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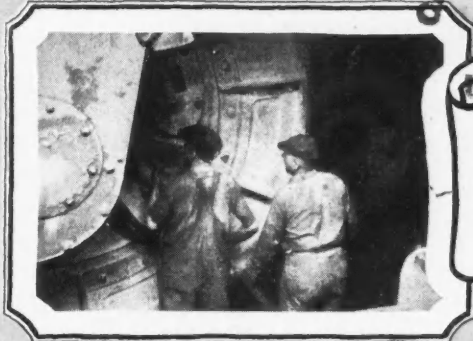
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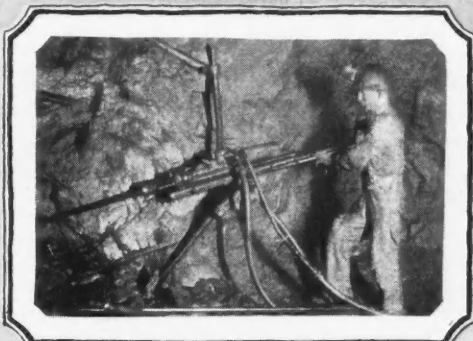
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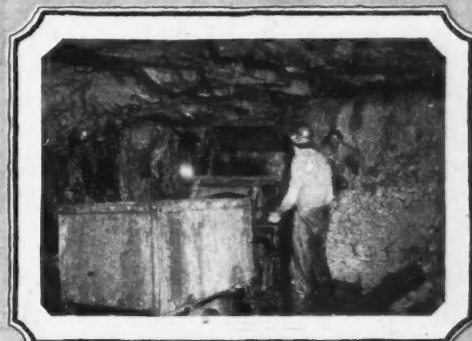
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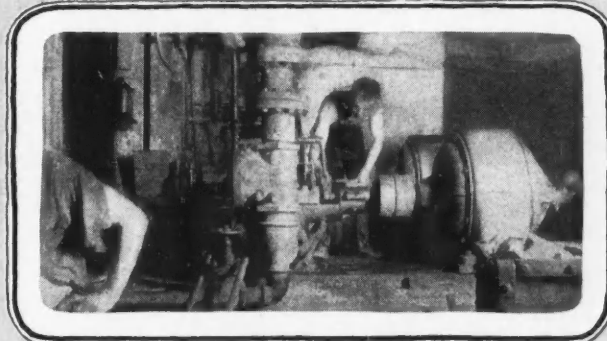
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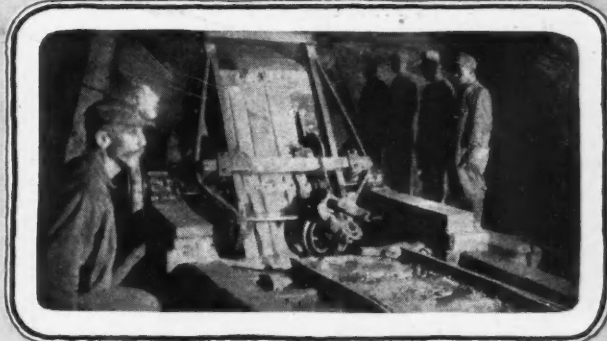
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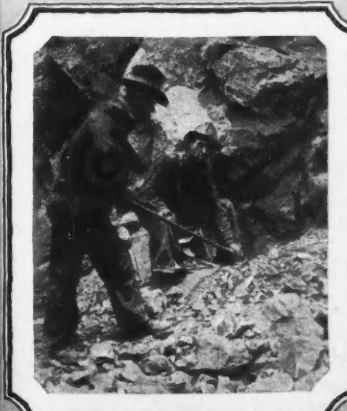
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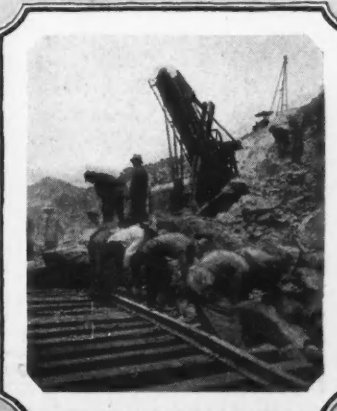
Centrifugal Pumps Underground



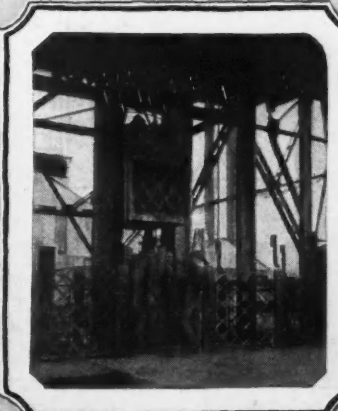
Dumping Mine Cars Into Pocket



Charging a Toe Hole



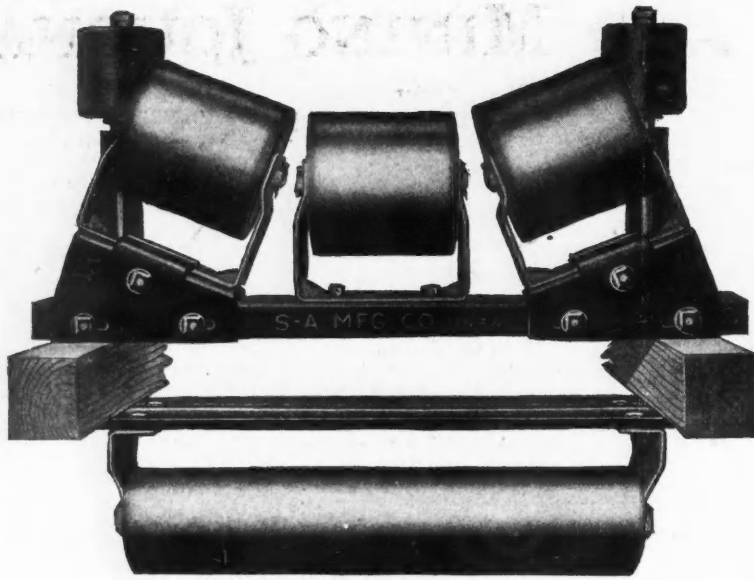
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A Weekly Journal of the Mining and Mineral Industries

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Volume 110

New York, July 17, 1920

Number 3

The Bankers and the McFadden Bill

THE report of the special committee of the American Bankers' Association on the McFadden bill is about what we could reasonably expect. Bankers have always shown themselves strong in practicing their art, but weak on the insight into its workings. Now they are afraid of tampering with the "gold standard." They say, "Nearly all the European states are on a paper basis. Only a few of the smaller countries of Europe are even approximately maintaining the gold standard. The United States, par excellence, and Japan as well, stand out conspicuously as nations maintaining the gold standard."

Surely this shows surprising lack of comprehension or candor. All countries of Europe are on a gold basis, but the value of their paper diminishes as their gold basis shrinks. The United States is on a similar basis, and its paper money is relatively more valuable, because of the larger amount of gold security underlying it. But it is still inflated, and that is one of the reasons for high prices; the bankers themselves admit that in general talk, and the necessity for deflation is recognized.

Again, "All the world believes that our dollars are as good as gold. We enjoy a proud pre-eminence in this respect, and it should be zealously guarded and maintained. The belief which obtains in the world today that our dollars are as good as gold must be maintained." There is the milk in the cocoanut. We know quite well that our dollars are not as good as gold, but we must not admit it to the world. England also maintains that her five-pound notes are as good as gold, but exchange rates show that America does not admit this, and reflect the different grade of underlying gold security. Were there a country having a larger percentage of gold to paper than the United States, the dollar would be at a discount in it. Actually, our dollar is now at a discount in Argentina and Japan. The Argentine peso, nominally worth \$0.96 of our money, is quoted at \$1.07; and the Japanese yen, nominally worth a little less than \$0.50, is quoted around \$0.51.

The report reiterates the same old economic principle, true of business on a gold basis, but which bankers do not seem to realize is not true of business on an inflated, semi-paper, or paper basis; and therefore absolutely inoperative in most countries at this time. It is that "diminished gold production in periods of high prices and high costs tends to reduce prices and costs again." Apart from the obvious lack of application of the theory, the facts at present sufficiently show this law inoperative. Otherwise, why the continual skyrocketing of prices, while the amount of gold relative to currency and credit diminishes? It is because we do not transact our business on a gold basis, and the elemental textbook laws which our bankers quote are not operative, except so feebly as to be powerless; nor will they operate according to specifications till we close up the gap between

gold and credit. One way is to increase production of gold; another is to reduce credit and thus promote deflation. We should do both.

An increased production of gold in this country—in all countries—is most desirable and necessary, and the McFadden bill provides a method which might well be adopted. Let us be honest and say that it does recognize the existing difference between a paper dollar and a gold dollar, which is in a less degree like that between a paper franc and a gold franc, the latter being worth as much as ever. But any remedy must admit this: even the measures of the Federal Reserve Bank to reduce inflation admit it.

Keeping Step With Progress

ROUTINE, at best, secures a productiveness that is dependent on manipulative skill, either of labor, machines, or both, and the output, or result, is necessarily limited by capacity. To exceed this limit—in other words, to increase capacity, reduce costs, or bring about greater efficiency—it is necessary to break away from a former routine and to adopt other methods, which may include the installation and usage of new equipment, a different order in the performance of the work, and certain changes that necessarily follow deviation from former accepted practice. Often the change is a slight one, although the degree of variation is indeed no measure of what may be accomplished, for it is a truism that the smallest alteration of a detail may be productive of great results.

One of the fundamental purposes of the great technical societies is to encourage the interchange of ideas and opinions, and this is also true of the smaller local organizations of a similar nature, each performing a function that is most necessary if the industry represented is to flourish and keep in step with the ever-changing order.

The technical press plays no small part in spreading the gospel of development and improvement. Reaching out, as it does, in many directions, and obtaining new ideas from a number of sources, it is able to present from different angles the opinions and methods of the practical man as well as the theorist.

Mining and smelting companies make it a practice to encourage their men to visit other districts and plants, realizing that by so doing the employees come in contact with many new practices, many of which can be adopted to advantage in their own establishments.

All of these ideas are progressive—the society membership, the technical press, the inter-plant visit; each presents its opportunity for the expression of opinion and for profitable observations.

Without a certain order or routine, real accomplishment is impossible. It is essential that the most efficacious method be found, and that routine, when adopted,

should be the best that can be devised under the circumstances and conditions.

The best results in mining or in any other operation are seldom attained by "snap judgment." They flow from a careful selection of some practical method, or a modification of it, which has already proved to be satisfactory and efficient.

The Future of Mining

LIVING in a mining camp in its initial stages is to live in an atmosphere of hope; for, discounting the few pessimists that are always present, there is the buoyant spirit of youth, the elemental outdoors, and the absence of the cluttering fussiness of the city. Turning forward the hands of the clock to the time when half the stamps are hung up, and the dawn is broken by a few lonesome whistles where formerly a medley stirred one to action, it is not difficult to see why an air of pessimism should pervade the streets of the camp. Consciously or unconsciously, the dweller in such an atmosphere expresses the thought that mining is dead.

The state of mind induced by the closeness of the local condition is unhealthy for the individual thus inflicted. Mining has its ups and downs locally, nationally, and internationally. A single mine may discover a bonanza after a heart-breaking period of purse-emptying prospecting. A decade may disappear without a new Cripple Creek or a Goldfield. But bear in mind that all industry is subject to similar vicissitudes. Mining is a bedrock industry.

Our civilization is a metal- and mineral-consuming civilization which is growing at a pace that can scarcely be realized by the puny individual. The per-capita consumption of the different metals increases year by year.

The situation in the petroleum industry (which is the subject of continued discussion) is illuminating. The rapid increase in the use of automotive appliances and internal-combustion engines raises the important question not only of where future supplies of petroleum are to come from, but awakens concern respecting the use and conservation of even present needs and resources. Admitting the rapid development in every oil field, the prospective supply can hardly keep pace with the increasing demand.

In sharp contrast is the existing condition in the copper industry. Restricted production due to a torpid market, with consequent low prices, has caused the more timid in the mining industry to inquire anxiously as to the future of the copper-mining industry. The future is assured. The present condition is only a passing phase, a temporary ebb in the demand tide. A decade or more may produce a condition in the copper market similar to that now existent in the petroleum industry. We appear to have now a sufficient number of copper mines to supply the demand, but some will be worked out and disappear, and it is problematical whether new mines can be brought to production fast enough to cope with the per-capita increase in the consumption of copper. When we look at the ever-growing electrical power development, the ever-increasing market for electrical appliances, we can visualize a greater and greater per-capita consumption of copper. It is so with many other metals and with minerals. Mining is inevitable.

The kind of civilization now existent is not going to change materially, but rather will it extend itself in the

direction now indicated. The miner will be hard put to meet this ever-increasing demand.

Mineral discovery is not as easy as it once was. Metal and mineral prices may be expected to increase materially as a consequence. Just as the "porphyry coppers," once thought to be too low-grade to work, have by improved and new methods become profitable, so will other metalliferous deposits, under the stimulus of high prices, become workable. Viewed broadly, the mining industry affords little opportunity for pessimism.

Lubrication of Air Drills

THE importance of lubrication in the economical operation of machines of various kinds has gradually won recognition. In steam engines, pumps, and particularly in high-speed machinery of all kinds, efficient lubrication by a system which will be continuous in its operation and almost entirely automatic is an accomplished fact. In hard-rock mines the air drill is pre-eminently important. With the former type of piston drill, lubricants were applied at two points. One was at the rotating mechanism. By removing a screw plug the lubricant could be applied at intervals, the movement of the mechanism carrying the oil to all parts. The other was by means of a small cup placed on the air pipe close to the valve chest. By filling this with lubricant and opening the valve, the lubricant was swept into the valve mechanism and carried into the cylinder. By applying the lubricant at sufficient intervals, the drill could be efficiently operated. Everything, however, depended upon the alertness of the drill runner.

With the advent of the hammer type of drill, a high-speed machine, the method of lubrication just described was inadequate. Some of the earlier and, in fact, fairly successful types of hammer drills failed to give all the service that was possible, on account of this all-important lubrication. Inadequate lubrication increased power requirements and repairs. A system that would be continuous with only occasional attention on the part of the drill runner was essential.

