear is expressed as to the legality of the act signed under these conditions, but it is pointed out that Congress again will be in session in five months, when the measure might be repassed and signed in the usual manner, if it should be deemed necessary. In the meantime, a great advantage is secured in that the Federal Power Commission can proceed with its work. Its organization and policies will have been perfected by the time Congress again meets.

Further Awards Made by War Minerals Relief Commission

Recommendations for awards in 158 claims under the War Minerals Relief Act totaled \$1,238,451.12 on June 12. This represents 32.6 per cent of the amount claimed. During the week ended June 12 the commission made one award. It recommended that \$3,762.91 be paid to R. J. Rowen on his chrome claim. This was 6.3 per cent of the amount claimed.

Awards recommended by the War Minerals Relief Commission during the week ended June 5 were as follows (the name of the claimant, the mineral, the amount recommended and the percentage of original award are given): Ott & Thompson, chrome, \$280.92, 8.63 per cent; Eugene Stevens, tungsten, \$962.06, 7.27; Markstein-Dorn Mng. Co., manganese, \$13,722.01, 18.98; May Dew Mining Co., manganese, \$3,327.04, 49; Stange Mining Co., manganese, \$88,907.74, 30.56; Manganese Development Co., \$5,874.12, 51.55; Cummings & Derby, manganese, \$2,501.46, 88; Dailey & Casey, chrome, \$63.88, 1.02; Henry & August Herman, chrome, \$140, 56.22; and J. J. Cummings, Jr., manganese, \$120, 20.27. Total amount recommended for award, \$112,747.19.

New Mining Experiment Stations Authorized

No Appropriation Made for Two of These Sought for Butte and Nevada

One of the new mine experiment stations which will be established by the U. S. Bureau of Mines will probably be devoted to the special problems of the lead and zinc industry. The other station will doubtless be devoted to the non-metals. The latter station will partake of the nature of a chemical station, since it will deal with the substances which represent a large proportion of the raw materials of the chemical industry. It is not unlikely that this station will be located in the South. Probabilities point to the location of the lead and zinc station in the vicinity of the Missouri-Oklahoma-Kansas district.

Two other mine experiment stations have been authorized but no appropriation was made for them at the last Congress. Had it been granted, it is understood that one of these would have been devoted to the rarer metals, and probably would have gone to Nevada. The Butte district is a strong competitor for the other one.

The Bureau of Mines is establishing a cryogenic laboratory in Washington in connection with its helium work. The money required to establish this laboratory is being furnished by the Army and Navy departments from their appropriations. The laboratory will be under the direction of R. B. Moore, the chief of the bureau's division of mineral technology.

No Call for Government Nitrate Only One Hundred Tons Asked for in Month—Offering Said To Have Stabilized Market

For more than a month 100,000 tons of the War Department's reserve of nitrate of soda has been available to all purchasers at \$88.90 a ton. Purchases may be made in ton lots, but despite the pleas made in Congress as to the dearth of this material orders for only 100 tons have been received thus far. No purchaser has called for more than one ton.

Although the chief reason for the lack of demand is held to be due to the absence of any crying need, it is true that in some districts nitrate is being sold at a less price than that at which the Government supply is offered. It is believed at the War Department, however, that the offering of this material has resulted in the stabilization of the nitrate market. The remainder of the 100,000 tons will remain available for purchase until Oct. 20 of the present year.

Greater Development of Alaska's Resources Planned

Interior Department To Open Country Generally to Americans—No One Group To Dominate

Plans are being worked out for the greater development of Alaskan resources through policies which will attract new capital and improve transportation connections with the United States, according to John Barton Payne, Secretary of the Interior. Recommendations made in the report of a special committee appointed to study the Alaskan situation have been approved by Secretary Payne and the committee has been instructed to put them into effect as soon as possible. The committee is composed of Alfred H. Brooks, chairman, representing the Department of the Interior; H. Y. Saint, Shipping Board; Otto Praeger, Second Assistant Postmaster General; and E. A. Sherman, Department of Agriculture.

Two of the most important steps taken by the department are efforts to consolidate the two American shipping lines now serving Alaskan ports with a view to greater economy and efficiency, and consolidation of Federal supervision of Alaskan affairs to secure prompt action.

Co-operation of the commercial organizations now interested in Alaska is expected in the plans for the opening of the resources of the Territory, Secretary Payne said. Conferences are to be held shortly with representatives of the Pacific Steamship Co. and the Alaska Steamship Co. The purpose of the Department is to open the country generally to Americans.

"Alaska has immense resources which have never been developed properly," said Secretary Payne. "During the war the white population actually decreased from 50,000 in 1915, to 36,000 at present and the output of minerals and other industries showed a similar decrease. The rich mining, agricultural and fishing reserves of the region have never been made properly available. Under the policies which the Department of the Interior is now putting into effect an opportunity will be given for the investment of new capital.

"Exploitation of the resources of the territory will not be turned over to one interest or group of interests. Improvement of shipping and railroad facilities is undertaken with the purpose of admitting fresh capital and opening the country for settlement by American citizens.

"The first step in this direction is the lowering of freight and passenger rates and the improvement of transportation and mail service through economies in-

troduced by combination of two existing steamship lines into one, which the Department hopes to effect.

"Concentration and co-ordination of Federal control of Alaska lands and resources is contemplated by obtaining legislative authority for an Alaska Development Board, and, pending this, by the appointment of an Inter-Departmental Alaska Committee.

"Other plans include the co-ordination of Federal road construction, and the development of a plan for a comprehensive system of roads and trails to serve the entire Territory. Also the requesting of an appropriation of at least \$1,000,000 for the inauguration of this system.

"In regard to the mining industry, the committee recommended that the Bureau of Mines make a report on the feasibility of smelting Alaska copper ores within the territory; this work to

be done in co-operation with the Geological Survey so far as may be necessary; that the Bureau make an investigation and report on methods and costs of placer mining in Alaska; this to be specially directed toward the development of methods of exploiting the large bodies of auriferous gravels of low gold content; and that every encouragement be given to coal and oil development, especially by making the terms of leases as liberal as the present law allows.

"The committee also recommended that Congress be asked to increase the appropriation for the investigation of the mineral resources of Alaska, as being one of the most important steps to further mining development in the territory and the development of tonnage for the railroad.

"The committee found that while the Alaska petroleum leasing law is liberal

for developed fields, for those where there are some surface indications of petroleum, and for those that are readily accessible, its terms do not encourage the search for oil in inaccessible wild-cat territory. The committee believes, for example, that to induce capital to explore for oil in the Arctic coast region of Alaska, where there are some indications of its presence, a more generous law than the present one must be enacted."

The President has announced two recess appointments of members of the Tariff Commission. The appointees are Dr. Marston Taylor Bogert, professor of chemistry in Columbia University, and ex-Governor Samuel W. McCall, of Massachusetts. This action must be confirmed by the Senate, when it convenes again, to make the positions permanent.

NEWS BY MINING DISTRICTS

ARIZONA

Dardanelles at Chloride Ships Fourth Car—Scrapping Old Railroad at Poland

Phoenix—Walter K. Osborn, of Los Angeles, has examined the Rowley mine, on the desert, near the Gila River, northwest of Gila Bend. The main shaft is approaching the 350-ft. level, where a crosscut will be started.

Kay Copper's operations are still held up pending receipt of a shaft and compressor equipment.

Christmas—Gila Copper Sulphide is retimbering its main shaft and shipping regularly to the Hayden smelter.

Parker—Operations have been started by the White Star Mining Co. on the Red Mountain group of 15 claims, 10 miles northeast of Parker. The corporation is controlled by Detroit and Phoenix capital.

Jerome—Jerome-Superior is to install electric equipment throughout, including hoist, compressors and pumps. Sinking is in progress from the 840 level.

Poland—The abandonment is to be made complete by tearing up the Poland branch of the Santa Fe, Prescott & Phoenix Ry. Dismantling of the United Verde & Pacific narrow-gage from Jerome to Jerome Junction is under way. This line is no longer needed. The three-mile broad-gage spur of the Congress Mines Co. has also been abandoned.

Winkleman—The two lessees of the 79 Group, who took over the property Nov. 15 last, have shipped 27 cars of ore to the El Paso smelter since Feb. 26. Returns on 17 cars have been received, the first 44-ton lot netting \$1,715. A four-mile road has been

built, which is to be extended another mile to permit the use of trucks to the mine. Sinking of a deep shaft is being considered.

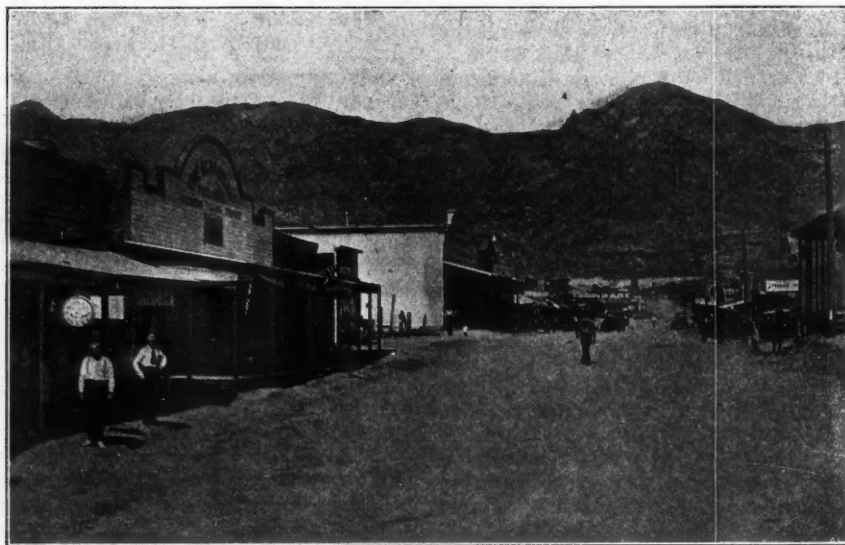
Prescott—The Peak Silver Mining Co. does not own, control or hold an option on the Emporia group of claims. A statement to the contrary in the issue of May 1 was incorrect. The Emporia group is the property of the Golden Dragon Mining & Milling Co., of Prescott, which took it over in 1916 by deed. J. Gardner Scott, of Prescott, is president of the Golden Dragon.

Chloride—The Juno has been taken over by Edward Welsh and associates on lease and bond. Work is now under way and a good grade of shipping ore is being mined.

The Distaff has a car of high-grade silver ore ready for shipment to the smelter. A new stringer of very rich ore has been opened up. Samples show several thousand ounces of silver per ton.

The Dardanelles shipped its fourth car to the Humboldt smelter. Returns on the third showed an increase in value per ton of \$8, bringing the run of mine ore up to \$50 in gold and silver. Pumping machinery is en route from San Francisco.

Molly Gibson-Chloride directors held a meeting in Chloride on Monday, June 7. The annual meeting of the stockholders will be held in the same place on Saturday, July 3, at two o'clock.



CHLORIDE, MOHAVE COUNTY, ARIZ., THE CENTER OF A DISTRICT WHERE SILVER MINING HAS EXPERIENCED A REVIVAL

CALIFORNIA

Bardsley Flotation Plant Near Completion—Calaveras Copper Raises Wages—Allison Ranch Cuts Ledge

Jackson—Two shifts are working at the Argonaut in an effort to dewater the mine as quickly as possible and resume active mining. Latest reports, however, are to the effect that it will be several months before this can be done. The railroad and other equipment are also being put in order.

There is some doubt whether the fire has been extinguished in the Kennedy mine, adjoining the Argonaut. Little work is being done in consequence.

No move has been made by the Kennedy to unwater the mine. The reason given is that fuel oil cannot be obtained. The Argonaut, adjoining, has been hoisting water for over a month, but recently on two shifts only, the third being devoted to track and shaft repairs. The water has been lowered but 50 ft., hoisting being done from both

Academy—An extensive development campaign has been outlined by the Copper King Co. Good ore is exposed and it is planned to speed development.

Copperopolis—Wages of machine miners and timbermen were advanced to \$5 per day and of trimmers and muckers to \$4.50 by the Calaveras Copper Co. Operations along broader lines are planned by the management.

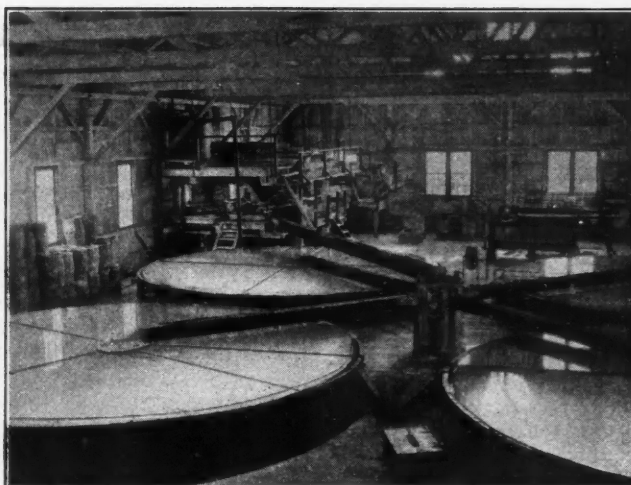
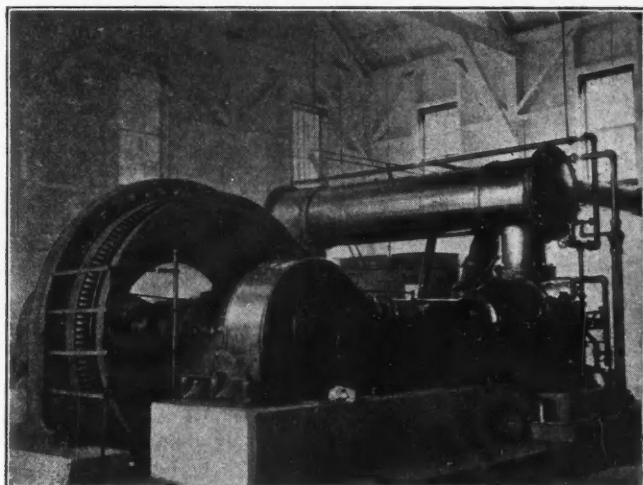
COLORADO

Portland Deepening No. 2 Shaft—Wolf Tongue at Boulder Resumes—A. S. & R. Testing Leadville Ores

Cripple Creek—Sinking of its No. 2 shaft has been resumed by the Portland Gold Mining Co. from the 2,300 ft. level, the intention being to deepen it 500 ft. The Portland struck unusually rich ore on the 23d level and the management believes that the same values can be found at a much greater depth than has yet been explored.

conducted by the American Smelting & Refining Co. at the old Pingrey mill upon low grade zinc-lead ores of the Leadville district and the plant is now treating about 50 tons daily of composite ores. By using selective flotation a high saving is made, it is said, and an acceptable zinc concentrate and an almost clean lead product are obtained. Silver or gold present is largely retained in the lead product.

Experiments were begun the first of the year by engineers and metallurgists of the company to determine the commercial possibilities of the complex low-grade ores of the Leadville dumps and mines which, without preliminary treatment, can not be handled at the smelter. A large tonnage of this has accumulated at the various mines, and if a successful method of separating the zinc, iron and lead can be worked out, the life of the camp will be greatly extended. It is reported that the company's metallurgists have recommended to the New York office that the present



LEFT—ELECTRICALLY DRIVEN I-R AIR COMPRESSOR AT EMPIRE MINES, GRASS VALLEY, CAL. RIGHT—CYANIDE PLANT AT EMPIRE MINES; SEPARATING SANDS AND SLIMES AND DEWATERING SLIMES

mines. Three air lift pumps are ready for installation.

Grass Valley—The largest tonnage of ore in the history of the Empire Mines is being treated in the mill, where 80 stamps are dropping. The mine is now one of the foremost producers of the state. The present yield of the Pennsylvania is sufficient to keep 20 stamps busy. Results of development on the lower levels are said to be satisfactory.

The rich ore recently cut on the third and fourth levels of the Alcalde is being opened rapidly. The capacity of the mill will be increased.

The Allison Ranch is said to have struck the ledge it has been looking for. The vein was cut in an upraise driven from the 1,500-ft. tunnel on the 10th level.

Portola—Erection of the Bardsley Copper Co.'s flotation plant is proceeding rapidly and the work is nearing completion. The cost is estimated at \$150,000. The Bardsley ore carries gold, silver and copper.

Lessees on the property of the Mary McKinney have opened up in virgin territory, on the 9th level, a vein of ore 5 ft. to 6 ft. wide, all of which is of shipping grade. Part of it runs from 4 to 5 oz. in gold.

Boulder—The Caribou Silver Mines Corporation has been organized to take over the old Caribou silver mine, the Boulder County and intervening properties. The Boulder County tunnel will be extended over 5,000 ft. to reach the Caribou, and will cut it at a depth of approximately 500 ft. below the present workings, now 1,100 ft. deep. Work has already started. The mill of the Boulder County mine will be remodeled to treat the ore from this property.

The Wolf Tongue Mining Co. has resumed operations on its Cold Spring group near Nederland. This property is known as one of the richest deposits in the tungsten field and the owners announce that they wish to determine whether at present prices the mines can be profitably worked.

Leadville—Experiments have been

plant be enlarged to a capacity of 150 to 500 tons daily.

Ouray—Reinhardt and associates, lessees, are starting to reopen the old Ruby Trust silver-lead mine at Sneffels. The mine has been considered a good silver-lead milling proposition.

Other active lessees are: Albert Ome, on the Black Girl; T. P. Mitchell, on the Silver Spur; J. N. Davis, on the B. B.; Fellin & Co., on the Neodesha; Frank Ward, on the Senorita; Martini & Co., on El Mahdi; J. F. Keleher, on the Wedge and Bachelor; Luna & Eckman, on the Wedge; Hall and Davis, on the Bi-Metallist; Krisher & Barnhart, on the Mountain Top; Van Valkenburg, in Poughkeepsie Gulch; E. W. Creel, on the Wyoming; and Lundberg-Johnson, the Barstow. Most of these are mining by hand, but several are using air drills and hoisting machinery and others are considering such installations.

Lundberg & Johnson, lessees on the Barstow, have begun milling the winter's production of gold ore and are stopping a good body of lead-silver ore

found last winter. They are planning to operate the mill this summer on both ores.

The Paymaster Mines Co. has installed a boiler, hoist and Cameron No. 4 pump at the shaft of the Paymaster and is sinking on good ore. It will be shipping as soon as the railroad to Silverton is running and by the middle of summer will probably be in the market for air drill equipment, as the development of this and the Monas Queen is satisfactory.

Good work has been done by the Eurades Mining Co. under W. E. Cuthbert in repairing the bridge and road up Poughkeepsie Gulch, taking up lumber, machinery and supplies, building a compressor house and shop, and installing a compressor and other equipment in quick time. The plant will start at once and three drills will be put on drifting to develop several veins.

The Silver Mountain Mines Co. is developing the Kentucky vein principally and taking out good ore from the upper workings. Shipments will begin soon.

Mayday—Tom Welborn and Joe Clark, lessees on the Idaho dump, are shipping ore said to assay 2½ oz. per ton in gold.

Fred Brandiger is loading a car of high grade from his lease on the Idaho.

IDAHO

Seek To Restrain Big Creek Company at Kellogg from Polluting Town Water

Kellogg—The City Council of Kellogg has joined the local water company in starting proceedings against the Big Creek Mining Co. to restrain that company from polluting the waters of Big Creek through the operation of its mill. Kellogg receives its domestic water supply from Big Creek, the water being taken from the creek about a mile and a half below the mill. This action will be strongly resisted by the Big Creek company, which will be able to show that its mining and milling rights were acquired many years before the Kellogg water company entered, and, further, that the people of Kellogg are not dependent upon Big Creek for a domestic supply of water.

Murray—The Paragon Mining Co. is preparing to resume operations. It recently purchased the holdings of the Murray Hill company, which included a mill of 100 tons capacity and eight claims. Considerable lead and zinc ore is available and the mill is expected to start in about three weeks. The Paragon property is near by and will also provide ore for the mill during sinking. The shaft is now down 60 ft. This property has shipped considerable ore.

Enaville—In driving a crosscut to intersect two known veins on the Hypotheek, a new vein was cut at a distance of 170 ft. from the portal, 12 ft. wide, which gives strong evidence of carrying commercial values in silver and lead with further depth.

MICHIGAN

Quincy's New Furnace Nearing Completion—C. & H. Starts Construction of Two Flotation Units

Hancock—Quincy's smelter improvements will make the plant the equal of any in the district. A new furnace, 16 x 32 ft., with a 300-hp. boiler in bypass flue and with stack 100 ft. high, is nearing completion. It will handle 130,000 lb. in one charge. A 22-ft. casting machine for casting anodes and a 12-ton motor crane for charging the furnace and a 6-ton crane for the casting room are being installed. Present smelter requirements are low, owing to falling off in Quincy's production and custom demands, so that the changes are being made without inconveniencing work.

Calumet—Calumet & Hecla has started work on two additional units for the flotation plant at its mills. At present 75 per cent of the conglomerate tailings are treated by flotation. With the additional capacity everything from the conglomerate workings and from the sand pile will be thus treated.

Seneca's drift on the 13th level is now in 300 ft., the copper content of the Kearsarge lode material remaining fair. The company has coal enough for 90 days. Nothing will be done with the stamp mill this summer, as there is a satisfactory arrangement now in force with the Copper Range Co., which is treating Seneca ore at the Baltic mill. Shipments continue from the 3rd and 4th levels. The 50-ft. raise up to the 4th level is finished.

Menominee Range

Stambaugh—Foundations are being built at the Riverton mine for engine house, laboratory, headframe and idler stands. This equipment will serve the new shaft which will soon be the main producing outlet. Ore from the Dober and Isabella properties will also come through the new Riverton shaft. A new electric hoist of Allis-Chalmers manufacture has been received.

Norway—New centrifugal pumps and compressors, electrically driven, have been installed by the Oliver Iron Mining Co. at the Aragon mine. Power for their operation is obtained from the company's hydro-electric plant at Quinnesec Falls, on the Menominee River.

Marquette Range

Ishpeming—The installation of a new plunger pump, of Aldrich manufacture, has been completed at the Barnes-Hecker mine. The mine is now equipped with two pumping plants, one of which is held in reserve.

KANSAS

Discovery of Gold Reported Near Augusta

Augusta—Gold is reported to have been discovered in a bluff three quarters of a mile south of Augusta by C. A. Calkins, who has driven a 75-ft. tunnel into the bluff. Six men are employed. The find is said to have been made last February.

MINNESOTA

South Chandler Mine at Vermilion Closed—Oliver Iron at Hibbing Curtails Shipments

Mesabi Range

Hibbing—One shovel has been started cleaning up ore remaining in the bottom of the South Uno pit. It is expected that this work will be completed during the coming season.

Initial shipments from the new Webb pit of the Shenango Furnace Co. will be made during the week of June 21. These will be from the mixed rock and ore capping and will be screened and washed before consignment.

Oliver Iron, which has been shipping at the rate of 1,800 cars daily from this district, has reduced production to 800 cars per day because of the congested conditions at lower lake ports, which are adversely affecting both the incoming coal and the outlet for ore.

Chisholm—Dismantling of equipment at the Bruce prospect has been completed and the machinery sent elsewhere. This was quite thoroughly explored by the Wisconsin Steel Co., a subsidiary of the International Harvester Co.

Delivery has been completed of the new electric hoist to be used in cleaning up the ore left in the Shenango pit. Tracks used under the old method have been removed. It was necessary to lower the heavy machinery 200 ft. down the old pit banks by means of "dead man" and cable.

Buhl—A pole line for power for the new Wabigon pit has been completed and one carload of the new electric shovel has arrived. The disassembled shovel will comprise eleven carloads. Twenty 20-yd. air dump cars for use in stripping and a 40-ton locomotive Brownhoist for use at the property have also arrived and will be used at other mines of the Hanna Ore Mining Co. until needed at the Wabigon.

At the Stubler prospect thirty-four drill holes have been completed, thirty of which have found the ore. It is estimated that the drilling has so far disclosed over 1,000,000 tons of good non-bessemer ore. Two other holes are being drilled.

Virginia—Test pits have been started at the old Virginia pit under exploration option held by the Shenango Furnace Co. The Virginia was abandoned by Pickands, Mather & Co. in 1914.

Vermilion Range

Vermilion—The Chippewa Iron Mining Co. has surrendered its lease on the McDonald forty after developing the shaft to a depth of 350 ft. The company has taken an option for lease on the La Rue property and will remove its equipment from the McDonald for the development of the former.

The South Chandler mine has been closed temporarily, the reason assigned being a 69,000-ton stockpile with no prospect of shipment. The mine has been working but one shift and gave employment to 65 men.

MONTANA

Butte & Jardine Makes Rich Silver Strike

Champion District—Opening of a new ore deposit recently in the old Champion mine by the Butte & Jardine, which recently took over the property, is attracting considerable attention because of the high-grade character of the development, assays across 4½ ft. running more than 600 oz. of silver and varying in the amount of gold. The ore is ruby silver, crystals of which are in evidence, together with some wire silver and brittle silver. A ledge more than 12 ft. has been opened. The vein material is altered granite and talc, the latter showing seams of very high-grade ore. The Champion is situated six miles from Race Track station, about 25 miles west of Butte, and was an old time producer of considerable prominence. This ore was cut at a depth of 600 ft. by a tunnel being driven to get under old workings of the property, and was made unexpectedly, as the working had not reached its objective or near it. The development is regarded as one of the richest made in silver mining in some time. Shipments of ore have already been started.

This strike has caused renewed interest in the Emery silver property nearby and it is expected that the company, having completed the survey of a power line, will take steps to resume operations. A 50-ton mill is on the ground and considerable milling ore is on the dump.

NEVADA

White Caps Cuts New Ore—Tybo Smelter To Be Blown In at Once—Broken Hills District Active

Tonopah—The Tonopah Belmont reports more men underground than for several months past. Developments are satisfactory with work being carried on from the 800, 900, 1,000, 1,100 and 1,166 levels. Recent work on the 1,100 level has shown the presence of undeveloped ore in one of the branches of the Mizpah Fault vein and the South vein.

The Tonopah Extension is milling about 250 tons per day, and mine conditions as regards labor are good. Development work from its No. 2 and Victor shafts is at the rate of about 130 ft. per week. In the McCane shaft re-tilting has been completed, the station on the bottom level repaired and the old crosscuts are being cleaned out preparatory to starting regular development. Present plans include connections to be run to the No. 2 shaft and Victor shaft for ventilation. Water has delayed work on this level but is now under control.

The profits of the West End in April were \$52,235.10, and 4,681 tons of mine ore was produced of a gross value per ton of \$22.24, and 622 tons of Jim Butler lease ore. Development footage is at the rate of about 140 ft. per week. Work in the "76" territory continues in favorable formation. An air connec-

tion is being driven to the 600 level of the Monarch Pittsburg.

In the Mizpah Extension, the north-east drift on the south dipping vein has disclosed no new ore shoot, although erratic ore occurrences have been found. Regular stoping operations on the south dipping and north dipping veins have been carried on, with width and values unchanged.

Divide—In the Tonopah Divide a station is being cut at the 800 level. Several small stringers carrying encouraging values are reported to have been cut in making this excavation. The shaft is to be deepened to the 1,000-ft. point. About 100 ft. of development work was performed last week with no changes of importance.

Many smaller Divide properties are operating, but without developments of interest.

Hawthorne—The Midas Gold Mining Co., which was recently incorporated in California, is developing a property on Cottonwood Creek, 14 miles north of Hawthorne. A new 20-hp. Rix compressor and engine outfit is being installed to operate Cochise jackhammer drills in driving a crosscut to intersect the vein at 225 ft. The ore is a dark grayish quartz carrying a small amount of galena, 3 to 4 oz. of silver, and 2 to 5 oz. gold per ton. W. H. Brulé is president and G. Sieberst secretary of the company.

Manhattan—On the 800 level of the White Caps mine, drifting east on the orebody and crosscutting at two points 70 ft. apart has disclosed 22 ft. of \$34 ore and 12 ft. of \$40 ore respectively. The drift has about 100 ft. to go before cutting the east fault, which is regarded as the easterly boundary of mineralization. The ore so far developed on the 800 level contains less arsenic than on the 660 level. The shaft will be deepened to the 1,000 level. To date 1,420 tons of ore have been shipped, partial returns indicating a content of 26.8 per cent arsenic and 1.06 oz. of gold per ton. No ore reduction on the property is being attempted at the present time.

Tybo—The Louisiana Consolidated Mining Co., operating a lead-silver property at Tybo about 65 miles north-east of Tonopah, has announced that flotation has proven successful and that the 50-ton smelter is to be blown in at once. There is said to be a considerable tonnage of milling-grade ore in the mine above water level and no deep mining is planned at the present time. The success of this enterprise will encourage prospecting and development of other promising properties in the district.

Broken Hills—Considerable interest is being taken in the Broken Hills district, in the northwest corner of Nye County. The original owners shipped several hundred tons of high-grade ore from their workings, and a company has now been organized to take over the main strike. The ore is said to occur in fissure veins in andesite, and on the lower level, about 150 ft. down, milling-grade

ore is being developed. Developments are meagre. Many new companies are being organized to prospect extensions of the main strike as well as parallel veins.

NEW MEXICO

Lordsburg—The Co-operative Mining Co. has received returns of about \$1,400 on its first shipment, which consisted of 22 tons of ore and 5 of concentrates.

Steins Pass—The owners of the Devine zinc property, that adjoins the McGee Bros. mine, will join with Hanover, N. M., interests to erect a mill. Magnetic separators will be used it is said. The ore carries considerable franklinite.

The King & Queen Copper Co. is erecting a 40-ft. timber head frame upon its property. E. Perry is superintendent.

Connors Bros. have optioned their magnesite property on Ash Creek to an eastern refractories company. This property consists of three claims that will be tested by opening three parallel veins with a cross-cut tunnel at a depth of about 100 ft.

OREGON

Medford—The War Eagle company, operating in the Gold Hill district, will add a 25-ton furnace to its equipment for handling mercury ore.

The Bolen Creek Mining Co. of Medford, with placer and quartz properties in the Waldo district, has acquired water rights on Sucker Creek from the state, sufficient to develop 90-hp. Operation has been resumed. A saw mill will be erected.

Jacksonville—George Kerns and A. H. Gunnell, of Grants Pass, have taken a 60-day option on a gold-quartz vein west of Jacksonville.

UTAH

Smelter Embargo Delays Some Tintic Shipments

Park City—Drifting is being done by the Ontario Silver on the 1,800 level westerly from the shaft to get under the large body of ore on the 1,600 and 1,700-ft. levels that was found last year, and it is hoped that with greater depth the ore will improve in grade. Milling tests are being made. Another raise is to be started from the 1,700 level. It is planned to re-open and extend the 2,000 level. The labor shortage is, however, effecting operations seriously.

The road to the Keystone is now clear, and shipments of accumulated ore will start at once.

The old mine dump of the Keith-Kearns mine, which is now a part of the Silver King Coalition, has been leased to T. L. Walden, who is working a small force.

The Naildriver reports 3 ft. of good ore in the face of a crosscut on the 700 level; a face of ore on the 600; and 4 ft. of ore on the 900. There are stated to be 500 tons of ore awaiting shipment. The road to the property is now open.

Eureka—During the week ended June 19 some Tintic mines were forced to suspend shipments entirely on account of an embargo by one of the smelters in Salt Lake Valley, which was put in force to clear away the congestion of ores of a certain character. Fluxing iron ores continued to be taken as usual. The week preceding the same mines were held down to half their usual output. The embargo was lifted June 19, when shipments again went out as usual.

About 60 lessees are working at the Iron Blossom and royalties from lease ore are said to be sufficient to meet the present dividend requirements. High-grade ore has been opened in the course of this work, usually in stringers.

Lessees at the Centennial-Eureka are reported in practically all cases to be making better than wages.

The Bullion Beck shaft is being re-timbered so that at present lessees, who work through the adjoining Gemini and Centennial-Eureka, are not shipping. When repairs are completed, the ore accumulated underground will be taken out through the shaft.

Alta—The favorable shipping season from the Cottonwoods has opened and a good tonnage is expected this year. The South Hecla is the largest shipper. The management reports that it will send out ore from two promising stopes. The Cardiff in Big Cottonwood will send down its ores by way of truck to the valley smelters.

CANADA

British Columbia

Royal Bank of Canada Opens Branch at Alice Arm

Alice Arm—The Taylor Mining Co. is now running daily trains from tide-water to the Dolly Varden mine for ore. Large quantities of fuel oil, mining machinery and railroad construction material is being hauled to the mine. Extension of the railroad three miles to the Wolf mine, also owned by the company, will be completed this summer. Two air compressors will be installed at the Wolf at once.

The Dolly Varden has been developed by a series of horizontal tunnels. The first, known as tunnel No. 1, is driven in about 300 ft. below the apex of the hill on which the Dolly Varden claims are situated. About 40 ft. below this is tunnel No. 2, while the lowest working, tunnel No. 4, is about 120 ft. vertically below No. 1 and is in a distance of nearly 900 ft. Between No. 4 tunnel and No. 2 and a little to one side is tunnel No. 3. These four tunnels constitute the mine workings and are connected by a system of raises, No. 1 tunnel connecting with a glory hole at the surface. During the last winter the crew has been driving a new development tunnel, No. 5, 230 ft. vertically below No. 4. This tunnel is about 800 ft. in and has already crosscut the first orebody appearing in the upper tunnels and is being driven to the second body, which it is hoped will be struck at about 1,000 ft.

The ore broken in the various levels is passed through raises to No. 4 tunnel, whence it is delivered to bunkers at the upper terminal of a 2,000-ft., 2-bucket aerial tramway, by which it is conveyed to bunkers at the railway terminal, 600 ft. vertically below No. 4 tunnel. Here it is loaded into cars and taken over the narrow-gage railway to Alice Arm, where it is transferred into a 1,500-ton bunker and thence into barges, which are towed eighteen miles by water to the Granby company's smelter at Anyox.

O. B. Bush, of the Bush Mines, Ltd., of Stewart, has bonded the Climax and Silver Horde groups of claims adjoining the Wolf mine and considerable development work is planned. Mr. Bush is now on the ground.

All strikes are over. Considerable building is going on in the town of Alice Arm, but lumber is scarce. Much prospecting and staking is being done.



STEWART, B. C., THE GATEWAY TO THE SALMON RIVER DISTRICT

The season was late and snow remained long in the sheltered timbered areas, but is now gone from the hills as high up as 2,500 to 3,000 ft. About 800 claims have been staked so far this year.

The Royal Bank of Canada has opened a branch bank in Alice Arm. The general outlook is good.

Ontario

Porcupine—The Hudson Bay Mines, of Cobalt, have ceased operations on the Dome Lake mine, which is now flooded.

New Brunswick

Fredericton—The antimony mines at Lake George, twenty miles from Frederick, N. B., are attracting the attention of capitalists. An inspection is being made by Stanley E. Elkin, of St. John, president of the North America Antimony & Smelting Co., Ltd., with a view to development on a large scale, if investigations now in progress indicate the occurrence of the ore in sufficient quantities. A party of Montreal men will also visit the mines, including representatives of leading financial interests.

PERU

The Peruvian Copper & Smelting Co. has completed a 48-mile auto-truck road from Pachacayo on the Central of Peru R. R. to its copper properties at Yauricocha and its coal mines at Jautenhuasi. It has also constructed a copper smelting plant of two reverberatories of 200 tons daily capacity. A 100-ton blast furnace purchased in 1918 together with a 300-hp. hydro-electric plant is under construction. A second 300-hp. unit is planned. Twenty beehive coke ovens of 4 to 5 tons capacity every 48 hours have been completed, these being situated at the Cosmos mine on the auto road. Coke made as a test and shipped to the Casapalca smelter has given results equal to those obtained from Pennsylvania coke. This coke, it is claimed, will bring \$40 a ton at Callao, where it can be delivered for half this sum.

"Previous to 1919," according to the

last annual report, "the company had acquired 650 acres of copper property—"Yauricocha and Felicidad"; 40 acres of silver-lead property—"Jupiter and La Porfia"; and the Jautenhuasi coal properties of 3,382 acres. During the last year the company has increased its holdings by acquiring through denouncement from the Peruvian Government, three copper properties between Yauricocha and Felicidad containing 180 acres; 20 acres of silver-lead property near Yauricocha; 200 acres of coal near Tingo; 500 acres of coal near Mangachocha; and 160 acres of copper property near Tingo, which have added over one thousand acres of valuable mining property to the company's holdings."

At the Yauricocha mine the two main shafts, respectively 225 and 400 ft. deep, are being enlarged and timbered. The 225-ft. level crosscut in No. 1 shaft is in ore running 23 per cent copper, and the main drifts in No. 2 are in ore of similar grade. Hoisting machinery, compressor plant, machine shop and other equipment have been installed at these two shafts.

THE MARKET REPORT

Published in part in San Francisco and mailed from there to our Western subscribers as a special service without charge pending the arrival of the *Engineering and Mining Journal*

Silver and Sterling Exchange

June	Sterling Exchange	Silver			June	Sterling Exchange	Silver		
		New York, Domestic Origin	New York, Foreign Origin	London			New York, Domestic Origin	New York, Foreign Origin	London
17	397	99½	90	49½	21	396½	99½	92½	51½
18	397	99½	89	49½	22	398	99½	93	52½
19	397	99½	91½	50½	23	397½	99½	92½	51½

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.

On the authority of the Secretary of the Treasury, we quote 100c. per oz. for silver, 1,000 fine, delivered at the option of the Director of the Mint to the New York Assay Office or to the mints in Philadelphia, Denver, or San Francisco, and proved to the satisfaction of the Treasury Department to have been mined, smelted, and refined in the United States. This quotation is retroactive to May 13.

Daily Prices of Metals in New York

June	Copper		Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.	
17	17.85	44.25	46.75	8.15	7.95	7.30	
18	17.80	45.25	48.00	8.25	7.90	7.30	
19	17.75	45.25	48.00	8.25	7.90	7.30	
21	17.75	47.50	49.00	8.15	7.90	7.35	
22	17.85	48.00	50.00	8.15	7.90	7.35	
23	17.85	47.00	49.00	8.15	7.90	7.40	

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 prompt and nearby deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point. All prices are in cents per pound.

Copper is commonly sold on terms "delivered," which means that the seller pays the freight from refinery to buyer's destination. The delivery cost varies, and it would be confusing to figure net prices on individual transactions. Consequently, an average deduction is made from the "delivered" price. At present the average cost of delivery from New York refineries is 0.15c. per lb., and that deduction is made to arrive at the New York price. When copper is sold f.o.b. or f.a.s. New York, of course no deduction is made.

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 special shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

June	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3 M	Spot	3 M	Spot	3 M
	Spot	3 M							
17	82½	84½	98	240	243	31½	33	39½	41½
18	82½	85½	97	245	249	31½	33½	38½	40
19
21	86½	89½	97	256	259	32½	34½	41	42½
22	86½	89½	99	261	265	33½	34½	40½	42½
23	86½	88½	100	256½	260	32½	34	40½	42½

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

Metal Markets

New York, June 23, 1920

General weakness continues in the metal market. A pronounced strengthening in London over the week end offered some hope to American sellers, but today's recession indicates that conditions there are still unsettled. With consumers in general disinterested, and with a great deal of forced liquidation among the London speculative element, the prices there dominate the local markets. Labor unrest became more pronounced in this country during the last week, and no further

improvement in the railroad situation is evident; in fact, conditions are worse in Philadelphia and Baltimore, with an increased number of switchmen absent from their regular duties. The strike in the Connecticut brass mills has cut down the consumption of copper and zinc materially, and the labor difficulties promise to continue for some time. Machine guns have had to be brought out to curb the lawless element. The A. S. & R. Perth Amboy refinery is closed by a strike, which it is feared may spread to other local refineries. The tie-up is not expected to last long, however.

Copper

No change can be reported for the last week, other than a further weakening in the outside market. The large producers in general continue to hold for 19c., but are getting almost no business, for lots as large as 500 tons can be purchased outside for July and August delivery at less than 18c. Copper for prompt shipment from Japan can be had at these prices, including wire bars and rods. The metal is of Australian, American, and Japanese origin. Consumers seem to be well supplied for current requirements, and producers have stopped predicting when the next buying movement will start.

Lead

June and July lead has been in good demand at current prices, with the supply a little better than early in the month. Local selling of duty-paid lead has possibly eased the situation, prices on this being shaded a little under those asked for the best domestic brands. Lead for August and September delivery may still be obtained for about ½c. under the prices which we quote. Sales have not been numerous, though of larger individual volume than those for prompt delivery. Production in the West is decreasing, on account of laborers going into the harvest fields and other more congenial pursuits.

Zinc

Producers are out of the market at current prices, but arbitrage sales of London commitments are sufficient to take care of domestic demands. Any English demand would, without doubt, put the market up very quickly, but when this will come nobody knows. The domestic situation is unchanged.

Tin

Tin has been quiet, with slowly rising prices, following London. Consumers are not buying to any extent; some were greatly disappointed at the advance over the week end, and are waiting for the recent slump to continue. Some buying by London interests has occurred, the recent low prices in the local markets offering an opportunity for an arbitrage business. The strike at Perth Amboy has compelled the A. S. & R. to cease quoting electrolytic tin for the last few days.

Straits tin for future delivery: June 17th, 46½@46¾c.; 18th, 47½@47¾c.; 19th, 47½@47¾c.; 21st, 48½@49c.; 22d, 49@49½c.; 23d, 48c.

Arrivals of tin in long tons: June 12, China, 50; June 15, London, 25; June 16, China, 10; June 17, Rotterdam, 50; June 21, Singapore, 400; Liverpool, 50.

Silver

As a result of negotiations between the producers and vendors of silver bullion on the one hand, and the U. S. Treasury, through the Director of the Mint, on the other hand, our Government, under the Pittman Act, is now prepared to purchase "Domestic Silver," that is, silver mined and refined in the United States, at \$1 per oz. 1,000 fine, provided this price, adjusted to the equivalent price for silver 999 fine and the cost of delivery from refinery to the Mint, is paid in settlement to the producer. Silver will now be quoted as follows:

Domestic silver on the basis of 99½c. per oz. 999 fine.

Foreign silver as price is arrived at and determined by the world markets.

Mexican Dollars—June 17th, 68½c.; 18th, 68c.; 19th, 69½c.; 21st, 70¼c.; 22d, 70¼c.; 23d, 70¼c.

Gold

Gold in London on June 17th, 103c. 6d.; 18th, 103s. 2d.; 21st, 103s. 4d.; 22d, 103s. 4d.; 23d, 103s. 6d.

Foreign Exchange

Sterling yesterday reached \$4 for the pound, the highest level since April. Further shipments of gold from England, up to \$100,000,000, are rumored. The gradual improvement in European conditions also reacted favorably on the Continental exchanges. On Tuesday, in units to the dollar, francs were 11.82, and lire 16.12. German marks, 2.73c. New York funds in Montreal, 13 per cent premium.

Other Metals

Aluminum—Ingot, 33c. per lb., with 32@33c. open market for 98@99 per cent virgin.

Antimony—Market weak. Spot, 8@8½c. per lb.; Cookson's "C" grade, 14c. Chinese and Japanese brands, 7½@8c. W. C. C. brand, 9c.

Antimony, Needle—Chinese needle antimony, lump, firm at 9½c. per lb. Standard powdered needle antimony (200 mesh), 12 to 15c. per lb. Unchanged.

Bismuth—\$2.70@\$3 per lb., 500-lb. lots.

Cadmium—Nominal, \$1.40@\$1.50 per lb. Unchanged.

Cerium Metal—Ingot form, \$8@\$9 per lb.

Cobalt—Metal, \$2.50 to \$3 per lb.; black oxide, \$2 per lb.

Iridium—Nominal, \$300 per oz. No business.

Magnesium—Metallic, 99 per cent or over pure, \$1.60@\$1.85 per lb. f.o.b. Niagara Falls.

Molybdenum Metal in rod or wire form, 99.9 per cent pure, \$32@\$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c.; Monel metal, shot, 35c.; blocks, 35c., and ingots, 38c. per lb.

Osmium—Open market, \$50@\$75 per troy oz.

Palladium—\$75@\$85 per oz.

Platinum—Market weak at \$80@\$90 per oz. Little business transacted.

Quicksilver—Market quiet. \$90 per 75-lb. flask. San Francisco wires \$87; firm.

Ruthenium—\$200@\$220 per troy oz. Unchanged.

Selenium, black, powdered, amorphous, 99.5 per cent pure, \$1.75@\$2 per lb.

Thallium Metal—Ingot, 99 per cent pure, \$18@\$20 per lb.

Metallic Ores

Bauxite—Containing about 52 per cent alumina, less than 2 per cent iron oxide and up to 20 per cent silica, and artificially dried to contain not more than 4 per cent free moisture, \$10 per gross ton at mine; 54 per cent alumina and about 15 per cent silica, \$11; averaging 57 per cent alumina, 8 to 12 per cent silica, less than 3 per cent iron oxide, \$13 on basis of 8 per cent free moisture. Ores of very low silica content suitable for manufacture of aluminum oxide and hydrate of alumina command a fancy price.

Chrome Ore—Guaranteed 50 per cent Cr₂O₃ foreign ore with a minimum of 6 per cent silica, 72@80c. per unit, New York. California concentrates, 50 per cent Cr₂O₃ and upward, 60@65c. per unit, f.o.b. mines. One large producer advises us that there is little movement in either chrome ore or ferrochrome, prices remaining unchanged.

Iron Ores—Lake Superior ores, per ton delivered at Lower Lake ports: Old Range bessemer, \$7.45; Old Range non-bessemer, \$6.70; Mesabi bessemer, \$7.20; Mesabi non-bessemer, \$6.55. There has been some delay in unloading cargoes at Lake ports.

Manganese Ore—High-grade ore, 80 @85c. per unit. Chemical ore (MnO₂), \$75@\$85 per gross ton.

Molybdenum—Nominal, 85c. per lb. of contained sulphide for 85 per cent MoS₂. Situation unchanged.

Tantalum Ore, guaranteed minimum 60 per cent tantalic acid, 65@70c. per lb. in ton lots.

Titanium Ores.—Ilmenite, 52 per cent TiO₂, 2c. per lb. for ore. Rutile, 95 per cent TiO₂, 20@25c. per lb. for ore, with concessions on large lots or running contracts.

Tungsten Ore—Scheelite, 60 per cent WO₃ and over, per unit of WO₃, \$7 f.o.b. mines; wolframite, 60 per cent WO₃ and over, per unit of WO₃, \$6.50@\$7.50 f.o.b. mines.

Uranium Ore (Carnotite)—\$2.75@\$3 per lb. for 96 per cent of the contained oxide (U₃O₈). Ores must contain a minimum of 2 per cent U₃O₈.

Vanadium Ore—\$1 to \$3 per lb. of vanadium content.

¹Furnished by Foote Mineral Co., Philadelphia, Pa.

Zircon—Washed, iron free, 10c. per lb. Zirkite—\$90@\$100 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at \$1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., June 19—Zinc blende, per ton, high, \$47.20; basis 60 per cent zinc, premium, \$45; Prime Western, \$42.50; fines and slimes, \$40@\$37.50; calamine, 40 per cent zinc, \$36. Average settling prices: Blende, \$41.62; calamine, \$38; all zinc ores, \$41.59.

Lead, high, \$102.20; basis 80 per cent lead, \$100@\$90; average settling price, all grades of lead, \$101.28 per ton.

Shipments for the week: Blende, 8,188; calamine, 82; lead, 1,735 tons. Value, all ores the week, \$520,480.

Though the price of lead dropped \$10 per ton today, the ore shipped this week was almost all settled for on last week's basis.

Buyers of blende today received orders to not pay over \$42.50 basis for any Prime Western grades, and sellers would not sell on that basis until late this afternoon.

Platteville, Wis., June 19—Blende, basis 60 per cent zinc, \$48.25 for high grade. Lead ore, basis 80 per cent lead, \$95 per ton. Shipments for the week: Blende, 861; calamine, 120; lead, 36; sulphur ore, 74 tons. Shipments for the year: Blende, 33,497; calamine, 2,180; lead, 3,027; sulphur ore, 878 tons. Shipped during the week to separating plants, 2,648 tons blende.

Non-Metallic Minerals

Asbestos—Per short ton f.o.b. Thetford, Broughton and Black Lake mines, Quebec, Canada. Freight rate from mines to Sherbrooke, Quebec, over Quebec Central R.R., 20c. per cwt.; from Sherbrooke to New York, 27½c. carload lots. Crude No. 1, \$1,800@\$2,500; crude No. 2, \$1,100@\$1,500; spinning fibres, \$400@\$700; magnesia and compressed sheet fibres, \$300@\$400; shingle stock, \$100@\$150; paper stock, \$60@\$80; cement stock, \$17.50@\$30; floats, \$8.50@\$15 per short ton. Crude No. 1, f.o.b. Thetford Mines, freight to New York \$8.45 per ton in carload lots. Five per cent Canadian royalty export sales tax must be added to these prices.

Barytes—Crude, 88 to 94 per cent barium content, \$8@\$10 per net ton; ground, (white) \$22@\$25 in bags, carload lots; (off-color) \$18@\$20 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, \$12 per gross ton; ground, (white) \$23@\$25; ground (off color) \$16@\$19 per net ton, f.o.b. Cartersville, Ga. Crude, 88 to 94 per cent, \$23; ground, (white) \$40.50; ground, (off color) \$27 per net ton, less than carload lots, f.o.b. New York.

Chalk—Domestic, extra light, 5@6c. per lb.; light, 4½@5½c.; heavy, 4@5c.; English, extra light, 5@7c.; light, 5@6c.; dense, 4@5c. lb., all f.o.b. New York.

China Clay (Kaolin)—Imported lump, \$25@\$35; imported powdered, \$30@\$60; domestic lump, \$10@\$20; domestic

powdered, \$25@30, all per net ton, f.o.b. New York. Crude, \$8@12 net ton, f.o.b. Virginia points; ground, \$15 @ \$40 net ton, f.o.b. Virginia points.

Feldspar—Crude, \$7.50@8 per gross ton, f.o.b. Maryland and North Carolina points; ground, \$22@25 car lots, f.o.b. Baltimore; ground, \$16@20, f.o.b. North Carolina points; up to \$16 to \$19 per ton, No. 1 ground, f.o.b. New York State.

Fluorspar—Gravel, f.o.b. mines, \$22.50@25; lump, \$17.50 f.o.b. Tonuco, N. M.

Fuller's Earth—Domestic, granular, \$25; powdered, \$18, f.o.b. mines, Florida; imported, \$35@40 per ton.

Graphite—Crucible flake, 80 per cent carbon content, 5c. per lb.; 90 per cent, 10c.; 30 per cent (dust polish grade) 1c.; 50 per cent (dust facing grade) 2c., f.o.b. Ashland, Ala.; 85 per cent carbon content, 8c.; 88 per cent, 9c.; 90 per cent, 10c., all f.o.b. New York. Mexican, amorphous, \$45@55 per short ton; Korean, 3c. per lb.; Madagascar, 8c.; Ceylon, 4c. @ 15c.

Gypsum—Wholesale, plaster of paris, carload lots, is \$3.75 per 250-lb. bbl., alongside dock New York.

Kaolin—See China Clay.

Magnesite—Dead burned, for refractory (see Refractories).

Magnesite, Calcined—High-grade caustic calcined, lump form, \$35@40 per ton, carload lots, f.o.b. California points. Freshly ground calcined, suitable for flooring trade, \$65@75 per ton, f.o.b. Eastern points.

Mica—Imported block mica slightly stained, per lb.: No. 6, 50c.; No. 5, \$1.20 @ \$1.40; No. 4, \$2@3; No. 3, \$4.25@5; No. 2, \$5.50@7; No. 1, \$8. Clear block: No. 6, 55c.; No. 5, \$2; No. 4, \$4; No. 3, \$5.75; No. 2, \$7; No. 1, \$9; A1, \$14; extra large, \$25, all f.o.b. New York.

Monazite—Minimum of 6 per cent thorium oxide, \$42 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports, 68 per cent tricalcium phosphate, \$6.85; 70 per cent, \$7.35; 74 to 75 per cent, \$10; 75 per cent minimum, \$10.50; 77 per cent minimum, \$12.50.

Pumice Stone—Imported, 3@6c. per lb.; domestic, 2c. per lb. Unchanged.

Pyrites—Placing of additional tax in Spain is holding down imports of this mineral. Spanish furnace size ore, 16c. per unit. Freight range from 15s. to 17s. No change in domestic situation.

Quartz—(Acid tower) fist to head, \$10; 1½ to 2 in., \$14; rice, \$17, all net ton, f.o.b. Baltimore lump, carload lots, \$5@7.50 net ton, f.o.b. North Carolina mines.

Sulphur—Unchanged; \$18 per ton for domestic; \$20 for export, f.o.b. Texas and Louisiana mines.

Talc—Paper making, \$9.50@14 per ton; roofing grades, \$8@9; rubber grades, \$9@15, all f.o.b. Vermont. California talc sells for \$20@35, talcum powder grade. Southern talc, powdered, carload lots, \$12 per ton; less than carload, \$15, f.o.b. cars. Freight

to New York, \$5.25 per ton, carload lots; less than carload lots, \$9.25.

Mineral Products

Arsenic—White arsenic, 14@15c. per lb.; sulphide, powdered, 20@21c. per lb., f.o.b. works.

Nitrate—Soda, \$3.85@3.90 per cwt., ex vessel, Atlantic ports. Market quiet.

Potassium Sulphate—Domestic, \$2.25 @ \$2.50 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocobalt—For 15-18 per cent material, \$200@250 per ton, f.o.b. Niagara Falls, N. Y. Unchanged.

Ferrocerium—Per lb., \$12@15. Foreign conditions as affecting the price of American goods remain unchanged.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 17@18c. per lb. of chromium contained; 4 to 6 per cent carbon, 18@19c.

Ferromanganese—For 70 to 80 per cent Mn, \$200@250 per gross ton, f.o.b. works. Spiegeleisen, 16 to 20 per cent Mn, \$70@75 per gross ton.

Ferromolybdenum—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, \$2.25@2.75 per lb. of contained metal.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, \$60@65; 50 per cent, \$80@90; 75 per cent, \$150@160.

Ferrotungsten—Unchanged at 85c @ \$1.15 per lb. contained tungsten.

Ferro-uranium—35-50 per cent U, \$7 per lb. of U contained. Unchanged.

Ferrovanadium—Basis 30-40 per cent, \$6.50@7 per lb. of V contained.

Metal Products

Copper Sheets—No change in Jan. 7 price of 29c. per lb.; wire, quoted 22@22½c.; market slightly weaker.

Lead Sheets—Full lead sheets, 12c.; cut lead sheets, 12c. in quantity, mill lots. Unchanged.

Nickel Silver—Unchanged at 39c. per lb. for 18 per cent nickel.

Yellow Metal—Dimension sheets, 26c.; sheathing, 25c.; rods, 3 to 3 in., 23c. Unchanged.

Zinc Sheets—\$12.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 12c. per lb. Unchanged.

Refractories

Chrome Brick—For 9-inch straights and sizes, \$80@90 per net ton, f.o.b. Baltimore. Unchanged at \$70@75 per net ton, f.o.b. Chester, Pa.

Chrome Cements—Unchanged at \$45 @ \$50 per net ton, f.o.b. Chester, Pa.

Clay Brick—First-quality fire clay. \$45@50 per 1,000, f.o.b. Clearfield, Pa.; second quality, \$40@45 per 1,000, f.o.b.

¹ Furnished by Foote Mineral Co., Philadelphia, Pa.

Clearfield, Pa. Fire clay, \$5 to \$7 net ton, f.o.b. Baltimore. First quality fire brick, \$75 per 1,000, plants, New Jersey; \$45, plants, St. Louis.

Magnesite—Dead-burned, \$48@55 per net ton, f.o.b. Chester, Pa.; brick, 9 x 4½ x 2½ in., \$90@95 per net ton, f.o.b. Chester, Pa. Nine-inch straights, \$90 per net ton, f.o.b. Baltimore; 9-inch sizes and shapes larger than 9-inch, regular extras. Dolomite, \$12.50 per ton, f.o.b. Ohio.

Silica Brick—Nine-inch straights and sizes, \$55 per 1,000, f.o.b. works, Chicago district; \$50@55 per 1,000, f.o.b. Mount Union, Pa.

Iron Trade Review

Pittsburgh, June 22, 1920

Possibilities of labor troubles in the iron and steel industry loom large in the week's news. The new situation appears to arise from the jealousy of the Amalgamated Association, prior to the Homestead strike of 1892 an important labor organization in the iron industry, but in recent years confined practically to the hot-mill labor at about 40 per cent of the sheet and tin plate plants and to the iron mills at Pittsburgh and farther west. The association endeavored unsuccessfully to commit the American Federation of Labor at the Montreal convention to a declaration that it should have exclusive jurisdiction, in the matter of organizing, to the whole iron and steel industry.

Some of the sheet and tin mills have withdrawn from the market. Generally speaking, demand for steel products is light. The traffic situation improves slowly, and at most mills shipments are somewhat less than production, which is at a fair rate. Prices are unchanged, though the general tendency is for the market to ease off, particularly for prompt shipment.

Pig Iron—The market is quiet, with prices strictly held at \$43 for bessemer, \$43.50 for basic, and \$45 for foundry, f.o.b. Valley furnaces, freight to Pittsburgh being \$1.40.

Steel—Sales have been made of a few thousand tons of small billets at \$67.50 and about 5,000 tons of openhearth sheet bars at \$75, the price at which the last bessemer bars went. Standard billets are quiet, nominally quotable at \$60@65.

Charcoal and Coke

Charcoal—Willow 7c. per lb. in bbls.; hardwood, 4c. per lb., in 250-lb. bbls.

Buffalo—For 72-hour Connellsville foundry, \$15; for 48-hour furnace, \$13.50 per ton.

Connellsville—Market stiffer. Prompt furnace, \$15@15.50; prompt foundry, \$16@16.50; contract foundry, \$12 per net ton at ovens. Nominal.

New River—Furnace, \$12@14, and foundry, \$14@15 per ton.

Pocahontas—Furnace, \$14@15 per ton.

Wise County—Furnace, \$14@14.50 per ton; foundry, \$15@15.50 per ton.

Copper Prosperity Deterrents

No Material Change in the Situation, Despite Favorable Statistical Position—Importance of Germany Overlooked—Decline in Silver and Impending Coal Shortage Blows to Copper-Market Activity

THE common but seemingly well-substantiated impression that deflation has actually begun is nothing new to copper producers. Their copper product has apparently stood the brunt of the attack on high prices, and, being all along in a vulnerable position, has had to fight strenuously to hold its position against the general economic readjustment. Despite profuse and emphatic predictions during the spring that the unfavorable portion of copper would soon improve, no marked betterment in the outlook is noticeable.

Figures are readily advanced to illustrate the favorable but yet illogical situation in copper and to explain its relatively low market price when compared with other commodities, but these figures, comforting as they may seem, have afforded no tangible relief in the matter. Occasional reports that foreign buying is to begin in earnest lend interest to the inactive condition of the market and appear to portend important developments and improvements in foreign purchases of American copper, but such reports to date have had little stimulative effect.

SURPLUS STOCKS STILL A FACTOR, BUT SUBORDINATE

What is the real condition of the copper market and what are the immediate prospects of its improvement? One of the chief handicaps that the copper industry has had to meet has been the large unsold copper stocks on hand. A month ago these stocks were estimated at 440,000,000 lb.—about four months' production. A present estimate would place the figure somewhat higher, at 500,000,000 lb., mainly due to decreased sales for May. However, estimates made by presidents of leading copper companies and others range all the way from 300,000,000 to 700,000,000 lb., from which one fact seems deducible: that the copper surplus no longer is so unwieldy and is becoming a minor consideration in the market. The heavy inroad made into these excess stocks last winter by unprecedented sales has still left its impression, but the good beginning has not been duplicated lately; in fact, tight money conditions have forced much liquidation of copper that was held in anticipation of filling future requirements. The general world consumption has been satisfactory, and, if the estimate of two of the officials of leading copper companies at 2,500,000,000 lb. annually is correct, is starting. Of the world consumption the United States is said to have furnished about 60 per cent.

THE IMPORTANCE OF EUROPEAN REQUIREMENTS

Although the domestic consumption has materially helped to reduce the copper surplus, the hope for the future lies more in the expansion of the market abroad than in the domestic demand, for roughly 45 per cent of our annual production is normally exported—in 1919 only 28 per cent was exported. A consideration of the general foreign copper consumption and its present state is a profitable study and helps to clarify the existing situation. Normally, Germany, France, and England are our chief foreign customers of copper in the order named. During the two pre-war years 1912 and 1913 these three countries accounted for about 70 per cent of our exports of refined copper, but in the following significant proportion: Germany was formerly our greatest European customer and used more United States copper than her two competitors combined; France came next, and then England. In 1913, for example, Germany took about 38 per cent of our exported copper, France consumed approximately 17 per cent, and England about 15 per cent. During the war all exports of copper to Germany were cut off, and the consumption of France and England, stimulated by war requirements, increased enormously, England quadrupling her copper

imports, and France trebling hers. In 1919, the first post-war year, the imports dropped precipitately to figures a little above the pre-war level for England and below for France, and Germany was out of the market almost entirely.

GERMANY'S IMPORTANT POSITION

There is little doubt that Germany's heavy imports of copper before the war were due partly to extensive military requirements, but it should not be forgotten that the country's intensive industrial development, particularly in important electrical lines, consumed enormous quantities of United States copper. The Treaty of Versailles has not appreciably altered Germany's ability to use copper, provided economic conditions allow the industrial life of the nation to return to normal, but the grave financial condition of Germany and the unsettled political future of the country will not facilitate the financing of any project to acquire large amounts of American copper. This is probably one of the main reasons why Germany has not prominently figured in the plans of American copper producers to market their copper abroad. They have turned more to France, whose improving financial status encourages that attention.

Copper export business has been daily expected to materialize, but no marked improvement in the situation has arisen. The recent report that France will take 75,000 tons over a period of two years has failed to change the course of the aimlessly drifting copper prices. Impressive though this business may seem to an inactive copper market, it is relatively small when compared to the 400,000 tons of copper exported annually from this country. One fact seems poignant—no substantial betterment in the foreign copper market can occur until Germany once more is a factor in the foreign consumption or unless some other country takes her place.

General European conditions are encouraging. The improvement in the exchanges is helping to restore the financial position of the nations, but labor troubles are still a great disturbing influence, particularly in Germany and England. Copper concentrates normally imported into England are being partly diverted to the United States because of labor unrest at some of the British smelters. France is showing splendid recuperative powers and Belgium is also rapidly recovering. English demands have not figured markedly in current European imports of copper, as requirements are believed to be temporarily filled.

The poor foreign copper inquiry accentuates the need of an enlarged domestic support, similar to that which greatly assisted matters last winter. The public-utility companies in the United States are counted upon, in their program of expansion, to absorb large quantities of copper, but the financing of new projects is not facilitated by present money-market conditions in this country. Besides, the unfortunate strikes in the brass mills and electrical manufacturing industries have not helped domestic consumption.

THE DROP IN SILVER A BLOW TO COPPER PRODUCERS

To aid in lowering the high cost of copper production, operators have relied upon the high price of silver produced as a byproduct. The recent sharp drop in silver will increase the cost of copper production, particularly for such companies as Anaconda, Phelps Dodge, American Smelting & Refining Co., Calumet & Arizona, Utah, and others, which produce large quantities of byproduct silver. The Lake copper companies, Calumet & Hecla and others, which do not produce much silver, will not be greatly affected—their high costs have never been offset appreciably by silver recovery; but districts in Montana with high labor costs

will greatly miss the higher precious-metals credit that has helped to alleviate the high cost of production.

The break in silver is another straw on an exceptionally strong camel that is sustaining a staggering load. The coal shortage and threatened famine are other impending burdens which will not help to ease the situation. The coming Presidential election and uncertain political developments may also have an effect on the copper market. We have not mentioned railroad congestion, but it is a further embarrassment to an active copper industry. Under pressure of all these circumstances, it is hard to believe that the situation can become much worse and that further developments will mature to harass the market. Any development in the near future should logically furnish a substantial betterment in the situation. Copper apparently has reached the bottom.

New Affidavit Needed for Sale of Mixed Silver to Government

Instructions were given the U. S. Assay Office at New York and the U. S. Mints at Philadelphia, San Francisco, and Denver on June 15 that the following form of preliminary affidavit is to be used to cover all purchases of mixed silver under the Pittman Act and is to be forwarded to the Superintendent of the Mint or Assay Office by vendors in each case immediately upon the acceptance of a tender of silver. Offers of silver in excess of 10,000 oz. will be received by the Director of the Mint at Washington.

AFFIDAVIT BY VENDOR IN CONNECTION WITH PURCHASE OF SILVER UNDER PITTMAN ACT

State of..... } ss.
County of..... }

In order to make a sale of silver to the Director of the Mint in accordance with the provisions of the Pittman Act approved April 23, 1918, the undersigned hereby represents and certifies under oath that he is the _____ of _____

(Title of Office) (Name of Vendor)
owner of certain silver to the amount of _____ fine ounces more or less, forwarded to the United States Mint at _____ on the _____ day of _____ 1920, and delivered for sale to the Director of the Mint under the provisions of said act for account of said vendor; that said silver is the product of mines situated in the United States and of reduction works so located, being either (1) wholly without admixture of the production of foreign mines or reduction works, or (2) part of a mixture of foreign silver and domestic silver delivered to domestic reduction works since Jan. 17, 1920, and within the proportionate part of such mixed product which represents the product of mines located within the United States and of reduction works so located, delivered by much mines to such reduction works since Jan. 17, 1920, after taking into account sales heretofore made to the Director of the Mint under said act; and that the vendor will forthwith file with the Superintendent of said Mint such statements and exhibits from its books of account and also such supporting affidavits and sworn statements or exhibits by itself and by the miner, smelter, and refiner, as may be demanded by the Director of the Mint under said act.

(Signature of Vendor or duly authorized officer.)

Subscribed to and sworn to before me this _____ day _____, 1920.

Notary Public

The forms of affidavits authorized on May 15 are declared to be still appropriate in the case of silver wholly produced in the United States. Suggested forms for use as supporting affidavits in the case of mixed silver are being prepared, but, as may be noted from the form of the affidavit shown, deliveries of mixed silver may be made after filing the preliminary affidavit subject to later filing of the necessary supporting affidavits and other proof.

This new affidavit is the outcome of the conferences between Government officials and smelting companies' representatives. It is a recognition by the Government, and at the same time a welcome concession to the mining and smelting companies, that have encountered serious difficulties in trying to separate their silver product with respect to origin—as required by the Government to insure beyond all question of doubt the domestic mining and refining of the silver. The modified affidavit should go far to facilitate the marketing of the silver produced in the United States at \$1 per ounce.

COMPANY REPORTS

Central Mining & Investment Corporation, Ltd.

Gold; South Africa

The annual report of the directors of the Central Mining & Investment Corporation, Ltd., for the year 1919, shows the extent to which this company is interested in mining. It carries on a general financial and investment business in connection with the development of twenty South African gold mines, but has other interests as well, comprising diamond mining in South Africa, lead production in Rhodesia, tin mining in Nigeria, oil developments in Trinidad, and railway lines in Chile. It is also interested in the British Metal Corporation, in the Chemical & Metallurgical Corporation, which controls the Elmore process for treating zinc-lead-silver ores, and the Cumberland Coal, Power & Chemicals Co., Ltd., a project to manufacture synthetic ammonia, in British colonies.

The accounts show a profit of £809,846 4s. 10d. for the year 1919, from which dividends amounting to £382,500 were paid on the 425,000 shares of £8 par value each. The "Appropriation Account" showed a balance on Dec. 31, 1919, of £186,872, 12s. 4d.

The group of South African gold mines in which this company is interested has a milling capacity of 14,358,000 tons per annum, but only 74 per cent of the available capacity was utilized during the year. Average results from mining operations for the group were as follows:

Average yield (calculated at standard price of gold).....	29.7s.
Average additional revenue from sale of gold.....	3
Average working cost, all expenses except taxes.....	24.3
Average taxes.....	1.4
Average net resultant profit from tonnage milled (exclusive of premium).....	4.0
Average net resultant profit from tonnage milled (inclusive of premium).....	7.0
Average net profit from other sources.....	4.0
Average amount of dividends paid.....	5.9
Average amount reinvested on capital amount, as near as can be ascertained.....	1.2
Average amounts carried forward by various companies	6.3

These results are an interesting commentary on the effect of the "gold premium" in South African operations.

Round Mountain Mining Co.

Gold; Nevada

The annual report of the Round Mountain Mining Co. for the year 1919 covers the placer and lode operations of the company. In the placer operations for the year, \$46,258.32 was recovered in bullion, and lode operations by lessees yielded bullion to the value of \$112,623.14, of which \$25,350.94 reverted to the company as royalties. Total revenues were \$113,533.01. Total development, stoping, milling, and marketing charges were \$19,433.89. General costs were \$30,560.66; placer operating costs were \$54,045.02; and total operating costs, \$104,039.57, which gave a net operating realization of \$9,493.44. Depreciation charges amounted to \$70,069.43. Depletion charge was \$43,480. No dividends were disbursed in 1919.

Rand Mines, Ltd.

Gold; South Africa

The directors' report of the Rand Mines, Ltd., shows that for the year ending Dec. 31, 1919, the company's income from dividends amounted to £531,791, as against £458,589 for the previous year. The total profit was £846,568, as against £528,961 for 1918, and of this £303,925 is due to share realizations.

The two interim dividends declared during the year amounted to 5s. per 5s. share, or 100 per cent of the issued capital of £531,498 15s., as against 4s. 3d., or 85 per cent., in 1918. The amount carried forward is £865,821, an increase of £504,747 on the balance brought forward from the previous year.

The Rand Mines, Ltd., has extensive interests in about thirty-four gold mines of South Africa.

MINING STOCKS

Week Ended June 19, 1920

Stock	Exch.	High	Low	Last	Last Div.	Stock	Exch.	High	Low	Last	Last Div.
COPPER						GOLD					
Adventure	Boston			*80		Alaska Gold	N. Y.	1 1/2	1 1/2	1 1/2	
Ahmeek	Boston	62	62	62	Mar. '20, Q	Alaska Juneau	N. Y.	2	2	2	
Alaska-B.C.	N. Y. Curb	1 1/8	1 1/8	1 1/8		Carson Hill	N. Y. Curb	30 1/2	27	30 1/2	
Alouez	Boston	30	30	30	Mar. '19, 1.00	Cresson Gold	N. Y. Curb			1 1/2	Mar. '20, 1.10
Anaconda	N. Y.	57	56	56 1/2	Feb. '20, Q 1.00	Dome Ex.	Toronto	*26	*23	*23 1/2	
Ariz. Com'l.	Boston			10 1/2	Oct. '18, 50	Dome Lake	Toronto	*5	*5	*5	
Big Ledge	N. Y. Curb			9 3/8		Dome Mines	N. Y.	9 1/2	9 1/2	9 1/2	Apr. '20, Q 25
Bingham Mines	Boston	9 1/2	9 1/2	9 1/2	Sept. '19, Q 25	Golden Cycle	Colo. Sprgs.	*74 1/2	*65	*74 1/2	May '20, Q 02
Calumet & Ariz.	Boston	60	58	58 1/2	Mar. '20, Q 1.00	Goldfield Con.	N. Y. Curb	*10	*9	*9 1/2	Dec. '19, 05
Calumet & Hecla	Boston	320	319	319	Dec. '19, Q 5.00	Hedley	Boston			4 1/2	June '19, 10
Can. Copper	N. Y. Curb	1 1/8	1	1		Hollinger Con.	Toronto	5.50	5.45	5.50	Apr. '20, 05
Centennial	Boston			11 1/2	Dec. '18, SA 1.00	Homestake	N. Y.	55	55	55	Sept. '19, 50
Cerro de Pasco	N. Y.	43 1/2	42 1/2	43 1/2	June '20, Q 1.00	Kewanas	N. Y. Curb	*45	*43	*43	
Chief Consol.	Boston Curb	3 1/2	3 1/2	3 1/2	Feb. '20, 10	Kirkland Lake	Toronto			1.05	Oct. '19, 02 1/2
Chile Cop.	N. Y.	16	15 1/2	16		Lake Shore	Toronto	1.05	1.00	1.05	May '20, 05
Chino	N. Y.	31	30	31	Mar. '20, Q 37 1/2	McIntyre-Porcupine	Toronto	1.90	1.82	1.82	May '20, 05
Con. Ariz.	N. Y. Curb			3 1/2	Dec. '18, Q 05	Porcupine Crown	Toronto	*26 1/2	*26 1/2	*26 1/2	July '17, 03
Con. Copper M.	N. Y. Curb	3 1/2	3 1/2	3 1/2		Reorgan. Booth	Colo. Sprgs.	*60	*55	*59 1/2	Apr. '20, Q 01 1/2
Cop. Range	Boston	38 1/2	38	38 1/2	Mar. '20, Q 50	Silver Pick	N. Y. Curb	*6	*6	*6	May '19, 05
Crystal Cop. (new)	Boston Curb	*30	*26	*30		Teck Hughes	N. Y. Curb	*9	*9	*9	
Davis-Daly	Boston	9 1/2	9 1/2	9 1/2	Mar. '20, Q 25	Tom Reed	Toronto			1.61	Dec. '19, 02
East Butte	Boston	12 1/2	12 1/2	12 1/2	Dec. '19, A 50	United Eastern	N. Y. Curb	3 1/2	3	3 1/2	Apr. '20, Q 21
First Nat'l	Boston Curb	*98	*95	*95	Feb. '19, SA 15	Vindicator Consol.	Colo. Sprgs.	*20	*18	*18	Jan. '20, Q 01
Franklin	Boston	2	2	2		West Dome	Toronto	*6 1/2	*6 1/2	*6 1/2	
Gadsden Copper	N. Y. Curb	*74	*70	*72		White Cap. Min.	N. Y. Curb	*12	*10	*11	
Granby Consol.	N. Y.	37	37	37	May '19, Q 1.25	Yukon Gold	Boston Curb			1	June '18, 02 1/2
Greene-Can.	N. Y.	30	28	29 1/2	Feb. '19, Q 1.50						
Hancock	Boston	4 1/2	4 1/2	4 1/2		SILVER					
Houghton	Boston Curb			*50		Arizona Silver	Boston Curb	*55	*41	*52	Apr. '20, M 03
Howe Sound	N. Y. Curb			3 1/2	Apr. '20, Q 05	Bailey	Toronto			*5	Apr. '16, 05
Inspiration Con.	N. Y.	53	52	52 1/2	Apr. '20, Q 1.50	Beaver Con.	Toronto	*41	*39	*41	May '20, 03
Iron Cap	Boston Curb	9 1/2	9	9	Feb. '19, M 25	Coniagas	Toronto		12.90		May '20, Q 25
Isle Royale	Boston	30	29	29	Sept. '19, SA 50	Crown Reserve	Toronto	*22	*20	*20	Jan. '17, 05
Kennecott	N. Y.	28 1/2	26 1/2	26 1/2	Mar. '20, Q 50	Kerr Lake	Boston	3 1/2	3 1/2	3 1/2	Sept. '19, 1.00
Keweenaw	Boston	1 1/2	1 1/2	1 1/2		La Rose	Toronto	*33	*33	*33	Apr. '18, 02
Lake Copper	Boston			3 1/2		McKinley-Dar.	N. Y. Curb			*48	Apr. '20, Q 03
La Salle	Boston			2 1/2		Mining Corp.	Toronto	2.00	1.85	1.85	June '20, 12 1/2
Magma Chief	N. Y. Curb	*21	*21	*21		Nipissing	N. Y. Curb	9 1/2	8 1/2	9 1/2	Apr. '20, Q 25
Magma Copper	N. Y. Curb			29	Jan. '19, Q 50	Ontario Silver	N. Y.	7 1/2	6 1/2	7 1/2	Apr. '19, Q 50
Majestic	Boston Curb	*20	*15	*15		Ophir Silver	N. Y. Curb			1 1/2	Jan. '12, 10
Mason Valley	N. Y. Curb	2 1/2	1 1/2	2 1/2		Peterson Lake	Toronto	*13	*13	*13	Jan. '17, 01 1/2
Mass. Con.	Boston	3 1/2	3 1/2	3 1/2	Nov. '17, Q 1.00	Sil. King Ariz. (new)	N. Y. Curb	*60	*30	*40	
Mayflower-O.C.	Boston	6	5 1/2	5 1/2		Temiskaming	Toronto	*33	*32	*33	Jan. '20, 04
Miami	N. Y.	20 1/2	20 1/2	20 1/2	May '20, Q 50	Trethewey	Toronto	*27 1/2	*27	*27	Jan. '19, 05
Michigan	Boston	5	4 1/2	4 1/2							
Mohawk	Boston	62	60 1/2	62	Feb. '20, Q 1.50	GOLD AND SILVER					
Mother Lode (new)	N. Y. Curb	5 1/2	5 1/2	5 1/2		Atlanta	N. Y. Curb	*2	*1 1/2	*2	
Nev. Con.	N. Y.	12 1/2	12	12	Mat. '20, Q 25	Barnes-King	Butte	1.28	1.28	1.28	Nov. '19, Q 05
Nev. Douglas	Boston Curb	*15	*14	*15		Bost. & Mont.	N. Y. Curb	*73	*71	*73	
New Arcadian	Boston	3	2 1/2	2 1/2		Cashboy	N. Y. Curb	*6	*5	*6	
New Baltic	Boston Curb			3		El Salvador	N. Y. Curb	2 1/2	2	2 1/2	
New Cornelia	Boston	17	16 1/2	16 1/2	May '20, 25	Goldfield Merger	N. Y. Curb	*2	*1	*2	
Nixon Nev.	N. Y. Curb			*9		Jim Butler	N. Y. Curb	*16	*14	*15	Aug. '18, SA 07
North Butte	Boston	17 1/2	17	17	Oct. '18, Q 25	Jumbo Extension	N. Y. Curb	*6	*5	*5	June '16, 05
North Lake	Boston			*75		Louisiana Con.	N. Y. Curb			1 1/2	
Ohio Copper	N. Y. Curb			1 1/2		MacNamara M.	N. Y. Curb			1 1/2	May '10, 02 1/2
Ojibway	Boston			1 1/2		Open Mat.	Open Mat.	1 1/4	1 1/4	1 1/4	Apr. '20, 50
Old Dominion	Boston	26	25 1/2	25 1/2	Dec. '18, Q 1.00	Tonopah-Belmont	N. Y. Curb	1 1/2	1 1/2	1 1/2	Jan. '20, Q 05
Oscola	Boston			40	Mar. '20, Q 50	Tonopah-Divide	N. Y. Curb	1 1/2	1 1/2	1 1/2	
Phelps Dodge	Open Mar.	1195	1180		Apr. '20, Q 2.50	Tonopah Ex.	N. Y. Curb	1 1/2	1 1/2	1 1/2	Apr. '20, Q 05
Quincy	Boston	50	50	50	Mar. '20, Q 1.00	Tonopah Mining	N. Y. Curb	1 1/2	1 1/2	1 1/2	Oct. '19, SA 15
Ray Con.	N. Y.	16 1/2	16 1/2	16 1/2	Mar. '20, Q 25	West End Con.	N. Y. Curb	1 1/2	1 1/2	1 1/2	Dec. '19 SA 05
Ray Hercules	Boston Curb			*75							
St. Mary's M. L.	Boston	41	40	40	Dec. '19, 2.00	SILVER-LEAD					
Seneca	Boston	14	13 1/2	13 1/2		Caledonia	N. Y. Curb	*27	*25	*25	June '20, M 01
Shannon	Boston	1 1/2	1 1/2	1 1/2	Nov. '17, Q 25	Consol. M. & S.	Montreal	26	25	25 1/2	Apr. '20, Q 62 1/2
Shattuck, Ariz.	N. Y.	9	8 1/2	8 1/2	Jan. '20, Q 25	Daly-West	Boston	4 1/2	4 1/2	4 1/2	Apr. '20, Q 15
South Lake	Boston			2 1/2		Eagle & Blue Bell	Boston Curb			2 1/2	Apr. '20, Q 10
South Utah	Boston			*14		Electric Point	Spokane	*39	*38	*39	May '20, SA 03
Superior	Boston	5	5	5	Apr. '17, 1.00	Fed. M. & S.	N. Y.			13 1/2	Jan. '09, 1.50
Superior & Boston	Boston			3 1/2		Fed. M. & S. pf.	N. Y.	35 1/2	34	35	Mar. '20, Q 75
Tenn. C. & C.	N. Y.	10 1/2	9 1/2	10 1/2	May '18, I 1.00	Florence Silver	Spokane			*45	Apr. '19, 01 1/2
Tuolumne	Boston	*65	*60	*65	May '13, 10	Iron Blossom	N. Y. Curb			1 1/2	Apr. '20, Q 02 1/2
United Verde Ex.	Boston Curb	32 1/2	31	31 1/2	May '20, Q 50	Marsh Mines	N. Y. Curb	*16	*13	*14	
Utah Con.	Boston	7	6 1/2	7	Sept. '18, 25	Prince Consol.	N. Y. Curb	*13	*13	*13	Nov. '17, 02 1/2
Utah Copper	N. Y.	69 1/2	67 1/2	68	Mar. '20, Q 1.50	Rambler-Cariboo	Spokane	*13	*13	*13	Feb. '19, 01
Utah M. & T.	Boston	1 1/2	1 1/2	1 1/2	Dec. '17, 30	Rex Con.	N. Y. Curb	*8	*6 1/2	*6 1/2	
Victoria	Boston	2 1/2	2 1/2	2 1/2		Stand. S. L.	N. Y. Curb	2.50	2.50	2.50	Oct. '17, 05
Winona	Boston	*50	*40	*40		Tamarack-Custer	Spokane	2.50	2.50	2.50	Dec. '19, 03
Wolverine	Boston	17	16	17	Jan. '20, Q 50	Wilbert	N. Y. Curb	*5	*4	*5	Nov. '17, 01
LEAD						NICKEL-COPPER					
Hecla	N. Y. Curb	4 1/2	4 1/2	4 1/2	June '20, Q 20	Internat'l Nickel	N. Y.	18	17 1/2	17 1/2	Mar. '19, 1.50
St. Joseph Lead	N. Y. Curb			16	June '20, QX 50	Internat'l Nick. pf.	N. Y.	81 1/2	80	81 1/2	May '20, Q 1.50
Stewart	Boston Curb	1 1/2	1 1/2	1 1/2	Dec. '15, 05	QUICKSILVER					
Utah Apex	Boston	1 1/2	1 1/2	1 1/2	Nov. '18, 25	New Idria	Boston			7	Jan. '19, 25
ZINC						TUNGSTEN					
Am. Z. L. & S.	N. Y.	14 1/2	13 1/2	14 1/2	May '17, 1.00	Mojave Tungsten	Boston Curb	*9	*9	*9	
Am. Z. L. & S. pf.	N. Y.			45	May '20, Q 1.50	VANADIUM					
Butte C. & Z.	N. Y.	8 1/2	8	8	July '18, I 50	Vanadium Corp.	N. Y.	84 1/2	78 1/2	84 1/2	Apr. '20, I 1.50
Butte & Superior	N. Y.	22 1/2	21 1/2	21 1/2	Sept. '17, 1.25	ASBESTOS					
Con. Interst. Cal.	N. Y.	14 1/2	13 1/2	13 1/2	June '20, Q 50	Asbestos Corp.	Montreal	88	82 1/2	82 1/2	Apr. '20, Q 1.25
New Jersey Z.	N. Y. Curb	204	200	201	May '20, SA 4.00	Asbestos Corp. pf.	Montreal	96	91 1/2	93	Apr. '20, Q 1.50
Success	N. Y. Curb	*5	*4	*4 1/2	July '16, 03	MINING, SMELTING AND REFINING					
Yellow Pine	Los Angeles	1	1	1.08	June '20, Q 03	Am. S. & R.	N. Y.	61 1/2	59 1/2	60 1/2	June '20, Q 1.00

*Cents per share. †Bid and asked. ‡Quotations missing.