In the development of hammer drills the manufacturing companies did not overlook this important feature of lubrication. An exhaustive investigation of available lubricants has been made, and exact specifications for suitable lubricating media have been determined. The kinds of lubricant suitable for different machines and purchasable on the market are specified. Drilling machines as they are sold are provided with a tag, which gives definite information as to the kind of lubricant and the method of lubrication best suited to the machine. The waste in power, labor, and repair parts in a mine employing twenty-five to fifty machines or more, due to neglect or carelessness in the selection and use of lubricants, is undoubtedly large unless provision is made to prevent such losses.

The condensed epitome of information on the subject of lubricating drill machines which may be found on the tag accompanying the drill when it is shipped by the maker indicates that a great deal of thought has been put into the preparation of this card. Back of the card there was an immense amount of research and experimentation, to evolve the important conclusions which appear on its face. Just a tag tied to a machine—but how often are the conclusions placed on this card carried out? We are well aware that many mining companies have gone into the study of air-drill lubrication and its application with the same thoroughness that has

characterized their other operations. But do all drill runners, master mechanics, superintendents, and purchasing agents realize the endless experiments required to secure this important information and do they take advantage of the knowledge which drill manufacturing companies have so generously and freely given them?

Technical Journalism

THE *Engineering and Mining Journal* is not a one-man paper. There are eight editors who contribute editorials. That is why irregularities will creep in and editorials or paragraphs which may not please will inadvertently be admitted. Any editorial or other feature which appears to you particularly sound and brilliant you may credit the editor-in-chief: that is one of his perquisites. The editorial which you find so punk or offensive is the work of the jail editor. The jail editor may be defined as that editor who wrote the editorial which offends you: he is also that editor who is off on his vacation. The custom developed in ante-bellum days in Germany, where the newspapers were continually subject to imprisonment penalties for references to the Kaiser and the government; so that the custom grew up of having an editor to assume the sentences. Other editors were apt to be discreet until he got out of jail—and to become very daring immediately thereafter.

We are not sure whether our subject should be "technical journalism" or "technically journalism." In either case, it is perplexing to plain engineers. Shall we try to be all things to all men, or shall we be known as speaking "the truth, the whole truth, and nothing but the truth"? We have got far enough to know that though the latter sounds fine, we musn't do it. Truth will ruin anybody.

Years ago, as a cub reporter on a small-town daily, we were sent out to report an accident. Being then truthful we wrote it up as follows: "Our respected fellow-townsmen Mr. Eliphalet Yokum, while drunk, fell off a sidewalk on Center St., and broke his leg." The editor remarked, "What in ———, etc., is this? Ain't you got any better sense than to say that?" "But it's true," we argued, "and everybody on the street knows it." The chief grabbed a pencil and wrote "Our esteemed fellow-townsmen, Mr. Eliphalet Yokum, narrowly escaped a serious accident last Wednesday. While hurrying from his office, a protruding curbstone tripped him, and he fell heavily, resulting in a compound fracture of his right femur. As his benevolence is well known, he will not sue the city; but this calls attention once more to the disgraceful condition of the city streets under the present administration."

No; our ideal is to skate as near the truth as we can, without breaking through. We know when we are near enough when the ice cracks and subscribers write in and call us names; and we skim off on the other foot. We enjoy, however, hearing her crack. One of our contemporary technical journals remarked concerning us that as we were catering to a certain group we had better be careful how we expressed certain sentiments. The idea that we were caterers hadn't occurred to us, but we are thankful for the conception and the advice. Off-hand, though, we should think a caterer should have the privilege of grilling a politician or of roasting a subscriber now and then for the delectation of our other readers. It is all for the common good; and a little unselfish altruism on the part of the subject is what we think we have a right to expect.

The Practical Miner

THE successful miner, be he drill runner or shift boss, and the successful engineer, must have one characteristic in common—horse sense. No amount of study on the part of the latter will make him successful if he is not fundamentally well balanced, keeps his feet on the ground and has his eye always open for the significant details which are of vital importance at one stage or another of a mining operation. Nor, in the case of the miner, mill man, or smelter employee, will discontent with the social system, nor even—on the other hand—any amount of hard and faithful back-breaking work, make him successful and open up his way to large responsibility and prosperity unless he "uses his nut."

Did you ever see a job where brains wouldn't help—where brains were not the chief thing? There is none. Brains plus muscle reared the pyramids, up-ended the obelisks, flung the Brooklyn Bridge across the river; but without practical sense these things could not have been done—nor could the men who did them have found out how by consulting textbooks and encyclopedias.

Every day in mining operations some man who is working in the mine or the mill has an idea—he has seen a better way to do this or that than has been tried before. When we visit mines in certain remote countries or mines in this country run by greenhorns, we are astonished to see how many entirely evident things could be improved. We have in mind a mine which was operated on a basis of, say, \$20 a ton cost. A new manager came on, with a bent for practical details, and by tinkering up this detail and that he brought the cost down to \$12. Same mine, same mill, same power plant, same men and same wages; same staff. What was the difference? Nothing tangible; just that invisible and imponderable quality—horse sense. He didn't reduce wages or fire the force. The latter process is the elementary idea of economy, and is usually very expensive.

It would be fine practice if every man who has a job around a mine or a plant would sit down at the close of the day, look over the good bit of work he has done during the day, and spend half an hour or so in trying to figure out *how he could have done the job with less work*. We have known men who were regular hogs for work; but their energy needed expression in their muscles, and to use their thinkpieces bothered them and was painful. We heard of a lad in a plant the other day who complained because his work was too varied; he wanted to get on piecework, and turn out a certain part of the work on a certain piece of a certain machine all day and every day. Then he knew where he was at. That lad, of course, is worth the standard price for a man from the shoulders down; but a lad who studies how to do this or that quicker, easier, and better, and is interested in learning some new thing each day, needs no college, and the world has no reward that is not available to him. That is why we see so many men in big and responsible jobs who rose from the ranks and know all the practical details of their business from bottom to top, because they have plodded systematically up the whole road.

George the Third, according to Carlyle, never could figure how the plums got into the pudding. The same dullness lost him the American Colonies.

Hats off, then, to the man of plain common sense! We need him around the mine and the plant, and if all the world were like him it would run more smoothly.

WHAT OTHERS THINK

The Litigation Geologist Protests

I have read with much interest your editorial comment upon apex litigation in the *Engineering and Mining Journal* of June 19. I note with interest and some amusement that you characterize me as "a geologist pure and simple." I am glad to be considered pure, and I quite acknowledge my simplicity. I am a little regretful, however, that you join with others in slamming geologists who testify in apex suits. I detest apex law or apex litigation as cordially as anyone, but the law is an inescapable fact, and controversies do arise in the presentation of which to the court testimony is required, and in connection with this work geologists must be employed.

It is not a fact, as you imply, that there is always or generally contradiction as to facts between the geological witnesses of the two respective litigants. On the contrary, there is usually and almost invariably a remarkable agreement as to facts. It is seldom, indeed, that a statement of fact by a witness on either side is questioned, and when it is there is a prompt and unanimous exodus to the controverted place by witnesses for both sides at the earliest opportunity for the purpose of establishing the truth, and if some witness discovers that he has inadvertently testified wrongly, he is the first to take the stand and correct his testimony. The differences come in the interpretation of the facts.

Now, it seems to me that our critics are generally men of little experience in such matters. They do not know, for instance, that a geological witness of any standing whatever customarily reserves the right to investigate the premises in question and to decide on his own examination whether or not he can and will espouse the cause of those who offer him employment. Our critics are certainly not aware of the fact that engineers and geologists who have some reputation as expert witnesses in such matters are frequently offered employment by both sides, and that they visit the property and make their examination before deciding in their own minds the merits of the case, and that they frequently decline to accept employment by those whose cases they feel unable to advocate.

We are represented as a pack of wolves roving around, seeking whom we may devour, and eager to stir up trouble and avid for employment regardless of the facts and the merits of the case. Our critics do not know that we settle out of court more cases than we contest, and that our advice and influence constantly tend toward compromise and the avoidance of the expense associated with litigation. Those of us who have gone through the mill in such matters, experienced the uncertainties, the annoyances, and the expense of apex litigation, are constantly endeavoring to settle controversies and frequently are successful in so doing. For all this we receive no credit whatever. Neighbors will persist in squabbling; covetousness is inherent in the human animal; large orebodies within the range of different claimants are generally the inspiration for efforts to gain title through the courts; lawyers will advise clients that

their chances for victory are bright, and litigation thus becomes unavoidable.

Nor would your suggestion of a selected body of engineers and geologists chosen by the court alleviate the situation. No such body will ever agree among themselves as to the interpretation of the facts in the light of apex law. The volume of legal decisions is so vast, and the complexities of geological structure in large mines are so numerous and so great, that even the keenest analysts and the most experienced geologists seldom agree on all points. Even when the facts are admitted, no two mining lawyers will agree as to many points which have not yet been decided by the highest court. Nor is there any limit to the number of such questions, for new cases constantly present new features, and the only method of final determination is through judicial decision.

It seems to me, therefore, poor taste constantly to impugn the good faith of those of us who are called in to advise in matters of this sort. We spend weeks and months in careful study. We learn the mines as no geologist ever learns them otherwise. We prepare plans, cross-sections, and models of unsurpassed accuracy and perfection of detail and presentation. We frequently succeed in developing valuable information which leads to the opening of unsuspected ore reserves. As a result of such careful study we reach conclusions which are so firmly fixed in our minds that we naturally become advocates and partisans with respect to our views; and I can say to you as a result of long experience that the correctness of the decisions reached by the courts is usually admitted by even the defeated litigant after the period of disappointment has passed. Thus, for example, in Butte the correctness of the Blue Vein theory, which was bitterly assailed at the time of trial, has now been universally admitted, and has led to the discovery of millions of tons of ore in that camp.

It is not perhaps surprising that there is a natural antipathy to the use of scientific testimony in connection with litigation. It is not surprising that the outside spectator who witnesses the spectacle of opposing scientists in such cases immediately jumps to the conclusion that they cannot both be right, and that therefore they are not both strictly honest. But it must be remembered that we are endeavoring to apply scientific facts to the statutes and that there is always room for a difference of opinion.

It never occurs to me to question the entire honesty of witnesses on the opposite side. I can see perfectly their point of view and understand thoroughly their mental processes in upholding their position. I should be sorry indeed to feel that my opponents in such litigation credit me with evasive or dishonest testimony or thought. Such being the case, I trust that you will no longer remain a member of that group of critics who are from time to time casting aspersions upon the integrity of men whom in other occupations they trust implicitly.

We all admit that the situation is unfortunate; that the system is wrong; that the law is inadequate; that it was never calculated to cover situations which have

arisen. But it is on our statute books, it regulates mining rights, and it must be interpreted in the light of the best information which can be obtained.

Minneapolis, Minn.

HORACE V. WINCHELL.

Mining Reports of the Bureau of Foreign And Domestic Commerce

Your editorial on page 1,247, in the June 5 issue of *Engineering and Mining Journal*, and the letter of Olof Wenstrom, on page 1,250 of the same number, interested me greatly, for on or about May 19 I asked, by postcard, for the Confidential Circular FE-130, "Copper Mines in Western Manchuria," and received a letter of the same tenor as that sent to Mr. Wenstrom, asking me to call at the Custom House in San Francisco and explain why I wished a copy of the report. Instead of this, I wrote to the Far Eastern Division, Department of Commerce, on June 3, stating that I am a mining engineer who has been in Manchuria and that it appeared to me also that as secretary of the San Francisco Section, A. I. M. E., I was entitled to a copy. I also inquired, if not outside of the regulations of the department, for information as to the harm likely to be done to the Government by publication of the report.

In reply, a copy of the report was sent to me on June 11, and also a copy of the department's letter to you of same date. You will doubtless deal with this matter in your paper, and I wish to say that in the opinion of a number of engineers with whom I have talked, and in my own opinion, the department is making an error in treating these reports as "confidential." With regard to the particular report of Dr. Clement's it seems to have been improperly marked as "confidential." Be that as it may, it is clear that if any persons are entitled to priority on these mining reports it is mining engineers; and I hope that your influence and that of the A. I. M. E. will be powerful enough to see that these reports are given full publicity.

In writing with reference to the withholding of these reports, Frank Harding (page 1,348 in the issue of June 19) mentions his desire to prospect in "Chinese country." I have not been in China for a good many years, but from all that I hear it is about the poorest place possible for a prospector, chiefly because of the difficulty of obtaining title to mining property. I think it would be useful if some of your readers who are familiar with present conditions in China would tell us if there are any inducements for an American prospector to try his fortune in China.

Palo Alto, Cal.

W. H. SHOCKLEY.

What Is a Living Wage?

When laborites, I. W. W.'s, bankers, and economists (amateur, professional and of the common or garden variety) have exhausted the subject as to what constitutes a Living Wage, some patient and simple soul with a high-school equipment in arithmetic, convinced that the truth has not yet been proclaimed, may perhaps retire to the woods for an hour or so and apply the same acumen to the problem that a successful farmer requires in computing the life of his red barn.

The human individual, mechanically, is a machine. In the creation, operation, maintenance, and replacement of machinery, these charges must be met: cost, interest on investment, insurance, maintenance, depreciation,

and replacement. The principles of scientific business management can be applied to the solution of the wage question as to all industrial problems. Why not attack the Living Wage on that basis?

No one has the courage. The most just and philanthropic employer, under a competitive system, would speedily go broke if he were to pay his employees a wage to keep the machine—the man—housed, clothed, and fed, plus an amount to amortize the mortgage of old age, plus the sum needed for repair (sickness), plus a 6 per cent profit on labor turnover, and an equal share above that percentage for the workers' allotment of the profits of the industry over and above all financial and industrial charges. And about 90 per cent of the working class—and that includes almost all of us—if we were to receive the custody of such sinking funds, would blow ourselves to all manner of luxuries, work only part time, and attain sixty poor and dependent, in strict accordance with age-old tradition and present practice.

These being the facts, there can obviously be no other solution to current and prospective industrial and social questions and difficulties than a more intensive education in thrift, industry, and common sense, and as wide a dissemination of the truth of the situation as is possible and as the patients can be made to accept and the world afford.

O'Ho.

New York City

A Message to Hoover

Mr. Herbert C. Hoover,
Washington, D. C.

My dear Herbert: I think the G. O. P. made an error in judgment in not placing you at the head of its ticket. However, I realize that my viewpoint on political questions is not very important, because, even if I had political sagacity, I have never had political training.

It is my conviction that the element of prominent political position is not a material factor in the "hoover" movement. You told me some years ago that you were in the position and had the inclination to do something for the public good. I feel sure that the vast majority of the men in the Hoover clubs of Colorado are inspired by the same spirit and will support you in your patriotic efforts whether you are in or out of office.