INDUSTRIAL NEWS

Easton Car & Construction Co. has moved its general offices from 30 to 50 Church St., New York City.

Ingersoll-Rand Co. and A. S. Cameron Steam Pump Works now have their Chicago offices at 709 Fisher Building, Chicago, Ill.

W. N. Dickinson, consulting engineer with the Otis Elevator Co., was recently elected president of the New York Electrical Society, 130 East 15th St., New York City.

Girard B. Rosenblatt, electrical engineer specializing in mining and metallurgical applications, has moved his office to 521 First National Bank Building, San Francisco, Cal.

The Brown Instrument Co., Philadelphia, Pa., makers of thermometers and pyrometers, have built two new buildings, one for making recording thermometers and the second to house a research department.

Howe Sound Co., Britannia Beach, B. C., with its Chihuahua Mining Co. and El Potosi Mining Co. subsidiaries, announces the removal of the New York office from 734 Fifth Ave. to Room 203, No. 665 Fifth Ave., that city.

Edison Storage Battery Co., 23 West 43d St., New York City, announces the appointment as assistant sales manager, in charge of its railroad department, of Don C. Wilson, of Broken Bow, Neb., formerly electrical engineer at Omaha, Neb., with Union Pacific R.R.

F. A. Calhoun has resigned as New York sales engineer for Tate-Jones Co., Incorporated, to become Eastern representative for Standard Fuel Engineering Co., Detroit, Mich., handling heat-treating furnaces. His office is in Lincoln Trust Building, 76 Montgomery St., Jersey City, N. J.

Yale & Towne Manufacturing Co., Stamford, Conn., announce that they have purchased the industrial electric truck division of C. W. Hunt Co., Staten Island, N. Y., and will combine that business with their hoist department, thereby adding electric trucks to their line of electric hoists.

The Merrill Co. of 121 Second St., San Francisco, Cal., announces that it is now supplying "Merco Nordstrom Plug Valve" in standard sizes from the factory of Swenson Evaporator Co., Angola, Ind. Inquiries and orders should be addressed to the Merrill Co., Monadnock Building, Chicago, Ill. Eastern customers will find the Chicago branch saves them freight and time.

Engineering Advertisers' Association held a meeting at Chicago on June 8, which was addressed by Louis Flader, of American Photo-Engraving Association. Mr. Flader spoke on photo-engraving and showed what a series of

improvements was entailed when that process was improved by the invention of the Ives half-tone screen. The next regular meeting of the association will be on Sept. 14.

Camphuis & Rives, customs brokers, announce that since April 1, 1920, they are operating under the name of Camphuis & Co., Inc., in the United States, and as Camphuis & Cia., S. A., in Mexico. All obligations remain the same, and there was no change in organization and management. President G. A. Camphuis, having retired from Camphuis, Rives & Gordon, Inc., the name of that company has been changed to Rives & Gordon, Inc.

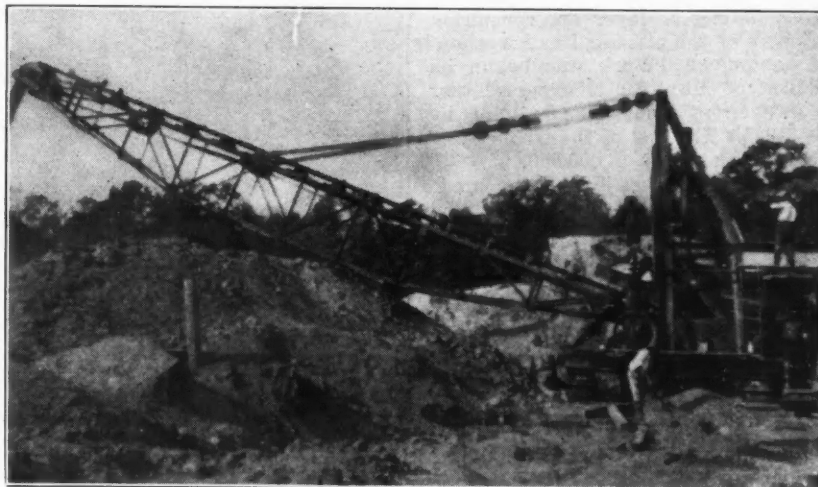
Pennsylvania Pump & Compressor Co., Easton, Pa., announces the opening of sales offices in the following cities: New York, 50 Church St., H. C. Browne, manager; Philadelphia, Pa., 2222 Chestnut St., W. J. Devlin, manager; Pittsburgh, Pa., 631 Fulton Building, C. W.

New Device Accomplishes Deep Stripping From Unstable Base

A portable stripping conveyor, recently installed by the "Floridin" company at its plant at Quincy, Fla., has effectively disposed of a troublesome stripping problem.

The deposit of fuller's earth on the company's property at Quincy is overlain by a deep overburden, and the moisture of the soft clay underneath prohibits the use of a heavy steam shovel for stripping.

The company, therefore, has employed a light revolving shovel, which, though limited in height of dumping, is supplemented by the stripping conveyor. The two machines working together solve the problem of deep stripping and unstable flooring. The conveyor removes the overburden far enough away to permit the underlying bed of clay to be removed by another shovel. As work proceeds the overburden from each succeeding cut is



HAMILTON PORTABLE STRIPPING CONVEYOR AT WORK

Gellinger, manager; Richmond, Va., Mutual Building, W. F. Delaney, manager; Birmingham, Ala., 2027 Jefferson Bank Building, H. I. Kahn, manager; Salt Lake City, Utah, Newhouse Building, C. H. Jones, manager; Milwaukee, Wis., 604 First National Bank Building, Coates & Zurling, representatives.

The Booth Electric Furnace Co., 53 West Jackson Boulevard, Chicago, Ill., announces the consolidation of its executive and sales offices at the same address as the engineering and production office, which has been located at 326 West Madison St. The district sales offices of the company now are: Edward B. Stott & Co., 175 Fifth Ave., New York City; Northern Engineering Co., 308 Chestnut St., Philadelphia; Charles L. Foster, 879 The Arcade, Cleveland, Ohio; M. A. Beltaire, Jr., 805 Hammond Building, Detroit, Mich.; Gassman & Cunningham, Brown-Marx Building, Birmingham, Ala.; Buckeye Products Co., 919 West 5th St., Cincinnati, Ohio. Among the foreign offices recently opened is one for Australasia, in charge of Mr. Bartholomew Bannon, 321 Pitt St., Sydney, N. S. W., Australia.

wasted into the space from which the clay has been removed.

The stripping conveyor operates under its own power, and moves along as the shovel proceeds into the overburden. It is placed in such relation to the shovel, also, that the shovel's swing is reduced one-fourth. This, together with the fixed height of the conveyor hopper and its fixed position with relation to the shovel, makes it easy—almost a habit—for the operator to attain a capacity much in excess of normal. The conveyor hopper is large enough, too, to eliminate the necessity for constant moving up. The accompanying photograph shows the conveyor part at work.

In the "Floridin" operation, the shovel operator has learned the cycle of digging-dumping to such a nicety that there are scarcely any delays, and at times capacity has been increased as much as 50 per cent, as compared with the older method of shovel and train of dump cars.

The stripping conveyor is designed and built by the Hamilton Manufacturing Co., 310 Schultz Building, Columbus, Ohio.

Largest Concrete Building Ever Erected on Manhattan Island Now Going Up

Warehouse and Loft at 395 Hudson St. To Be Occupied by the Western Electric Co. and the New York Telephone Co.

The largest concrete building ever erected on Manhattan Island is now being built at 395 Hudson St. The building, partly an eleven-story office building and warehouse and partly a five-story-and-basement warehouse, will occupy the entire block surrounded by Hudson, West Houston, Greenwich, and Clarkson Sts. The construction will cover an area of 338 x 200 ft. and will be built throughout of reinforced concrete, with the exception of a veneer of brick on the exterior walls.

Contracts have recently been signed between the 395 Hudson Street Corporation and the Turner Construction Co. McKenzie, Voorhees & Gmelin, of 1,123 Broadway, are the architects. Meyer, Strong & Jones are consulting engineers of the electrical and mechanical equipment. Work was begun on the first of May. It is expected that the owner will occupy the building by May, 1921. The cost of the whole operation will be nearly \$3,000,000.

Fifteen-year leases have been made by the Western Electric Co., Inc., and the New York Telephone Co. The telephone company will have a garage and warehouse, and the Western Electric Co. will use the building for its local New York territory sales and distributing forces. Executive offices will be situated on the upper floors, and dining rooms, hand-ball courts, shower baths and the like will be provided for Western Electric employees.

The Industrial Car Manufacturers' Institute at its second annual meeting in Pittsburgh elected the following board of directors: Lion Gardiner, vice-president of the Lakewood Engineering Co., chairman; N. A. Doyle, vice-president American Car & Foundry Co.; W. E. Farrell, president Easton Car & Construction Co.; J. M. Hansen, president Standard Steel Car Co.; J. R. Kilbourne, general manager, the Kilbourne & Jacobs Manufacturing Co.; R. J. Magor, president Magor Car Corporation; and J. C. Shirer, president the Star Manufacturing Co. Col. James Milliken was re-elected president of the Institute, and H. M. Wey, secretary. The institute is really a get-together association of a number of manufacturers of industrial cars. The organization has been divided into the four groups: 1, coal-mine cars; 2, standard-gage dump cars; 3, other standard-gage cars; 4, all narrow-gage cars, except coal-mine cars.

After the meeting those in attendance were taken to dinner at the country home of Charles H. Clark, president of the Clark Car Co., in the South Hills of Pittsburgh. After dinner interesting talks were given by representative men, including C. E. Watts, of the American Mining Congress.

Parker Portable Conveyor An Efficient Device at Reasonable Cost

For rapidly elevating coal, broken stone, ore, and the like, the portable conveyor shown in the accompanying cut has been devised by George W. Parker, Jr., of Philadelphia, Pa. It is mounted on a wheeled frame, and consists of an endless belt mounted on a long frame and adapted to deliver a continuous stream of material from a pile on the ground level to an elevated position, where it is discharged into a wagon or truck. The endless conveyor is driven by an electric motor.

Power is transmitted by means of a chain to a sprocket wheel on a shaft on one side of the drums on which the conveyor belt is mounted. Fenders on either side of the conveyor belt keep the material from running off while be-



PARKER PORTABLE CONVEYOR IN USE

ing elevated. The device is adjustable to various angular positions by means of adjustable side struts. The apparatus is manufactured by the Specialty Engineering Co., Allegheny and Trenton Avenues, Philadelphia, Pa.

Material Handling Machinery To Be Shown at New York Electrical Exposition

Several types of machines used in handling materials will be exhibited at the Electrical Exposition to be held at the Grand Central Palace in October. These exhibits will be presented and demonstrated under the auspices of the Material Handling Machinery Manufacturers' Association. In order that there shall be sufficient room properly to demonstrate small trucks, portable cranes, trailers, and other devices, the entire third floor will be given over to this exhibit.

Cutler-Hammer Manufacturing Co., Milwaukee, Wis., announces the removal of its Utah-Wyoming-Idaho sales representative to larger quarters at 59 West Broadway, Salt Lake City. L. Brandenburger was appointed to that position late in April.

TRADE CATALOGS

Performances of Centrifugal Pumps

In an illustrated pamphlet entitled "High Efficiency Centrifugal Pumps," the De Laval Steam Turbine Co., of Trenton, N. J., has described official tests made by the city of Minneapolis on a 20-in. De Laval centrifugal pump driven by an induction motor, and similar tests made by the city of St. Paul on two 12-in. De Laval centrifugal pumps driven by synchronous motors. The Minneapolis pump, which discharges 30,000,000 gal. per day against a head of 251.56 ft., showed a combined efficiency of motor and pump of approximately 82½ per cent and a pump efficiency of 86 per cent. The smaller St. Paul units, pumping against heads up to 185 ft., showed over-all efficiencies, including pump and motor, of 78 and 78.4 per cent, respectively, and pump efficiencies of 81.8 and 82.2 per cent. These performances, together with favorable contracts for electric power, have resulted in remarkably low costs for pumping water in each instance.

Concrete Structures.—"Concrete in Architecture and Engineering," Vol. 3, No. 1, Feb.-Mar., 1920. 6 x 9, 24 p. illust. Portland Cement Associations. This issue particularly emphasizes the usefulness of concrete in building industrial houses, and the very noteworthy record of two 55,000-bbl. concrete tanks built for the France and Canada Oil Transport Co. at Aransas Pass, Tex.

Flotation—The Colburn Flotation and Engineering Co., 416 East Tenth Ave., Denver, Col., in a recent bulletin announce the Colburn Vacuum Flotation Process, which claims the recovery of a larger proportion of the mineral in ores than any other concentration method, and is particularly adapted to the treatment of slimes. It is stated that the vacuum principle employed in the Colburn flotation machine, together with the violent agitation of the pulp, and the perfect emulsification of the oil, makes it possible to treat ores that do not respond to other processes.

Superheaters—In Bulletin No. T-6 the Locomotive Superheater Co., New York and Chicago, shows results of tests made at the railway shops of the "Nickel Plate" R.R., Conneaut, Ohio, previous to and following the installation of Elesco superheaters. According to tests made under actual operating conditions about two weeks apart, with the flues in approximately the same condition, the plant under the latter installation showed a saving of 26.7 per cent in coal consumption and 20 per cent in steam consumption, or an increased efficiency of boiler, furnace, and grate of 21.2 per cent.

ENGINEERING AND MINING JOURNAL

JOSIAH EDWARD SPURR, *Editor*

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Published Weekly. Entered as Second-Class Matter June 20, 1879, at the Post Office at New York, under the Act of March 3, 1879.

Member Audit Bureau of Circulations. Member Associated Business Papers, Inc.

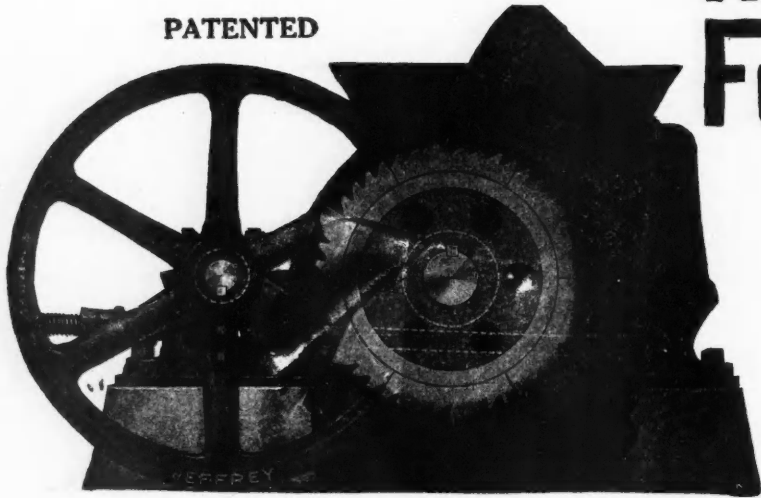
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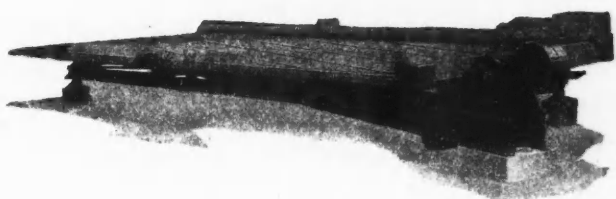


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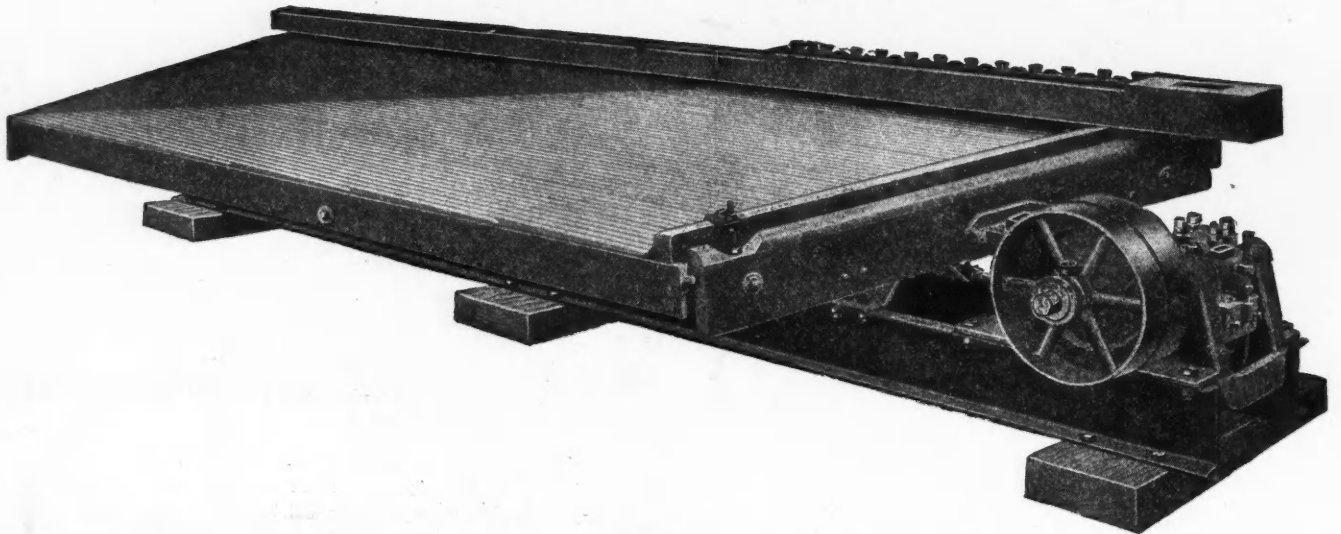
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A regular Wilfley Table complete in every detail—two interchangeable decks, enclosed head motion, and tilting device. It's a miniature of our mill table at a low cost.

Ruth Flotation Machine

An Ideal outfit for determining the flotative properties of any ore, and the effect of various oils and reagents. The pulp, thoroughly mixed with air is drawn down the hollow impeller shaft, and here it is forced in a steady stream toward the froth discharge lip—a complete laboratory size Ruth Machine.

Massco Clay Goods

Muffles, Crucibles, Scorifiers and Roasting Dishes made from the famous Colorado fire clays by experienced workmen—the standard of assay service.

WRITE FOR OUR BULLETIN — MASSCO EQUIPMENT
INCLUDES EVERY LABORATORY REQUIREMENT

The Mine and Smelter Supply Company

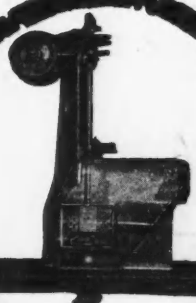
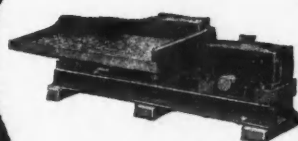
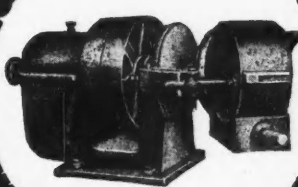
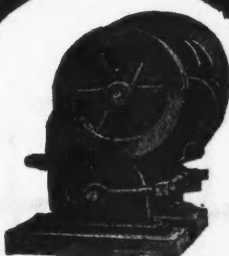
A Service Station Within Reach of You

Denver

Salt Lake City

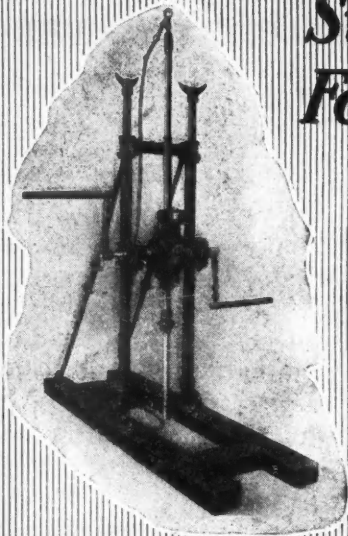
El Paso

New York Office: 42 Broadway

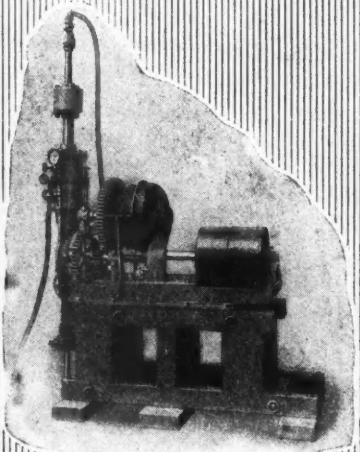


SULLIVAN DIAMOND DRILLS

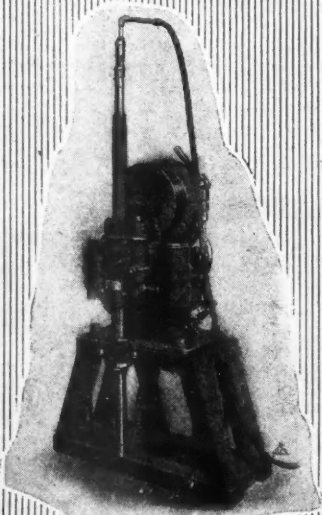
Standard of the World For Mineral Prospecting



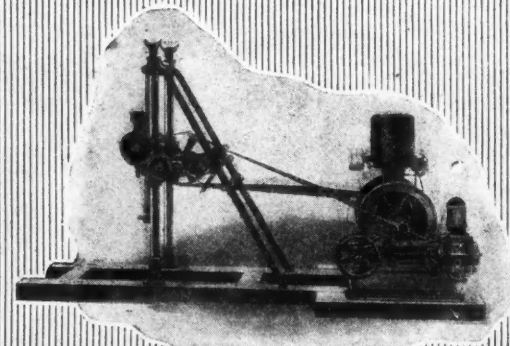
"BRAVO" Hand Power 300 feet



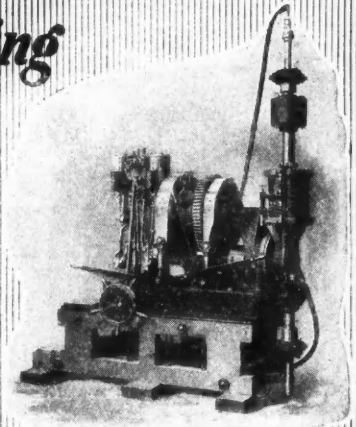
"B" Belt Driven 1800 feet



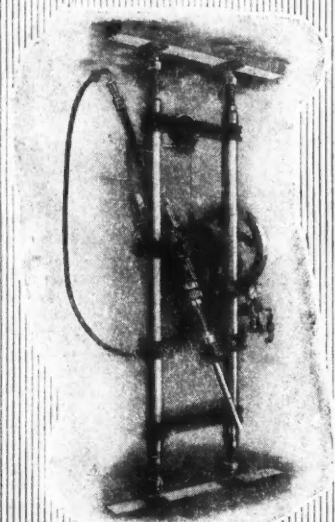
"BEAUTY" 500 feet



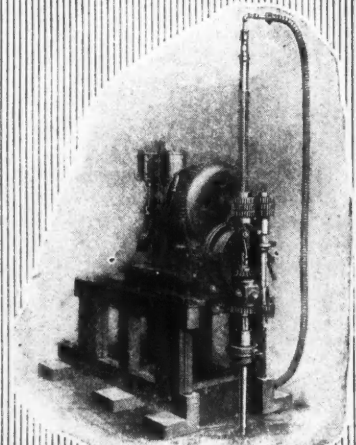
"BRAVO" Gas Engine Drive 600 feet



"B" 3500 feet



"E" (underground) 500 feet



"HC" Screw Feed 1600 feet

SINCE 1875, Sullivan Diamond Core Drills have been relied on by mining engineers the world over for their accuracy and economy in locating and proving mineral deposits.

Sullivan Drills are built in more than a dozen sizes and types for removing cores to depths from 300 to 7000 feet.

The Sullivan contract drilling department performs core drilling work for customers in all parts of North America and in several foreign countries.

*Ask for
Bulletin 269*

Sullivan Machinery Company
126 So. Michigan Avenue
CHICAGO

New York, London, Paris, Santiago,
Sydney, Tokyo.

The Wedge Mechanical Furnace

(Patented)

Your Roasting Problem Interests Us

When you are considering increased capacity or greater efficiency in roasting, or have some new process in which roasting is an important factor, we will endeavor to be of service.

Write us fully, stating analysis of ore, concentrates, mixture or material you desire to roast, characteristics and physical condition of same, number of tons to be treated per twenty-four hours, and the results you desire in the calcine.

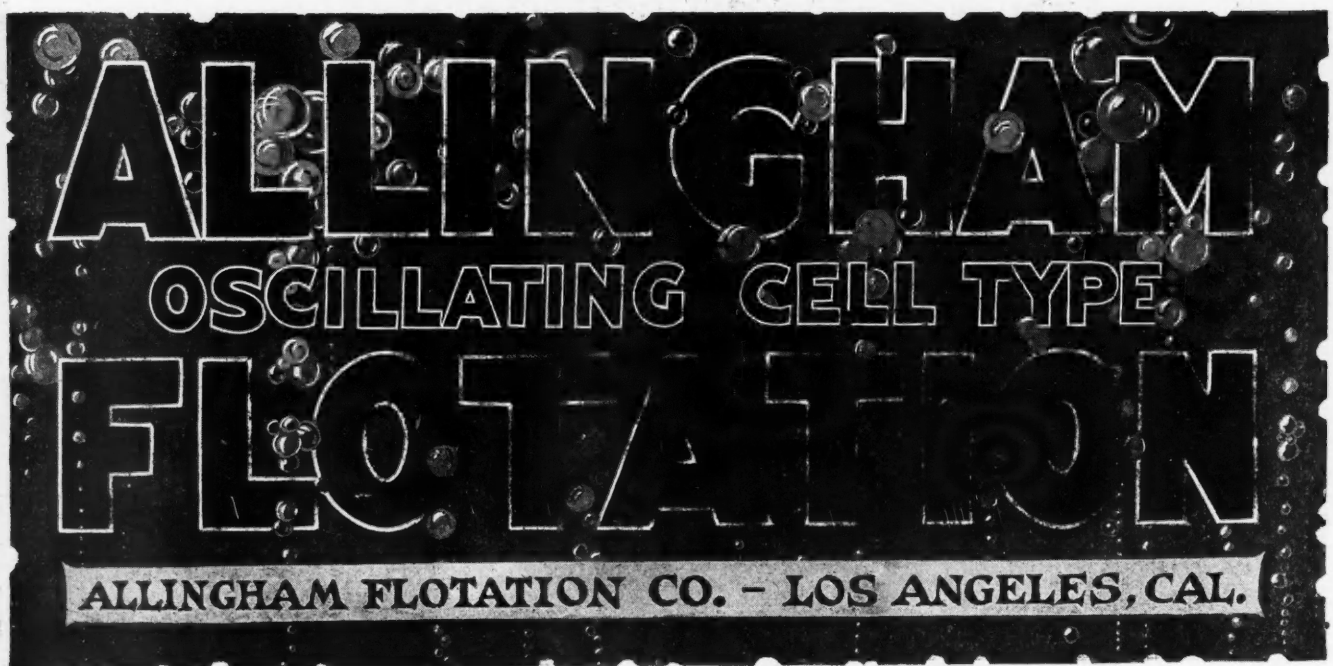
Wedge Mechanical Furnace Company
Greenwich Point, Philadelphia

[The first of a series of announcements on ALLINGHAM FLOTATION]



Announcement

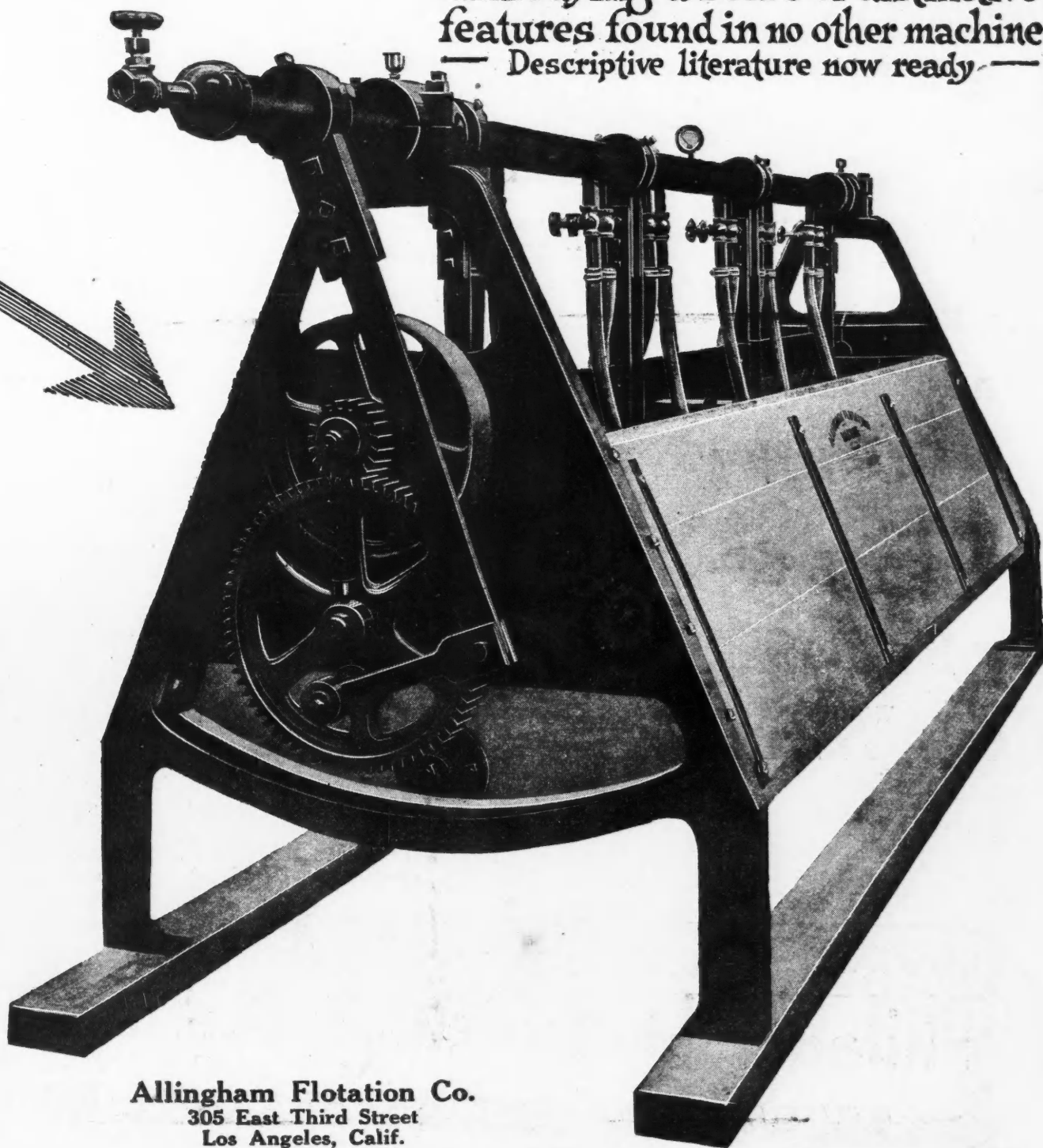
- a radical advancement
in flotation machinery
- representing the
accomplishment of
many years study and
experimentation



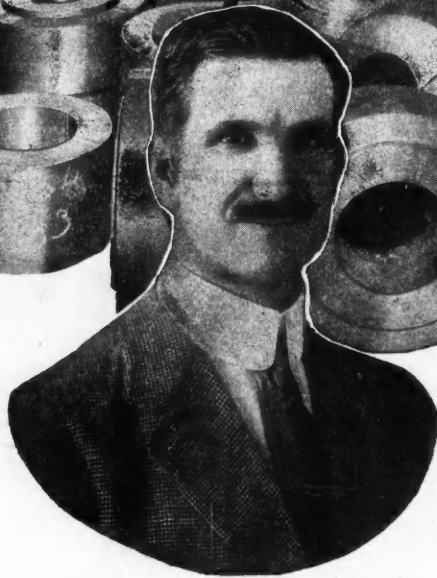
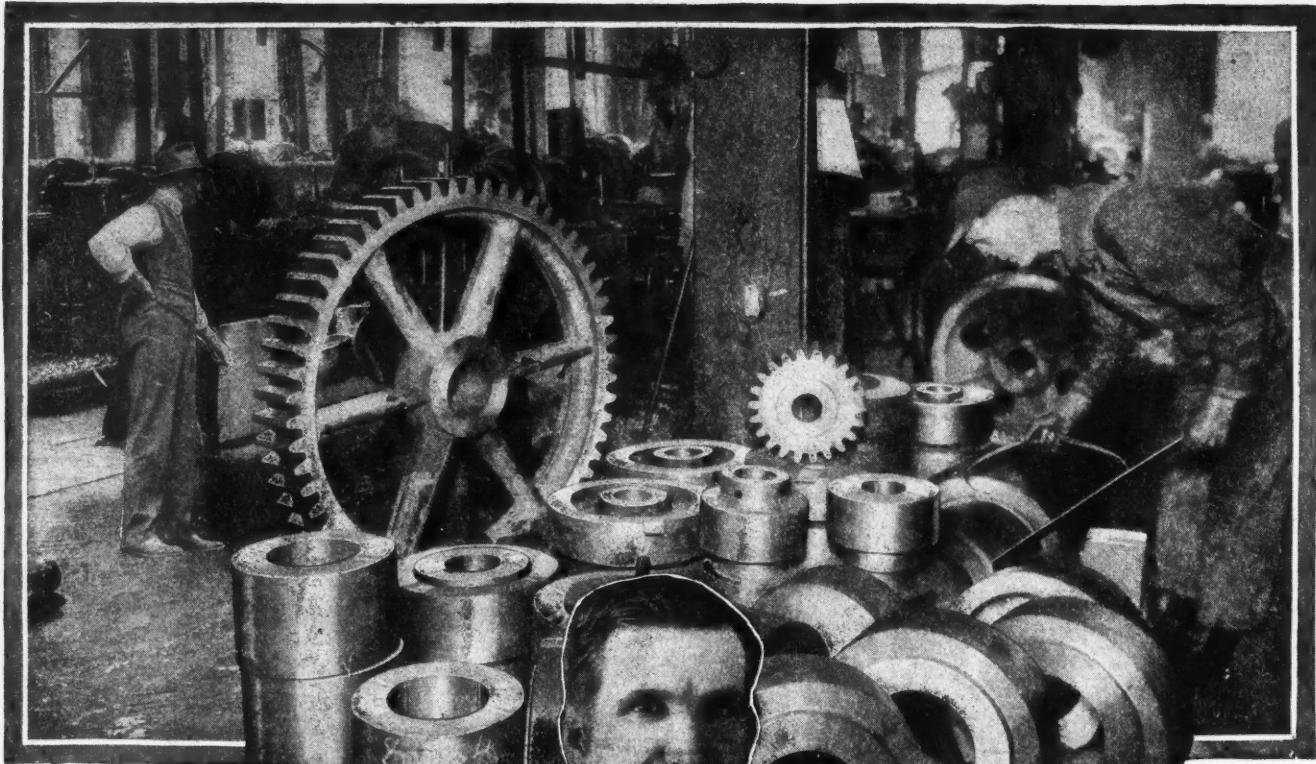
ALLINGHAM
OSCILLATING CELL TYPE
FLOTATION
ALLINGHAM FLOTATION CO. - LOS ANGELES, CAL.

ALLINGHAM

A new type of flotation machine
embodying a score of distinctive
features found in no other machine
— Descriptive literature now ready —



Allingham Flotation Co.
305 East Third Street
Los Angeles, Calif.



Picking a Few Winners

There is no "by-guess" or "by-gosh" in the selection of gears or blanks when Phillie Gear fills your order.

You get exactly what you require. You get it with a speed that creates enthusiasm. You get the quality that is second to none.

Our workmen are experts in gear creating. They turn their best efforts toward precision and their "know how" enables them to work at high speed.

We are often able to fill your order from stock. If we can't, you will be fully as satisfied because we make and ship gears as speedily as men and machines can do so.

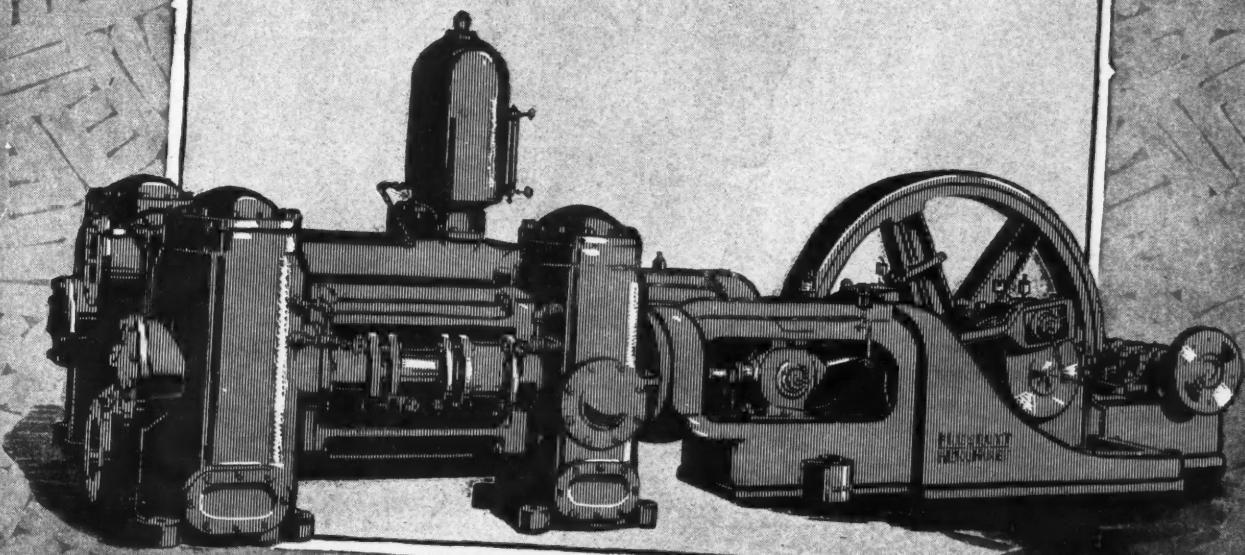
Gears Philadelphia have saved hours and dollars for many a mine operator. Surely you can afford to follow their lead.

Get the Phillie Gear Book today. It enables you to order with the certainty that you will get what you want.



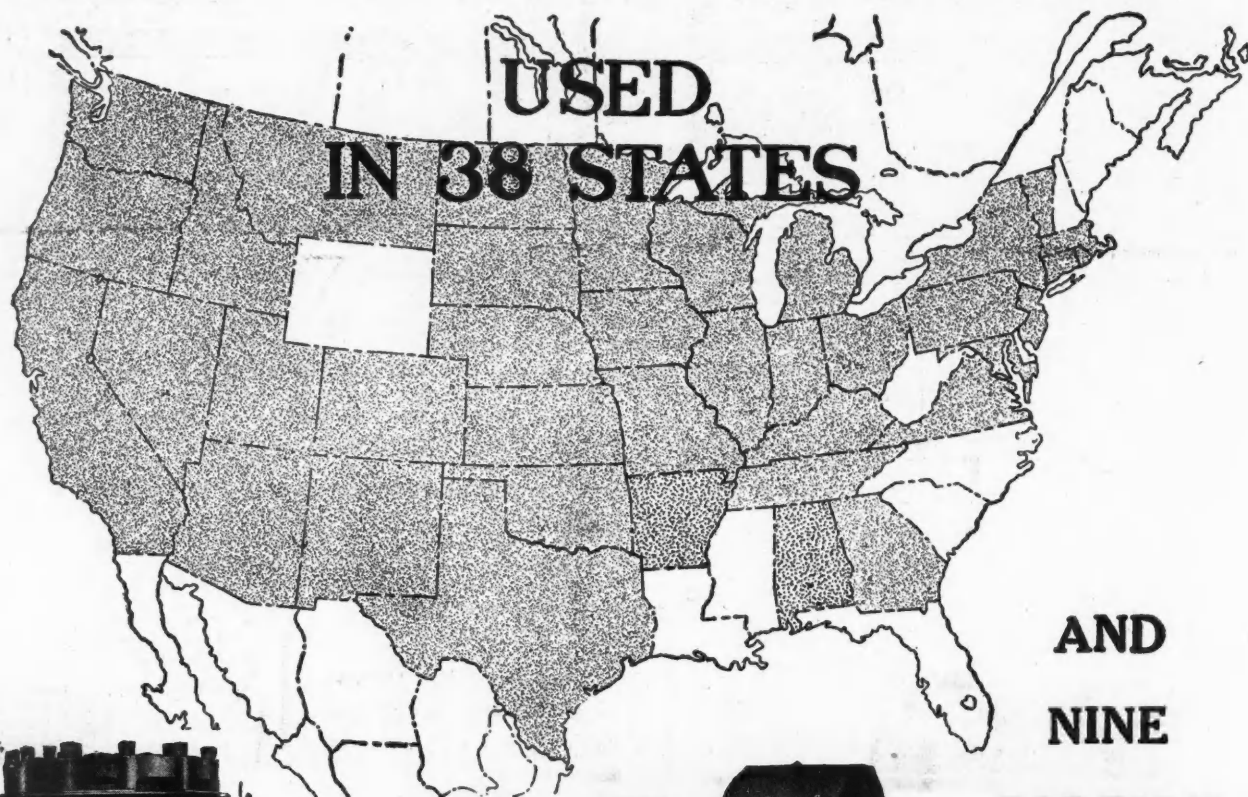
PRESCOTT MENOMINEE

MINE PUMPS

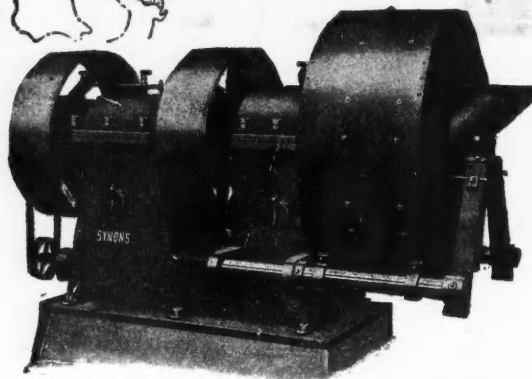
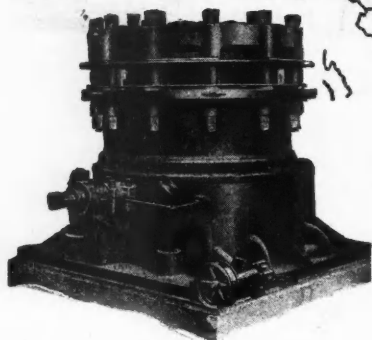


THE PRESCOTT COMPANY
MENOMINEE, MICHIGAN, U. S. A.

SYMONS DISC CRUSHERS



AND
NINE
FOREIGN
COUNTRIES
Why?



A Few of the Companies Using SYMONS DISC CRUSHERS

Chile Exploration Co.
New Cornelia Copper Co.
Inspiration Consd. Copper Co.
Braden Copper Co.
Montezuma Copper Co.
Federal Lead Co.
Calumet & Arizona Mining Co.
United Verde Copper Co.
Copper Queen Consd. M. & S. Co.
Detroit Copper Mining Co.
Arizona Copper Mining Co.
Bunker Hill & Sullivan M. & C. Co.

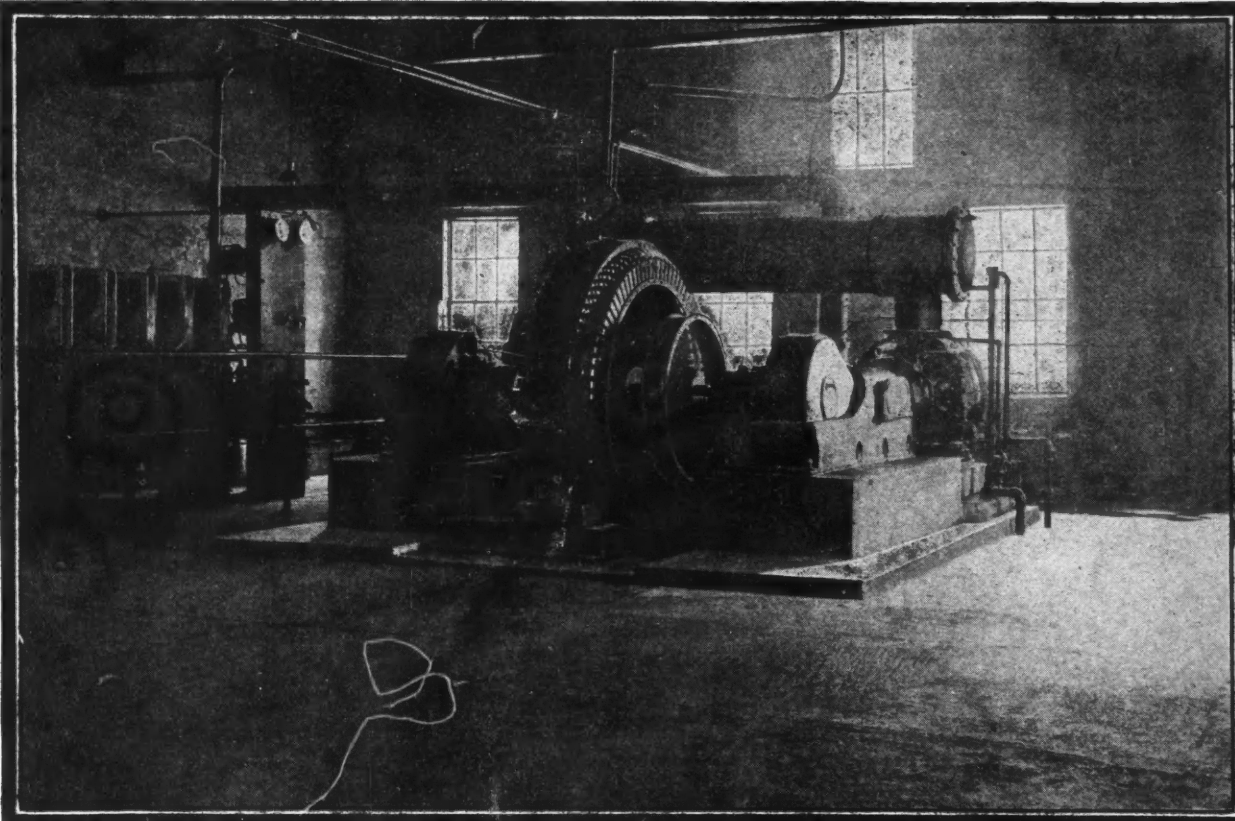
Because Symons Disc Crushers give most remarkable crushing economy and uniformity of product — operating on all sorts of material from soft carbonates to the tough cherty ores *continuously for years* without breakage or replacements.

Symons Disc Crushers take primary breaker product and reduce it to $\frac{3}{4}$ in. or smaller in one break—centrifugal force many times stronger than gravity feeds the ore to the manganese steel disc—spreads it evenly, without choking—and promotes the quick discharge of uniformly sized product—*it's the only crusher that reduces to small sizes without grinding action.*

Write for our *Symons Bulletin* and illustrated booklets on other Chalmers & Williams ore reduction machinery.

CHALMERS & WILLIAMS, Inc.

1400 Arnold St., Chicago Heights, Ill.



Upon the successful operation of the mine air compressor depends the uninterrupted service of your rock drills, drill sharpeners and pumps—in fact, the progress of your operations. The selection of the compressor calls for the most careful investigation and study. Often times, the experience of others helps you solve your problem.

The Bingham Mines Company purchased the first high speed, direct connected, synchronous motor driven compressor in the Utah district. After taking this Ingersoll-Rand Class PRE unit through a two mile stretch of tunnel at their Dalton and Lark Property, it was installed in the compressor station 1,500 feet underground. Here it has been in practically continuous service for over four years, running at 257 revolutions per minute.

The following year the Eagle & Blue Bell Mining Company, Eureka, Utah—controlled by the Bingham Mines Company—purchased a larger compressor of the same design. This compressor which is shown in the above photo, is installed at an altitude of 6,500 feet above sea level. It furnishes air for about 30 drills in the Eagle & Blue Bell property and for 2 or 3 drills in the Victoria Mine, which is owned by the same company.

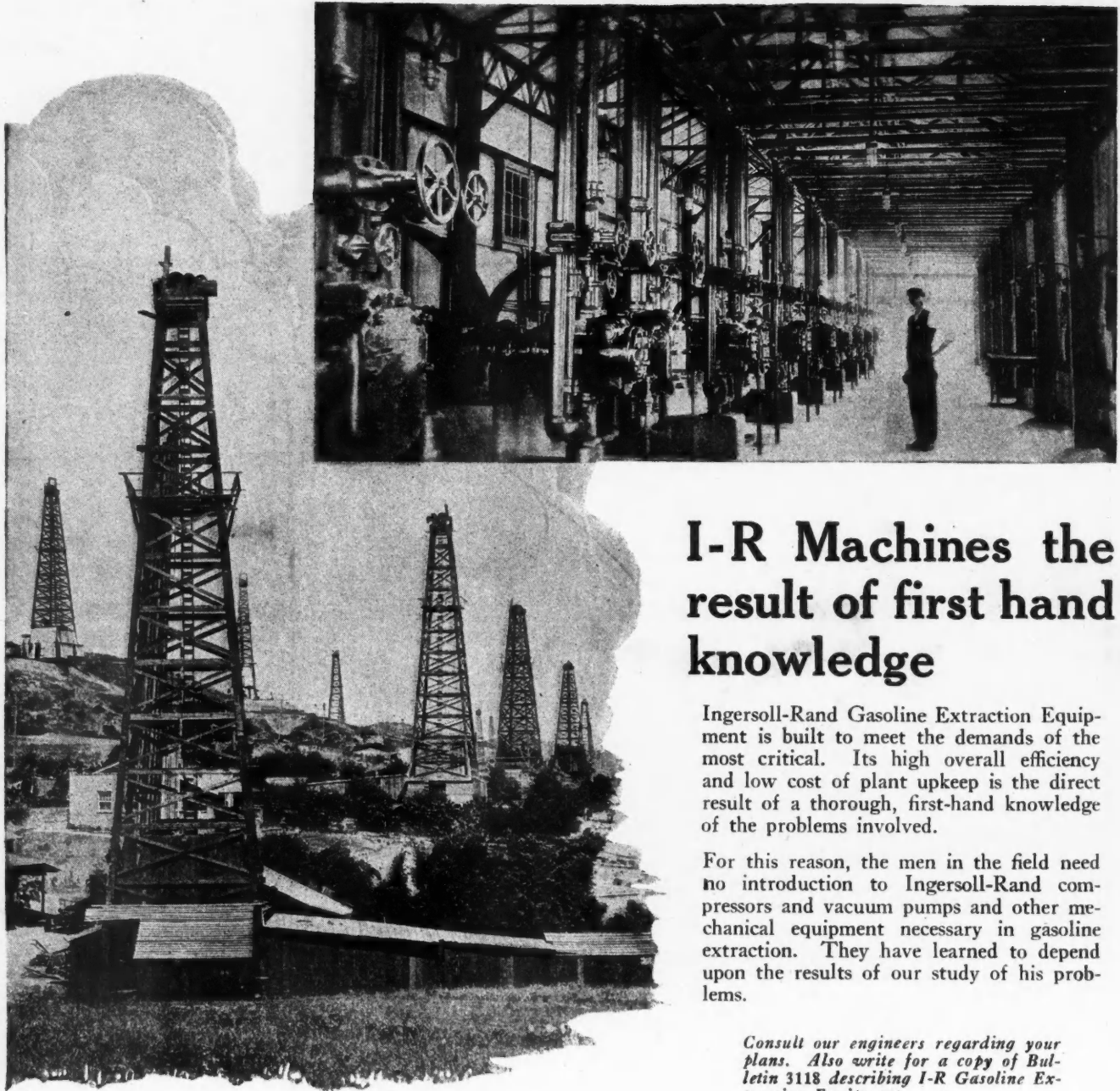
*Consult our engineers with reference to
your next air compressor installation.*

Ingersoll-Rand Company
11 Broadway, New York

462-C

Ingersoll-Rand

Gasoline Extraction Equipment



I-R Machines the result of first hand knowledge

Ingersoll-Rand Gasoline Extraction Equipment is built to meet the demands of the most critical. Its high overall efficiency and low cost of plant upkeep is the direct result of a thorough, first-hand knowledge of the problems involved.

For this reason, the men in the field need no introduction to Ingersoll-Rand compressors and vacuum pumps and other mechanical equipment necessary in gasoline extraction. They have learned to depend upon the results of our study of his problems.

Consult our engineers regarding your plans. Also write for a copy of Bulletin 3118 describing I-R Gasoline Extraction Equipment.

Ingersoll-Rand Company

11 Broadway, New York

165 Q. Victoria St., London

Offices Everywhere

461-0

Ingersoll-Rand



CONICAL MILL

HARDINGE Conical Mills are meeting the present day demand for machinery that requires a minimum expenditure of labor. A notable instance of how well they are meeting this demand is evidenced in an installation of 64 Hardinge Conical Mills at the Calument & Hecla plant, which require the attention of but two men per shift.

At the Bunker Hill and Sullivan plant—another Hardinge installation,—but one hour's operation in one year was lost by Hardinge Conical Mills—concrete evidence of Hardinge reliability for continuous operation.

The concerns not using Hardinge Conical Mills are probably the ones who have not had an opportunity of investigating their merits, and for such concerns we have very interesting grinding data, which will prove well worth the asking.

Hardinge Conical Mills are built upon a scientific principle—require less labor and no loss of time through shut-down. Night and day they grind away.

**NIGHT AND DAY
THEY GRIND AWAY**

HARDINGE COMPANY

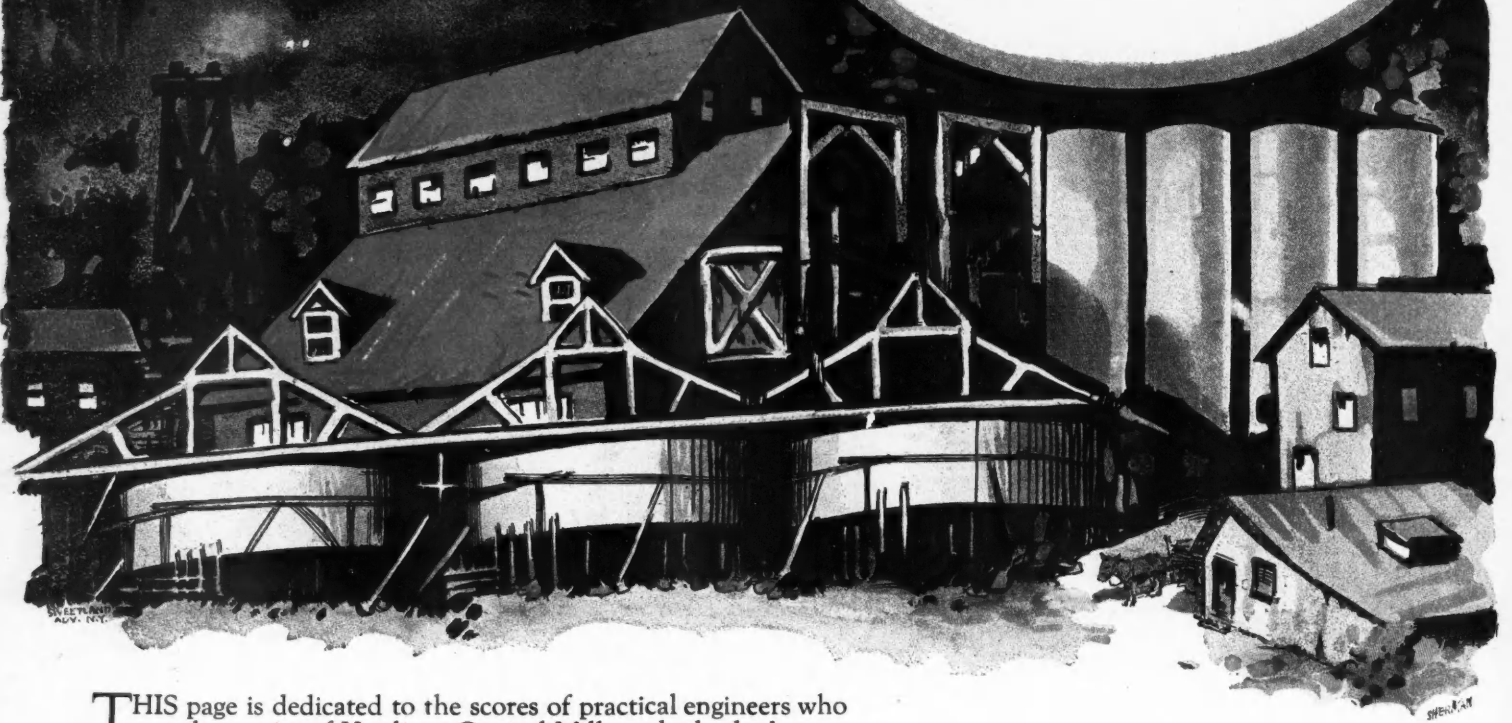
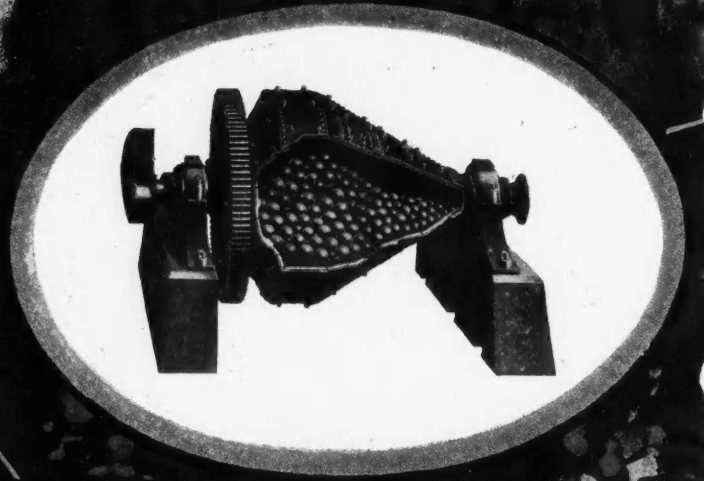
WORKS
YORK, PENNA.
DENVER, COLO.
ERITH, ENG.

BRANCH OFFICES
DENVER, COLO., FIRST NATIONAL BANK BUILDING
SPOKANE, WASH., OLD NATIONAL BANK BUILDING
SALT LAKE CITY, UTAH, NEWHOUSE BUILDING
LONDON, ENGLAND, SALISBURY HOUSE

CABLE
ADDRESS
"HARDINGMIL
NEW YORK"

HARDINGE

CONICAL MILL



THIS page is dedicated to the scores of practical engineers who saw the merits of Hardinge Conical Mills and who had courage enough to back up their judgment by giving them a practical test. These men are *big* men and men of vision—men who have won their important place by the service they have rendered their company and the money they have made and saved for them by their progressiveness and initiative.

The day has arrived when a "list of users" of Hardinge Mills is hardly necessary.

Think of the important companies, manned by *big* men and you will invariably see the Hardinge Mill, night and day, grinding away.

NIGHT AND DAY THEY GRIND AWAY

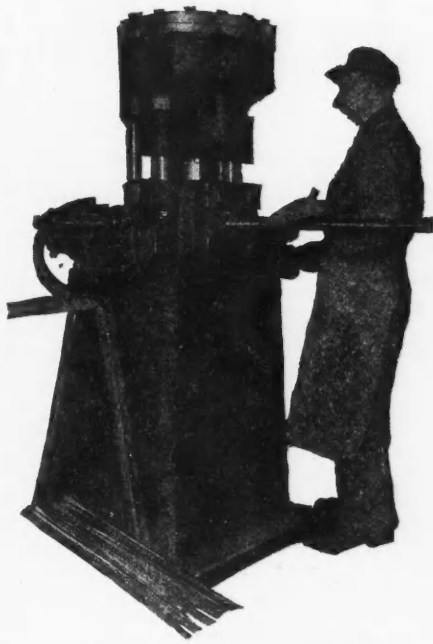
HARDINGE COMPANY

120 BROADWAY NEW YORK N.Y.

WORKS
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ERITH, ENG.

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DENVER, COLO., FIRST NATIONAL BANK BUILDING
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CABLE
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"HARDINGMIL
NEW YORK"



"The Waugh Way Wins"

A Perfect Tribute

THE Tonopah Extension Mining Company, speaking through its Master Mechanic, Mr. H. A. Reid, says of the Waugh Model 8 Drill Sharpener:

"AS we have been using one of your Waugh D. S. 8 drill sharpeners at the Tonopah Extension in Tonopah, and one at the White Caps mine in Manhattan, for a period of over three years with most gratifying results, I wish to state that we consider it the best sharpener on the market today.

"WE have used several different types of machines, changing makes to keep abreast of improvements as they came up. * * *

"TO date we have purchased no repairs for any of the equipment, and we consider the Waugh D. S. 8 to be the best machine we have ever used from every standpoint, as to low upkeep, durability, low air-consumption, and efficiency."

TRIBUTES of this sort not only point the way to contentment and efficiency in the mine blacksmith shop, but afford further proof of the well-known fact that

"The Waugh Way Wins"

THE Denver Rock Drill Manufacturing Co.

Denver, Colorado

San Francisco
Scranton
El Paso

Los Angeles
Seattle
Salt Lake City

Joplin
Wallace
Birmingham

Lima
Santiago
Mexico City

New York City
Houghton
Butte

Melbourne
Johannesburg

Canadian Rock Drill Company, Limited
Sole Agents in Canada

Toronto, Ont.

Nelson, B. C.

Cobalt, Ont.

Vancouver, B. C.

VULCAN



ALUMINUM bearing rock may be calcined at a lower cost in Rotary Kilns than by any other method.

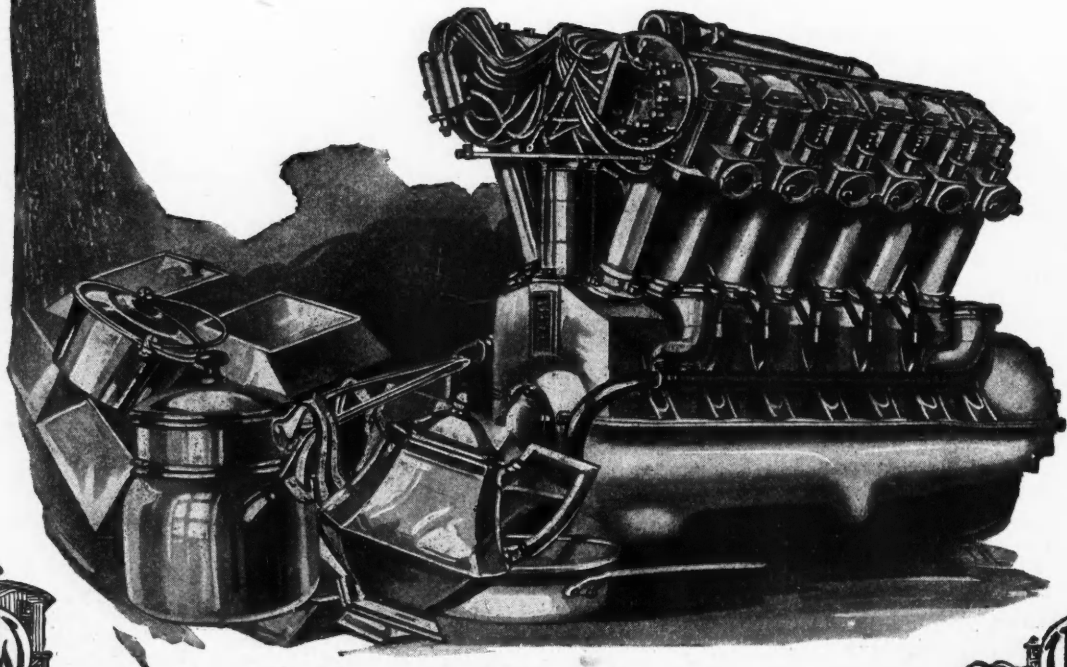
Uniform burning, easily regulated charging and unloading, together with continuous feed, are important essentials in the reduction of the aluminum ores.

VULCAN Rotary Kilns have been used successfully for several years in the calcining of aluminum ores.

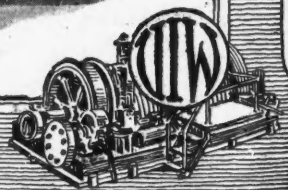
Correspondence Invited.

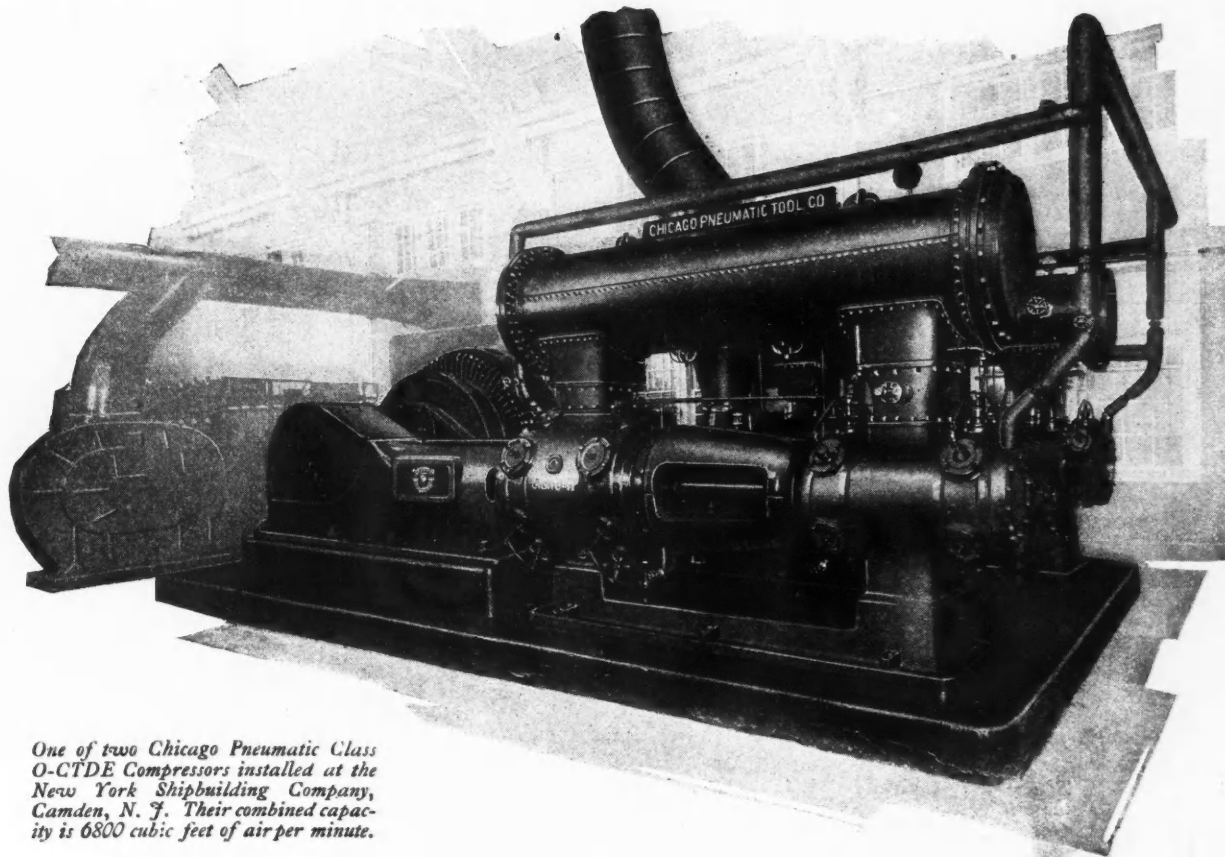
VULCAN IRON WORKS

*Designers and Builders of Rotary Kilns for 26 years.
1733 Main St., Wilkes-Barre, Pa.*



VULCAN





One of two Chicago Pneumatic Class O-CTDE Compressors installed at the New York Shipbuilding Company, Camden, N. J. Their combined capacity is 6800 cubic feet of air per minute.

The heart of an air compressor is its valves

WITH the silence and unyielding endurance of the Sphinx, the air valves of Chicago Pneumatic Compressors frequently operate *years* in heavy duty service without replacement or attention beyond an occasional inspection. They're Simplates!

Besides being practically indestructible, Simplate Flat Disc Valves require no lubrication. automatically adjust themselves to

fluctuating load demands (on both intake and discharge sides) and due to their simplicity are singularly free from troubles too often common in compressors employing mechanically operated and other complicated valve designs.

All Chicago Pneumatic Compressors—over 300 distinct sizes and types—are Simplate Valve equipped. *Built* for better service—they *give* it. Ask for bulletins.

Chicago Pneumatic Tool Company

Chicago Pneumatic Building · 6 East 44th Street · New York

*Sales and*Service Branches all over the World*

BIRMINGHAM · CHICAGO · DETROIT · EL PASO · JOPLIN · MINNEAPOLIS · PHILADELPHIA · RICHMOND · SEATTLE · BARCELONA · BRUSSELS · CHRISTIANIA · HONOLULU · LONDON · MONTREAL · SEOUL · VANCOUVER
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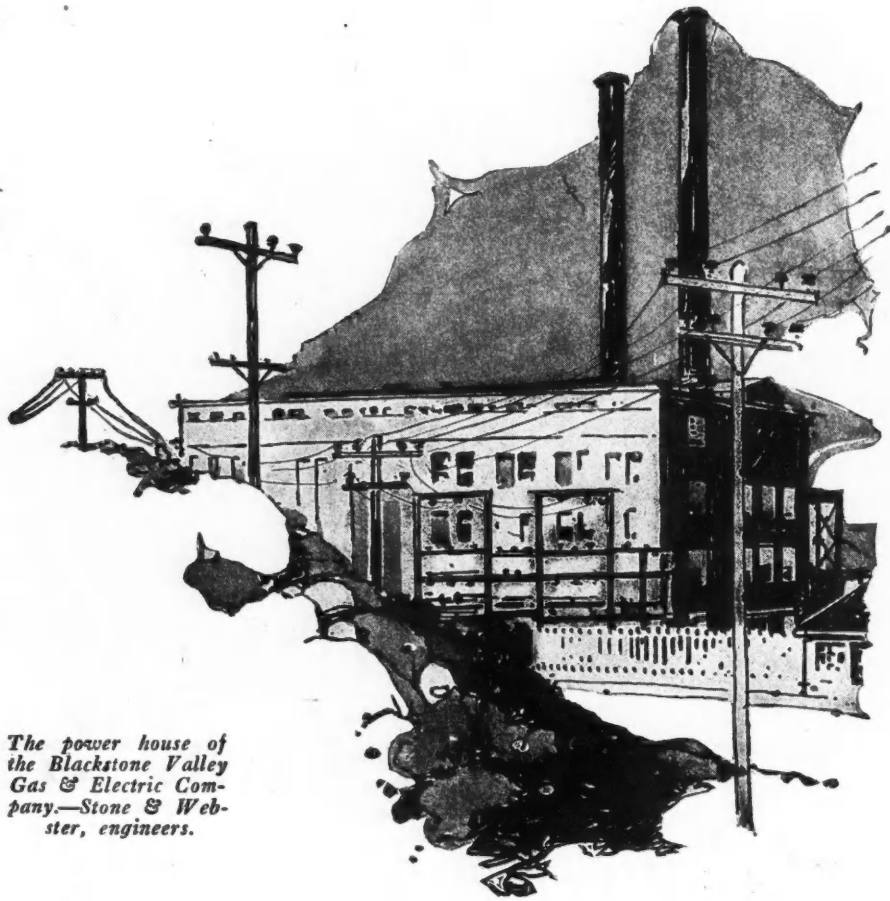
BOYER PNEUMATIC HAMMERS · LITTLE GIANT PNEUMATIC AND ELECTRIC TOOLS
 CHICAGO PNEUMATIC AIR COMPRESSORS · VACUUM PUMPS · PNEUMATIC HOISTS
 GIANT OIL AND GAS ENGINES · ROCK DRILLS · COAL DRILLS

CHICAGO
The Compressor with



PNEUMATIC
the Simplate Valve

C-47



*The power house of
the Blackstone Valley
Gas & Electric Com-
pany.—Stone & Web-
ster, engineers.*

INCo
MONel metal

THE INTERNATIONAL NICKEL COMPANY

They call it water, but it rots Cast Iron

There's a lot more than water flowing down to the sea between the banks of the Blackstone River, and it's pretty poor stuff as water goes. From above the power house of the Blackstone Valley Gas & Electric Company comes textile and dye-house waste and CO₂, and because it is near the sea, the salts found in tide water are aggressively present. But the condensers have to handle it, and they do—till the machines give out. The present system was put in two years ago by Stone & Webster, and corrosion gas sent the cast iron drum of the condenser to the scrap heap but—the impeller and guide vanes were made of Monel Metal and they are still in good condition.

Stone & Webster knew what to specify and so do the other leading engineers all over the country. They have learned by their wide experience to appreciate and utilize the remarkable properties of Monel Metal. They recognize that for valve parts in superheated steam service there is nothing that can be relied upon like Monel Metal. Against alkalis, most acids, superheat, hot gases, and unusual conditions of abrasion, corrosion and stress, Monel Metal is known to stand up long after most other installations would have to be scrapped.

The name MONEL is given to a line of metal products developed from a natural nickel alloy, 67% nickel, 28% copper and 5% other metals. These products include MONEL blocks, MONEL rods, MONEL castings, MONEL sheet, MONEL wire, MONEL strip stock, etc.