If I remember correctly, I believe that some of your greatest successes have occurred where the other fellow was the titular figurehead.

So here's to Harding and Hoover. Harding may adorn the prow of the ship of state, but I am sure that Hoover will have a lot to do with the operation of the rudder.

Sincerely,

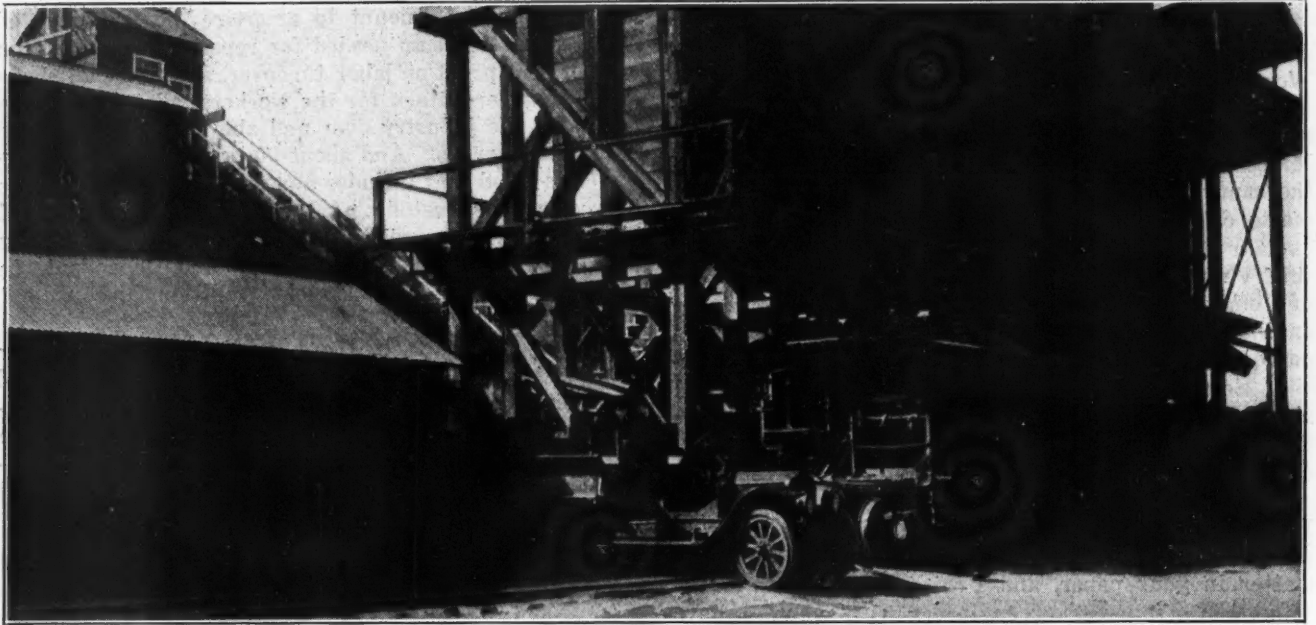
Denver, Col.

GEORGE R. BANCROFT.

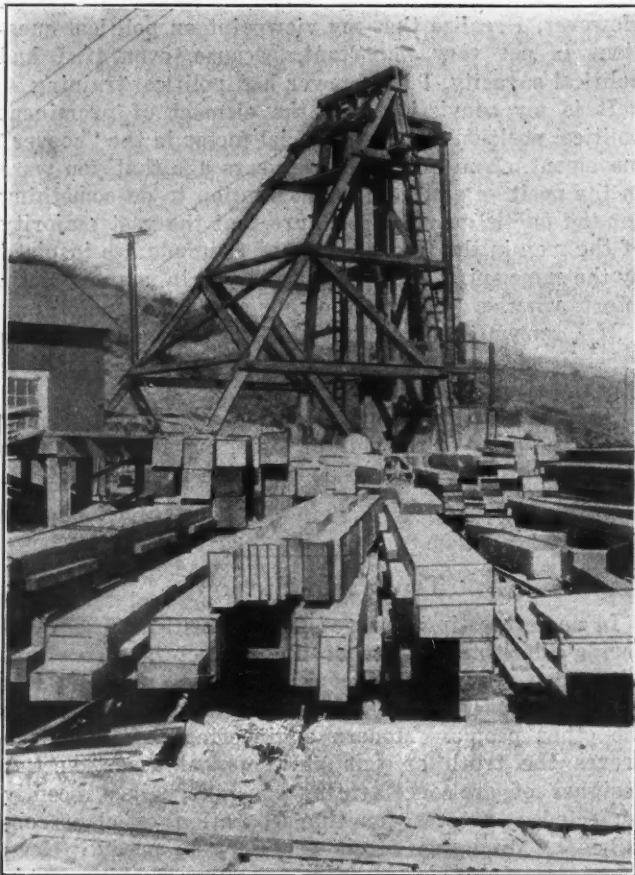
Truth and Fiction

In an interesting work of fiction entitled "The Wandering Blacksmith," one of the characters states that when men study other people's business they get lots of new ideas and are able to give good advice to the other people. Modern engineering practice often proves the truth of this philosophical assertion. A designer of ore-concentrating machinery has recently perfected a process for the separation of clams obtained by dredging. It is necessary to produce clean clams, free from broken shells and other rubbish. This is now being done at low cost. The details of the process have not been divulged.

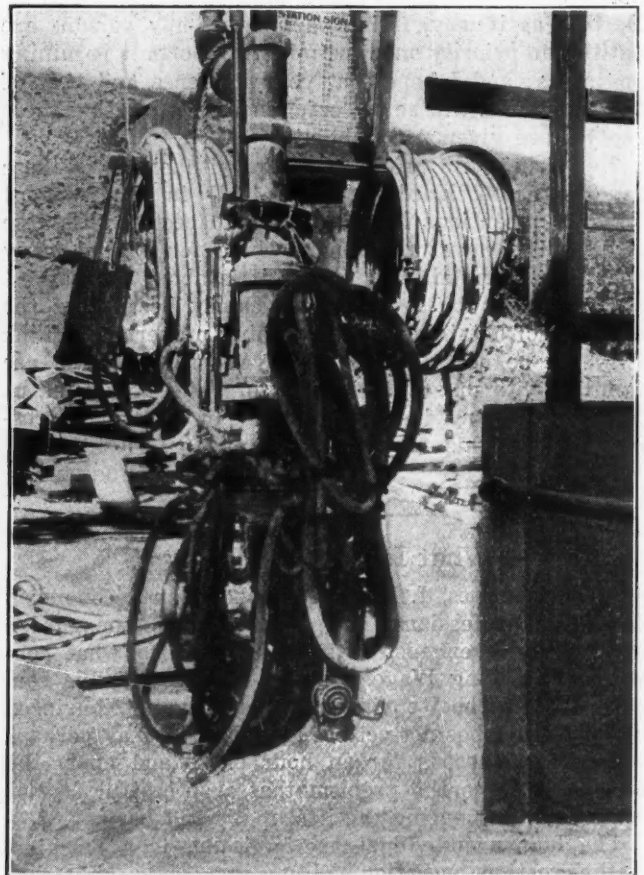
The Arizona Commercial Mine, Globe, Ariz.



MOTOR TRUCKS DELIVER SUPPLIES, AND RAILROAD CARS TAKE AWAY THE ORE FROM THE NO. 1 SHAFT OF ARIZONA COMMERCIAL MINING CO.



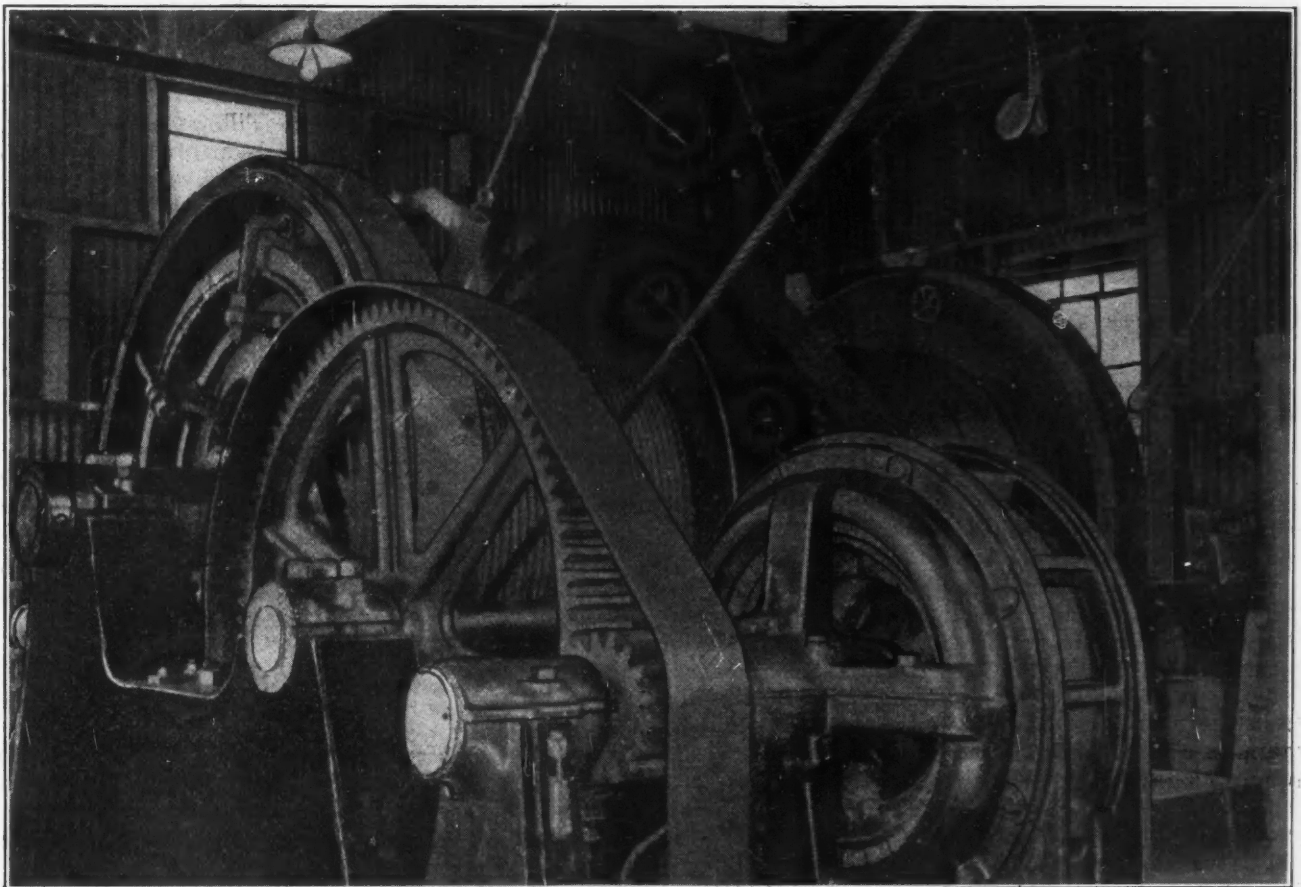
HEADFRAME OF NO. 2 SHAFT, WHICH IS BEING CONCRETED AT COLLAR



HEADER AND EQUIPMENT USED IN SINKING NO. 2 SHAFT



NO. 1 SHAFT OF ARIZONA COMMERCIAL MINING CO. AT COPPER GULCH, NEAR GLOBE, ARIZ.



INTERIOR OF HOIST ROOM AT NO. 2 SHAFT, ARIZONA COMMERCIAL MINING CO., GLOBE, ARIZ.

An Economic Method of Thawing Dynamite

Utilization of Heat Supplied by Lunch Room or Change House Stove Provides Hot-Water Coil in Thawing House at Safe Distance—Arrangement Eliminates Danger From Fire Hazard and Provides Economical Construction

BY DOUGLAS LAY

Written for *Engineering and Mining Journal*

A SIMPLE, economic, and safe method of thawing dynamite, and incidentally one which greatly adds to the comfort of miners on shift, is here-with described.

A change house or lunch room of sufficient size to accommodate the miners and others on shift is erected close to the portal of working tunnel, or shaft collar, as the case may be. A large box stove in this building is supplied with a hot-water coil, by means of which a horizontal water coil is heated in a thawing box, situated in a small building about one hundred yards from the change house and placed at as great an elevation above the latter as the profile permits. The two water pipes between the two buildings are placed in a wooden box filled with hay or straw, the box being buried about eighteen inches below the surface of the ground.

The essential idea in the placement of the two buildings is that if the change house catches fire, the latter cannot possibly spread to the thawing house. At the same time, although the method of thawing

larger the better, which contains a heating coil. The top of the stove serves to heat tea and coffee. The building contains no ceiling boards. It is preferable to place the building at the side of a mine track, so that any waste wood from the mine or timber shed, e. g., ends of timbers, old wedges, and similar materials, may be readily conveyed to the change house and utilized as fuel. The general arrangement is shown in Fig. 2.

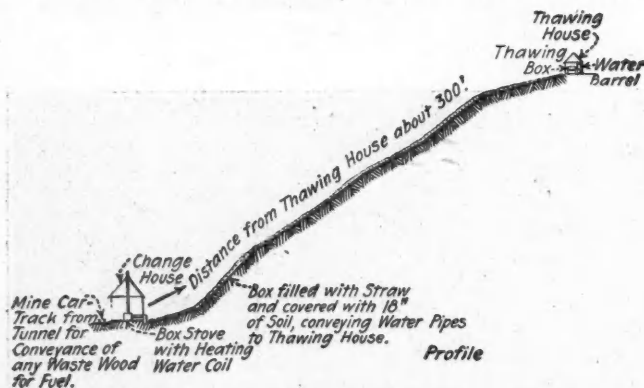
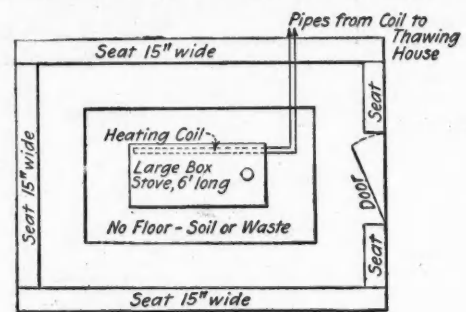


FIG. 1. GENERAL ARRANGEMENT OF CHANGE AND THAWING HOUSES

dynamite is comparatively safe, such a building as the thawing house should always be placed in an isolated spot, taking advantage of any natural protection afforded by ground contour, so that any untoward happening therein is not likely to cause loss of life. The above general arrangement is illustrated in the profile sketch, Fig. 1.