MONEL Metal can be machined, cast, forged, rolled, drawn, brazed, soldered, and welded by electric or oxy-acetylene method.

MONEL Metal is a product of The International Nickel Company, widely known as the sole producers of Inco Nickel.

THE INTERNATIONAL NICKEL COMPANY
43 Exchange Place New York, N. Y.
The International Nickel Company of Canada, Ltd., Toronto, Ontario



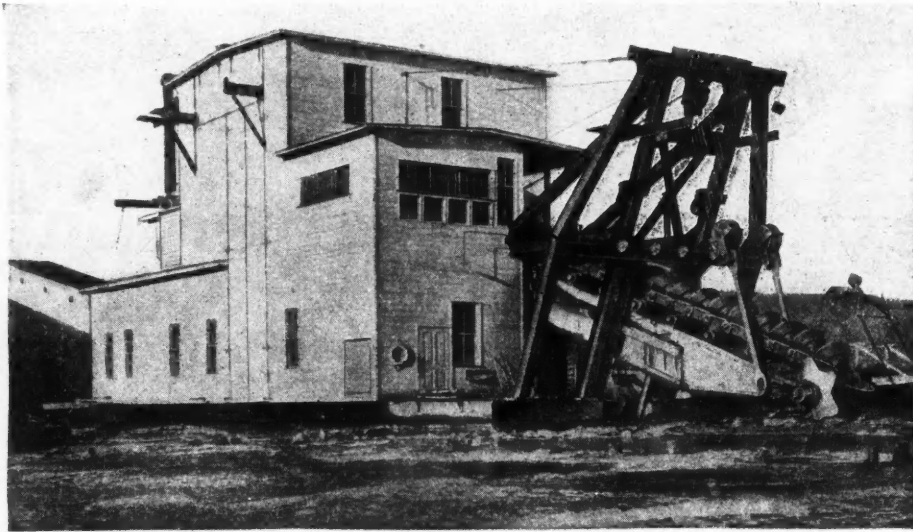
*Monel fitted impeller
handling, Blackstone
river water.*



THE INTERNATIONAL NICKEL COMPANY

NEW YORK ENGINEERING CO.

2 RECTOR STREET, NEW YORK, U.S.A.



A Fact-Producer

Absolute knowledge of the value of your property—that's what an "Empire" Drill will give you, in advance of actual development. Think what that means—whether in financing a placer proposition, or in equipping and working it. All doubt, all uncertainty, all chance, removed by "Empire" testing—and, to work with and build upon, a positive knowledge of conditions and values. As a fact-producer, the simple inexpensive "Empire" Drill has saved hundreds of thousands of dollars, for investors and engineers.

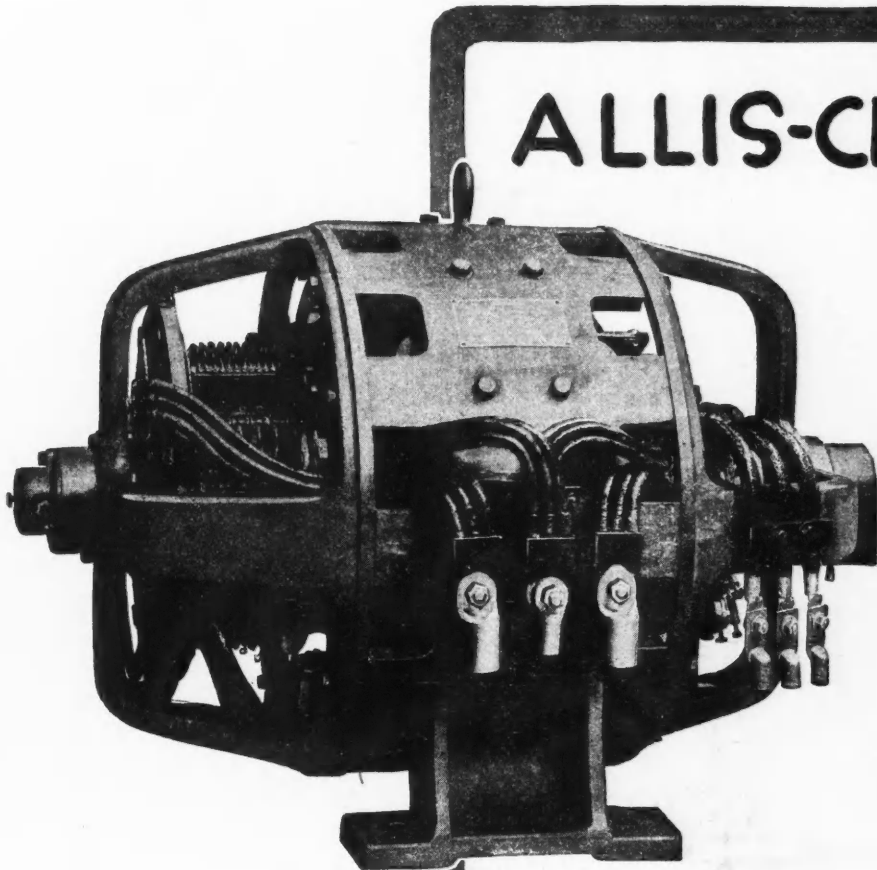
Let us send the Catalogs.

GOLD DREDGES PLACER MINING EQUIPMENT
EMPIRE PROSPECTING



DRILLS





ALLIS-CHALMERS

Bracket Bearing Type Rotary Converters

These machines are especially adapted to mining and industrial plants where a rugged, compact machine is required to deliver direct current when fed from an alternating current supply system.

Ratings of 100 K.W., 150 K.W., and 200 K.W. are built in this type, all being for 60 cycles, six phase and 250 or 275 volts.

The compactness of these machines, their rugged construction and their accessibility due to open construction; the use of commutating poles, an auxiliary squirrel winding for starting and their thorough ventilation, all contribute to ease of installation and operation and low maintenance expense.

ALLIS-CHALMERS MFG. CO

**Milwaukee
Wis.**



WORTHINGTON
BALL MILL

... another tried and true Worthington product

THE machine pictured at the head of this page is first cousin to "Superior Jaw and Gyratory Crushers," and in its field is equally efficient and worthy.

It is the Worthington Ball Mill—another tried and true Worthington product that is manufactured at our great Power and Mining Works at Cudahy, Wisconsin.

Worthington Ball Mill is designed and built by the same mining machinery experts who are responsible for the success attained by Worthington mining machinery the world over.

Other Worthington Products

Gyratory Crushers, Jaw
Crushers, Air Compressors,
Mine Pumps, Revolving Stone
Screens,
Ball and Tube Mills.

Worthington Pump and Machinery Corporation

Executive Offices: 115 Broadway, New York City

Branch Offices in 24 Large Cities

PUMPS—COMPRESSORS—CONDENSERS—OIL & GAS ENGINES—METERS—MINING—ROCK CRUSHING & CEMENT MACHINERY

WORTHINGTON

Deane Works, Holyoke, Mass.

Blake & Knowles Works
East Cambridge, Mass.
Worthington Works
Harrison, N. J.

Epping-Carpenter, Pittsburgh, Pa.

Laidlaw Works, Cincinnati, Ohio.

Gas Engine Works, Cudahy, Wis.

Power & Mining Works
Cudahy, Wis.
Snow-Holly Works
Buffalo, N. Y.

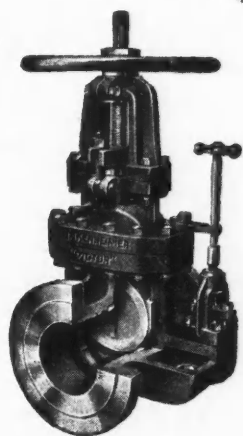


AMERICA'S BEST
LUNKENHEIMER
QUALITY
SINCE 1862

The LUNKENHEIMER
solid wedge disc -
double seated.



LUNKENHEIMER "VICTOR" GATE VALVES



have a solid wedge disc which seats on rings threaded into the body in exact alignment with the disc faces. The disc is guided and travels to practically a closed position before coming in contact with the seat ring faces. This construction eliminates the "dragging" of the disc across the seats and the consequent wear prevalent in valves employing loose parts.

The generous proportion of all parts and the high quality materials insure ample safety factors for all service conditions.

An exclusive Lunkenheim feature is the gasket between the body and the bonnet flanges, consisting of a seamless copper wire partly embedded in the body flange. It cannot blow out and is practically indestructible.

The bearings are bushed to insure long life to the wearing parts and to further enhance their durability as a whole, all the parts are interchangeable.

Made with Inside Screw Stationary Stem and with Outside Screw and Yoke, Rising Stem in Bronze, Iron and Steel for pressures up to 350 pounds and temperatures to 800 degrees F.

For *Safety, Service and Economy* specify LUNKENHEIMER "VICTOR" GATE VALVES and insist on their installation.

Distributors of Lunkenheim Products situated in every commercial center.

THE LUNKENHEIMER CO.
"QUALITY"

Largest Manufacturers of
High Grade Engineering Specialties
in the World

CINCINNATI

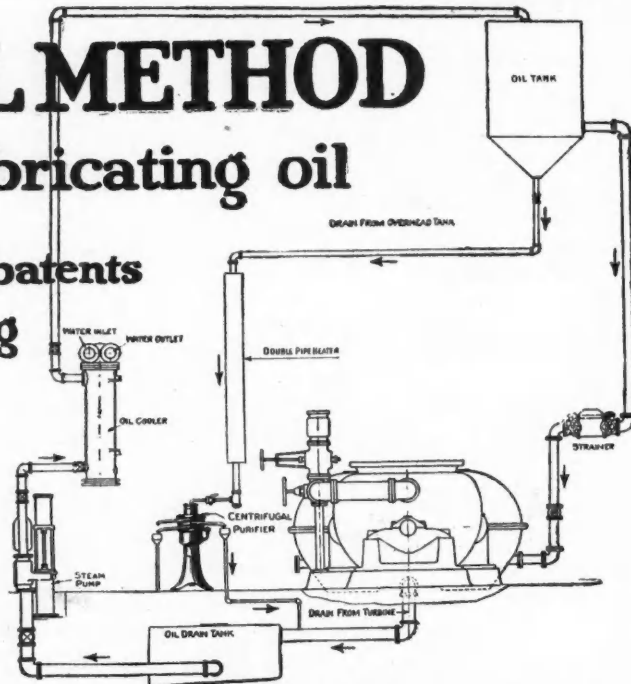
New York Chicago Boston London

THE DE LAVAL METHOD

of purifying lubricating oil

Process fully covered by patents
and patents pending

The De Laval Method of purifying lubricating oil is a simple and effective means of eliminating water, metal particles, core sand, pipe scale, carbon and other impurities from the oil. By its use, the original lubricating qualities of the oil are restored and indefinitely maintained.



This installation shows the De Laval Method applied to a steam turbine; it is equally applicable to any kind of power unit.

The De Laval Oil Purifier is the result of over forty years of leadership in centrifugal engineering. The purification is instantaneous, rapid and complete, and the method is simple and inexpensive. The Oil Purifier occupies less than two square feet of floor space and requires less than two horsepower to drive. It is furnished in three sizes, each size in either electric, belt or direct steam turbine drive.

In many public service power plants, as well as large machine shops where the most modern and extensive filtering systems were in use, the De Laval Oil Purifier eliminated large quantities of impurities and water from the oil which had previously passed through the filtering systems. These concerns have since discarded filtering systems and now employ the De Laval Method exclusively. Full particulars, including names, on request.



De Laval
Oil Purifier
Turbine
Driven

Write to nearest office for bulletin No. 100
and users' reports

The De Laval Separator Co.

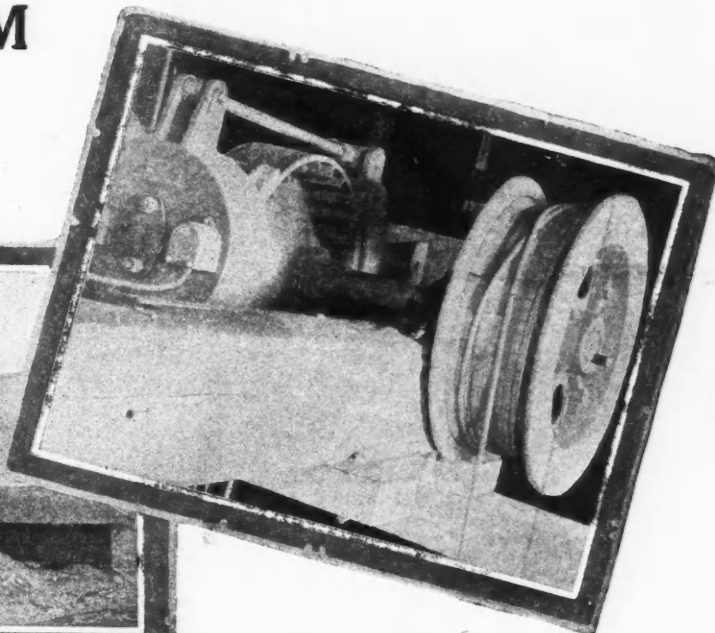
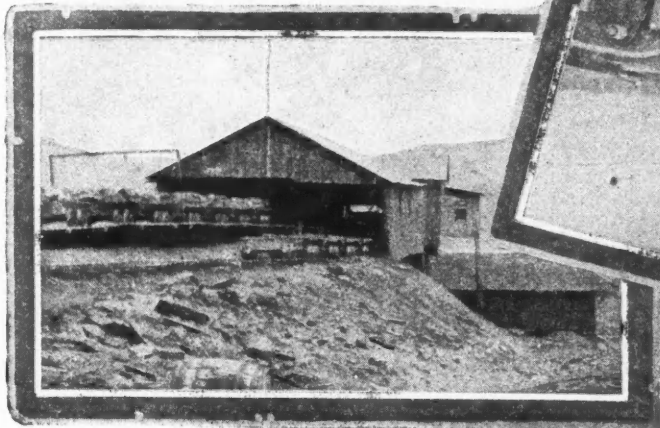
Largest Manufacturers of Centrifugal Machinery in the World
165 Broadway, New York 29 East Madison St., Chicago

DE LAVAL DAIRY SUPPLY CO.

Manufacturers' Selling Agents
SAN FRANCISCO

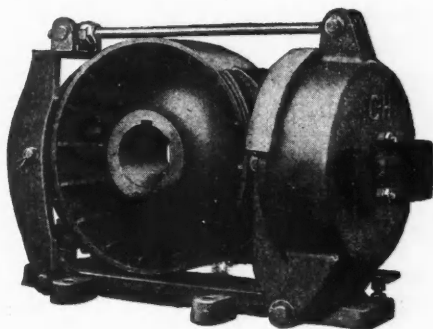


Here a C-H Type M Brake Released One Man



The C-H Type M Brake installed in coal tipple of Sterling Coal Co., Salineville, Ohio, and used as holding brake on weigh pan. This application made it possible to eliminate one man.

The C-H Type M Electric Brake replaced a hand operated brake and a workman who released this brake on signal from the weigh room man.



the coal tipple pushes a button of a control station with his foot and the electric brake at the weigh pan releases.

Now the weigh room man in

The extra man formerly needed has been released for other work.

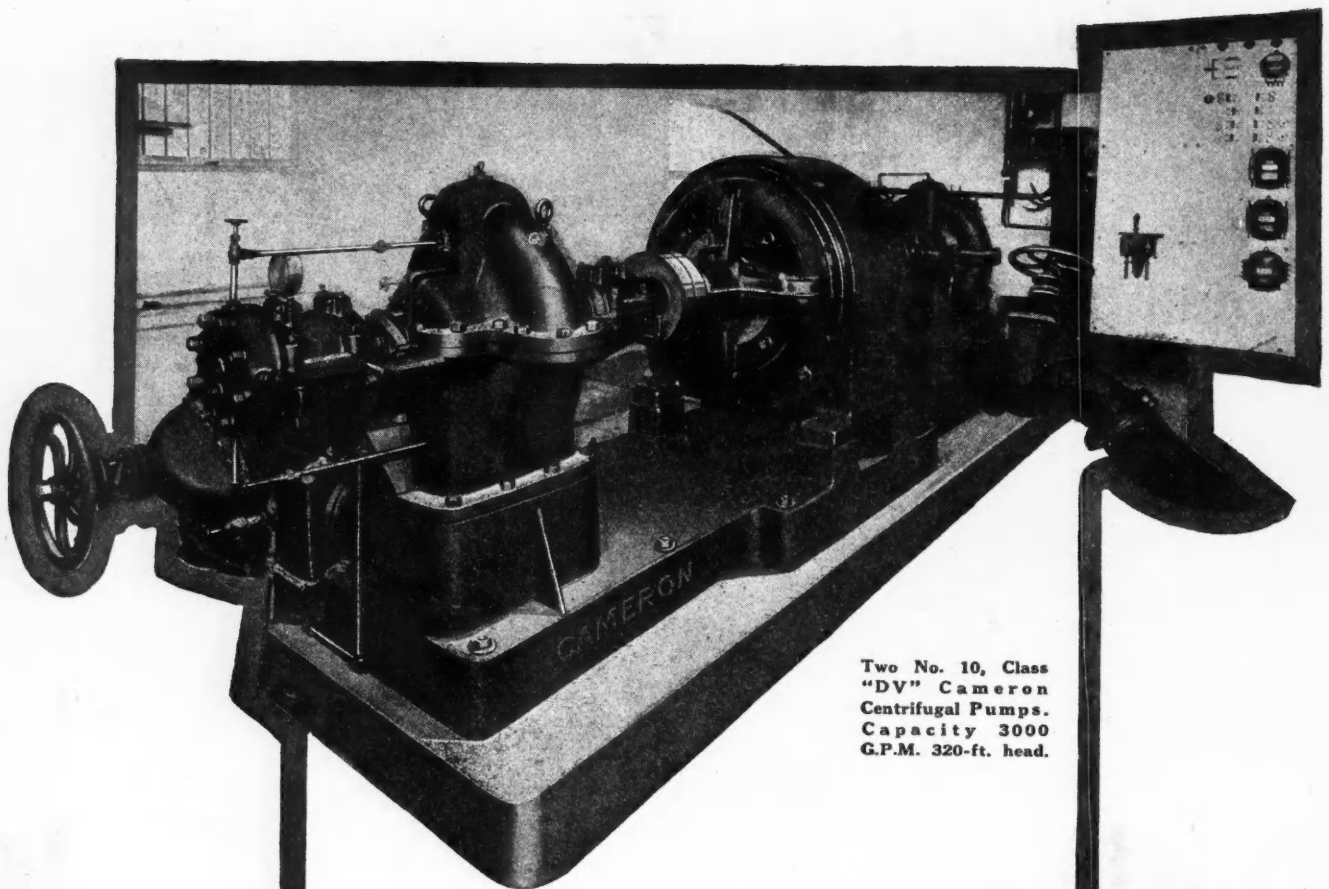
New Publication 850 tells all about Cutler-Hammer Electric Brakes. Any district office will forward a copy to you.

THE CUTLER-HAMMER MFG. CO.
Works: Milwaukee and New York

District Offices: New York: Hudson Terminal Bldg. (50 Church St.); Chicago: 323 No. Michigan Ave.; Pittsburgh: Farmers' Bank Bldg.; Boston: 77 Franklin St.; Philadelphia: Commonwealth Bldg.; Cleveland: Guardian Bldg.; Cincinnati: Gwynne Bldg.; Detroit: 905 Kresge Bldg.

Selling Agents: H. B. Squires Co.; San Francisco: 583 Howard St.; Los Angeles: 206 So. San Pedro St.; Seattle: 553 First Ave. Sq.; General Machinery Co.; Birmingham, Ala.: Brown-Marx Bldg.; H. L. Vaughan; Denver: 1710 Glenarm St.; L. Brandenburger; Salt Lake City: 59 W. Broadway.

CUTLER-HAMMER



Two No. 10, Class
"DV" Cameron
Centrifugal Pumps.
Capacity 3000
G.P.M. 320-ft. head.

The City of Glendale, California, installed these pumps over two years ago. They have been in constant service and when opened for inspection exhibited no signs whatever of wear.

Mr. H. B. Lynch, Manager of the Public Service Department, says:

"The pumps are entirely satisfactory in every way and have completely fulfilled our expectations."

Do you obtain that satisfaction which is a part of Cameron Service?

Send for Bulletin 7250

A. S. Cameron Steam Pump Works
11 Broadway, New York

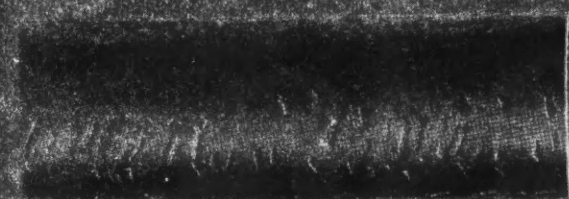
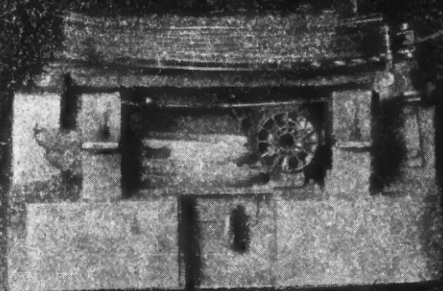
Offices the World over.

83-DV

CAMERON CENTRIFUGALS

HAZARD

"LORECA" REEL CABLE



Quality Survives

A Comparison of Costs

You pay less for ordinary reel cable than for HAZARD "Loreca" Reel Cable, but ordinary reel cable costs more.

The rough usage such cable encounters in service quickly cuts the covering, which strips or peels back from the insulating compound. Then the locomotive operator must stop to make repairs.

You pay for his time and the repair materials.

Only *long continued wear* can affect the efficiency of HAZARD "Loreca" Reel Cable—and when it finally wears out the difference in price between it and ordinary cable has been absorbed many times over by the uninterrupted tonnage and absence of repairs you get from HAZARD "Loreca" Cable.

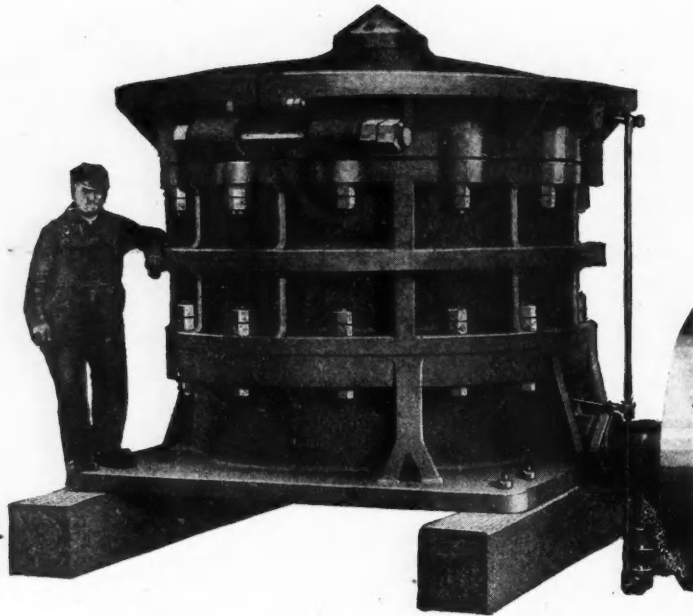
A sample of this remarkably durable and dependable cable will show why it outwears "just cable." Shall we send it?

Hazard Manufacturing Co.
Wilkes-Barre, Pa.

NEW YORK
533 Canal Street
PITTSBURGH
1st National Bank Bldg.

CHICAGO
552 W. Adams Street
DENVER
1415 Wazee Street

Upper: What happens to ordinary reel cable.
Lower: How uniformly HAZARD "Loreca" Reel Cable wears after months of severe service.



TELSMITH CRUSHER TALK
No. Five

HEAD-ROOM

Telsmith saves head-room, but not where usually anticipated.

The picture represents a No. 9 Telsmith Primary Breaker complete except for the discharge chute, which is merely a hopper of steel plate fastened to the base of the machine. Measured from the rim of the crown to the bottom of the discharge chute, Telsmith is just as long as any lever-shaft crusher. But, nevertheless, Telsmith saves head room as follows:—

(A) ABOVE THE CRUSHER:—Necessary over-head clearance for repairs is reduced about thirty per cent, due to the shorter shaft.

(B) BELOW THE CRUSHER:—All repairs on Telsmith Primary Breakers are made from *above the crusher*, so no clearance is required below the machine for lowering the eccentric and main driving gear.

(C) IN LOCATING CONVEYOR:—For the same reasons as stated under heading B, it is possible to run a bucket elevator or belt conveyor directly under a Telsmith Breaker. This generally cuts the depth of the conveyor pit considerably.

The importance of this saving in head-room was well illustrated in laying out the mill of a leading copper producer. Telsmith's advantage in head-room made it possible to reduce the cost of the coarse ore bins, crusher house, conveyors and chutes by an amount greater than the whole cost of the breakers! But this economy in head-room is not uniform. It varies with the character of the installation, reaching the maximum where belt conveyors are used for transporting the crushed rock from the breaker. Dimension tables will be found in catalog No. 168 (Telsmith Primary Breakers) and bulletin No. 2F1 (Telsmith Reduction Crushers.)

SMITH ENGINEERING WORKS

3195 Locust St., Milwaukee, Wis.

Old Colony Bldg.,
Chicago, Ill.
523 Boston Bldg.,
Denver, Colo.

30 Church St.,
New York City

Salt Lake Hardware Co.,
Salt Lake City, Utah

710 Witherspoon Bldg.,
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Boston, Mass.

2540 University Ave.,
St. Paul, Minn.
625 Market St.,
San Francisco, Calif.

110 W. Park Way, N. S.
Pittsburgh, Pa.
Old National Bank Bldg.,
Spokane, Wash.

Selecting the Babbitt

"So much of this, so much of that and so much of something else."

You send in an inquiry for a price on a babbitt to contain so much of this, so much of that and so much of something else.

The order goes to the lowest bidder. He makes it up to specifications, "so much of this, so much of that and so much of something else," and you accept it.

Whether it is a homogeneous alloy, or just a mixture of specified ingredients, is of no apparent concern—so long as it contains "so much of this, so

much of that and so much of something else," it is acceptable. *It's got to be.*

When will the babbitt buyer learn that the mere content of a babbitt is not the all-important factor? When will he learn that the alloying of the babbitt to complete amalgamation is even *more important* than its content? And when will he learn that the manufacturing cost of a babbitt to complete amalgamation, is more than that of just putting the ingredients together so that it will analyze to "so much of this, so much of that and so much of something else"?

UNITED AMERICAN METALS CORP'N

1011 Chestnut Street
Philadelphia, Pa.

Main Office and Works:
Diamond Street and Meserole Avenue
BROOKLYN, N. Y.

443 S. Dearborn Street
Chicago, Ill.



CEMENT-GUN (Trade Mark)



Lindsay-Strathmore irrigation district, San Joaquin Valley, Cal.—2-in. "Gunite" walls, reinforced with wire mesh.

The "Cement-Gun" is not a restricted article. It may be purchased outright from us and used by anyone.

Gunite Builds a Big Flume

Whenever concrete must be extra strong, durable and watertight, the job calls for GUNITE. This was the case with the Lindsay-Strathmore Irrigation Flume, so the "Cement Gun" was used. Whether you are building walls, floors or masonry of any kind, use the "Cement Gun." On repair jobs about the mine the "Cement Gun" will complete the work in less time and more economically than possible by other methods.

Our Bulletins will tell you all about the "Cement Gun"

Cement-Gun Co., Inc., Allentown, Pa.

New York Office, 30 Church St.; Chicago Office, 904 Fisher Bldg.; Pittsburgh Office, 211 Fulton Bldg.; Los Angeles Office, Citizens' National Bank Bldg.; Spokane Office, 612 Mohawk Block; Richmond Office, 812 Virginia Railway and Power Bldg.; General Supply Co., Ltd., Winnipeg, Man.; 204 R. A. Long Bldg., Kansas City.

Agencies in all principal foreign countries

Traylor Portable Steam or Electrically Driven Air Compressors for Mine and Contractor.

Dewey Combined Air Dryer and Water Heater delivers Dry Air to your "Gun" or Air Tools.



Dependable Distribution of Power

is an acknowledged accomplishment of

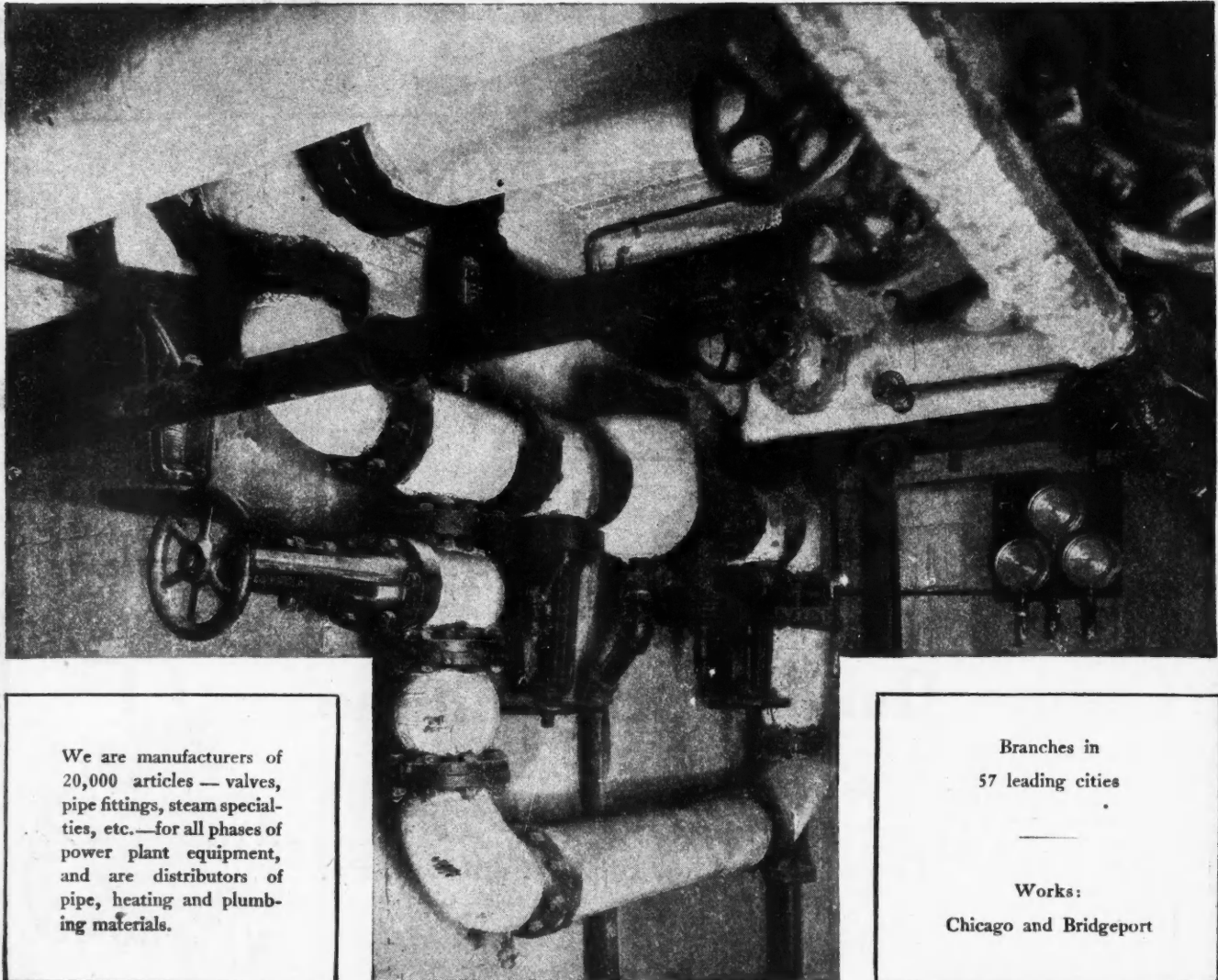
CRANE

VALVES, FITTINGS, STEAM SPECIALTIES

Designed to meet their specific needs and thoroughly tested to insure proper functioning.

1855 — **CRANE CO.** — 1920

836 South Michigan Avenue
Chicago



We are manufacturers of 20,000 articles — valves, pipe fittings, steam specialties, etc. — for all phases of power plant equipment, and are distributors of pipe, heating and plumbing materials.

Branches in
57 leading cities

Works:
Chicago and Bridgeport



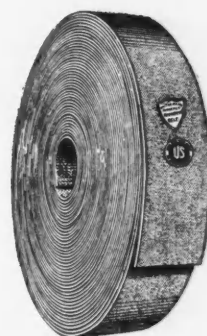


Rubber Goods for the Mining Industry



Giant Belt

THE mining salesmen and the practical factory men of the United States Rubber Company are qualified through study and experience to recommend the right mechanical rubber goods for any condition existing in this industry.



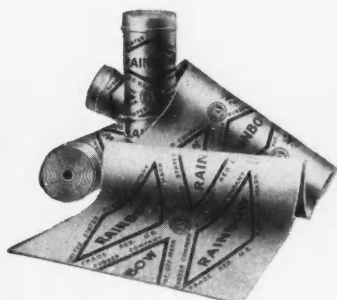
Rainbow Belt



4810 Air Hose

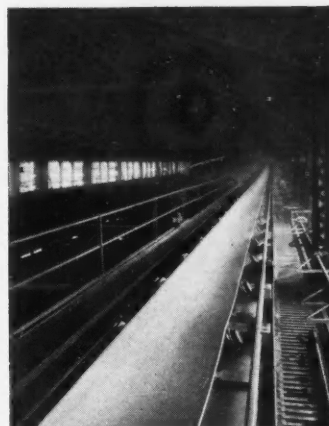


Rainbow Steam Hose



Rainbow Packing

They are ready to assist mine operators by advising as to the best application of mechanical rubber goods in order that the greatest possible service may be obtained for every dollar invested.



U. S. Conveyor Belt

United States Rubber Company

The World's Largest and Most Experienced Manufacturer of Mechanical Rubber Goods

BELTING

Transmission "Rainbow," "Pilot," "Shawmut," "Giant Stitched"
Conveyor "United States," "Grainster"
Elevator "Matchless," "Granite," "Grainster"
Tractor "Sawyer Canvas," "Little Giant Canvas"
Agricultural "Rainbow," "Bengal," "Grainster," "Sawyer Canvas"

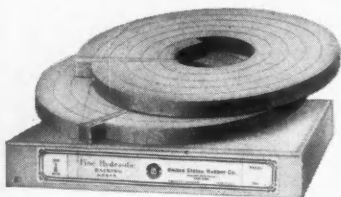
HOSE

Air "4810," "Dexler"
Steam "Rainbow," "Giant," "Perfected"
Water "Rainbow," "Mogul," "Perfected"
Suction "Amazon," "Giant"
Garden "Rainbow," "Mogul," "Lakeside"

Also Hose for Acetylene, Oxygen, Acid, Air Brake, Gasoline, Oil, Hydraulic, Air Drill, Auto Radiator, Car Heating, (Chemical, Coke, Creamery, Discharge, Vacuum, Sand Blast, Spray, etc.



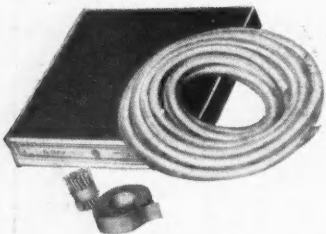
Rubber Goods for the Mining Industry



573 Hydraulic Packing



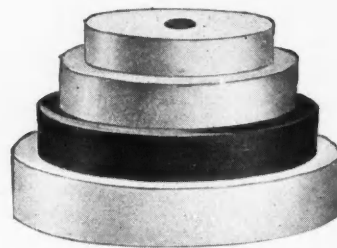
Perfected Water Hose



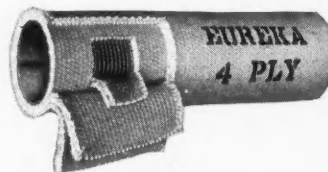
Eclipse Tubular Gaskets

BEING in close touch with the trade and with each other, our salesmen and factory men are able to combine their experience for the benefit of our customers, large or small.

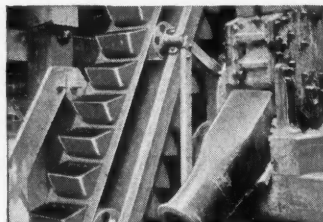
Take advantage of this Company's facilities and experience when in the market for rubber goods. Through our nearest Branch you can obtain the fullest cooperation of our organization.



Pump Valves



Cotton Rubber Lined Fire Hose



U. S. Elevator Belt

United States Rubber Company

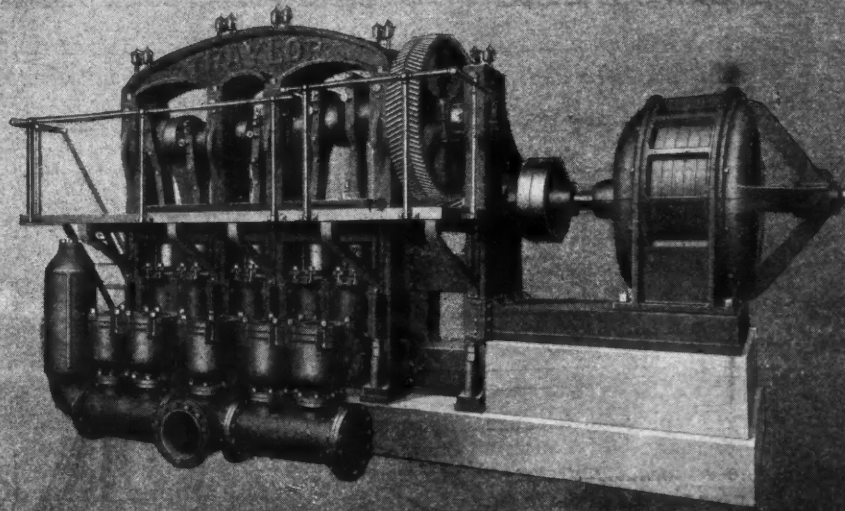
*The World's Largest and Most Experienced
Manufacturer of Mechanical Rubber Goods*

PACKINGS	MISCELLANEOUS	
<p>Rod "Wizard," "Rainbesta," "Peerless," "Honest John," "No. 573" and hundreds of other styles in coils, rings, gaskets and diaphragms —</p> <p>Sheet "Rainbow," "Vanda," "Paramo" Usco Valves —</p> <p>THE RIGHT PACKING IN THE RIGHT PLACE</p>	<p>Mats, Matting and Flooring, Plumbers' Specialties, Rubber Covered Rolls, Moulded Goods</p>	<p>Dredging Sleeves, Hard Rubber Goods, Printers' Blankets, Tubing, Soles, Heels, Jar Rubbers, Friction Tape, Splicing Compd.</p>





“a better pump for any service”



THE
TRAYLOR
SUPERPUMP

Bulletin M-101 tells you why your next should be
A SUPERPUMP—Get It

Traylor Engineering & Mfg. Co.

ALLENTOWN, PA.

NEW YORK
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DUPLEX TRUCKS

BUILT FOR BUSINESS

Careless Truck Buying Makes Transportation Cost Too Much!

The Truck is a Piece of Business Machinery. It Should Represent the Most Economical Method for Doing its Particular Job. Buy Your Truck on That Basis—And it Will be a Good Investment

RISING costs and the shrinking value of the dollar to a large extent can be offset by *intelligent buying*.

A steadily increasing number of business men are getting the facts and then buying their trucks on the basis of the facts.

There are many good trucks on the market. But value in a truck, very much like character in a man, isn't always completely revealed by what the eye can see.

Back of every Duplex Truck are *Fundamental Principles*—of design and of construction—factors that result in the *remarkable degree of service value in Duplex trucks for the man who buys*.

There is Nothing Somebody Else Can Do to Save a Man From Paying the Price of His Own Limitation or His Own Carelessness

Look in the used car columns of your local paper. Note the number and makes of trucks offered for sale and *think about* all the reasons.

In one day in three cities 324 different used trucks were listed for sale—and not one Duplex among them.

Are these trucks for sale because they were not bought right?

There is something significant here when you stop to analyze it.

Why is this tendency to standardize on Duplex so noticeable of late years?

The answer is very likely that trucks are *more and more being bought on the business basis of service delivered and what the service costs over a period of years*.

This is a Time for Intelligent Buying

A truck is just as much a piece of business equipment as any other piece of machinery. Its value is in *what it does and how cheaply it does it*.

Transportation is a necessary part of every business.

A truck gives a business man transportation facilities—at a high or a low price. *It depends on the fitness of the truck for its job*.

Now take a man who buys a truck for his business without getting all the facts first. Later he discovers that his truck is not as economical as it should be. He sells it at a sacrifice and gets another—and so on. Finally he buys the truck he should have selected the first time.

What is the result?

He pays too much for his transportation. His costs for trucking are not right.

The Duplex Users of Today Are Probably the Most Intelligent Buyers and Users of Trucks in America

Think of this—ninety per cent of the Duplex dealers have been distributing Duplex Trucks ever since this company was first organized.

What does this signify? It shows for one thing that their customers have found the Duplex Truck to be a *successful truck for them*.

The great significance of all this is that *Duplex users stay Duplex users*. Many of them had tried out five or six different makes of trucks before they got their first Duplex.

The whole history of this business shows that when a man buys his first Duplex it is only a little while until *he standardizes on Duplex*.

Get the Facts for Yourself

We have hundreds of letters from users in our offices that show some very remarkable facts. They are not edited. The letters stand just as they were written.

If you are a truck user and want to read these letters write us and we will send them to you for your private perusal. For ethical reasons we do not care to publish them.

What Do You Think?

Duplex 4-Wheel Drive

Many companies in the heavy duty fields say that the Duplex 4-Wheel Drive is the *only successful truck they ever owned*.

If your kind of work has proved too much for the ordinary truck—you will find that the Duplex dealer near you can give you some really interesting facts. Many owners still seem to be using the *wrong kind of trucks*. Get the Duplex facts.



The Duplex Limited

Thoughtful men have entire confidence in the Duplex Limited—feeling that this *high speed Duplex* is a safe investment because of the fact that it is a Duplex.

Medium capacity—Pneumatic Tired—Two Wheel Drive—Full Electrical Equipment—here is a Speed Truck that *lasts*. Strong, rugged, mechanically and constructively *right*—it handles as easily and smoothly as a passenger car—and at a minimum of upkeep.

Duplex Truck Company

Lansing • Michigan

One of the Oldest and Most Successful Truck Companies in America

Tintic Standard of Utah Tells Its Story



"Six FWD'S take the output from the ore dump to the tipple, nearly five and a half miles. It is a steep climb all the way, the grades running from 3 to 15 per cent. In wet weather it is a slough of mud. Nevertheless, the FWD trucks, with loads averaging 8,000 to 10,000 pounds per truck, make the trip day and night—sometimes hub deep in mud. The trucks operate in two shifts over the twenty-four hours, delivering three to four carloads of ore at the tipple for each twenty-four-hour run of the mine."

The writer also adds that the standard 56-inch road tread of the FWD makes it easier to operate, because many of the roads are only wide enough for a wagon.

Only an investigation of the FWD can show what remarkable results are achieved in mine trucking.

Four Wheel Drive Auto Co.
Dept. 115 Clintonville, Wisconsin
Canadian Factory: Kitchener, Ont.

FWD TRUCKS

*The Boys from the
Front will tell you*



A National Investment Service

THROUGH the aid and co-operation of our correspondents we are enabled to offer an investment service national in scope.

We have the privilege of being connected by private wires with the following well known firms having offices in various cities:

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HORNBLLOWER & WEEKS

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PORTLAND
PROVIDENCE

Investment Securities

Founded in 1888

NEW YORK
CHICAGO
DETROIT

Members of the New York, Boston and Chicago Stock Exchanges

PORTABLE POWER

USE more dynamite! It is a powerful agent in condensed form. In one hand, a miner or contractor who uses dynamite can carry about with him to any desired point stored energy equal to that of scores of boilers and electric generators.

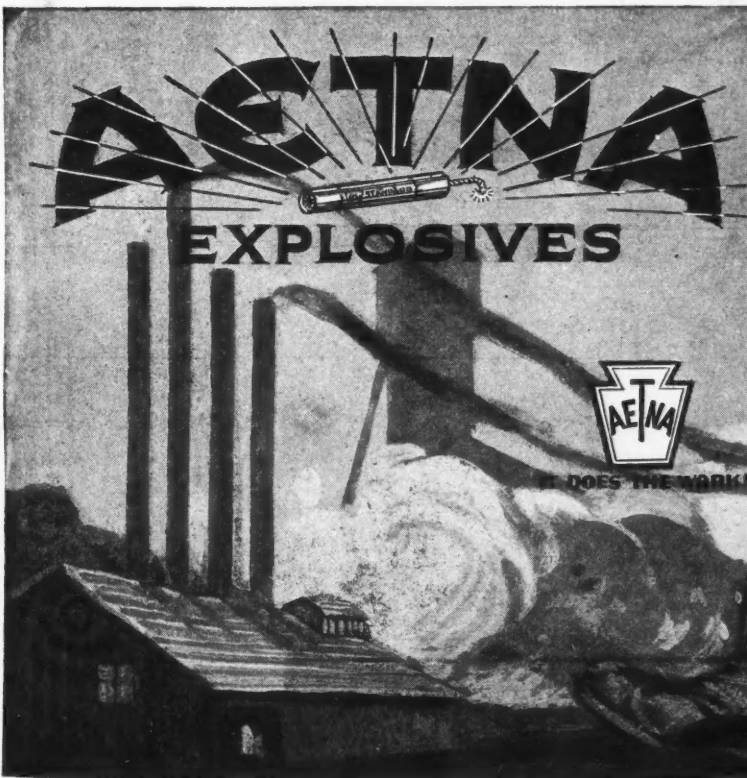
Whenever a tremendous force is needed to move or break things in a second of time, dynamite is daily finding new uses.

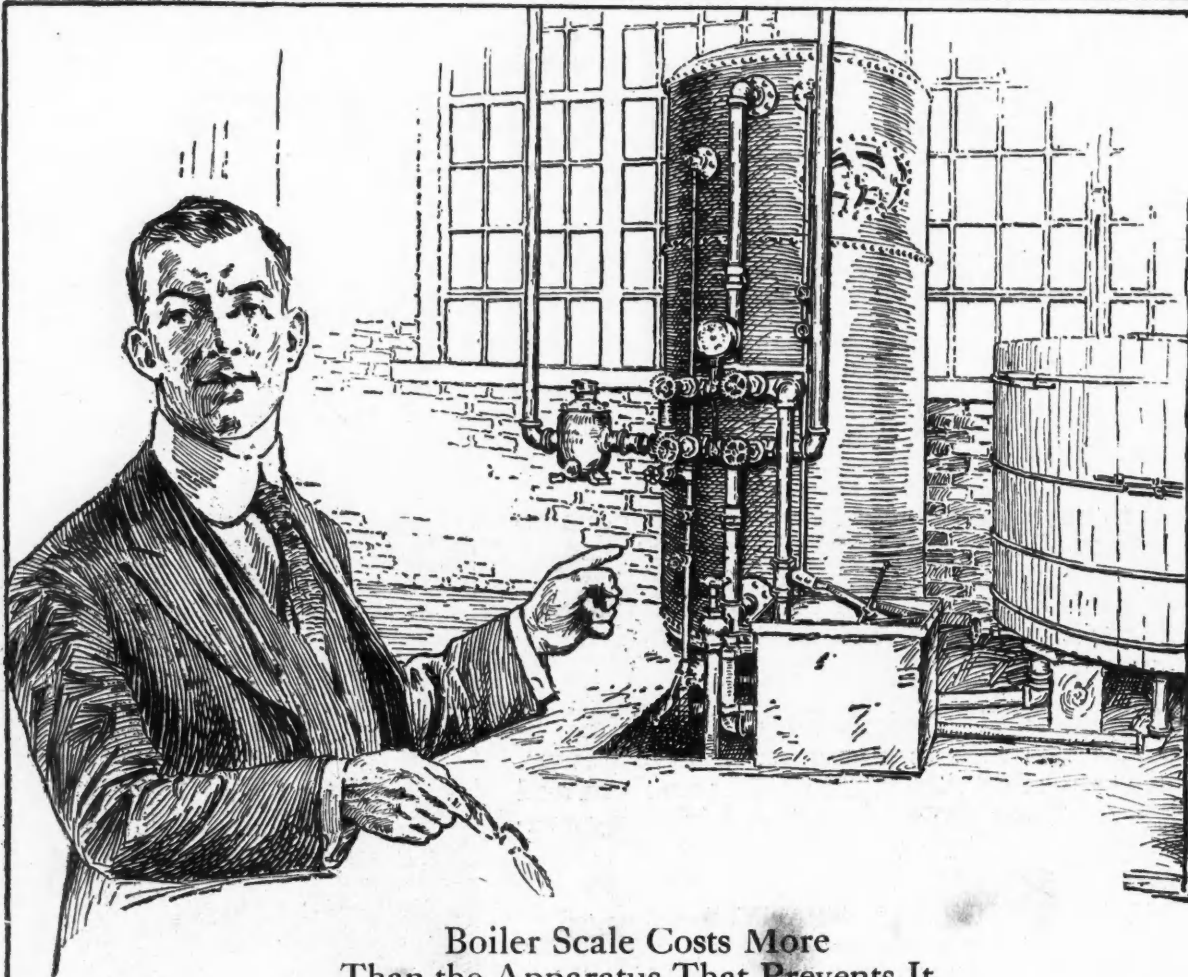
Carefully made and carefully handled, high explosives are just as safe as any other motive power. You will always find Aetna Explosives uniform and dependable. They are manufactured in many convenient types for different uses.

AETNA EXPLOSIVES COMPANY, Incorporated
165 Broadway, New York

BRANCHES

- | | | | | |
|------------------|---------------|-----------------|-----------------|------------------|
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| Buffalo, N. Y. | Denver, Colo. | Louisville, Ky. | Pottsville, Pa. | Wilkesbarre, Pa. |
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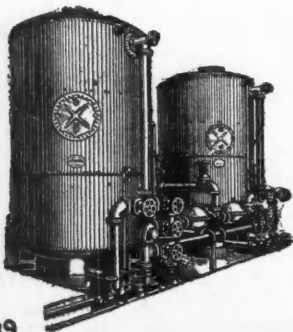
Boiler Scale Costs More Than the Apparatus That Prevents It

because in wasted fuel, repairs, supplies and labor, boiler scale is an everlasting, daily expense, whereas a Permutit Water Softener that will positively prevent scale, has a moderate initial cost, and low upkeep.

Figure out your boiler room charges for tube replacements, cleaning, repairs and the labor employed for that purpose. Add in about 20 per cent of your fuel bill, which is a conservative waste estimate if your scale is bad, and then tack on a few dollars for idle boilers, interrupted service, and your investment in idle equipment.

You will arrive at a figure that looks too big to be true, but we assure you that this method of figuring gives a most conservative estimate of the money you are daily losing, and money that can all be saved by Permutit Equipment.

Hundreds of Permutit Equipped plants are now banking those former losses. It costs nothing to investigate. Let us analyze your water supply, and quote facts to you. No obligations. Write today.



The Permutit Company
440 Fourth Ave. New York
Offices in all principal cities

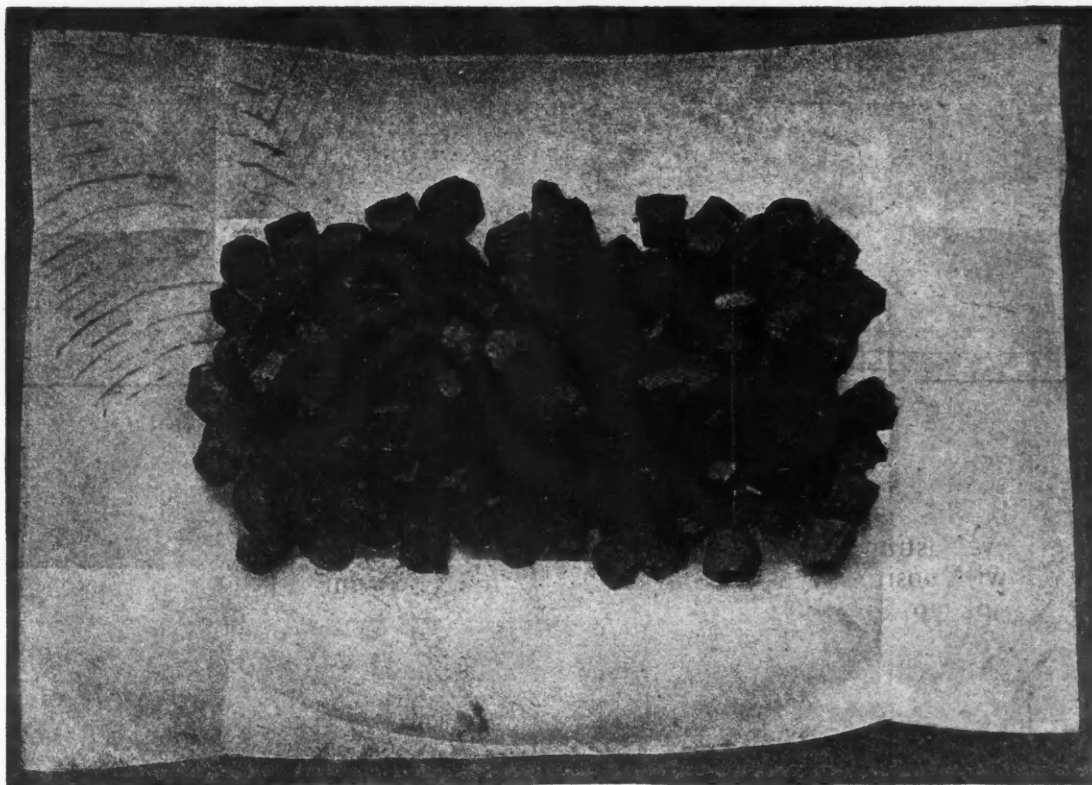
The S. Rose Company

1133 Broadway, New York

Selling Agents for

J. K. Gulland, Ltd., and L. M. Van Moppes & Sons, London, England

Carbons (Black Diamond) Bort

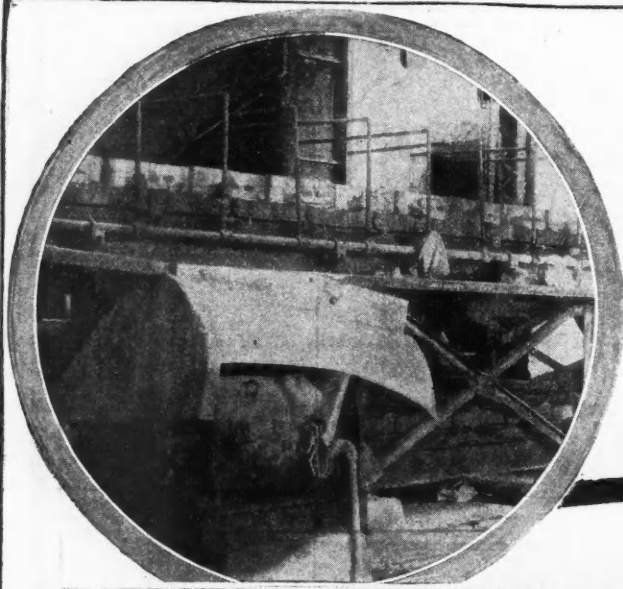


Just Received Shipment

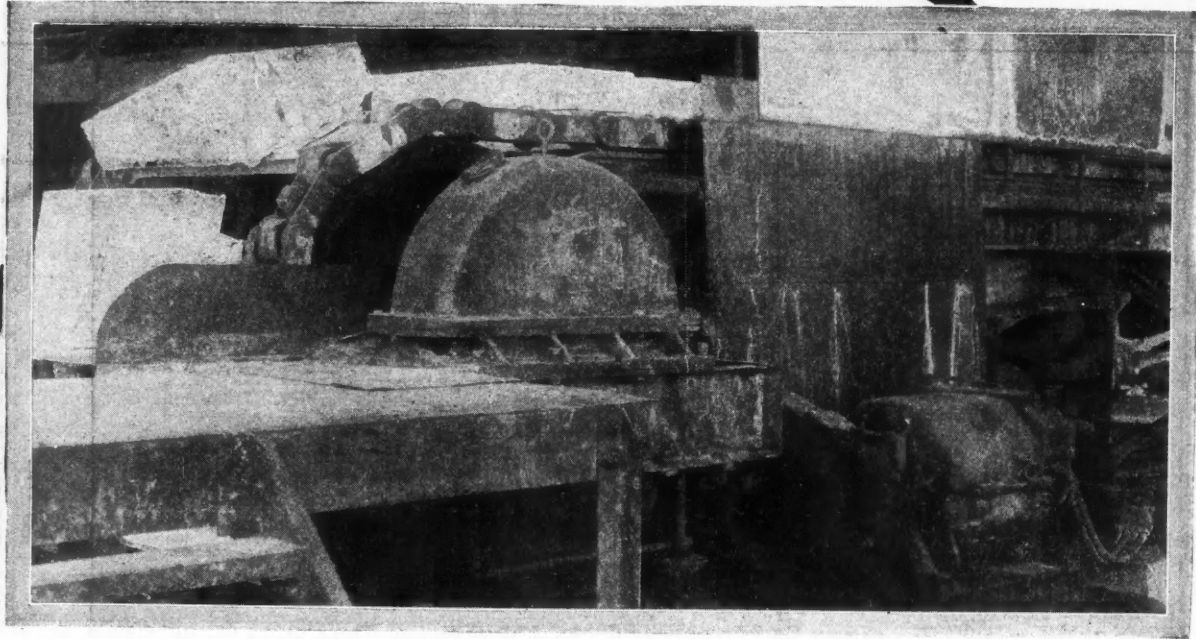
**Fine Quality Carbon, Perfect Shapes
Also Ballas Bort**

**Will send Quotations or parcels for examination if requested
by wire, at our expense**

Address Carbon Department



Qualified in Every Respect



Westinghouse Motors for Casting Machines

have convinced every user of their high commercial value.

Their ability to resist dust, heat and severe usage reveals the fact that every detail of their construction, both mechanical and electrical, has been skillfully planned by Westinghouse Engineers.

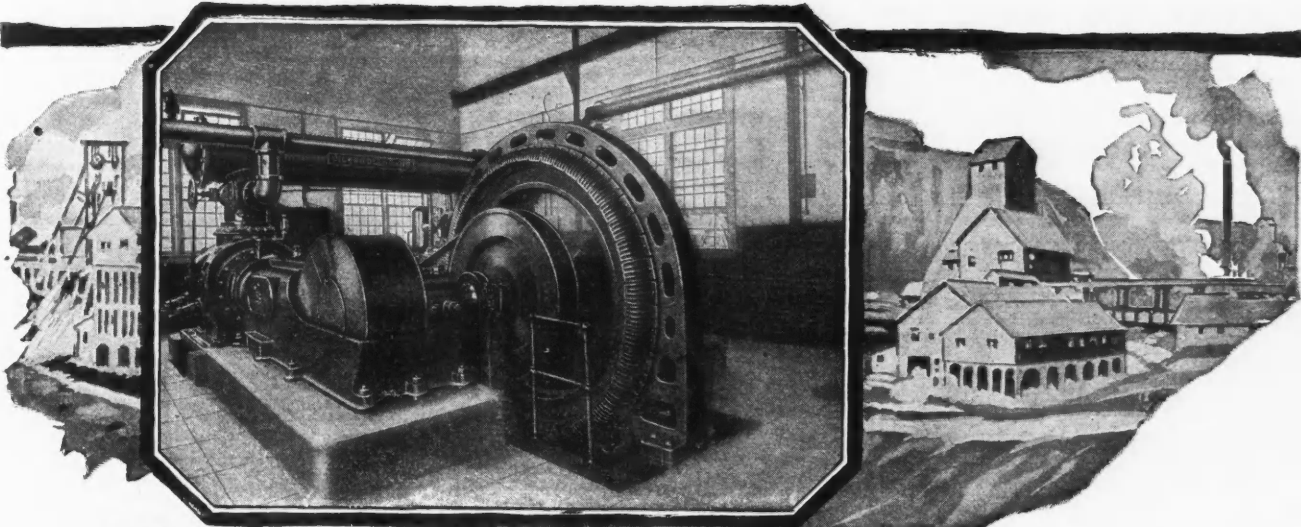
The control for operating this motor is the most simple, convenient and reliable.

WESTINGHOUSE ELECTRIC & MFG. CO.
East Pittsburgh, Pa.



Westinghouse

Synchronous motors and condensers have made America's electric power go further without increasing generating or transmission equipment.



400 h.p.-150 r.p.m. Synchronous Motor-driving Compressor at copper mine

When synchronous motors should be used

WHEN your power factor is low and you need greater generator, transformer or feeder capacity.

When you are paying for power at a rate which is now, or shortly may be, dependent upon the power factor of your load.

When your voltage regulation is poor on account of an existing induction motor load and production falls off in consequence, synchronous motors will raise the average voltage and help keep it constant.

When continuity of operation is imperative and dirty operating condi-

tions make a small motor air gap inadvisable.

The General Electric Company has designed complete lines of synchronous motors covering a wide range of speeds and capacities which are in extensive use throughout many industries driving rolls, compressors, pumps, grinders, crushers, blowers, fans, conveyors and mills. Some of these motors have been in continuous service for a score of years.

Our experts will be pleased to select suitable synchronous motors for your work.

43-164

General  Electric Company
 General Office Schenectady, N.Y. Sales Offices in all large cities

ENGINEERING & MINING JOURNAL

Think "SEARCHLIGHT" First

ADVERTISING RATES

<p>POSITIONS VACANT—Business Opportunities and other undisplayed ads, 8 cents a word, minimum \$2.00 an insertion.</p> <p>POSITIONS WANTED—Evening work wanted, tutoring and other undisplayed ads of individuals looking for employment, 4 cents a word, minimum 75 cents, payable in advance.</p>	<p>ADD 5 WORDS for box number in undisplayed ads if replies are to any of our offices. There is no extra charge for forwarding replies.</p> <p>DISCOUNT OF 10% if one payment is made in advance for 4 consecutive insertions of undisplayed ad.</p>	<p>ADS IN DISPLAY TYPE—Space is sold by the inch (30 in. to a page), the price depending upon total space used within a year, some space to be used each issue.</p> <p>RATE PER INCH for ads in display space:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">1 to 3 in., \$4.50 an in.</td> <td style="width: 50%;">15 to 29 in., \$3.90 an in.</td> </tr> <tr> <td>4 to 7 in., \$4.30 an in.</td> <td>30 to 49 in., \$3.80 an in.</td> </tr> <tr> <td>8 to 14 in., \$4.10 an in.</td> <td>50 to 99 in., \$3.70 an in.</td> </tr> </table>	1 to 3 in., \$4.50 an in.	15 to 29 in., \$3.90 an in.	4 to 7 in., \$4.30 an in.	30 to 49 in., \$3.80 an in.	8 to 14 in., \$4.10 an in.	50 to 99 in., \$3.70 an in.
1 to 3 in., \$4.50 an in.	15 to 29 in., \$3.90 an in.							
4 to 7 in., \$4.30 an in.	30 to 49 in., \$3.80 an in.							
8 to 14 in., \$4.10 an in.	50 to 99 in., \$3.70 an in.							

POSITIONS VACANT **EMPLOYMENT** **POSITIONS WANTED**

POSITIONS VACANT

ACCOUNTANT wanted immediately, mine mountains Durango, Mexico. Must have previous Mexican mine experience; first-class man; conditions safe here; salary, \$225 month, transportation paid. P-887, Eng. & Min. Journ., Old Colony Bldg., Chicago.

CHEMIST, with experience in usual copper smelter analyses. Must be accurate and rapid on routine work. Graduate preferred. The International Nickel Co. of Canada, Limited, J. W. Rawlins, Metallurgist, Copper Cliff, Ontario.

CHEMIST-SURVEYOR wanted for mining work in healthy climate near coast of West Africa. Young American graduate preferred. One or two year contract; good salary; all expenses paid. Address P. O. 2091, Boston, Mass.

CHEMIST wanted for Western smelter thoroughly familiar with inorganic determinations. Give experience, references and salary expected. P-903, Eng. & Min. Journ., Old Colony Bldg., Chicago.

INSTRUCTOR in mining and metallurgy wanted. Must be graduate in mining engineering and should have some practical experience. Salary, \$1,600 to \$1,800 per year. Location, Ohio. P-747, Eng. & Min. Journal, Leader-News Bldg., Cleveland.

MINE FOREMAN for silver mine in Central Mexico. Must have thorough practical knowledge of underhand and shrinkage stoping, and shaft sinking. Speaking knowledge of Spanish necessary. To take working charge of mine producing 250 tons ore daily. Apply, giving full details, experience, nationality, whether married or single, salary expected and references; technical graduate preferred but not required. P-888, Eng. & Min. Journ., Old Colony Bldg., Chicago.

SUPERINTENDENT wanted for Southern Mexico, for 500 ton cyanide plant; good salary for capable man. Apply, stating experience and references. Knowledge of Spanish essential. P-892, Eng. & Min. Journal.

In Reply to "Blind" Ads

be careful to put on envelope the key number in the ad and also local address of office to which reply is sent.

10th Ave. at 30th St., New York.
935 Real Estate Trust Bldg., Phila.
533 Leader-News Bldg., Cleveland.
1570 Old Colony Bldg., Chicago.
531 Rialto Bldg., San Francisco.

Important

Original letters of recommendation or other papers of value should not be enclosed to unknown correspondents—send copies.

EMPLOYMENT AGENCIES

POSITIONS secured promptly for well-qualified men in all branches of mining and metallurgical work; 17 years established clientele with largest companies in the industry. Wanted immediately: Assistant chief chemist, Mexican border, \$190; 2 cyanide shift bosses, Nevada, \$165; zinc smelter superintendent, Missouri, \$225; junior mining engineer, Mexico, \$150 start; master mechanic, Mexico, \$250; mill draftsman, Mexico, \$225 start. Apply Business Men's Clearing House, Denver, Colorado.

Employment Service

EXECUTIVES qualified for salaries of \$2,500 to \$25,000 and upward, are invited to communicate in strict confidence with the undersigned, who will conduct preliminary negotiations for such positions. The procedure used is peculiar to this service, differing essentially from all others; and is constructive and initiative, applied individually, and in no way jeopardizing present connections. Established 1910. Send name and address only for particulars. R. W. Bixby, Inc., 308 Lockwood Building, Buffalo, New York.

POSITIONS WANTED

CHEMIST, assayer and executive assistant, desires only responsible position. Louis Bernado, Ft. Dodge, Iowa.

FLOTATION engineer, age 30, technically trained with six years' experience in the working out of gravity and flotation mill problems. PW-904, Eng. & Min. Journ., Old Colony Bldg., Chicago.

MASTER mechanic open for engagement at once; experienced in mining and smelting machinery, power house operation and installation; any part of United States or abroad. PW-886, Eng. & Min. Journ., Old Colony Bldg., Chicago.

MINING engineer manager, very broad experience twenty years. Proven ability and capacity. References exchanged. Minimum salary \$6,000. Age 42, married. PW-899, Eng. & Min. Journal.

SAFETY-ENGINEER—Graduate engineer with 11 years general mining experience; at present engaged in safety and welfare work, wishes larger opportunity with corporation definitely pledged to this line of endeavor; organizer, capable and tactful; married, age 36. PW-902, Eng. & Min. Journ.

**Poddar Mining Syndicate
Wardha C. P.—India**

Owners of the large and rich Asbestos Mines in India, can supply regularly all grades from the finest weaving fibre to material suitable for tiles, sheets and cements. Prices and samples on application.

Wanted Agents—for sale and manufacture. Apply stating terms.

MEN FINDERS**Interstate—Foreign Service**

12 E. M. SURVEYORS.

Mexico, South America, Central America, Asia. Prefer those speaking Spanish with some experience underground surveying, 2 year contracts, large mining corporations and private companies, \$125 to \$175 and living, transportation is paid both ways.

Wire, state age, data of experience, married or single, physical defects if any.

Foreign contracts pay fare.

No time for correspondence. Wire quick.

Give age, experience, references.

A live service for live ones.

INTERSTATE CO.

Kittredge B., Denver, Colo., U. S. A.

Before It's Service, It's Will—It's Devotion.

**Geologists
Mine and Mill
Supts., Foremen
Mine Surveyors
Assayer Chemists
Master Mechanics
Smelter Supts.
Metallurgists
Electricians
Draftsmen
Accountants**

YOU WANT EXPERTS—WE CAN FIND THEM

**WE ARE EXPERTS IN OUR LINE—SECURING MEN
MINING—CIVIL—OFFICE—METALLURGICAL**



**BUSINESS MEN'S
CLEARING HOUSE**
CHAMBER OF COMMERCE BLD.

DENVER, COLORADO.

WORK WANTED

ALL minerals located, including coal, oil and gas, faulted veins, placers, precious stones, salt and fresh water veins and animal bodies. WW-896, Eng. & Min. Journal.

BUSINESS OPPORTUNITIES

Mining Engineers and Capital Wanted To examine and develop silver or copper prospects in the Alice Arm District. For information, address C. P. Riel, Alice Arm, B. C.

WANTED

Used Carbon (Black Diamonds) and Bortz And fragments wanted; will pay highest prices. S. Dessau's Son, 180 Broadway, New York City.

Maurice S. Dessau, 6 Maiden Lane, N. Y., Will pay highest prices for carbon (black diamonds) and Bortz fragments, also large and small used stones. Payment made return mail for merchandise purchased.

FOR SALE

Mineral Land For Sale
Over 200 acres ready for development; claimed to be very valuable; will sell cheap to close estate. Janet Kelly, Clinton, Missouri.

**JOHN BOYLE, JR.
PATENTS**

Ouray Building, Washington, D. C.
16 years on the Examining Corps of the U. S. Patent Office

FOR SALE

Gold Mining Property

192 acres, 50 acres of virgin timber, fir, pine, tamerack, tunnels, shafts, houses, assay office, barns, mill, gasoline engine, mining engineer reports blue print. Large amount of high grade and milling ore in sight, carrying gold and silver. Property ready for examination and operation.

For particulars address

G. H. KECK & SON
Suite 72-73, Parker Building,
Schenectady, N. Y.

Get your Wants
into the Searchlight

In Replying to "Blind" Ads

be careful to put on envelope the key number in the ad and also local address of office to which reply is sent.

10th Ave. at 36th St., New York.
935 Real Estate Trust Bldg., Phila.
533 Leader-News Bldg., Cleveland.
1570 Old Colony Bldg., Chicago.
531 Rialto Bldg., San Francisco.

Important

Original letters of recommendation or other papers of value should not be enclosed to unknown correspondents—send copies.

ECONOMIC MINERALS

Mining Engineers, Prospectors and Students will find a reference collection of scientifically labeled and classified economic minerals of inestimable service.

We call attention to 56 such collections which we put up. These are enumerated, along with many other scientific collections of minerals and rocks in Price List 190, which will be sent to you free on request.

These collections range in price from \$2 to \$850, and include from 18 to 700 specimens. Circular 211 enumerates our many other Price-Lists and catalogues. It is also free.

**WARD'S NATURAL
SCIENCE ESTABLISHMENT**
Department of Mineralogy and Petrography
George Letchworth English, Manager
81-102 College Ave., Rochester, N. Y.

FOR SALE

CHEMICAL PLANT

Fully equipped plant suitable for manufacture of heavy chemicals or metals can be adapted to the requirements of foundry practice for small castings. Originally designed for lixiviating process for extraction of rare metal compounds and for reduction of pure metals. Premises include thoroughly up-to-date Chemical Laboratory and equipment for manufacture of pure chemicals. Very advantageously located at labor and railroad facilities, with available electric power, gas and water. Plant formerly operated by the Primos Chemical Company at Primos, Delaware County, Penna., eight miles from Broad Street Station, Philadelphia, on the Philadelphia, Baltimore and Washington Division of the Pennsylvania Railroad. For further particulars write or have representative call

**Vanadium Corporation of
America**
Primos, Delaware Co., Penna.

**Important House for
Foreign Railway
Materials**

is desirous—for the purchase and sale in Belgium—to enter into business relations with important Belgian House having good connections with Belgian steel and metallurgic works. Kindly address offers

B. N. R. 1894 to Ala-Haassenstein & Vogler
Berlin W. 35.

**WANTED
ARSENICAL PYRITES, TIN
AND BISMUTH ORES**
Also rare and complex ores of all kinds
L. C. BUTLER,
New Dorp,
Borough of Richmond,
New York City
Telephone 276 New Dorp

FOR SALE

**SILVER PROPERTY
IN COLORADO**

Six patented claims. Water and timber. Worked by tunnel. Over 5,000 feet of development. Large amount of high grade and milling ore in sight. Fine mill. Property ready for examination and operation. For particulars address:

UNITED METALS COMPANY
332 S. Michigan Ave., Chicago, Illinois

**SPOT CASH FOR
PRECIOUS METALS**

We buy high grade ores, concentrate, amalgam, retort, etc., containing gold, silver or platinum. Small or large amounts bought and refined. Ship to us by mail or express. Cash sent by registered mail promptly. We also buy scrap gold, silver or platinum in any shape or form. Satisfied customers in all parts of the world, distance no bar. We also buy mercury, broken jewelry or silverware, palladium, solutions or residues containing gold, silver or platinum. Bank References. The Ohio Smelting and Refining Co., 202 Lennox Bldg., Cleveland, Ohio, U. S. A.

FOR SALE

SILVER MINING PROPERTY

In Austin, Nevada, consisting of approximately 1200 acres, one-half of which are patented. Last owned by Austin-Manhattan Consolidated Mining Co. Includes old mines of the MANHATTAN MINING CO., with record production of over TWENTY MILLION DOLLARS. None of the old mines are deep.

WM. A. MARSHALL
Resident Agent, Austin, Nevada.

A Study Mineral Collection

115 specimens, good sized, and each specimen with label adhered; every important mineral specie represented; the best mineral collection ever sold at the low cost of \$23.50, delivered. Send for pamphlet. I buy choice mineral specimens of any kind; mineral collections for sale; mineral specimens any kind sold.

G. S. SCOTT, 20 Nassau St., New York.

BOGUE SUPPLY CO.

New and Used Machinery
Mine, Mill and Smelter
Equipment

210 Felt Bldg., Salt Lake City, Utah

**Rocha, Moreira & Co.
IRON AND MANGANESE ORES
EXPORTERS**

37 Visconde Iuhauma Rio de Janeiro
Cable Address: Bocaina, Brazil

WANTED

LOCOMOTIVE

By an Illinois Coal Company. 1 trolley locomotive, 6-ton, 22-in. gauge, 250 volts. Give full description, age, make, type and condition. Best cash price and delivery.

W901—Eng. Mining Journal
1570 Old Colony Bldg., Chicago, Ill.

For Immediate Delivery Attractively Priced for Quick Sale

- 1—"HUNT" No. 2818 COAL CONVEYOR COMPLETE; Consisting of:
615 lineal ft. Conveyor Chain, with sheet steel buckets.
1 Pawl type belt driven driver.
245 lineal ft. Conveyor Track, on double rail stands.
305 lineal ft. Conveyor Track, on stands.
16 Dumpers.

And

All necessary accessories for a complete coal conveying outfit. Capacity approx. 50 tons per hour. Installed 1917; used but little and in excellent condition.

ALSO

- 1—FULL REVOLVING CRANE; Consisting of:
60 ft. latticed steel boom (brand new). Propelling engine, assembled and ready for operation.
Wire Rope and all necessary appurtenances. Runs on 14 ft. 6 in. gauge track. Capacity 6,000 lb.

Thoroughly overhauled and in first-class operating condition.

For further particulars apply

**Narragansett Electric
Lighting Company**
Providence, R. I.

FOR SALE

- Industrial Filtration Company's 4 ft. dia. x 4 ft. rotary hopper dewaterer.
Ott steam jacketed copper still with condenser. Capacity, 50 gallons.
Hilles & Jones' No. 2 back geared shear, capacity 2 1/2-in. round steel.
Ingersoll-Rand 18 1/2-in. x 12-in. air compressor, capacity 627 cubic feet, 30 pounds pressure.
W. & B. Douglas 1 1/2-in. centrifugal sump pump with 2 Hp. Westinghouse vertical motor.
Corliss steam engine, 125 Hp., 100 pounds steam pressure, 80 r.p.m.
Schwartz, class A. No. 2, fuel oil furnace, 1,000 pounds capacity.
Double chamber stationary melting furnace for No. 17 crucibles.

**THE CONNECTICUT METAL
& CHEMICAL COMPANY**
New Britain, Conn.

Structural Steel

We have over two thousand tons of structural Steel of all shapes and dimensions. This is secured from mill buildings we are dismantling.

Write or wire us your requirements.

We have one item of 200 tons of 24-in. 100 lb. I Beams in 50 to 55 foot lengths. A large number of columns, girders, channels, I beams, angles, etc.

20 complete steel buildings.

**The Morse Bros. Machinery
& Supply Co.**
Denver, Colorado

CLASSIFIERS

- 18—45-in. Akins, complete with tanks.
3—Dorr Duplex, with steel tanks.
Immediate delivery from Denver Stock.

The Morse Bros. Machinery & Supply Co.
Denver, Colorado.

Guaranteed Machinery

NEW—USED—REBUILT

Rosenburg & Company has created a distinct reputation of being one of the leading distributors of guaranteed machinery and miscellaneous equipment. Our large stocks permit prompt deliveries and our binding guarantee protects every purchaser. Let us know what your needs are and we shall quote prices.

MISCELLANEOUS EQUIPMENT

Shafting
Gasoline Hoists
Air Compressors
Gasoline Engines
Steam Engines
Steam Hoists
Boilers
Triplex Pumps
Centrifugal Pumps
Air Receivers
Rails, 8 and 12-lb.
Railway Equipment
Pipe of All Kinds
Corrugated Iron

Generators
Motors
Elevators
Cast Iron Pulleys, all sizes
Split Steel Pulleys, all sizes
Wood Pulleys, all sizes
Paper Pulleys
Sheave Wheels
Shaft Collars, all sizes
Smoke Stacks and Bases
Channel Iron
Steel Plates
Oil Superheaters

Air Drill Tripods with Weights
Steam Governors
Magnetos
Valves, high and low pressures, 1/8-in. to 10-in. gate, globe, foot, etc.
Link Chains
Water Heaters
Drill Presses
Steam Gauges
Angle Iron
I-Beams



Ask for Prices and Specifications.

Office and Sales Floor:
305 East Third Street, Los Angeles
Branch: Congress Junction, Arizona

There is a
Searchlight Section
in each of the following papers:

- [1] American Machinist
- [2] Coal Age
- [3] Electrical World
- [4] Electrical Merchandising
- [5] Electrical Railway Journal
- [6] Engineering and Mining Journal
- [7] Engineering News-Record
- [8] Chemical and Metallurgical Engineering
- [9] Power
- [10] Ingenieria Internacional
(International Engineering—Spanish).