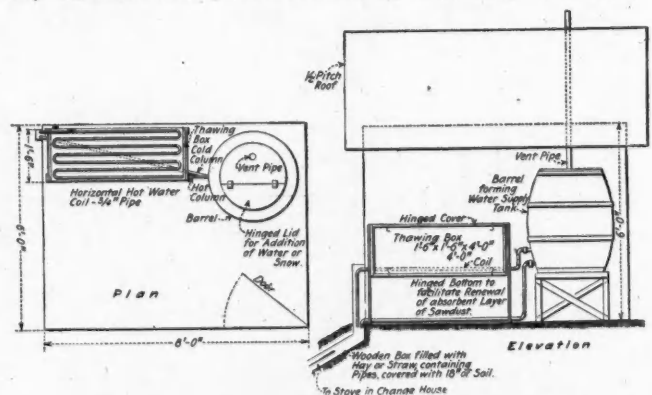
The size of the change house and lunch room depends, of course, upon the number of men it is desired to accommodate. Around the sides of the interior is a seat 15 in. wide, with a foot rest in front 21 in. in width. With this exception the building contains no floor, the soil being merely leveled off, with perhaps a layer of fine waste scattered over it. This ensures absence of danger from any hot ashes from the stove. A brick chimney for the latter is highly advisable, but if a stovepipe is used care should be taken to insulate it thoroughly. Most stovepipes are a constant menace unless run into brick chimneys. In the centre of the building is a large box stove, the



Change House - Sketch Plan
Size depends on Number of Men

FIG. 2. PLAN OF CHANGE HOUSE

A convenient size for the thawing house is 8 x 6 ft., with 6-ft. walls and half pitch roof, sufficient to accommodate thawing box, water barrel, and a few unopened boxes of dynamite. (See Figs. 3 and 4.) The thawing box is made of 2-in. plank, and is 18 in. wide by 18 in. deep by 4 ft. long. Filling the bottom is a coil of 3/4-in. pipe, over which a layer of sawdust, which acts as an absorbent of any exuded nitroglycerine, is sprinkled. The box has a hinged, tightly fitting cover. The sticks of dynamite are put in the box without any definite order, the idea being that they will criss-



FIGS. 3 AND 4. PLAN AND ELEVATION OF THAWING HOUSE

cross and so permit of efficient distribution of heat from the coil. The bottom of the box is hinged and opens downward, so that the sawdust may be renewed periodically. With this arrangement, the operation of removing old sawdust and putting in fresh occupies two or three minutes only. Obviously, attention should be paid to this matter of changing absorbent. The

bottom of the thawing box is set 18 in. above the floor of the building. The water-supply tank consists of an old oil barrel, which is provided with a vent pipe to outside, so that no steam is liberated in the building. A hinged cover permits of ready addition of water to compensate for evaporation. If the weather is sufficiently cold to require the thawing of dynamite, there is usually an abundance of snow adjacent, so that it is convenient to use this for the purpose instead of water.

Advantageous features of the method are as follows: (1) The high measure of safety; (2) inasmuch as it is frequently necessary in any event to provide some sort of change house or lunch room close to working tunnel or shaft, little extension is necessary to provide a thoroughly practical method of thawing dynamite in large quantities (the heat required for the change house is also used for thawing purposes); the fuel consumption is in any event not material, as odd bits of wood from the mine can be utilized, which would otherwise go over the dump; (3) if the man appointed for the purpose forgets to stoke up the stove before going on shift, it is morally certain that others on shift will see that there is a supply of fuel on hand for the purpose, otherwise they will have to eat their lunch in a cold building.

I have used this method for some years, and am impressed with its good points. There was always an abundant supply of thawed powder on hand, with the minimum of trouble.

Mining Industry of Abyssinia

THE mining industry in Abyssinia is undeveloped. There are evidences of commercial deposits of coal, iron, oil, sulphur, gold, silver, copper, and potash, but none of these deposits, excepting the potash, are now being worked on a commercial scale, according to Consul Addison E. Southard, of Aden, Arabia. However, the Abyssinian Development Syndicate, Ltd., a British concern, is planning to undertake the exploitation of Abyssinian mineral resources.

The potash deposits now being worked are in north-eastern Abyssinia about six miles from the Eritrean frontier and about forty-six miles from the Red Sea coast. An Italian company, the Societa Mineraria Coloniale, of Asmara, Eritrea, is working the deposit and shipping the product overland to the small port of Mersa Fatimari, on the Red Sea, and thence to Massowah. The potash deposit has been worked since 1915, but the amount taken out in any one year has not equaled 4,000 metric tons. In 1917, the latest year for which statistics are available, 3,578 metric tons of potash salts from this deposit were exported. The potash produced is said to be 90 per cent pure, and 1,000,000 metric tons are estimated to be available.

GOLD, SILVER AND OTHER MINERAL DEPOSITS

Alluvial gold is found in several river beds in western Abyssinia, principally at the edge of the Sudanese plain. Natives wash gold from the beds of the Blue Nile, the Dabus and its tributaries, the Beni Shongul, and the Tumat rivers. This gold reaches Adis Abbeba, usually in the form of small rings and ingots, and much of it is exported through the Bank of Abyssinia. Officials of this bank estimate the total exports as averaging a quarter of a million dollars in value per annum.

Quartz gold deposits are also found in western and

central Abyssinia, but none are at present worked on a commercial scale. Under ordinary circumstances the government of Abyssinia demands and collects a royalty of 50 per cent on all Abyssinian gold brought into the market.

Silver is said to be found in the district south of the Baro River, southwestern Abyssinia. No deposits are known to be worked at this time.

Iron is widely distributed, and some rich ore deposits are known. In the Province of Tigre the Abyssinian peasants smelt the richer ores over wood fires. The comparatively small quantities of iron thus produced are used by native blacksmiths to make plowshares and various cutting tools of simple pattern. This industry may be regarded as one of the primitive native sort and cannot be said to be of commercial importance in the present stage of its development.

COPPER, ASBESTOS, OIL, SALT

Prospectors have found evidences of copper and nickel deposits in the Walego Province. Aluminum clays are also said to have been found in this same province.

Oil and sulphur indications are reported from the vicinity of Ankober, Shoa Province, but no development work has been done.

Asbestos is reported from various sources, but this mineral has not yet been mined and marketed.

Salt deposits are found in the lowland desert plains between the Abyssinian Plateau and the Red Sea north of the Straits of Bab-el-Mandeb. Natives quarry this salt for use in plateau trading centers. The total quantity thus handled is probably not great, and there is no way of obtaining figures as to the actual amounts which enter into the inland trade of the country.

The Abyssinian government does not collect statistics and there are available no official publications or other forms of statistics.

New Paint Mine in New Jersey

By S. H. HAMILTON

Written for *Engineering and Mining Journal*

The Pequest Co., of Butzville, N. J., is operating a new pigment plant under the direction of Herbert Cox. The raw material comes in part from the old Ahles iron mine, which formerly supplied the furnace at Pequest. The ore is soft, earthy, and composed of several minerals. Owing to its physical condition, and the presence of considerable manganese, it was not a desirable furnace ore. However, the deposit is large, with well-defined walls of Franklin limestone. It was found that by means of Dorr classifiers a 200-mesh product can be separated, making a desirable pigment, and the coarser material can still be used for iron ore.

Italy's Small Mineral Resources

As is well known, the mineral resources of Italy are relatively of small importance. The country produces no high-class steam coal, little more than half of its requirements of iron ore, and neither gold nor silver. The slender mineral output of the peninsula is supplemented, however, by the products from adjacent islands under the Italian flag. The bulk of Italy's iron ore is mined in the Island of Elba; rich lead deposits are worked in the Island of Sardinia; and for generations the Island of Sicily has held first place as the center of European sulphur production.

Charts for Computing Blast-Furnace Performances

Determination of Slag Production, Matte Fall, and Tonnage Smelted Per Square Foot At Copper Queen Smelter Is Aided Considerably by Graphical Methods -- Much Arithmetical Work Eliminated

BY HAROLD L. FICKETT

Written for *Engineering and Mining Journal*

CHARTS are investments that pay large dividends. The investment is spare time and odd moments, and the returns are valuable moments saved, when time is at a premium. When once made and put into use, charts are capable of yielding returns far in excess of the original investment. To be most useful they must be simple, legible, and accurate. A failure in any one of these prerequisites may be disastrous.

It is remarkable how great a field of variations can be covered easily and accurately by means of a few simple calculations and a piece of standard cross-section paper. Routine calculations of furnace performances

As *C* is constant, the equation becomes the equation of a straight line for varying values of *S*. Therefore, it is necessary to solve the basic equation but twice for each value of *N* in order to obtain sufficient data to construct the chart.

(b) *Construction of the Chart*

If the horizontal co-ordinates represent the specific gravity, and the vertical co-ordinates represent the tons of slag produced, the pots of slag must be represented by a series of straight lines, in which series each line represents a certain number of pots. The basic equation must be solved for each value of *N* represented;

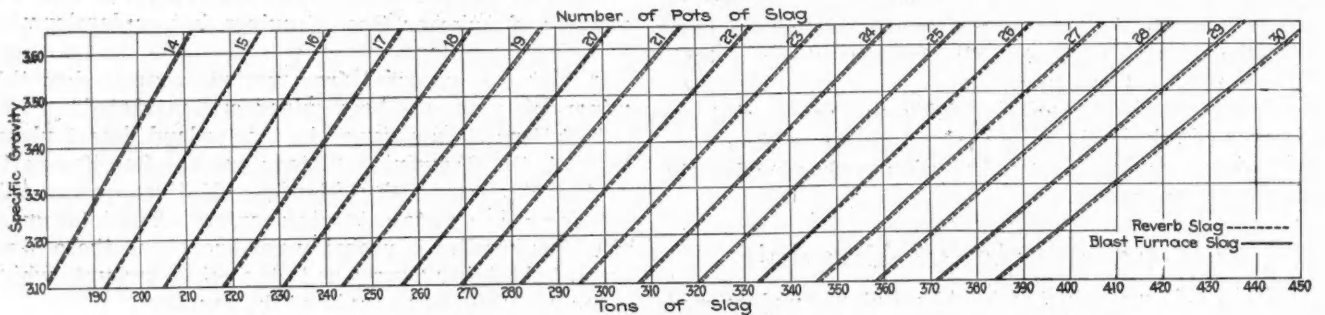


CHART FOR COMPUTING WEIGHT OF BLAST-FURNACE AND REVERBERATORY SLAG

offer great opportunities for using charts, and it is the purpose of this article to show how such aids are used in making up the daily blast-furnace reports at the Copper Queen smelter.

I. CHART TO DETERMINE THE WEIGHT OF SLAG PRODUCED

(a) *Basic Data*

A Copper Queen slag pot will hold 4.13 tons of slag the specific gravity of which is unity. A specific gravity determination is made on every composite daily slag sample, and used in calculating the slag production. As an example of the importance of considering the specific gravity in these determinations, a reference to the accompanying chart will show that, for 25 pots of slag, a difference of 0.10 in the specific gravity will make a difference of ten tons in the amount of slag produced.

On the daily blast-furnace log, the furnacemen record the number of pots of slag produced by each furnace. Experience has shown that, in blast-furnace computations, the specific gravity of the slag varies between 3.10 and 3.60, and that the number of pots of slag varies between 14 and 30. Hence, in making the chart, these become the limiting values.

The weight of slag produced may be expressed as

$$W = CSN$$

where,

- W* = weight of slag produced,
- S* = specific gravity of the slag,
- N* = number of pots of slag,
- C* = weight of slag whose specific gravity is unity.

once where *S* = 3.10 and once where *S* = 3.60. These values are taken because they lie at the extremities of each line in this particular chart.

When the specific gravity is 3.10, the equation for *N* = 14 becomes

$$W = 4.13 \times 3.10 \times 14 = 179.242$$

The equation for each succeeding value of *N* may be solved by adding the constant $4.13 \times 3.10 = 12.803$ to *W* for the preceding value of *N*; thus:

14 pots =	179.242
plus	12.803
15 pots =	192.045
plus	12.803
16 pots =	204.848

and so on as far as it is desirable to go. In the same manner points on the 3.60 specific gravity line are located.

The points thus obtained are plotted on standard cross-section paper, and corresponding points on the extreme specific gravity co-ordinates are joined by straight lines. Each line will then become the locus of the equation for each value of *N*. With the indicating of the co-ordinates, the locating or plotting of the points obtained from the calculations, and the joining of corresponding points by straight lines, the chart is ready for use.

(c) *The Use of the Chart*

Follow the horizontal line corresponding to the specific gravity of the slag whose weight is desired, to its

intersection with the diagonal line representing the number of pots produced. Vertically under this intersection will be found the tonnage.

II. CHART TO DETERMINE THE PER CENT OF MATTE FALL

(a) Basic Data

In the usual method of computing the per cent of matte fall, the tons of matte produced is divided by the sum of the matte and slag produced. With the aid of a chart it is possible to read the per cent of matte fall at a glance.

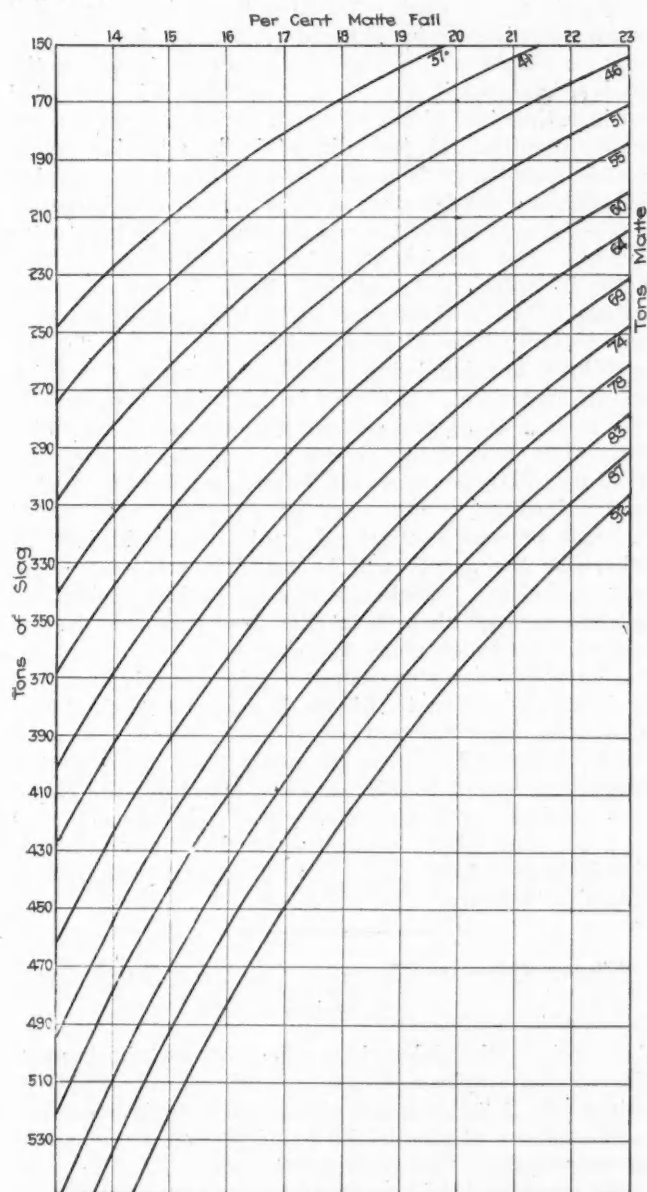


CHART FOR DETERMINING PERCENTAGE OF MATTE FALL

The tons of matte and of slag are figures which are obtained from calculations made in the office, from data reported by the furnacemen. It has been determined that a pot contains, on an average, 9.2 tons of blast-furnace matte. It is the custom of the furnacemen to report the matte produced to the nearest one-half potful. Therefore, in the construction of this chart, it is convenient to locate the curves at intervals equivalent to one-half pot of matte.

Unlike the other, this chart is composed of a series

of irregular curves, which intersect the X-axis only at infinity. The basic equation may be stated thus:

$$M = \frac{X}{X + Y}$$

where

M = per cent of matte fall,
 X = tons of matte produced,
 Y = tons of slag produced.

In the making of this chart the limiting values of X are 37 and 92; and the limiting values of M are 0.13 and 0.23. It must be borne in mind that M is less than unity in all these calculations.

(b) Construction of the Chart

At intervals of 2 per cent it is necessary to solve the basic equation, in order to locate sufficient points for each value of X. When these points have been determined from the computations, corresponding points for each value of X are joined by lines, drawn with the aid of a French curve. Many short-cuts may be used in compiling the necessary data for the chart.

The matte lines are spaced at intervals of four or five tons, and it is possible to determine a constant for each set of intervals and reduce the mathematical work largely to additions. The work of compiling the intersection of the 37, 41, 46, and 51 tons of matte curves with the 13 per cent matte fall co-ordinate may be outlined as follows:

$$\frac{X}{X + Y} = M; \quad Y = \frac{X - MX}{M} = \frac{X - 0.13X}{0.13} = 6.6923 X$$

First solve:

$$4\text{-ton interval} = 6.6923 \times 4 = 26.7692$$

plus constant 6.6923

$$5\text{-ton interval} = 33.4615$$

Then solve:

$$\text{When } X = 37, Y = 6.6923 \times 37 = 247.5161$$

plus 26.7692

$$X = 41, Y = 274.2853$$

plus 33.4615

$$X = 46, Y = 307.7468$$

plus 33.4615

$$X = 51, Y = 341.2083$$

In order to use the chart, locate the tons of slag on the horizontal co-ordinates, then follow that co-ordinate to its intersection with the curve representing the tons of matte produced, and the vertical co-ordinate nearest the intersection will be read as the per cent matte fall.

TONS SMELTED PER UNIT OF HEARTH AREA

The most satisfactory method of comparing blast-furnace performances, in case of different size furnaces especially, is by comparing the tons of charge smelted per square foot of hearth area. At this plant are three sizes of blast furnaces, those with 66 sq.ft. of hearth area, 73.3 sq.ft. of hearth area, and 100 sq.ft. of hearth area, which are locally called small furnaces, medium furnaces, and large furnaces, respectively. The use of charts for determining the tonnage smelted per square foot of hearth area has been found a time-saving expedient. In the ordinary plant where all furnaces are of one size the preparation of such charts is comparatively simple. Subsidiary curves should be plotted for cases where the furnace is delayed for 10, 20, 30 or more minutes during the twenty-four hours.

Laying Flanged Pipe on a Steep Hillside

BY DOUGLAS LAY

Written for *Engineering and Mining Journal*

THE profile survey of a pipe line will determine the various points at which the surface of the ground departs from a straight line. Obviously, minor local sags are disregarded, as they can best be overcome by blocking the pipe up at these points. Care will distinguish between such points and those at which there is a change of grade for a material distance. In the latter case, in the actual construction of the pipe line, the alternative lies between insertion of metallic taper gaskets between pipe flanges and excavation. In rocky ground excavation will prove expensive, and in loose ground may be inadvisable.

Again, the exterior of the pipe will require re-painting periodically, and this cannot be done if pipe is buried. Most steel-riveted pipe leaks more or less, when the water is first turned in, and it is advisable, therefore, to have all portions of the pipe open to inspection.

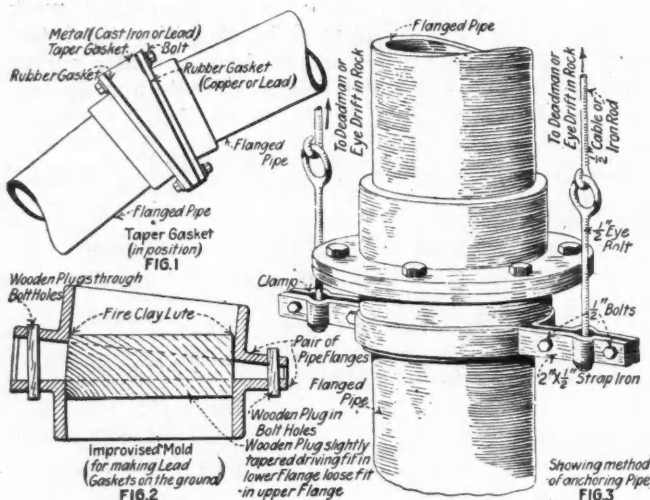


FIG. 1. TAPER GASKET IN POSITION
FIG. 2. IMPROVISED MOLD FOR MAKING LEAD GASKETS
FIG. 3. PIPE ANCHORAGE AND CLAMPS

The advantage undoubtedly lies with the use of taper gaskets, on the score of cheapness, if for no other reason. The dimensions of the majority of those required can be ascertained from an accurate profile survey, and the best plan is to have them made of cast iron by the company supplying the pipe, so that they will arrive on the ground simultaneously with the pipe. The thin end should be approximately one-quarter inch, and the thick end may be three inches. Assuming a flange diameter of eighteen inches, the stated dimensions will give a deflection of $4^{\circ} 20'$ at each flange face, or a total of $8^{\circ} 40'$ at the joint. The taper gaskets must match the pipe flanges, in respect to diameter and bolt holes. When the gasket is in position the bolts are not quite at right angles to the flange faces. This places a limit on the maximum thickness of the gasket. It is well, therefore, to specify bolt holes of liberal diameter, so that when the gasket is in position, the bolts can be readily passed through. A rubber gasket (copper or lead is preferable) is placed on each side of the taper gasket, as shown in Fig. 1. It will be obvious that by

means of these taper gaskets, the pipe line can be deflected not only up or down, but also laterally.

To avoid any chance of error, the taper gaskets are sometimes made of lead on the ground, as the pipe is being laid. By laying two adjoining lengths of pipe in position at the required deflection point, the dimensions of the necessary taper gasket are accurately indicated. A satisfactory mold for casting lead gaskets can be readily improvised out of a pair of companion flanges. A slightly tapered wooden plug, about four inches long, of diameter equal to that of the pipe, is driven into one flange, so that it fits tightly, the smaller end of the plug pointing upward. The other flange is now pressed down over the projecting end of the wooden plug, at such an angle as to give the required taper to the gasket, as shown in Fig. 2. Any movement is prevented by inserting two pieces of wood, of the lengths respectively required, at two diametrically opposite points between the flange faces, and by inserting a small wedge between the wooden plug and the side of the flange.

The tapered end of the wooden plug is now luted with fireclay, after wooden plugs have been inserted in bolt holes in order to "core" bolt holes in the resulting gasket. Two or three plies of building paper are then wired tightly round the circumference of the flanges, a suitable opening being left for pouring at the thick end of the gasket. The mold is now ready for pouring, but it is a good precaution, and one which occupies little time, preventing chance of mishap, to bury the mold up to the pouring hole, before pouring the molten lead. Needless to say, when once pouring has started it must proceed continuously until the mold is full; otherwise the gasket will be made in two pieces and will be useless. Sufficient lead must be kept melted. It is also essential that the molten lead must not be too hot, or the wooden plugs will char.

A pipe line on a steep slope must be securely anchored at intervals, either to I-bolts in rock or to deadmen, depending upon the nature of the ground. A good method of attachment is by means of a clamp at the flanges, as shown in Fig. 3. For attaching the clamp to a deadman or I-bolt, either iron rods or cable may be used. The I-bolts connecting anchor lines to clamp should have a fairly long thread, so as to afford considerable "take-up."

Use of Glue in Electrolyzing Zinc-Sulphate Solutions

To retard the deleterious effect of certain impurities in zinc-sulphate solutions, such as cobalt, U. S. patent No. 1,322,071, granted to Royale H. Stevens, covers the use of glue in the solutions that are about to be electrolyzed. The inventor states:

"In adapting this invention to the current practice in the electro-deposition of zinc, I add a certain small proportion of glue in solution either to the electrolyte before passing into the cells or to the electrolyte in the cells. The amount of glue added is determined by the amount of impurities present in the solution, and such amount increases as the impurities increase, within limits, owing to continuous circulation of the solutions. Moreover, when manganese is present in the electrolyte in the form of manganese sulphate, a scale of manganese dioxide is formed on the anodes, which, in the presence of glue, is deposited in more coherent form, which inhibits corrosion of the anodes."

Time-Saving Devices in an Assay Office

Proper Distribution of Compressed Air Around a Disk Pulverizer—Sheet-Iron Holders for Flasks—Water Spray in Sink for Quick Cooling—Hoods Without Sides—Individual Cyanide Burettes

By F. L. SMITH

Written for *Engineering and Mining Journal*

A CONCISE description of a few labor-saving arrangements used in the laboratory of the Nevada Consolidated Copper Co., Ruth, Nev., and found indispensable for combining speed with accuracy, is here presented:

Compressed air is used for blowing out the grinder in two different ways, as follows: First, a foot lever (see Fig. 1) is used to release a strong blast of air from beneath the machine. This completely cleans the grinder, except the drawer, the inside of the disks, top of disks, and lid. These places are then cleaned by a $\frac{1}{2}$ -in. air nozzle attached to a short rubber hose, which is hung at a convenient distance above the feed hole of the grinder by a fine wire spring. This holds the nozzle out of the way, but allows it readily to be grasped and pulled in any direction.

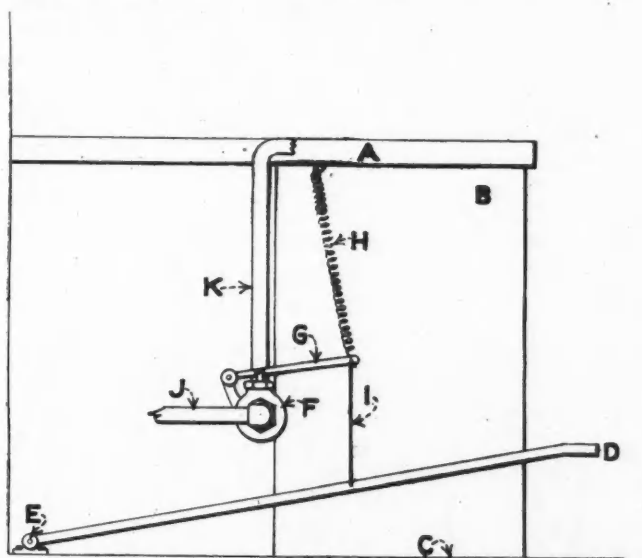


FIG. 1. SIDE VIEW OF FOOT LEVER AND CONNECTIONS

A—Section of Bench under Grinder	F—Throttle Valve
B—Concrete Foundation	G—Lever of Valve
C—Floor	H—Spring
D—Foot Lever 42" long	I—Rod $6\frac{1}{2}$ " long
E—Pivot	J—Supply Pipe for Compressed Air
K— $\frac{1}{2}$ " Air Pipe leading to the Receptacle under Grinder	

To direct the air beneath the grinder, a receptacle was made of heavy sheet iron (see Fig. 2) welded at the seams, round underneath, and slightly convex on top. This was let flush into the bench under the drawer of grinder, which is a Braun, type "U. A." The top was drilled with rows of holes so placed as to attain greatest cleaning effect. A $1\frac{1}{2}$ -in. lock-nut was welded on to a hole in each end, that in front being fitted with a plug to admit of cleaning out; that behind being connected by a pipe to a $1\frac{1}{2}$ -in. quick-opening throttle valve operated by the foot lever. (See Fig. 1.)

Some advantage might be gained by adding to this equipment a receiver made of, say, a 4-ft. length of 12-in. pipe, fitted with a small pet-cock underneath. This would serve the double purpose of increasing the volume of the sudden blast of air, and of obviating trouble caused occasionally by water in the air pipe during damp weather.

The dust thus stirred up is effectively restrained by a hood (see Fig. 3), which completely incloses the grinder except in front, leaving just enough room for the work to proceed without hindrance. This hood, made of sheet iron, is 18 in. wide, 20 in. deep, and 33 in. high, and is fastened to the bench with pieces of angle iron riveted on to its lower edge. It fits close to the body of the grinder on the right-hand side, whereas on the left a space of 1 ft. is provided. The front is inclosed for about 9 in. from the top.

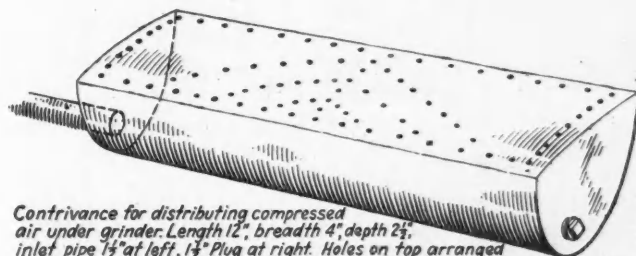


FIG. 2. DEVICE FOR DISTRIBUTING COMPRESSED AIR UNDER GRINDER

Contrivance for distributing compressed air under grinder. Length 12", breadth 4", depth 2 $\frac{1}{2}$ ". Inlet pipe $1\frac{1}{2}$ " at left, $1\frac{1}{2}$ " Plug at right. Holes on top arranged to catch grinder walls and edge of disks. Total area of small holes not to exceed more than about $\frac{1}{3}$ the area of the $1\frac{1}{2}$ " inlet pipe. Size of small holes $\frac{1}{16}$ ". Distance between small holes in the rows is $\frac{1}{2}$ ".