Each of these 10 papers is the leading periodical of the industry it serves.

Searchlight advertisements will get you in touch with the important men of these important industries.

Equipment from Hackberry Mines priced for quick removal

WE have just acquired part of the reserve plant of the well-known Hackberry Mines situated at Hackberry, Arizona, and are determined to dispose of stock immediately.

Everything Practically New

If you are in the market for equipment of the very latest type, it will be to your interest to wire for quotations.

List of Equipment Includes: Special Semi-Diesel Oil Engine (Chicago Pneumatic)

- 1—100 Horse Power Perfect Condition. Only slightly used. Wire for details.
- 1—100-hp. Chicago Pneumatic semi-diesel fuel oil engine, duplex, class AO. In good condition.
- 1—Hardinge Conical Ball Mill, 8-ft. x 30-in., manganese steel liners. Mill was in use about three months and is in excellent condition.
- 12—tons of Chrome steel balls.
- 1—Dorr Classifier, type DSC, duplex, model C, 6-ft. x 18-ft. Practically new.
- 1—100-hp. 2-cylinder Fairbanks-Morse, type RE Oil Engine.
- 1—6-in. 2-stage Byron-Jackson vertical centrifugal pump.
- 1—5 x 8 Gould Triplex Pump, figure 957, direct connected to a 5-hp., 440-volt, 3-phase, 60-cycle, motor.
- 1—American Filter, 12 leaves. Diameter of leaves—6-ft. 2-in. each.
- 1—Fairbanks-Morse compressor, 10 x 10, type NC. In good condition.
- 1—25-hp. Fairbanks-Morse engine, type N, equipped with tops-burning head. In excellent condition.
- 1—25-hp Foos engine hoist. 650 feet $\frac{3}{4}$ -in. cable. In good condition.
- 1—450-ft.—24-in. Meese & Gottfried Belt Conveyor.
- 1—Air receiver, 36-in. x 6-ft. and fittings.

Absolutely New

200 H. P. Fairbanks-Morse Semi-Diesel Engine

200-hp. Fairbanks-Morse semi-diesel 4-cylinder engine, type Y, style V, direct connected to 170 KW. AC Generator, 3 phase, 60 cycle, 440 volt, including exciter, exhaust stacks and fittings. This engine is in perfect shape, and has been installed only a short time. It forms a reserve unit of a large plant and has not been used more than a week's actual running time. Guaranteed the same as a new engine. A bargain.



305 East Third Street, Los Angeles
Branch: Congress Junction, Arizona

MACHINERY FOR SALE

AUTOCLAVES—Two 120-gal. steel with stirrers. One 75-gal. jacketed, one 100-gal. lead lined.

CENTRIFUGALS—60-in., 46-in., 44-in. iron basket; 48-in., 40-in. and 26-in. copper basket.

COOKERS—5-ft. x 16-ft. with stirrer and steam jacket.

CRYSTALLIZERS—One Buffalo 300-gal. crystallizer, steam jacketed.

DRYERS—Direct-heat rotary dryers: 3-ft. x 25-ft., 3½ x 25-ft., 4-ft. x 30-ft., 5-ft. x 35-ft., 5½-ft. x 50-ft., 6-ft. x 50-ft. and 7½ x 60-ft.; double shell dryers: 4-ft. x 20-ft., 5-ft. x 30-ft. and 6-ft. x 35-ft.

Steam-heated air rotary dryers: 4-ft. x 30-ft., 6-ft. x 30-ft.

Steam-jacketed dryers: 4-ft. x 18-ft. with stirrer.

Rotary vacuum dryers: 4-ft. x 15-ft., 3½-ft. x 25-ft., 3-ft. x 15-ft., 5-ft. x 30-ft. and 2-ft. x 4-ft.

Vacuum shelf dryers: 4 shelves, 9 shelves, 17 shelves, 17 shelf (double doors).

All this equipment is complete and in good condition

EVAPORATORS—One triple effect with copper tubes. One single effect, iron tubes; one double effect and one triple effect, all copper; one double effect, basket type, iron tubes.

FILTER PRESS—No. 150 and No. 250 Kelly's, No. 9 Sweetland, 3-ft. x 4-ft. (acid proof) and 12-ft. x 20-ft. rotary continuous filter. (Oliver). Plate and frame presses of wood and iron.

HYDRAULIC PRESSES—500-ton, 350-ton, 200-ton, 100-ton and 75-ton hydraulic presses. Continuous fish presses.

KILNS—Rotary kilns: 8-ft. x 60-ft., 6-ft. x 60-ft., 3½ x 25-ft. and 3-ft. x 25.

NITRATORS—2,400-gal., 1,600-gal., 500-gal., 350-gal. and 250-gal. nitrators.

MILLS—24-in., 22-in. and 20-in. Schutz-O'Neill mills, 6-ft. x 5-ft., 2½-ft. x 3-ft., 3-ft. by 3½-ft. pebble mills; 5-ft. x 3½-ft., 6-ft. x 6-ft., 5-ft. x 4-ft., 4½-ft. x 3½-ft. and 2½-ft. x 2½-ft. ball mills; 3-ft. Marcy mill; 33-in. and 24-in. Fuller-Lehigh mills; 4½ x 20-ft., 5-ft. x 11-ft., 5-ft. x 22-ft. and 6-ft. x 20-ft. tube mills; 20-in. x 13-in., 9-in. x 12-in., 7½-in. x 13-in. and 7-in. x 10-in. jaw

crushers; one No. 00 and one No. 2 Williams' swing hammer mills; one Kent type "G" mill; one Aero pulverizer type "D"; two 36-in. and one 42-in. cage mills; one 8-ft., two 4½-ft. and two 3-ft. Hardinge conical mills; 18-in. x 12-in., 20-in. x 12-in. and 30-in. x 10-in. roll crushers; No. 0, No. 1, and No. 3 Sturtevant rotary crushers; one No. 2 Sturtevant ring roll crusher; one 4-roll Raymond mill; one No. 3 Telesmith breaker; one 36-in. Sturtevant emery mill; one Griffin mill; one 51-in. x 14-in. chaser mill.

MIXERS—One 1-ton acid phosphate mixer; 1-ton batch mixer; ten 100-gal. W. & P. heavy duty, jacketed mixers; 150-gal. dough mixers.

SULPHONATORS—2,000-gal., 400-gal. and 350-gal.; 1,200-gal. reducer.

STILLS—Copper stills with dephlegmators, condensers and fractionating columns; 16-in. x 60-in. in diameter for solvent recovery or alcohol or other manufacturing; 4½ x 3-ft. 6-in. copper vacuum still; 500-gal. phenol stills; 8-ft. x 3-ft. beta naphthol still.

W. P. HEINEKEN, Engineer

95 LIBERTY ST., NEW YORK
Tel. Cortl. 1841

Portland Filters

The following rebuilt filters in our Denver stock ready for immediate delivery.

1—12 x 7½ ft. 4—12 x 9 ft.
2—12 x 8 ft. 1—12½ x 14 ft.

The Morse Bros. Machinery
& Supply Co.
Denver, Colorado

"UNITED"
REBUILT MACHINERY

1—Belt Driven S.D. Cone Friction Hoist.
1—Belt Driven Double Drum Cone Friction Hoist.
5—8 x 8 S.E. S.D. Cone Friction Hoists.
1—11 x 15 Link Motion Mine Cage Hoist.
1—40 hp. Gas or Gasoline Fairbanks S.D. Hoist.

UNITED IRON WORKS, INC.
JOPLIN, MISSOURI

NEW 4 x 4 BALL MILL

Latest heavy pattern
For immediate delivery
At a special price

HALLIDIE COMPANY
Spokane, Wash.

FOR SALE

12—Ore Crushers and Pulverizers.
16—Ore Screens and Elevators.
7—Air Compressors, Hoists, Steam Shovels, Locomotives and Cars.

Get our Lists and Prices
J. F. DONAHOO CO.
Birmingham, Ala.

For a list of unusually good bargains in

RAILS—CARS

Locomotives, Engines, Generators, Boilers, Hoists, Pumps, Pipe Piling, Tanks, Wire Rope, etc.

Write for our Latest Big Bulletin.

ZELNICKER IN ST. LOUIS

GENERATORS

75 K.W. Westinghouse, 3 phase, 25 cycle, 440 volt, 500 R.P.M., with built in exciter.
150 K.W. Westinghouse, 3 phase, 60 cycle, 440 volt, 1200 R.P.M., with built in exciter.
200 K.W. Westinghouse, 3 phase, 60 cycle, 440 volt, 200 R.P.M.
300 K.W. Westinghouse-Parsons Turbo Generator Set, 3 phase, 60 cycle, 440 volt, 3600 R.P.M., exciter 10 K.W., 125 volt, 3600 R.P.M.

DIRECT CURRENT

2 K.W. Westinghouse, 125 volt, 1400 R.P.M.
30 K.W. General Electric, 125 volt, direct connected to a 11 x 8 Marine Type Vertical Automatic High-Speed Engine, 305 R.P.M., with switchboard and panel.
60 K.W. General Electric, 125 volt, direct connected to 13 x 12 Ball Automatic Engine.
75 K.W. Akron Electric Co., 250 volt, 275 R.P.M., with Switchboard, Field Rheostat Switches instrument.
90 K.W. Western, 6 pole, 550 volts, 460 R.P.M., etc.
225 K.W. Westinghouse, 550 volt, 510 R.P.M., 6 pole, Compound Wound.

All the above equipment is in Denver stock ready for immediate delivery, each piece has been thoroughly overhauled, and is guaranteed to be in first-class condition.

Morse Bros. Machinery & Supply Co., Denver, Colorado

LOCOMOTIVE

Baldwin, consolidation, type 2-8-0. Class 10-34, E510, Shop No. 7942. Built for Huntington & Broadtop Mt. R. R. Co. 44-in. wheel centers, 56-in. boilers, 14-ft. rigid wheel base, 20 x 24 cyis., tractive force 21,216 lbs., 8-33-in. wheel tender, engine weight 108,000 lbs. Now in service. Bargain for plant's use.

We Also Have

Steam Shovels, Loco. Cranes, Cars,
Hoists, Boilers, Pumps, etc.

READING ENGINEERING CO., INC.
Tribune Bldg., New York, N. Y.

The Searchlight
Advertising in
This Paper

is read by men whose success depends upon thorough knowledge of means to an end—whether it be the securing of a good second-hand piece of apparatus at a moderate price, or an expert employee.

The Best Proof

of this is the variety of this journal's Searchlight ads. Without a constant and appreciable demand for such machinery or services, by its readers, the market-place which these advertisements represent could not exist for any length of time.

Are you using the Searchlight Section?

FOR SALE

HYDRAULIC
EQUIPMENT

23,000 ft. double riveted
drive pipe, 11 in.-30 in.
Elbows, tapers, tees and
gates.
3 Campbell elevators.

Complete inventory on request.

FS900—Eng. & Mining Journal
10th Ave. at 36th Street, New York City

U. S. ARMY AND NAVY SALVAGE GOODS

Bunks—Upper and lower sleeping Bunks, made of Black Angle Iron, National Spring and helicals, size 2 ft. 6 in., \$5.50.

Bunks—Upper and lower sleeping Bunks, made of continuous posts, white enamel, size 3 ft., \$6.50.

Steel Lockers, size 12 in. x 15 in. x 42 in. in height (double), in units of 16, \$5 per locker.

Pyramid Government Tents—Slightly used, all repaired in first-class condition, made of 12-oz. canvas, 3-ft. wall, size 16-ft. x 16-ft., \$30.

U. S. Government Khaki Wagon Covers. New size, 11 ft. 6 in. x 14 ft. 6 in. Price \$16.50.

Wall Tents—(White) size about 9 ft. x 9 ft., flies and poles complete (slightly used), \$30.

Pup Tents—Used, in good condition, suitable to cover sewer pipe work, \$3.

Tarpaulins—Government used, in fair condition, size 17 ft. x 30 ft., price \$40.

U. S. Navy all wool Blankets (white), \$6.

U. S. Rubber Hip Boots, new, salvaged from S. S. Port Hunter, all sizes, \$4.65.

Cotton Blankets, Double (reclaimed), \$1.65.

Contractors' single size double cotton Blankets, rough, \$1.50.

O. D. Government Khaki Comforts (reclaimed), \$2.00

Comforts, fancy scroll designs, \$1.25.

Mattress bed sacks, as used by contractors, \$0.85.

White cotton felt mattress, size 3 ft. A. C. A., tick \$4.95.

Silk floss mattresses, size 2 ft. 6, A. C. A., tick \$5.00.

Cotton Mattress Pads, Fancy Tick, size 3 ft. (used), \$3.50; in good condition.

Cotton Top and Bottom Mattresses, size 3 ft. (used), \$2.50; in good condition.

W. W. REID, INC., 97 Branford Place, Newark, N. J.
Phone Market 950

FOR SALE

PRODUCTOGRAPH —AT A BARGAIN

Will keep count and curve drawing sheet record on .20 producing machines. Operates on 20-v. D.C. service.

Original cost \$600. First-class shape. Various spare parts included.

W. A. HEFNER

c/o McGraw-Hill Co., 10th Ave. at 36th St.
New York City

FOR SALE

Pumps and Crushers

Two Compound Burnham

Condensing Pumps

One Single Acting Burnham High Duty Pump.

Rock Crushers

Four 18 in. x 24 in.

For prices and specifications apply to

Michigan Copper Mining Co.
Rockland, Michigan

New Rails Relayers

HYMAN-MICHAELS CO.

Peoples Gas Building, Chicago

Iron and Steel Scrap

Write or wire us when in the market to buy or sell

Railway Exchange Building ST. LOUIS, MO. 1st National Bank Building PITTSBURGH, PA. 1324 Woolworth Building NEW YORK

SOME ONE WANTS TO BUY

the equipment or machinery that you are not using. This may be occupying valuable space, collecting dust, rust and hard knocks in your shops and yards.

SELL IT BEFORE DEPRECIATION SCRAPS IT

THE SEARCHLIGHT SECTION IS HELPING OTHERS
—LET IT HELP YOU ALSO

0079

GUARANTEED MACHINERY

BOILERS

300 H.P. Rust Vertical Water Tube, 150 lbs. Pressure.

250 H.P. Heine Water Tube, 115 lbs. Pressure.

100 H.P. Heine Water Tube, Horizontal Tubular Boilers, all sizes from 20 to 125 H.P.

Vertical Boilers, sizes from 20 to 40 H.P. Locomotive Type, sizes from 10 to 25 H.P.

FEED WATER HEATERS

160 H.P. Reynolds (closed type).

100 H.P. Sims.

80 H.P. Wainwright (closed type).

ENGINES

16 x 42 Allis-Corliss.

16 x 36 Allis-Corliss.

15 x 36 Hamilton-Corliss.

16 x 24 Atlas Side Crank Automatic.

14 x 20 Atlas Side Crank Automatic.

15 x 15 Armington Simms.

14 x 18 Woodbury Side Valve.

PUMPS

9 x 14 x 10 x 12 Smith Vaile Duplex, Outside packed.

10 x 6 x 12 Jeansville Duplex, Outside packed.

10 x 4 x 10 Snow Duplex, Outside packed.

14 x 8 1/2 x 12 Snow duplex, Piston Pattern.

14 x 10 1/2 x 12 Knowles Duplex, P. & R. Pattern.

16 x 8 x 10 Knowles Single Piston Pattern.

14 x 10 x 10 Deane Duplex, P. & R. Pattern.

2 1/2-in. Krogh, 4 stage, Vertical Centrifugal, Sinking Pump with 35 H.P. Vertical G.E. Motor, 3 phase, 60 cycle, 440 volt.

No. 11 Cameron Sinker.

No. 13 Cameron Sinker.

No. 5 Cameron Sinker.

8-in. Morris Centrifugal Sand Pump, Direct connected to a 8 x 5 Morris twin vertical engine.

6-in. Wheeler, 2 stage Centrifugal; has extension base for motor.

4-in. Worthington Single Stage Turbine, extension motor base.

BLOWERS

16 x 42 x 36 Guild & Garrison, Blowing Engine.

No. 7 Green Rotary, 67 cu.ft. per rev.

No. 6 Connersville, 57 cu.ft. per rev.

No. 5 Baker, 25 cu.ft. per rev.

HOISTS

16 x 25 Nelsonville Double cyl., Double Drum, Link Motion.

14 x 18 Lidgerwood, Single Drum, Link Motion.

12 1/2 x 15 Lidgerwood, Double cyl., Double Drum, Link Motion.

11 x 15 Gates Iron Wks., Double Single Drum, Link Motion gear

GOLD DREDGE

3 1/2 cubic foot Marion Elevator Dredge, Electrically equipped with 3 phase, 60 cycle, 440 volt Motors.

Write for specifications of this Dredge.

This is only a partial list of equipment which we have in stock. We can give immediate delivery on all of the above equipment.

Write us your requirements.

Morse Bros. Machinery & Supply Company
Denver, Colo.

"Boys, I'm going to let the business die—I'm going to STOP ADVERTISING"



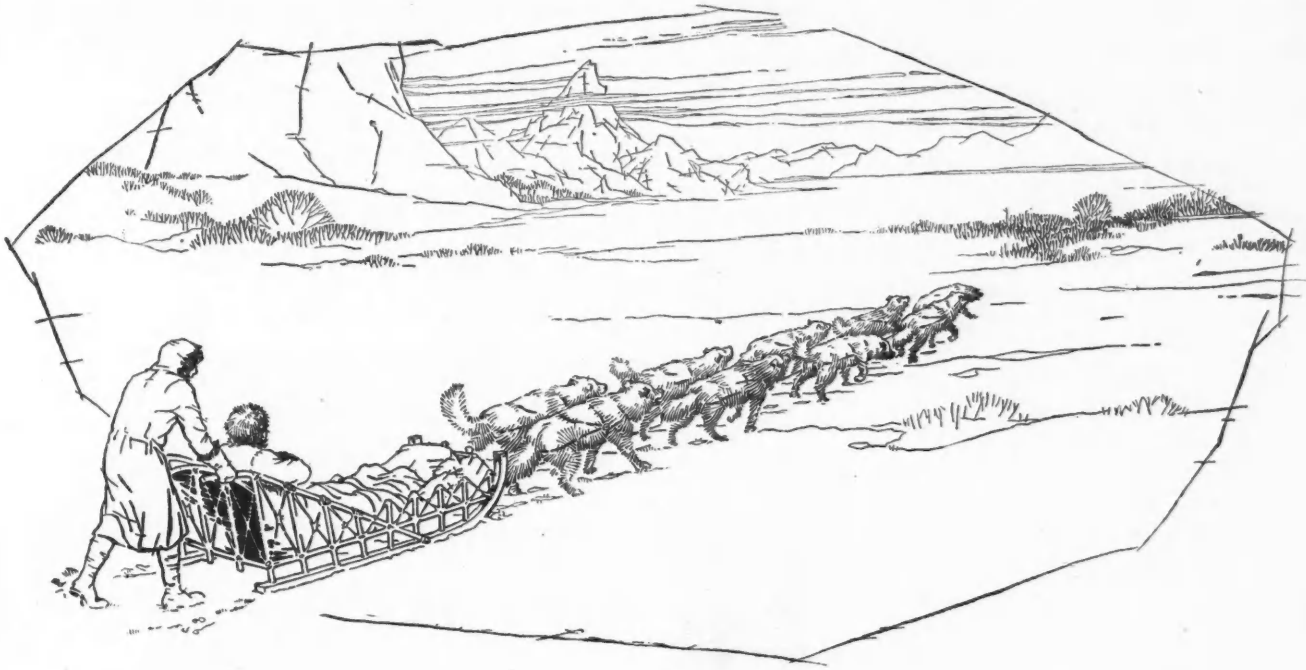
A True Business Story

REMEMBER "RUBIFOAM"? Some years ago 'Rubifoam' was in general demand as a tooth and mouth wash. Then came a time when the "Rubifoam" advertisements began to dwindle in the magazines—and, to the group of advertising solicitors who called on the President to ask the reason why, the "old man" made the above statement. For reasons that were good and sufficient, the "Rubifoam" publicity was gradually cut down, then ceased. *Today you recall only with an effort the name of this once widely popular and well-known toilet article.*

If you are thinking of stopping advertising—remember "Rubifoam." If continuous publicity was a vital necessity to a "popular" product of that kind, how much more so to dealers and to jobbers of equipment in a field where competition is keenest and business goes to the firm that is best known. Don't let your business die—

Keep Advertising in the

0159



Editing your technical journal from the field

“LIVE STUFF”—the articles and pictures that tell you what is happening in your profession out where the sky is the only roof in sight—can be secured in just one way: by going after it. And your McGraw-Hill representatives go after “live stuff.”

Sometimes it means a dog-sled trip across Alaska; sometimes a month's journey into Mexico at a time when they are dis-electing a president with bullets for ballots. Sometimes an expedition of half a year to South America is necessary. But the trips are taken and you are kept in touch with the engineering progress of the world.


As a McGraw-Hill reader you hold a subscription to an eleven-fold editorial service. For each of these virile publications profits to the utmost by its association with the other ten. From his associates your editor gains authoritative knowledge of related engineering fields—and in your publication is reflected this breadth of contact which gives you the utmost in editorial service.

The 11 McGraw-Hill Publications

Power
Coal Age
American Machinist
Electrical World
Electrical Merchandising
Journal of Electricity
Electric Railway Journal
Engineering News-Record
Ingenieria Internacional

*McGraw-Hill Co., Inc.
Tenth Avenue at 36th Street
New York*

Chemical & Metallurgical Engineering
Engineering & Mining Journal

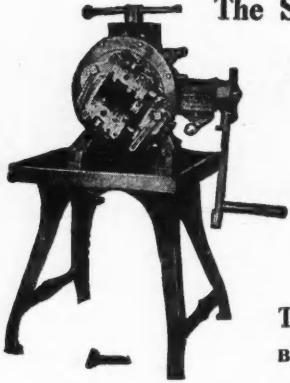


TAYLOR'S SPIRAL RIVETED PIPE

SPIRAL RIVETED PIPE
with forged steel pipe connections
LIGHT—STRONG—DURABLE
Extensively used for high pressure lines

Catalog and special prices on request

AMERICAN SPIRAL PIPE WORKS
CHICAGO, ILL.



The Same Dependable Dies


that have for a quarter of a century given such satisfaction in Genuine

ARMSTRONG

Stocks are used in the Nos. 0 and 00 Armstrong Pipe Threading and Cutting-Off Machines. All dealers carry them. Send for complete catalog including prices of repair parts on these perfect machines.

The Armstrong M'fg Co.
324 Knowlton Street
BRIDGEPORT CONN.
New York—248 Canal Street

THE TANK WITH A REPUTATION



Caldwell

Dependable Water Pressure

Caldwell Tubular Towers give you a positive, dependable water supply at a good pressure—all year around.

They are strong and durable, and yet so simple you can easily erect one yourself. Approved engineering principles throughout, and workmanship, backed by thirty years' experience, make it a permanent, satisfactory investment.

Send for Catalogue


W. E. CALDWELL CO.
INCORPORATED
2170 BROOK ST., LOUISVILLE, KY.

The productive efficiency of mill or mining plant depends largely upon its tanks.

Pacific Wood Stave Tanks

Have maintained a record of dependable service for thirty years.

Redwood Tanks — PACIFIC MADE — are unequalled for long life and service.



PACIFIC TANK & PIPE CO.
THE STANDARD SINCE '05

306 MARKET ST., SAN FRANCISCO
2602 ST. PAUL BLDG., NEW YORK

Redwood and Douglas Fir Tanks

At our Portland factory we manufacture tanks of either California Redwood or Douglas Fir. These are the two best known woods for tank purposes and are used in many of the largest installations throughout the United States and Alaska.

"National Quality" Tanks have a long life and give exceptional service due to the careful selection of material and the special attention paid to milling the staves and bottoms. We are in position to make prompt shipment by either rail or water.

National Tank & Pipe Company
275 Oak Street, Portland, Ore.

ROOT Spiral Riveted Pipe—
Pipe Specialists for 48 Years
Abendroth & Root Mfg. Co.
Works: Newburgh, N. Y.
N. Y. Office: 233 Broadway


Redwood — Douglas Fir

WOOD PIPE

CONTINUOUS STAVE—WIRE WOUND—BORED

WESTERN WOOD PIPE PUBLICITY BUREAU
WHITE BUILDING, SEATTLE, U. S. A.

Address all inquiries for prices and details to the following:
Redwood Mfgs. Co., San Francisco American Wood Pipe Co., Tacoma
Continental Pipe Mfg. Co., Seattle Pacific Tank & Pipe Co., San Francisco




Crescent Wire Rope

WIRE Rope of every kind and for every purpose—Accessories, too. Let us send catalog and quotations.

GEO. C. MOON CO., Garwood, N. J.
New York, 124 White St. Cleveland,
Rockefeller Bldg. San Francisco and
Portland, Ore., Rolph, Mills & Co. 52

WATERBURY WIRE ROPE



Flexibility and Strength for the Stiffest Requirements

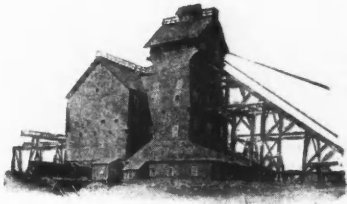
WATERBURY CO. 63 PARK ROW NEW YORK

Big Results from Little Ads

The advertisements in the Searchlight Section are constantly bringing together those who buy, sell, rent or exchange. They convert idle commodities into useful cash, idle cash into useful commodities, and that which you have but don't want into that which you want but don't have. The cost is a trifle, the results considerable.

Get Your Wants into the Searchlight

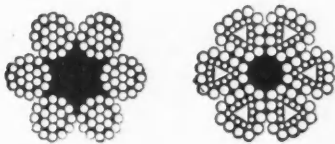
0059



MINE HOISTING

To handle heavy loads at high speed with safety and economy are the wire rope requirements of mine hoisting.

In order to accomplish this a wire rope must have strength, toughness and durability. Moreover, it must be constructed so as to best develop all of these properties.



Leschen Wire Rope is the result of many years of practical experience in wire-rope making. Every Leschen wire rope is made according to the Leschen methods and up to the Leschen standard, thereby assuring uniformity and dependability.

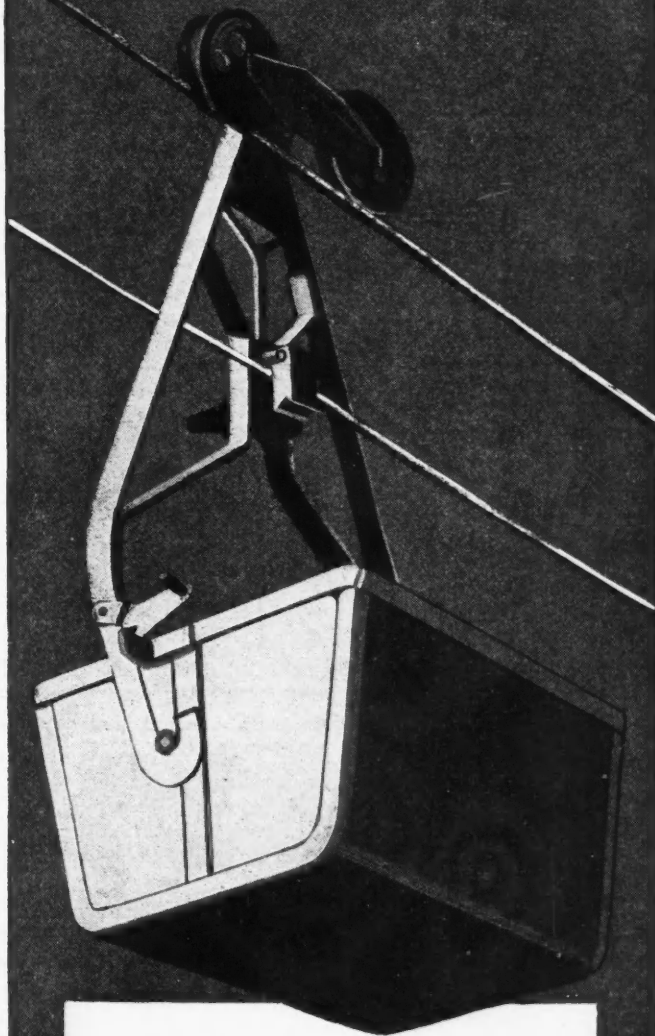
A. LESCHEN & SONS ROPE CO.

St. Louis, Mo.

New York Chicago Denver San Francisco



SPEED!



It's quicker to haul from mine to mill or railroad by B. & B. Aerial Tramway. Also it's less trouble and far cheaper.

B. & B.

Aerial Tramways

take the air route, and they hurry. No animals to bother with and feed, and mighty little help needed. There's a type to do just what you want.

Get Catalog

Broderick & Bascom Rope Co.

New York ST. LOUIS Seattle

B-40b

**ANACONDA
COPPER WIRE**

*Made from the famous
B&M Brand Copper
containing less
than 1/100 of 1%
Metallic Impurities*

**ANACONDA COPPER
MINING COMPANY**
Rolling Mills Dept
Great Falls, Mont.

*General Office
Rolling Mills Dept
Chicago*

Connersville

Rotary Positive Blowers meet the needs of FLOTATION work by their reliable, continuous service. Of rugged construction, they fill the requirements of heavy duty efficiently. Bulletin No. 23 tells of them.

Connersville Blower Co. Connersville, Ind.

Monadnock Bldg.
Chicago

114 Liberty St.
New York

**American
Wire
Rope**

Send for Special Illustrated Catalogue

**American Steel & Wire
Company**

CHICAGO
NEW YORK
CLEVELAND
PITTSBURGH
DENVER
U. S. STEEL PRODUCTS CO.

BUTCHART

Concentrating Tables, Flotation Apparatus,
Classifiers, Screens, etc.
W. A. BUTCHART, Denver, Colo.
A. P. Watt, Eastern Representative
52 Vanderbilt Ave., Room 1903, New York

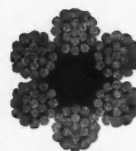


Jigs, Screens, Sand and
Slime Tables, Classifiers,
Automatic Ore Feeders, etc.

Manufactured by
JAMES ORE CONCENTRATOR CO.
35 Runyon Street, Newark, N. J.

Hydraulic Presses Accumulators
Special Castings
Cast Iron Pipe Fire Hydrants
Hydraulic Operating Valves
R. D. Wood & Co., Philadelphia, Pa.

ROEBLING



WIRE
ROPE
and
WIRE

John A. Roebling's Sons Co., Trenton, N. J.

MORE EVIDENCE

We recently furnished the Quincy Mining Company 248 Plat-O Tables.

We have just shipped the American Smelting & Refining Company 40 Plat-O Tables and 15 Deister Cone Baffle Classifiers.

We are now filling a repeat order from the Phelps-Dodge Corporation for 214 Plat-O Tables, making a total of 283 Plat-O Tables for the Phelps-Dodge Company.

In addition to the above mentioned orders many smaller orders have recently been received.

This evidence substantiates our claims for the superiority of the

PLAT-O TABLE

Manufactured and sold exclusively by

DEISTER MACHINE COMPANY

East Wayne Street

E. DEISTER, Pres. and Gen. Mgr.

W. F. DEISTER, Vice-Pres.

Fort Wayne, Ind., U. S. A.

E. G. HOFFMAN, Sec'y and Treas.



*Economical
Efficient*

Adjustable while running

Smelting Blowers

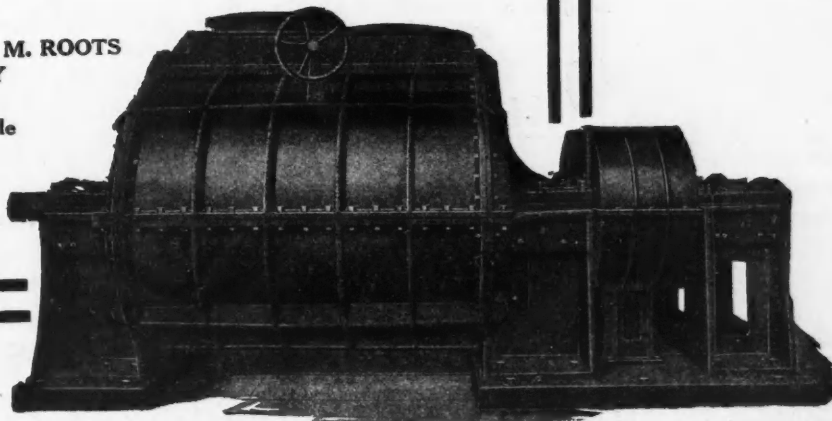
"An Accurately Measured Quantity of Air Positively Delivered."

Catalog 60 explains why ROOTS Rotary Blowers are predominant in the Smelting field.

P. H. & F. M. ROOTS
COMPANY

Connersville
Ind.

CHICAGO
NEW YORK



Buchanan ^{All Steel} Crushers



Designed for heavy continuous duty patented adjustable jaw stroke, prevents slabs and slimes being made when machines are adjusted for fine crushing.

Large and Small Crushers
Crushing Rolls Magnetic Separators
Complete Plants

C. G. BUCHANAN CO., Inc.
91 West St., New York

ALLEN CONES



**SAND CONES
SLIME CONES
Sand Washing Cones**

POSTAL BRINGS BULLETINS

The ALLEN CONE CO., El Paso, Texas



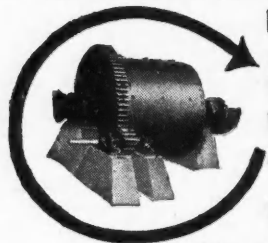
Austin

Gyratory Crushers
Portable and
Stationary Plants

Capacities. 5 to 500 tons
per hour

AUSTIN MANUFACTURING CO.
CHICAGO
New York San Francisco

STANDARD BALL MILL



IS ALL IT'S NAME IMPLIES
A TYPE ACCEPTED AS
CORRECT AND PERFECT
100% OPERATING TIME
SIMPLE STRONG AND
DURABLE
MADE IN MANY SIZES

SEND FOR BULLETIN

MORSE MACHINERY & SUPPLY CO. DENVER U.S.A. BROS

**DUROLOID GRINDING
BALLS AND LINERS**

will solve your grinding
problem. Quick Delivery

LOS ANGELES FOUNDRY CO.
2444 So. Alameda, Los Angeles, Cal.



The
Standard
Mill

Crushes
Grinds
Pulverizes
and
Concentrates

In
One
Operation

See our advertisement in last or next week's Mining Journal
THE STANDARD EQUIPMENT CO.
New Haven, Conn., U. S. A.

Chrome Steel Linings

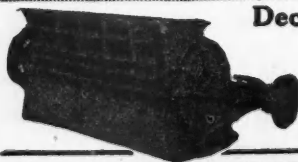
for
Ball Mills—Tube Mills
THE QUEEN CITY FOUNDRY CO.
Denver, Colo.

Manganese Steel Castings

For Crushers—Pulverizers—Screens
Steam Shovels—Gold Dredges

H. A. JOHANN

1806 Railway Exchange, St Louis, Mo.



Decrease Operating Costs
with the

**American
Ring Pulverizer**

AMERICAN PULVERIZER CO., ST. LOUIS, MO.

SEND FOR CATALOGUE OF
FARREL ORE & ROCK CRUSHER
FARREL FOUNDRY AND MACHINE COMPANY
EARLE C. BACON ENGINEER HAVEMEYER BUILDING
NEW YORK

THE STEARNS-ROGER MFG. CO.

ENGINEERS
MANUFACTURERS
CONTRACTORS

DENVER, COLO.

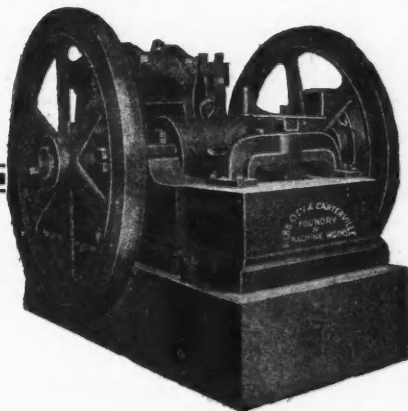
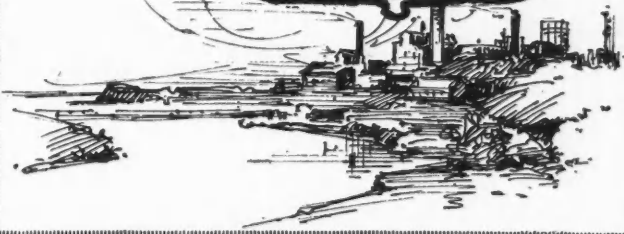
MINING AND
MILLING MACHINERY
AND PLANTS

Holbeck Pulverized Coal System

The Holbeck system is used by many of the most successful corporations in this country—and the fact that they have seen fit to adopt it, expresses more eloquently than words of ours the reception accorded the Holbeck system.

Our catalog describes the system fully. Send for it.

The Bonnot Co.
Canton, Ohio



Back of the Webb City and Carterville Crusher

is not only a most highly efficient organization but a worth-while record of past performances in the lead-zinc districts of Missouri, Kansas and Arkansas.

Our crushers are provided with renewable false wear plates in the bed and swing jaw—and a two-inch adjustment of the jaws is possible.

Send for descriptive booklet

Webb City and Carterville Foundry and Machine Works
Webb City, Missouri



GRINDING BALLS

—produced from superior alloyed steel, will give greater durability.

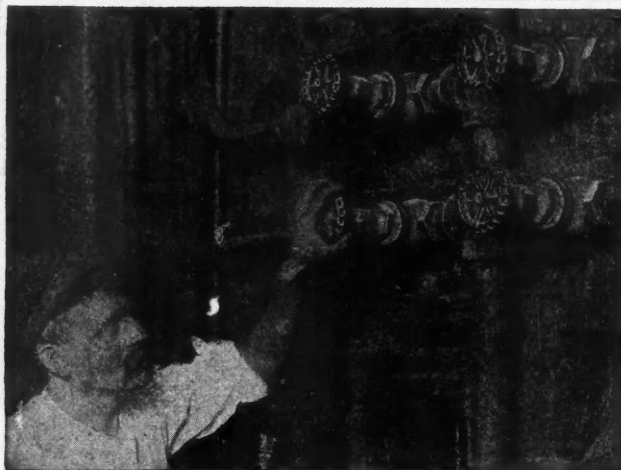
XX Grinding Balls will *not* break in *any* kind of Ball Mill, on any kind of ore. We guarantee producing results.

Write for full information

American Alloy Products

401 Union Oil Building, Los Angeles

D. H. MILLER, Sales Manager



Extra Heavy Brass Valves Fitted With Renewable Steam Metal Discs

The four valves illustrated are Jenkins 1 1/2-in. Extra Heavy Brass Globe Valves on the steam line used for blowing soot. They are fitted with Jenkins Renewable Steam Metal Discs and work under a 150-pound pressure.

Jenkins Extra Heavy Brass Valves are made in various types and sizes suitable for working steam pressures up to and including 300 pounds, or water and air up to 500 pounds. They are carefully designed to give maximum service and satisfaction—and do. Supply houses everywhere carry Jenkins Valves—know them by the Jenkins name and "Diamond Mark."

JENKINS BROS.
 New York Philadelphia St. Louis Washington Montreal
 Boston Chicago Pittsburgh San Francisco London Havana



From Prospector to General Manager

Whatever are the activities of the mining man, he rightly insists upon reliable goods with which best to do the work at hand.