An 8-in. pipe (see Fig. 3) connected with the top of this hood leads to the intake of a blower installed in the attic. The blower is of 1,500-cu.ft. capacity with 18-in. fans and $\frac{1}{4}$ -oz. pressure, and is driven at about 2,000 r.p.m. The 8-in. pipe to the blower was fitted with a "T" in the attic, one branch connecting with the grinder, as described, the other leading from a hole in the center of the bucking-room ceiling. Each branch was fitted with a damper, so that full suction can readily be obtained for either. The hole in the ceiling is used for carrying away the dust when blowing out the room with a hose.

The net results of the foregoing are (1) that respirators are no longer required, and (2) that one man easily grinds 150 samples of porphyry ore per hour, the average weight of samples being 50 g., and average screen test, 99 per cent minus 80 mesh, and over 90 per cent minus 100 mesh; and this with the assurance that the grinder is thoroughly cleaned out after each sample. This rate of speed will probably just about occupy one average man at the balances.

Most of the copper determinations are made by the slop KCN method without filtering. By paying sufficient attention to details, the error is reduced to within

about $\frac{1}{100}$ of 1 per cent on a simple low-grade ore, when checked against the best custom-office umpire work. The samples are weighed into flasks set in trays with a capacity of forty flasks each (see Fig. 4). These trays, which save much time and eliminate confusion and accidents, were each made of two pieces of sheet iron, 19 x 30 in., $1\frac{1}{2}$ in. apart, held together by bolts. Each has five rows of eight holes, $3\frac{1}{2}$ in. from center to center. For ordinary 250-c.c. flasks, $3\frac{1}{4}$ -in. holes in the top sheet, and 3-in. holes in the bottom sheet are found suitable. Handles are provided on top at each end.

Acid having been added, the tray containing the flasks is placed on the 18 x 30-in. hot plate. It is

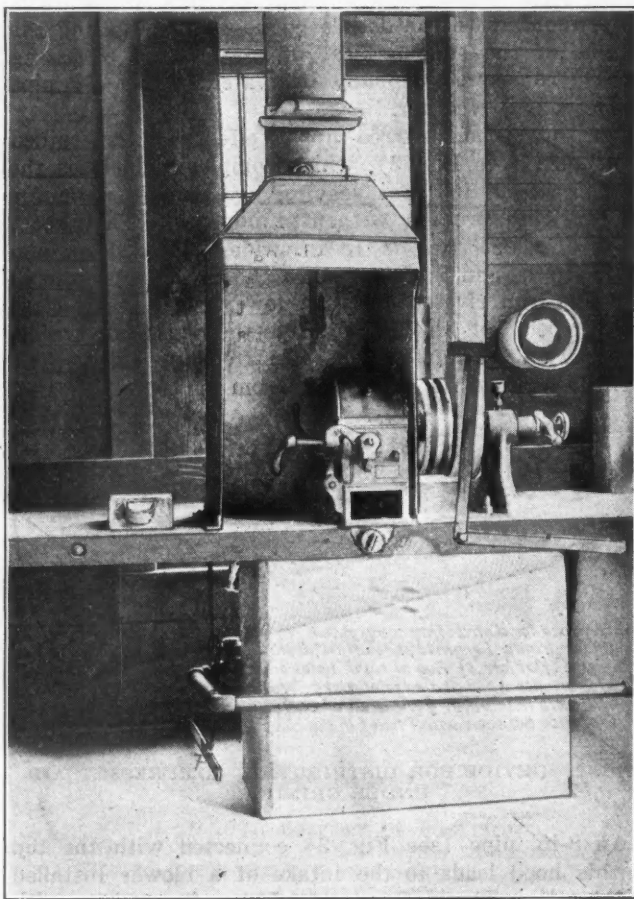


FIG. 3. GENERAL VIEW OF GRINDER, SHOWING HOOD

advisable to have another tray of the same pattern ready to receive the flasks as they are removed from the hot plate, as they may not all boil evenly. After removal from the hot plate, water and ammonia are added, and the tray, with its batch of forty flasks, is placed in a lead-lined cooling tank. The outlet hole of the latter was made of a 1-in. sleeve into which is screwed a nipple. This projects upward about $\frac{1}{2}$ in., keeping the water at a suitable depth.

Water for cooling is supplied by the following contrivance (see Fig. 5). Four pieces of $\frac{1}{2}$ -in. pipe, 21 in. long, with a cap screwed on one end, were arranged parallel with each other, 7 in. apart from center to center, and connected with "T's" to one main pipe. This latter rests on the back wall of the tank, and is fitted with an elbow joint, which serves as a hinge and enables the apparatus either to be folded back out of the way or brought down level for use. The elbow joint was treated with white lead, and has

never leaked. The four arms come exactly between alternate rows of flasks, and each of them was drilled with two rows of five pin-sized holes on the lower side, in such a manner that, when the water is turned on, each of the forty flasks receives a fine stream, thus cooling the whole batch to the desired temperature

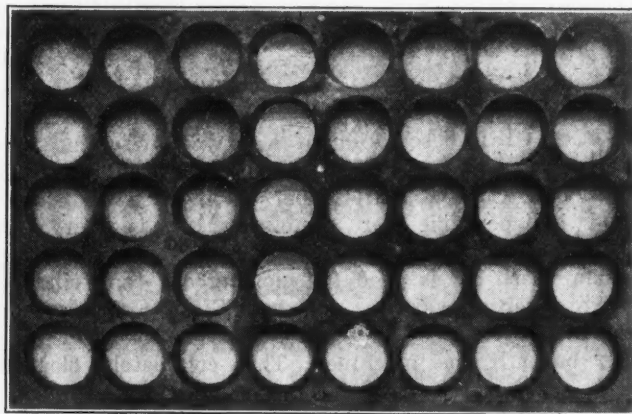


FIG. 4. SHEET-IRON TRAY FOR FORTY FLASKS

quickly and evenly. The pipe is fitted with a plug for rapid draining.

To expedite the work connected with the hot plate, the hood was made without sides or front, but with practically only a top. To insure that the fumes would go up instead of into the room, a $\frac{1}{4}$ -in. compressed air pipe was inserted into the chimney about 3 ft. above the hood, and made to point upward. A valve in this pipe, placed conveniently near the hot plate, enables the operator to turn on the air whenever required, creating an upward draught, which effectually carries off the fumes.

The cyanide solution is kept in the attic in two lead-lined tanks, which were burned at the seams and not soldered. It comes down by gravity through a 1-in.

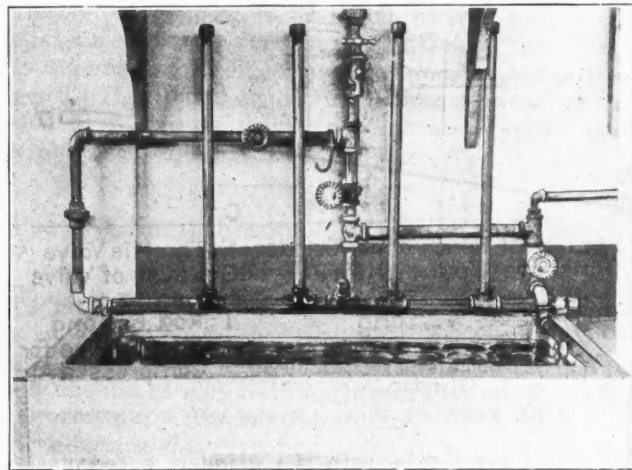


FIG. 5. PIPES FOR DISTRIBUTING COOLING WATER

iron pipe into the line of forty burettes, corresponding to the number of flasks in a tray. The 1-in. pipe was fitted with forty $\frac{1}{2}$ -in. nipples, 5 in. apart, to which the burettes were connected with rubber tubing and Mohr's clamps. Valves of iron, and not of brass, must be used for this pipe line. The slight yellow discoloration of the solution caused by the iron pipe is no detriment, though a valve for draining the pipe is found necessary at times.

A Picturesque Mining Experience

II. The Diamonds of Mitrovitza

By J. E. SPURR*

THE other day I was looking over a map of the new kingdom of Yugoslavia, and somewhere in the center I traced out in strange Slavonic letters the name Mitrovitza. I knew that town, although it has wandered far and wide geographically since my brief sojourn there. I had to get out of that town, before daylight, for my health. I own it without shame.

This happened some time ago—I hate to say how long; in fact, on reflection, I won't. I was sent out from Constantinople by special edict of the Sultan, Abdul Hamid, whose chief mining engineer, geologist, and adviser on mining matters I had become, on the recommendation of our Secretary of State, John Hay. I had various specific jobs cut out for me, all of which turned out picturesquely enough, and finally I drove many miles over country roads in an open carriage to Mitrovitza. I had with me two military aides and protectors—both Albanians, as we were to pass through Albania and it took an Albanian to protect an unintroducted stranger in Albania. It was no job for a Turk. Both were from the Palace Guard in Constantinople—one a terrible little major, an aide-de-camp of the Sultan, the son of a powerful vali or governor, and a little devil; the other a big stupid captain who had two wives, and much domestic trouble in consequence. Also, I had an interpreter.

It was a raw country through which we drove and tossed for two days. Not a man that we met but was hawk-eyed, free in action, and armed to the teeth. We stopped at night at a miserable little inn, where we lay on rude pallets on the sides of the low stone structure, floored with earth. The stove was a great affair of stone, in which open fires cooked food, when there was any to cook. There was none to cook that night—no bread—nothing but sour milk and raw cucumbers; and I regretted that I partook heartily of these. The house was crowded with great somber fellows in short embroidered jackets, embroidered silk shirts, thick knee trousers, and flat fezes. In the sashes at their belts were wonderful long inlaid pistols and great daggers; and each kept close to him a rifle of slender breech and prodigious length of barrel. Take any description by Scott of such a scene in the time of the Crusaders, and, save for the firearms, you will not have to alter a detail of local color.

The next evening, tired, we crossed a bridge over a river, and rolled down the principal street of a considerable town—Mitrovitza. The street was dense with people, who had to part to let us drive on, and they cheered and shouted wildly as we went through. This was "nuts" for my Albanian officers, proud of the Sultan's insignia on their uniforms, and they smiled and bowed paternally.

At this stage, I recall that it is necessary to explain

*This "Picturesque Mining Experience," and the first one by Lieutenant Colonel Binckley, are designed as "decoy ducks" to induce the wild ducks of engineers and mining men to come across, each with an informal yarn.

Will you please send in yours?—EDITOR.

the job on which I had been sent to Mitrovitza. It was such a secret that I almost told my story without betraying the confidence with which I was sent there. I had been advised by the Sultan's First Secretary, Tassin Bey, the most powerful man in the empire, that diamonds had been reported from Mitrovitza, and I would receive further information from the head man of the city. In the meantime, mum was the word. Therefore, none of my companions knew my mission.

Arriving at a rude hotel, where the mayor or head man and other members of the city government met us with great courtesy, curiosity, and inexplicable disappointment, I was eagerly preparing to eat something and rest my jolted bones, when it was translated to me, out of Albanian into French, by my interpreter, a Hebrew attorney from Constantinople, that they regretted an appearance of inhospitality, but I must turn right around and go right back again. I demanded to know the reason, and they hesitated to explain; whereupon I informed them that there was "nothing doing." They pleaded with me, and at last explained.

Mitrovitza at that time was on the borders of Albania, nominally under Turkish rule, and Bosnia, nominally under Austrian rule; and had a sort of dual government, with representatives of both the Turkish and the Austrian sovereigns. I was informed that the chief local ruler had been appointed from Constantinople, a "civil governor" and dear to the heart of the people. Probably he did not collect and send enough taxes to Constantinople. At any rate, the Sultan had dismissed him, and installed a "military governor," whose measures the fierce Albanians would have naught of. They had so informed the Sultan, and as no corresponding action had been taken, they had sent word that unless the military governor were removed and the civil governor were reinstated on a certain day, they would pull off a first-class revolution, and would not recognize Constantinople at all. It was on the evening of this certain day (I protest I am telling the plain truth) that we drove into Mitrovitza, and the people, seeing the Sultan's uniforms, and the benevolent countenances, concluded that the Sultan had been kind. All this the mayor explained; also, that the town was full of armed men who had flocked in from the province around—I now understood—and that if they found out that, instead of noticing their request, the Sultan had sent us to Mitrovitza for diamonds, our lives would not be worth that much. He did not apprehend that; he could promise it to us of a certainty.

Life suddenly turned stale and flat; but I valiantly swore that I had come to examine diamonds and I would not go back without having done so. They conferred, and then told me that the diamonds were in the river sands at the edge of the town. Why not go right down and expert them p.d.q.?—or Albanian to that effect. So into the carriage I went, and drove back across the bridge and down onto the sandy shore of the river, where the women were doing their laundry.

The officials washed some sand for me, and glittering crystals, brilliant gems, came out of it. Secretively a

bottle containing some that had been already washed out was stuck before my nose. They were certainly beautiful. With my hand-lens I looked at them, and saw that they were double hexagonal pyramids—all perfect dihexahedra of quartz, with no prisms—as like a finely cut diamond as you might wish. I have never seen anything like it before or since.

Looking around, I soon found the matrix, a quartz porphyry, out of which these crystals were residual. My job was done. We drove back to the inn. To the eager queries of my military aids and the city council, I made no reply. I confiscated all the "diamonds" I could lay my hands on, as evidence, and insisted on dinner and bed, promising to clear out before daylight. Everybody took great care that we did so—a stealthy breakfast, and we drove back down the deserted main street of Mitrovitza hours before daylight, and were far away when the sun rose. As we fled, we met continually shadowy groups of the warlike country folk, armed to the teeth. Every group stopped us. "Who are you?" "Albanians — comrades — brothers!" proclaimed my guard. "Are you for the military governor?" "Surely not—may the devil take him!" "If that is so, yell for the civil governor." And we all yelled for the civil governor, by name—yelled cheerfully, even happily, and lustily; and so we fled merrily and yelled all the morning.

There are times that I hold the telephone and telegraph in slight esteem; and the blessing of having none was exhibited to me that day: for Mitrovitza closed behind me and I never heard of it again. What dramatic events took place that day in the city I do not know; for neither telephone, telegraph, nor newspapers chronicled such events in those days in Turkey; and it was impolitic as well as useless to inquire.

Formulae for Obtaining Haulage Efficiency

BY PAUL S. COULDREY

Written for *Engineering and Mining Journal*

In determining the gradient to be adopted in the main haulage drifts of a mine, allowance is, or should be, made for the kind of equipment to be used. This refers more particularly to the style of car wheels, because the gradient of equal traction for roller or ball bearings would be much too small for other types of wheel. Conversely, in old mines, with existing irregular or steep grades, the advantages of roller-bearing wheels might not be so great as would appear at first consideration. For example, a wheel with a brass bushing (also having a small frictional resistance) might be found equally serviceable. Up to the present time ball bearings have not met with much favor for rough mine work, especially where there are sharp curves or where much handling of cars on turn sheets is required.

Assuming that roller bearings (and the gradient that goes with them) can be adopted, the question of interest is, How flat should this gradient be made to take advantage of the bearings? Any gradient in excess of actual requirements will affect not only the haulage but also, eventually, the pumping and hoisting costs, noticeably so in long tunnels and scattered workings.

To answer this question it is necessary to know the coefficient of traction under average working conditions. With Hyatt roller-bearing wheels, under ideal conditions, this figure has been brought down as low as

3.9 lb. per ton, but a working figure usually quoted is 13 lb. per ton.

If w is the weight of an empty mine car; W , the weight contained in a well-loaded car; k the coefficient of traction going up hill empty; K , the coefficient of resistance going down hill full; a , the gradient of equal traction, and P , the drawbar pull per car necessary on this gradient—then after acceleration period is over, and car is going at uniform speed,

$$P = kw \cos a + w \sin a \text{ going up hill empty and}$$

$$P = K(w + W) \cos a - (w + W) \sin a \text{ going down hill full, so that } kw \cos a + w \sin a = K(w + W) \cos a - (w + W) \sin a$$

$$\text{or } \tan a = \frac{KW - (k - K)w}{2w + W}$$

$$\text{or, since } a \text{ is small, } a = \frac{K - (k - K) \frac{w}{W}}{2 \frac{w}{W} + 1}$$

Assuming the coefficient of traction of the loaded car to be 75 per cent of that of the empty car, the above equation becomes

$$a = \frac{K \left(1 - \frac{1}{3} \frac{w}{W}\right)}{2 \frac{w}{W} + 1}$$

It is obvious that the difference in value between k and K is of secondary value compared with K itself.

The ratio $\frac{w}{W}$ depends upon the design of the car and the nature of the ore, and will be made as small as practicable to obviate the hauling of dead weight. Assuming a value of $\frac{1}{3}$ for $\frac{w}{W}$ and 13 lb. per ton for K ,

$$a = 0.29 \text{ per cent or approximately } 3 \text{ in } 1,000$$

Drainage grades have been made as flat as 1 in 7,200, and though it is not suggested that the gradient of equal traction could ever be brought to such a low figure, there is still a margin left for further improvement. On the other hand, mines equipped with roller-bearing wheels are probably not reaping the full benefit of their equipment if grades approximating 0.5 per cent are still being used, though sharp curves and high starting resistance may prevent a strict adherence to the calculated figure.

The loss of efficiency due to the adoption of the 0.5 per cent grade when one of 0.29 per cent only is called

for is expressed by the fraction $\frac{(0.5 - 0.29) 1/100}{k + 5/100}$ i. e.,

about 15 per cent in the above instance.

The smaller the value of k , the greater the percentage loss due to heavy grades. This loss could be remedied

in part if the factor $\frac{w}{W}$ could be still further reduced.

In Roasting Sulphide Ores in furnaces of the McDougal type it is sometimes advisable to reverse certain of the rabble blades. This gives longer roasting on any desired hearth and at the same time stirs up the ore bed more than could be accomplished by dropping some of the rables entirely.

Transporting Dredging Parts By Barge and Truck

Written for *Engineering and Mining Journal*

AT HAMMONTON, Cal., the Yuba Consolidated Gold Fields Co. operates eight gold dredges, scattered over a large area. Transportation of parts and supplies to and from the dredges has been worked out in an interesting way. A system of roads is maintained which gives access to points near by the dredges. As the dredges are continually advancing these roads have to be extended from time to time.

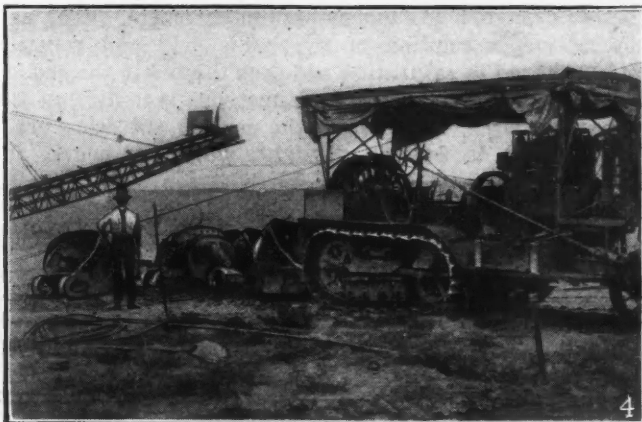
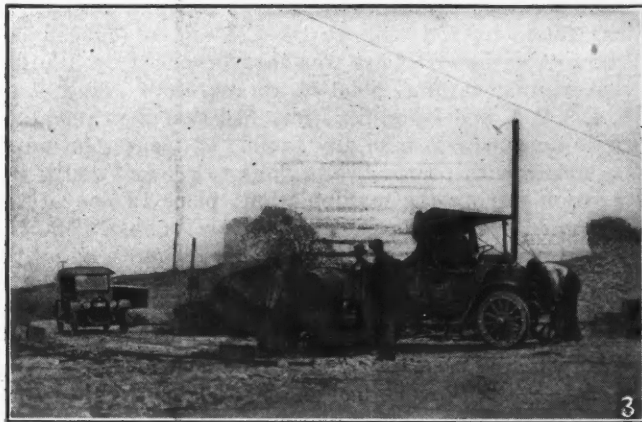
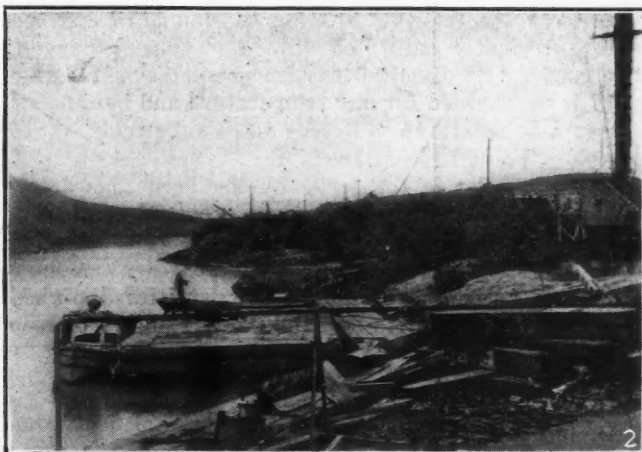
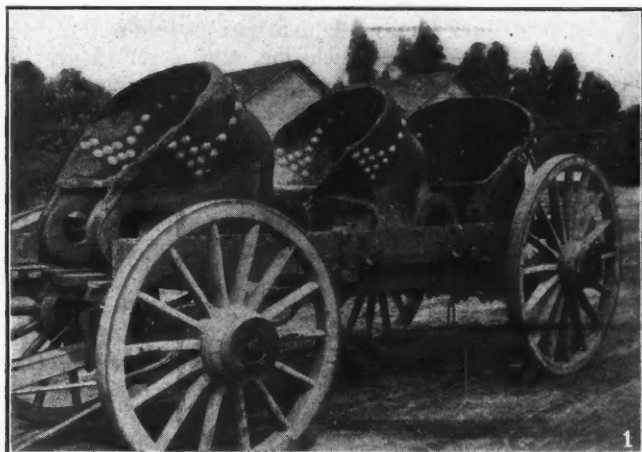
Some of the dredges are not readily accessible to the roads, and must be reached by canals which are connected to the dredge ponds. For transportation in the canals and in the dredge ponds, light steel barges of 20-ton capacity are provided. These are towed by a

a 60-hp. Holt caterpillar, which is used for heavy service.

Loading and unloading heavy parts is a necessary feature of transportation. At the shops a boom derrick is used for loading the parts on the trucks. At each road head a small derrick of the same type unloads from the truck and transfers to the barge. Transference from the barge to the dredge is accomplished by the two derricks which are a part of the dredge structure and are placed close to the bow of the dredge.

Power is used on all of the derricks, and loading and unloading are rapidly and conveniently effected. The steel barges are also used as working platforms where repairs are required upon the bucket line.

For transporting major parts of the dredge, such as the steel spuds, weighing up to forty-five tons apiece, the upper tumbler, twenty tons, and the lower tumbler, fourteen to fifteen tons, special trucks are employed. Tractors are used for haulage. The weights given are



TRANSPORTATION OF DREDGE PARTS

(1) Wagon trucks used to haul dredge buckets (each bucket weighs approximately 4,200 lb.). (2) Steel barge, launch and derrick at road head. (3) Auto truck carrying dredge supplies. (4) Dragging dredge buckets by caterpillar tractor.

power launch, or, where the distance between dredge and road head is small, the barge is pulled to and from the dredge by a wire rope operated from the dredge and also from the derrick which is placed at each road head.

Small parts are transported by boat and launch; larger parts are loaded on the barges. All small parts and supplies, such as lubricating oils and other necessary commodities, are loaded into a one-ton auto truck and carried to the road head. Large parts, such as dredge buckets, pins, tumblers and gears, are placed on wooden trucks, which are hauled singly or in trains to the road head. Two tractors are provided for this service, one a Yuba ball tread for light and the other

for the parts of an 18-cu.ft. steel dredge. An 18-cu.ft. dredge bucket weighs 4,200 lb. complete, and is the heaviest piece that requires frequent handling. The capacity of the different derricks is: Weight capacity of dredge bow derricks, 2 tons; weight capacity of traveling crane, 15 tons; weight capacity of road head derrick, 25 tons; weight capacity of shop derrick, 25 tons.

Iron Ore has been discovered in the canton of Aargau, Switzerland, between the villages of Herzuash and Wolfinsivil, according to the *Iron Trade Review*. It is claimed to contain from 23 to 35 per cent iron, without appreciable amounts of phosphates or sulphur, and therefore should be of as good quality as the Lorraine product.

Oxygen in Cyanide Solutions

Its Determination, by White's Method, May Be Made With More Precision if Caramel Is Used As a Coloring Medium

By E. M. HAMILTON

Written for *Engineering and Mining Journal*

READERS of *Engineering and Mining Journal* may be interested in an experience I had recently in working the new method for estimation of oxygen in cyanide solutions devised by H. A. White, of Johannesburg. (*Jour. Chem. Met. & Min. Soc. of S. A.*, June, 1918.) The method depends on the degree of coloration imparted to a cyanide solution by the addition of pyrogalllic acid and caustic soda.

A set of color standards is prepared, taking as the tint for the first of the series the color produced by the addition of the reagents to a known volume of distilled water previously saturated with atmospheric oxygen. The quantity of dissolved oxygen present at saturation point is determined for any temperature and barometric pressure by reference to Roscoe and Lunt's table. (See Sutton's "Volumetric Analysis").

The first color in the series having been thus determined, five or six more bottles are prepared containing the proper proportions of the original color solution (diluted up to volume with water) to represent amounts of oxygen per liter of solution in quantities diminishing by 1 mg., the series finishing with $\frac{1}{2}$ mg. of oxygen per liter.

MAKING STANDARD COLOR

For the standard colors White recommends "Diamond" brown dye shaded to a match by addition of methyl orange, acid, and potassium chromate, or, as an alternative, a solution of pyrogalllic acid and caustic soda oxidized to saturation and then diluted to the shade required. By the first of these methods it is difficult to obtain a match, whereas, in the second, the color produced seems to fade in daylight, which, of course is detrimental to its use as a standard for more than a brief time.

I have found that a perfect color match without experimenting can be obtained by the use of a solution of caramel, and the tint appears to be permanent as far as could be observed in a period of three to four weeks. This solution, however, produced a slight fungoid growth after ten or twelve days, but this could probably be prevented by the addition of a preservative, such as formaldehyde.

At a mill in Mexico where I recently tried the method I found that the details as given by the inventor must be modified to make it workable. The difficulty was that immediately on addition of the reagents to the cyanide solution to be tested, a color was produced that was many degrees darker than that shown by the standard of distilled water saturated with oxygen. This first color, however, faded so rapidly that comparison of shades was impossible. At the end of five or six minutes the fading had retarded sufficiently to be able to make the comparison, though even at this point the density of color was equivalent to two or three times the oxygen content shown in saturated distilled water.

Why was the fading not allowed to continue to the point at which it matched the saturated distilled water, may be asked. The reason was that after standing for six or seven minutes the solution began to cloud, and

before the tint had time to approach that of the standard, the test was so murky that any comparison was impossible.

At the end of five or six hours a heavy ochre-colored precipitate settled out, leaving the supernatant solution almost colorless. I did not have an opportunity to analyze this precipitate, but as the solution contained silver to the amount of about 1 oz. or over per ton, and as White makes no mention of such a precipitate in gold solutions on the Rand, it is probable that the silver was responsible for the condition noted. That the dissolved oxygen is a factor in the phenomenon is shown by the fact that unprecipitated but de-aerated solution gave no sign of a precipitate on standing, whereas with the precipitated and aerated solution, a distinct cloudiness was apparent after about half an hour, though not to the same extent as in the pregnant solution.

PROCEDURE

The procedure finally adopted was as follows: I took a sample of precipitated solution, and, after saturating it with atmospheric oxygen, placed it in one of the stoppered test bottles of 250-c.c. capacity, filling to a point such that the stopper could be inserted without leaving an air bubble. I then added 100 mg. of crystallized pyrogalllic acid and 1 c.c. of twice-normal NaOH, as recommended by White, and after shaking down the crystals, inserted the stopper, and agitated until dissolved. I then allowed it to stand for exactly six minutes, and the color observed at that point was taken as the standard color corresponding to a saturated solution of oxygen in distilled water. This color was then matched with a solution of caramel which formed the first of a series of color standards.