For the individual needs of all, we manufacture and sell the highest quality of assay materials, laboratory equipment and chemicals.

Inventors and Manufacturers of
BRAUN

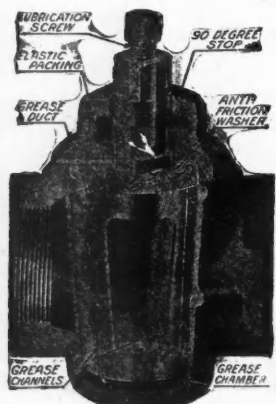
**Crushers Pulverizers
 Grinders Furnaces**

Dealers in Heavy Chemicals for metallurgical use. Also, c.p. chemicals and laboratory equipment.

Address File No. 9 for
CATALOGS—BULLETINS—CIRCULARS

BRAUN-KNECHT-HEIMANN CO.

Founded 1852
 576-584 Mission Street, San Francisco, U. S. A.
"We Know How to Pack for Export"
 Cable Address: "Braundrug" Los Angeles House
 All Codes Used THE BRAUN CORPORATION



The Plug Valve that never sticks

MERCO NORDSTROM

Never binds. Won't leak. Always readily opened or closed. Indispensable on air, gas or solution lines.

Write for Catalogue

THE MERRILL CO.
 121 Second Street, San Francisco
 Monadnock Bldg., Chicago



GARLOCK PACKINGS

are Specially Adapted to the Severe Service of MINING MACHINERY

Write for Catalog.

THE GARLOCK PACKING CO., Palmyra, N.Y.
 Branches in Principal Cities

WE-FU-GO AND SCAIFE

WATER

PURIFICATION SYSTEMS
 SOFTENING & FILTRATION
 FOR BOILER FEED AND
 ALL INDUSTRIAL USES

WM B. SCAIFE & SONS CO. PITTSBURGH, PA.

Harbison-Walker Refractories Company

MANUFACTURERS OF
 High Grade Silica, Chrome,
 Magnesia, and Fire Clay Brick,
 Dead Burned Magnesite and Furnace Chrome,
 Chrome Ore,
 Metalkase Magnesite Brick (Maccallum Pat.)
 PITTSBURGH, PA.

The Knox Coupling

Abolishes leaks in air hose. A big improvement over the types. Prevents wear.

The Knox Throttle Valve

Insures efficient control of your mining machines, drills, etc.

Send for Illustrated Catalog.

Knox Mfg. Co. 821 Cherry St., Phila., Pa.



PLIBRICO

FOR BOILER SETTINGS and BAFFLES
 BETTER THAN FIRE-BRICK

Can Be Installed By Inexperienced Labor
 Will Withstand 3100 Deg. Temperature -
 Shipped in Steel Containers only

JOINTLESS FIRE BRICK CO.
 OFFICE and FACTORY 130-150 CLAY ST. CHICAGO

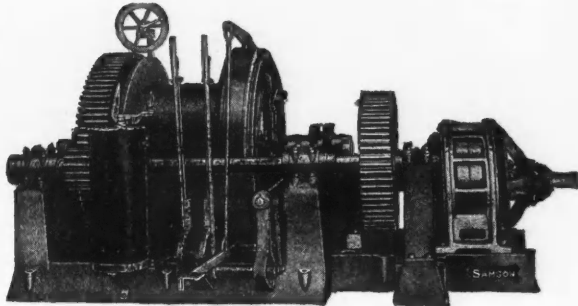
DE LAVAL

Steam Turbine Co., Trenton, N. J.
 Builders of TURBINE MACHINERY, including
 Steam Turbines of all capacities for high or low-
 pressure steam and for direct connection, or for
 belt of rope drive. Complete Turbo-Generator Sets,
 Centrifugal Pumps for all Heads and Capacities,
 Centrifugal Blowers and Air Compressors.

Write for special bulletins on apparatus in which you are interested.



"Samson" Single Friction Drum Electric Hoist



A glance at the above cut will satisfy the mine operator and hoistman of the rugged construction and up-to-date features of this Hoist.

It is built in two sizes for maximum rope pulls of respectively 5000 to 7000 pounds.

Detailed specifications cheerfully furnished.

The English Tool & Supply Co.

Iron Works Department
Kansas City, Missouri, U. S. A.



Prompt Deliveries of Electric Hoists

With A.C. Motors, 3-phase,
60-cycle, 220-440 volts
15 to 50 HP.

Flory Electric Mine Hoists

can be obtained promptly. We show herewith a single motor, double friction drum electric mine hoist—one of the Flory Line that is in great demand on account of satisfactory performance and ease of operation.

Send us your inquiries for immediate requirements.

S. Flory Mfg. Co., Bangor, Pa.

New York, 95 Liberty St. Pittsburgh, First National Bank Bld.
Chicago, Monadnock Block. Hartford, Conn., K. B. Noble Co.

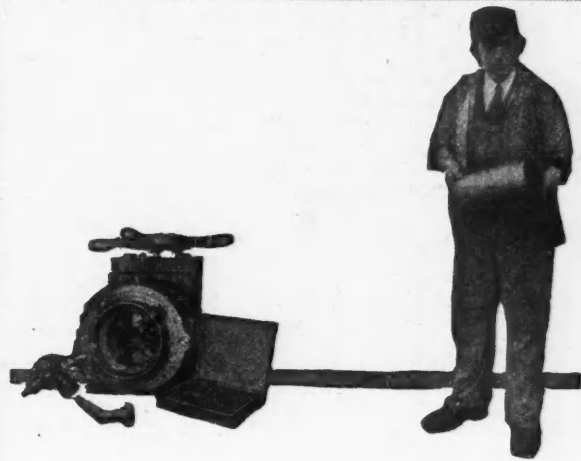


A LONG SERVICE PACKING FOR AIR COMPRESSORS

"PALMETTO"

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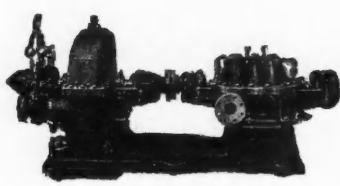
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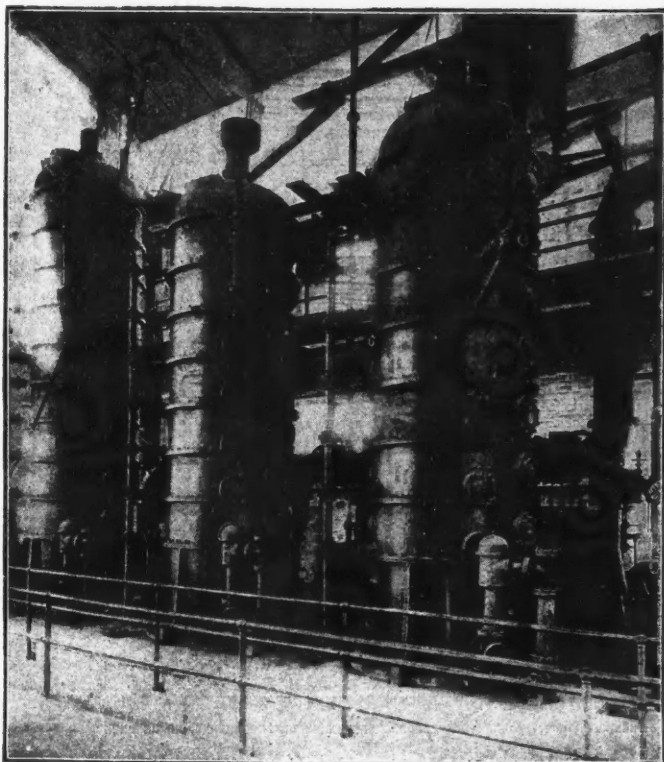
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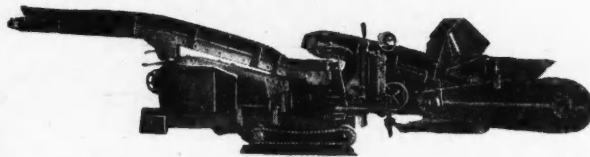
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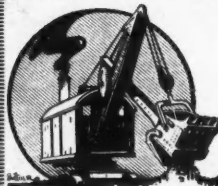
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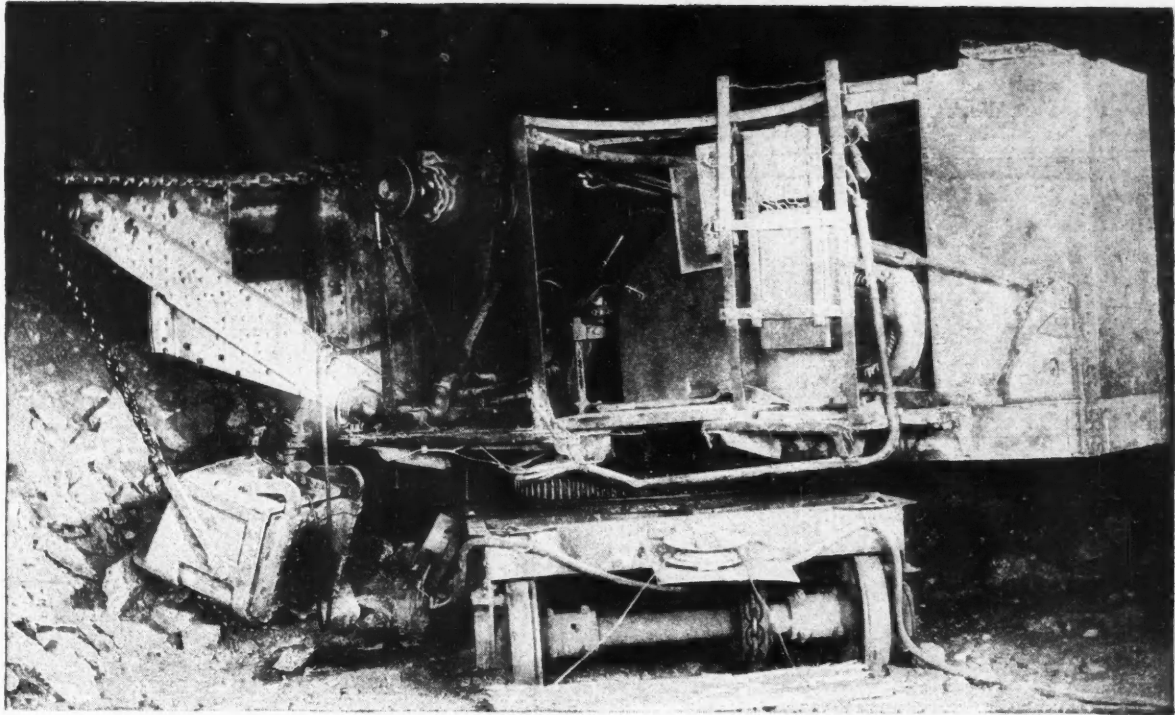
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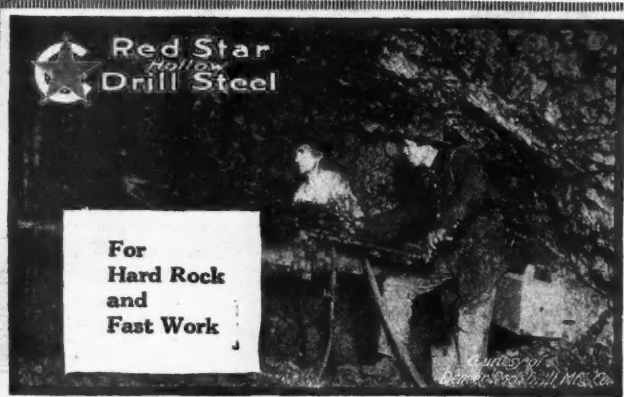
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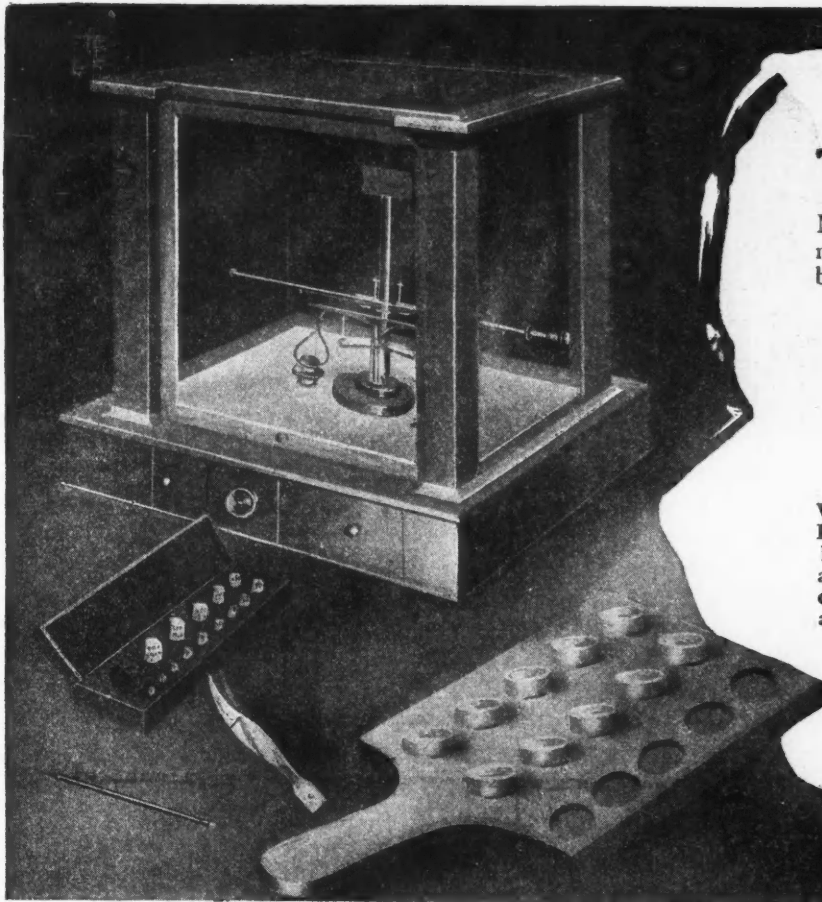
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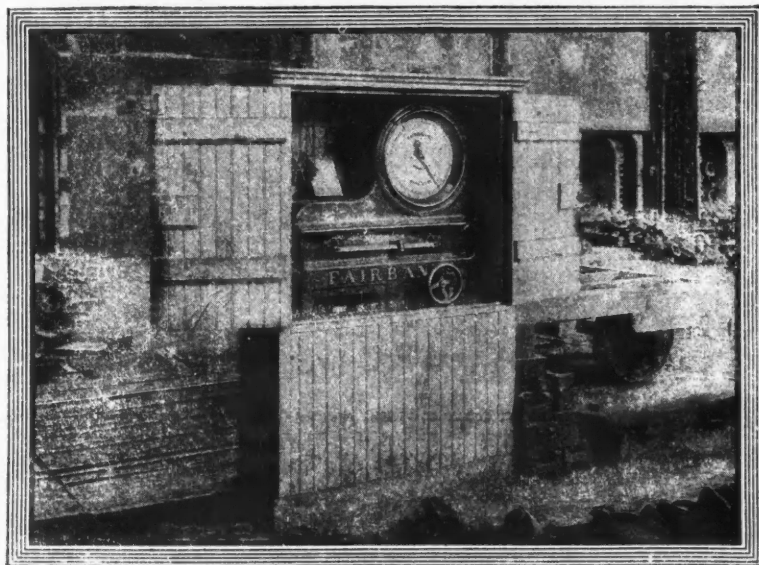
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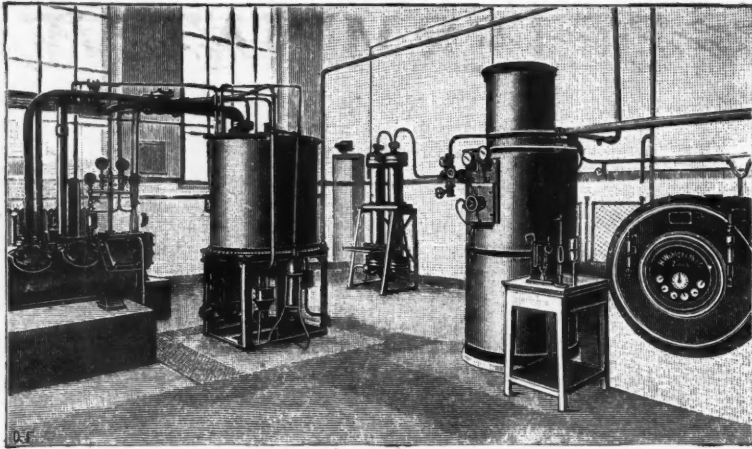
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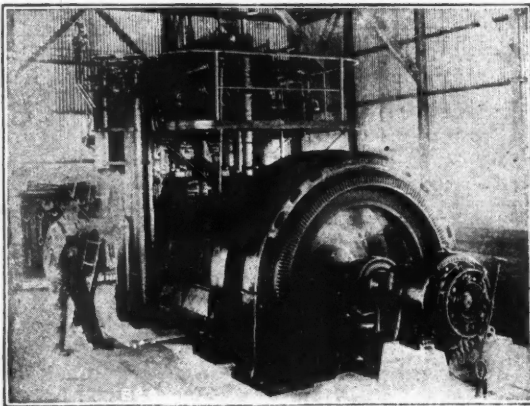
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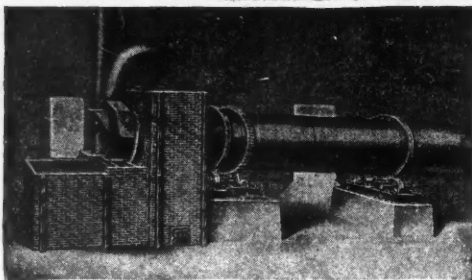
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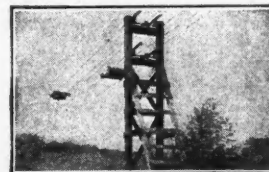
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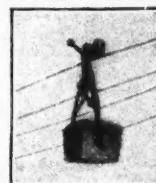
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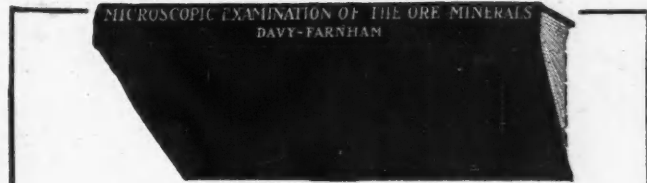
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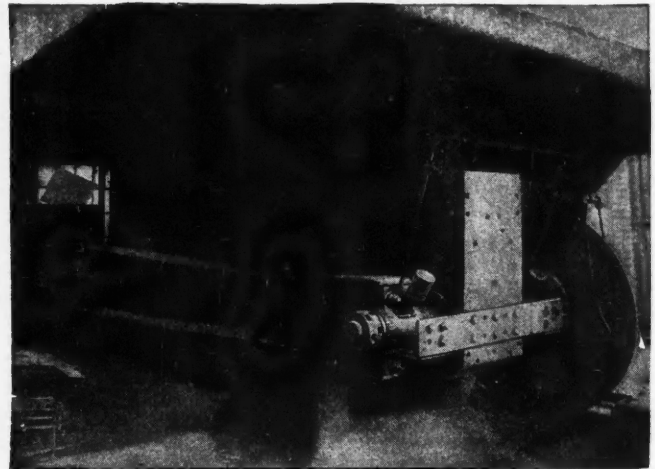
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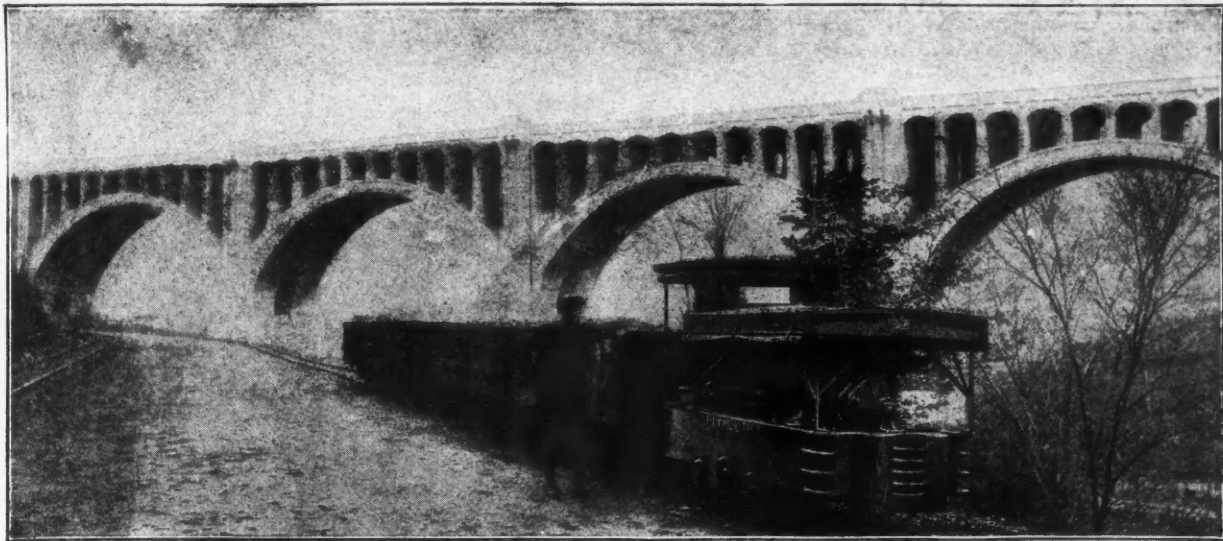
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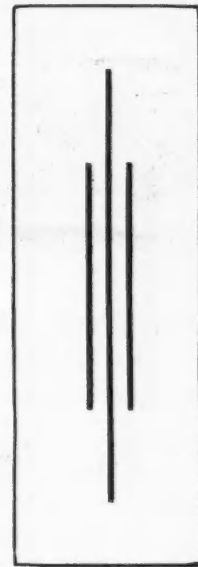
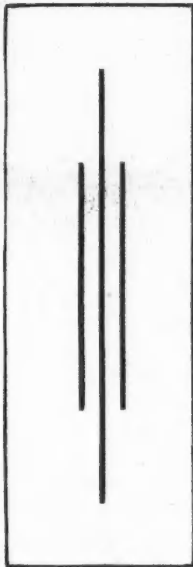
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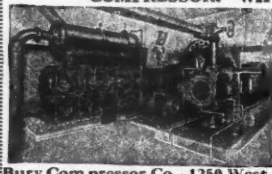


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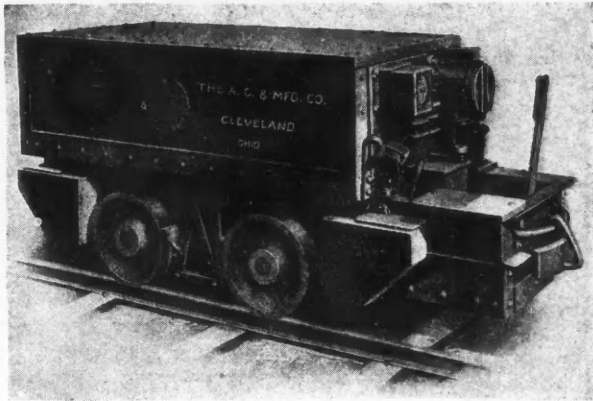
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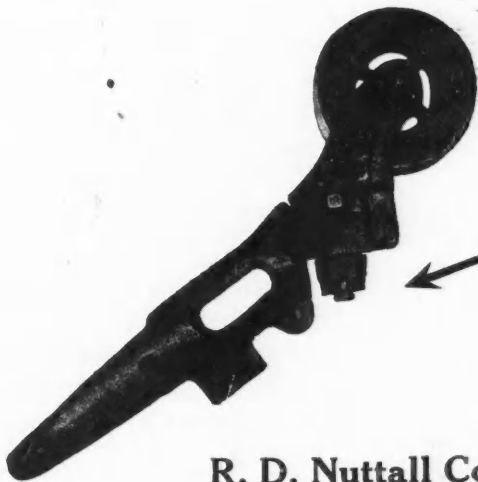
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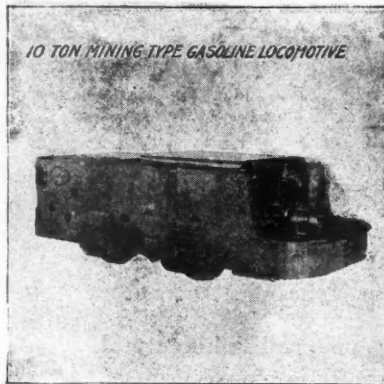
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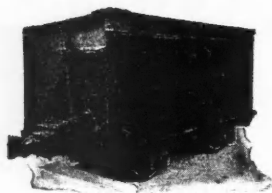
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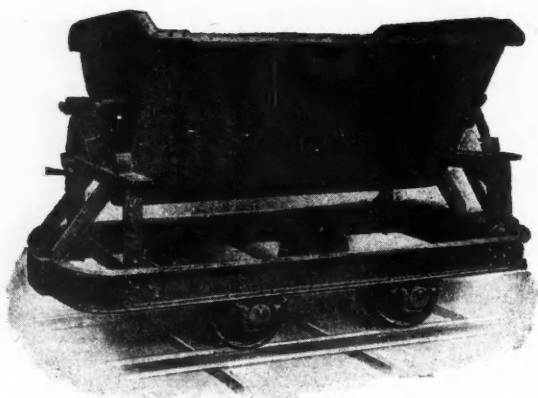
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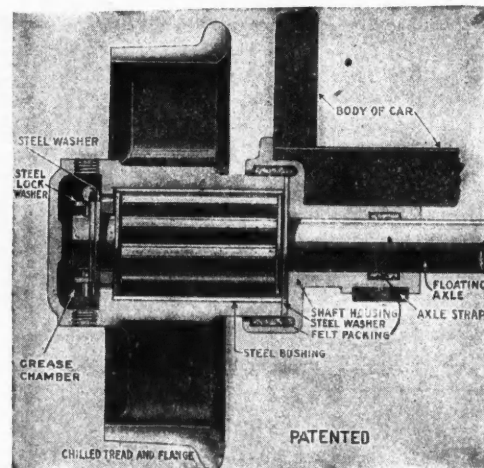
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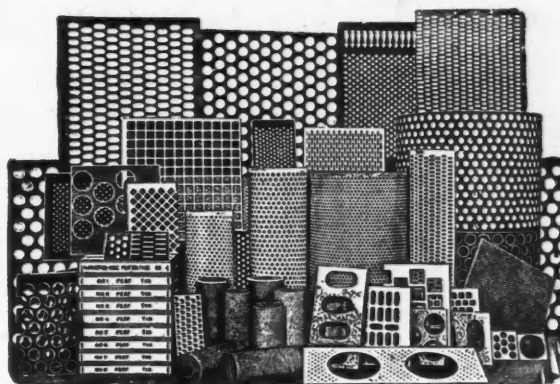
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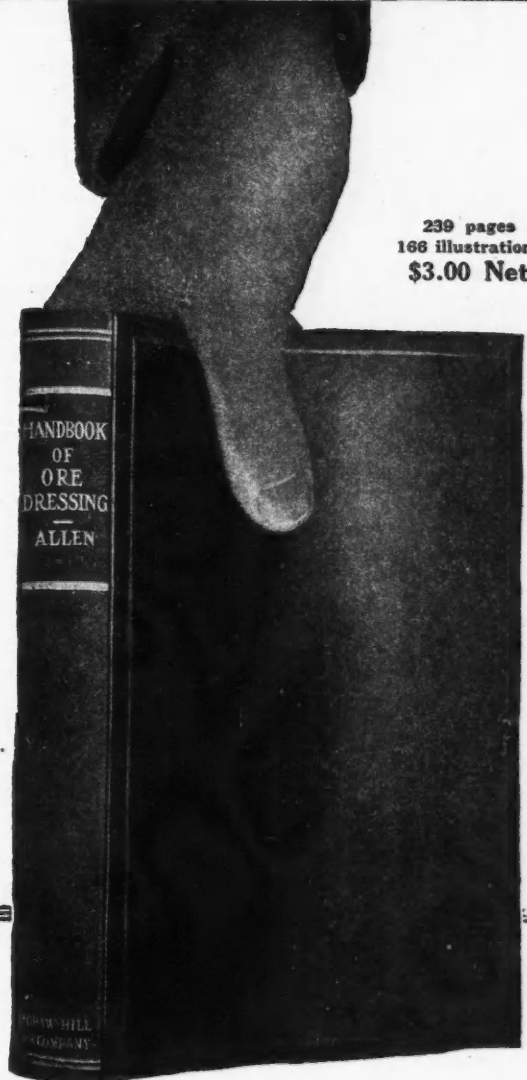
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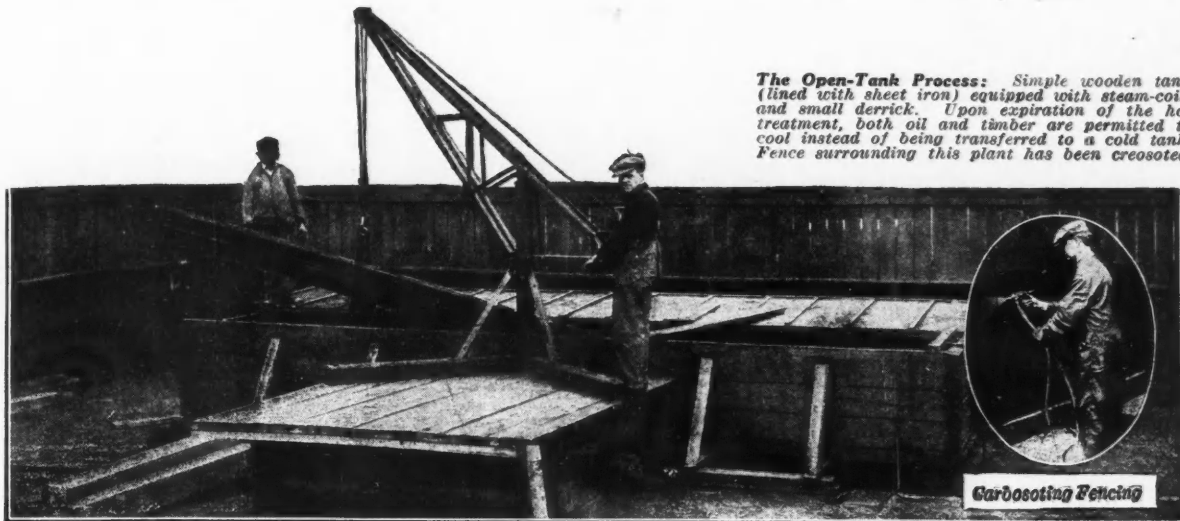
Valves, Pop Safety
Lunkenheimer Co.

Valves, Pump
Jenkins Bros.

Valves, Blow-Off
Lunkenheimer Co.

Valves, Non-Return
Lunkenheimer Co.

Valves, Pop Safety
Lunkenheimer Co



The Open-Tank Process: Simple wooden tank (lined with sheet iron) equipped with steam-coils and small derrick. Upon expiration of the hot treatment, both oil and timber are permitted to cool instead of being transferred to a cold tank. Fence surrounding this plant has been creosoted.

Creosoting Fencing

Life Insurance for Timber—

CREOSOTING insures longer life and greater service of timber structures.

Wood preservation reduces the huge economic loss caused by decay; in many instances saves half of the overhead expense for repairs and replacements, and often times much more.

Non-pressure methods of creosoting are available to every consumer of structural wood. The illustrations indicate the simplicity of equipment and ready adaptability to practically all conditions.

Where question arises as to the method to use, our experts will recommend the treatment which combines the highest degree of practicability and efficiency. This *technical service* may be obtained gratis by addressing nearest office.

Carbosota Creosote Oil is the *universal preservative* for non-pressure treatments. It is a pure coal-tar creosote, highly refined and specially processed to make it physically fit for the purpose. It conforms



to standard specifications—and is *standardized*, absolutely uniform the world over. Specifying Carbosota assures satisfactory results. Wood preservation is the short-cut to timber conservation—the nation's greatest need. Booklets free upon request.

(Green wood cannot be effectively creosoted by non-pressure processes. It should be air-dry.

In regions of moist, warm climate, wood of some species may start to decay before it can be air-dried. Exception should be made in such cases and treatment modified accordingly.)

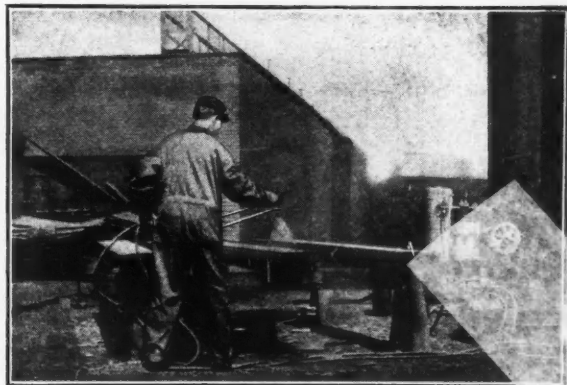
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Timber must be seasoned air-dry, and completely framed—all bolt holes drilled, tenons and mortises cut—before treatment.



Spraying sills and floor joists with Carbosota.

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Iron is objectionable in both abrasives and refractories.

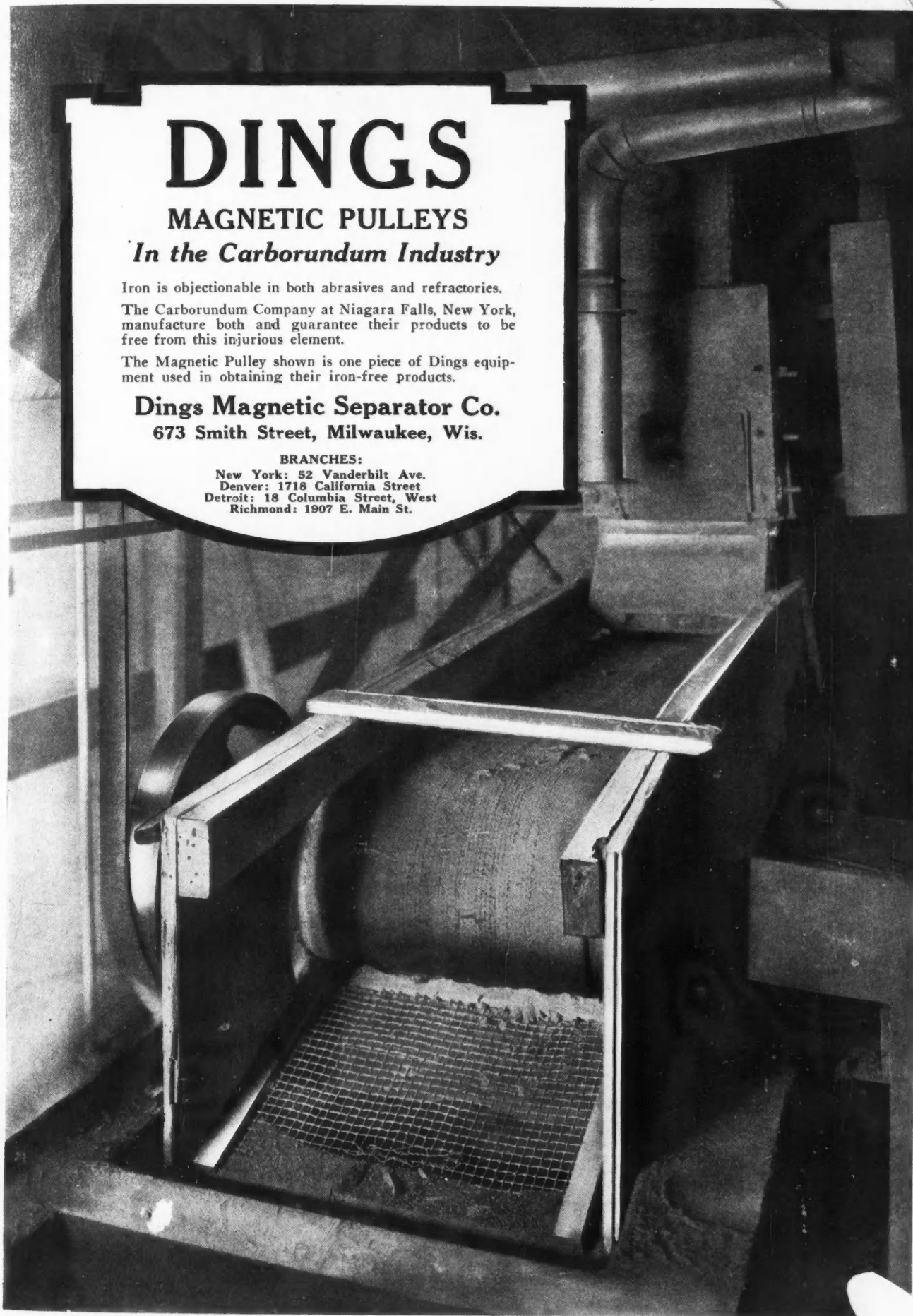
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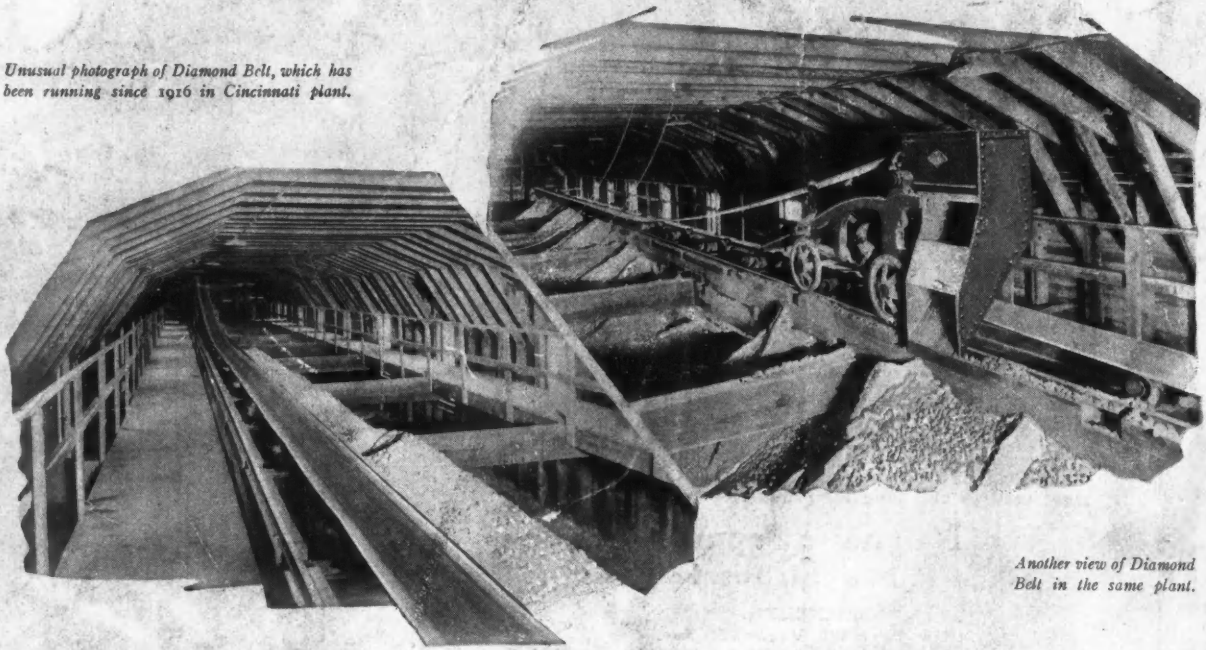
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