The saturation point of oxygen in distilled water at a temperature of 18 deg. C. at the altitude of the mill was found by the table to be 6.25 mg. of oxygen per liter. A series of colors was then prepared by diluting the original caramel solution to represent respectively 5, 4, 3, 2, 1, and $\frac{1}{2}$ mg. per liter. All that then remained to be done was to take any sample of plant solution to be tested, with proper precautions to prevent additional aeration during the manipulation; place in one of the stoppered test bottles so that no air bubble would be left on inserting the stopper; add the reagents, and after stoppering and shaking to dissolve the crystals, allow to stand for exactly six minutes and then compare the color with the set of standards, picking out the shade with which it most nearly matched and which was taken to indicate the oxygen content of the test.

Some of the determinations resulting from this method may be of interest:

OXYGEN CONTENT BY MODIFIED WHITE METHOD

	Oxygen, Mg. per Liter
Mill solution from storage tank	6.0
Mill solution overflow from pulp collecting tank	5.0
Pregnant solution, precipitation head before de-aerating	5.0
Pregnant solution after de-aerating by the Crowe process	0.5
Barren solution, effluent from precipitation presses.	trace
Barren solution in barren storage tank	6.0

Variations of 1 mg. of oxygen per liter may be detected easily.

Carbon tetrachloride, used in fire extinguishers, has too high a freezing point, and so is usually mixed with chloroform. When the latter was scarce, during the war, the Bureau of Standards found gasoline or turpentine could be used instead, the resulting mixture being a fire-extinguishing liquid.

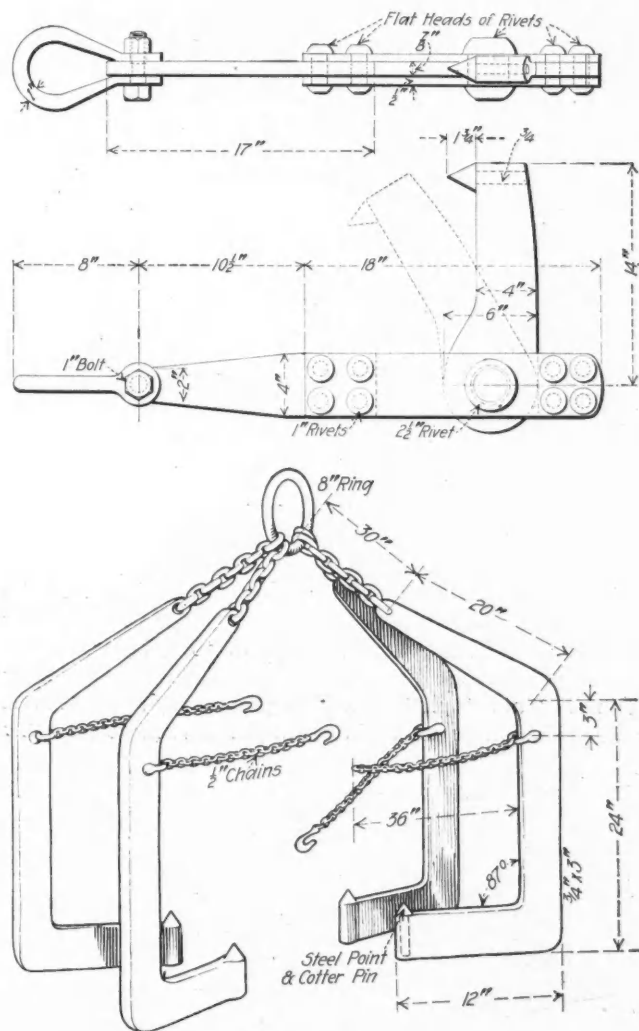
Handling Broken Rock and Ore Chunks

BY H. H. HUNNER

Written for *Engineering and Mining Journal*

IN THE operation of most rock crushers handling hard ore or rock there is considerable delay each shift due to extra large chunks of rock blocking the mouth of the crusher. Though blasting will usually remove or displace them at the first attempt, it should be avoided as much as possible on account of the increased maintenance cost on crusher and building caused by blasting.

At the Cornwall Ore Bank Co., Cornwall, Pa., where a hard magnetite ore is mined, a hook has been devised for use with a five-ton air lift over the crusher mouth and over dump cars. The hook seldom fails to take hold of a rock mass, and retains its grip long enough to at least shift the lump into a new position after



UPPER FIGURE IS DETAILED DRAWING OF A ROCK HOOK USED IN ROCK CRUSHING. LOWER FIGURE, A HOOK USED IN OPEN-PIT MINING FOR HANDLING LARGE ROCK MASSES AT THE OPEN PIT OF THE CORNWALL ORE BANK CO., AT CORNWALL, PA.

each try. On account of the sharp steel point, the hooks cannot slip off the most irregular chunks until the strain is sufficient to cause it to gouge itself out. Quite often, on an extra large slab that is either too heavy

to lift or is keyed in with other lumps so solidly that it cannot be shifted by pulling it near the middle with the full five tons, the slab will fail in the center. The steel point is held in place by a cotter pin and the operator keeps a few sharp points on hand.

In blasting by drill holes on 70 or 80 ft. banks, the large area that is covered by the scattered rock at the toe of the bank is difficult to clean up by using a derrick and loading buckets by hand. An effective practice is to lay the loading track about 50 to 60 ft. in from the outside chunks and use a ten-ton derrick to clear the roadbed and sweep up the outside chunks. In handling the big chunks of rock with the derrick, heavy tongs were first tried out, but the workmen were reluctant to use them, on account of their weight and because they dropped the chunks about half the time, having only two points of support on the chunk. Lately a four-point grab that has lifted chunks weighing over eight tons has been tried out and has several good points to recommend it. It is easy to make, convenient for two men to handle, and is quickly attached to irregular chunks lying at random in a pile. Four times out of five it will release itself when the chunk is deposited on the stockpile. The material for the legs is $\frac{3}{4}$ x 3 in., but I would recommend using $\frac{1}{2}$ x 3 in., or 1 x 3 in., when the apparatus is designed to handle chunks weighing more than seven tons, as hooks of the size shown in the figure have in practice required to be straightened out once or twice.

The chunks may be blockholed before or after moving with the derrick, as they are always set down on the stockpile in the same relative position. The jackhammer work can be done before the derrick is advanced far enough to reach the chunk. The foreman marks the chunks he thinks the derrick can handle, and they are not blasted unless the derrick fails to lift them. In this way, most of the large chunks are moved above the loading track without breaking them up and loading the small pieces into buckets by hand. The lower chains, three of which have hooks on the end, are pulled up snug and cross-tied after the legs are worked under the chunk at points convenient to get at. On round chunks, three legs are usually sufficient to make a lift, but in moving long slabs the four points of support are necessary.

Repairs to Rotary Pumps

BY ROBERT C. BAKER

Written for *Engineering and Mining Journal*

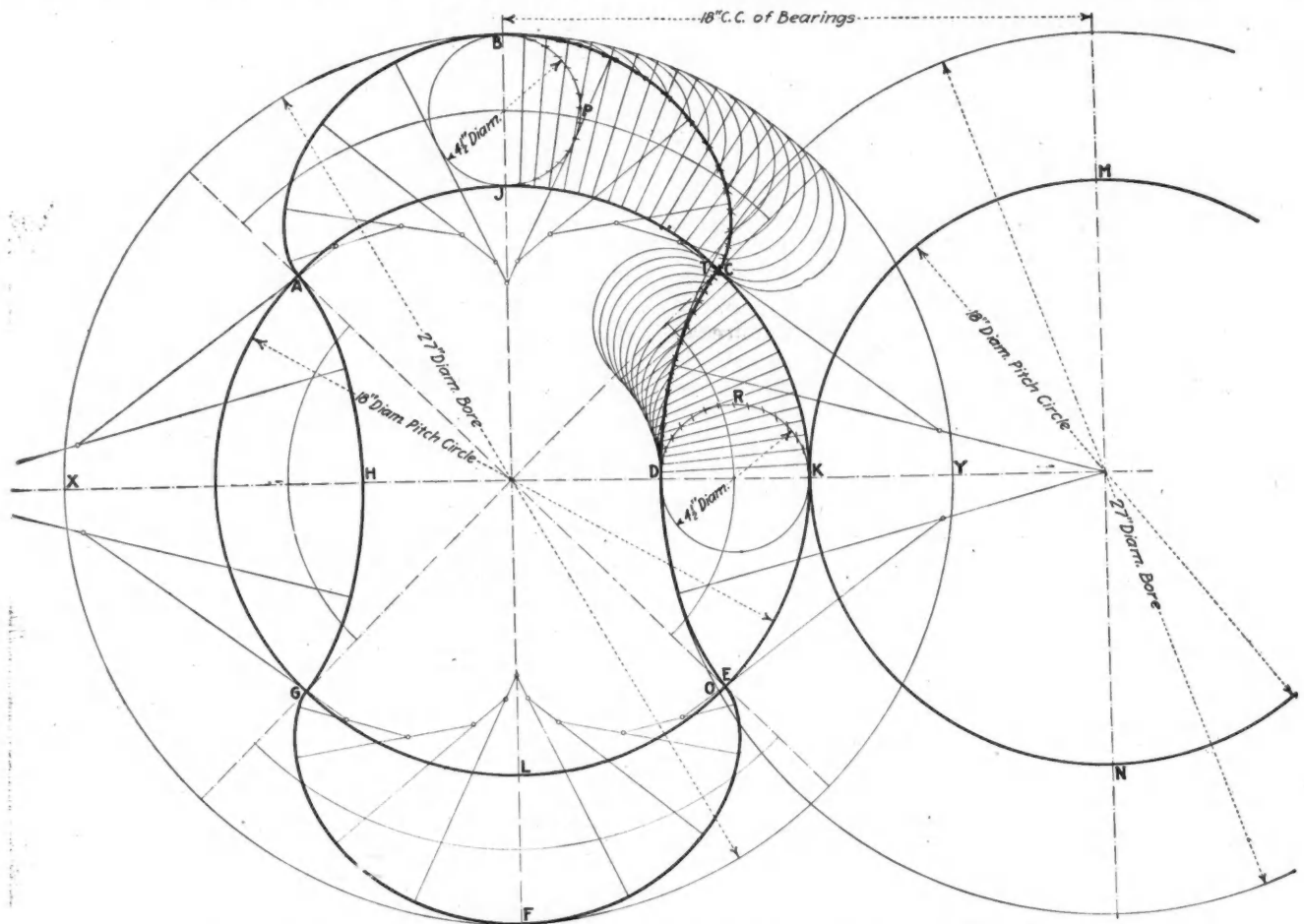
THE repair of rotary pumps which have become so badly worn that their efficiency is impaired is a comparatively simple matter if one bears in mind that there are certain definite relations which must be maintained between the bore and the distance between centers.

When it was recently decided to repair one of the rotary pumps in service at a plant in Nacozari, Mexico, the first thought was to rebore the barrel of the pump, which had become badly worn, making it $27\frac{5}{16}$ in. in diameter, instead of the original 27 in. The pump was a Connersville, with a capacity of 39 gal. per revolution. This would have entailed, of course, the casting of new impellers, which it was thought would be a simple matter, necessitating only the putting of additional stock on the ends of the impellers and making the throat sufficiently smaller to allow for the change. However,

this was found to be impossible, as a rolling fit could not be secured. Investigation developed the fact that, with the original distance between the centers in the pump 18 in., a bore of only 27 in. could be used.

cle is one-fourth of the diameter of the pitch circle.

From the above it will be apparent that the bore will be $1\frac{1}{2}$ times the distance between centers, or $1\frac{1}{2}$ times the diameter of the pitch circle.



LAYOUT OF PITCH CIRCLES IN READJUSTING IMPELLERS OF ROTARY PUMPS

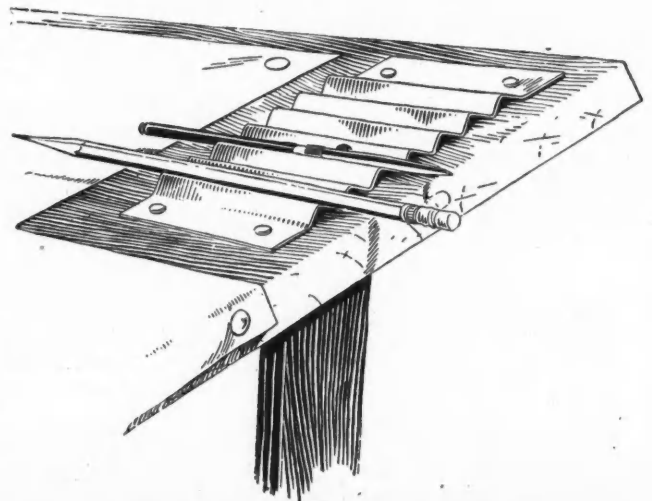
The repairs were therefore made in the following manner: The barrel of the pump was first relined, and then rebored to the original dimension of 27 in. The impellers were then developed as per the accompanying sketch, and cast. This gave a perfect rolling fit, with the pump in practically as good condition as new. The impeller, which is in outline wholly a series of developed curves, was laid out in the following manner:

First, lay out the pitch circles, as shown. Next, lay out the bore circles, as shown, and intersect the pitch circle with diagonals at 45 degrees, as *AE* and *GC*. The curve *ABC* is then developed as an epicycloid by means of the generating circle *BPJ* on the arc of the pitch circle *AJC*, as director. The curve *EDC* is also developed as a hypocycloid by means of the generating circle *DRK* on the arc of the pitch circle *EKC*. The remainder of the impeller is laid out in a similar manner.

It is, of course, apparent, that to secure a perfect rolling fit it is necessary for the curves *ABC* and *CDE* to join on the pitch circle at the diagonal 45-degree line. Thus it is seen that the arc *BPJ* of the generating circle must equal the arc *JC* of the pitch circle; likewise the arc *DRK* must equal *KC* of the pitch circle. Therefore, it follows that *the circumference of the generating circle is one-fourth the circumference of the pitch circle*, and likewise that *the diameter of the generating cir-*

Drafting Table Rack

When the drafting board was on the incline and the draftsman found himself picking up things one after another, his patience slowly began to give out. His ruling pen became a rolling pen, and rolling tools gather a loss. This "uplift" work began to rack his nerves, and he began to rack his brain for a rack to hold his



RACK FOR DRAFTSMAN'S TOOLS

things in place above board. A simple rack which he devised did the trick and restored his equilibrium.

A sheet of heavy paper about five inches by eight inches was folded as illustrated and tacked near the top of the drawing board. This simple rack afforded a berth for every tool, checked the gravity of the situation, and prevented further waste of time.

Feed and Product Size Diagram

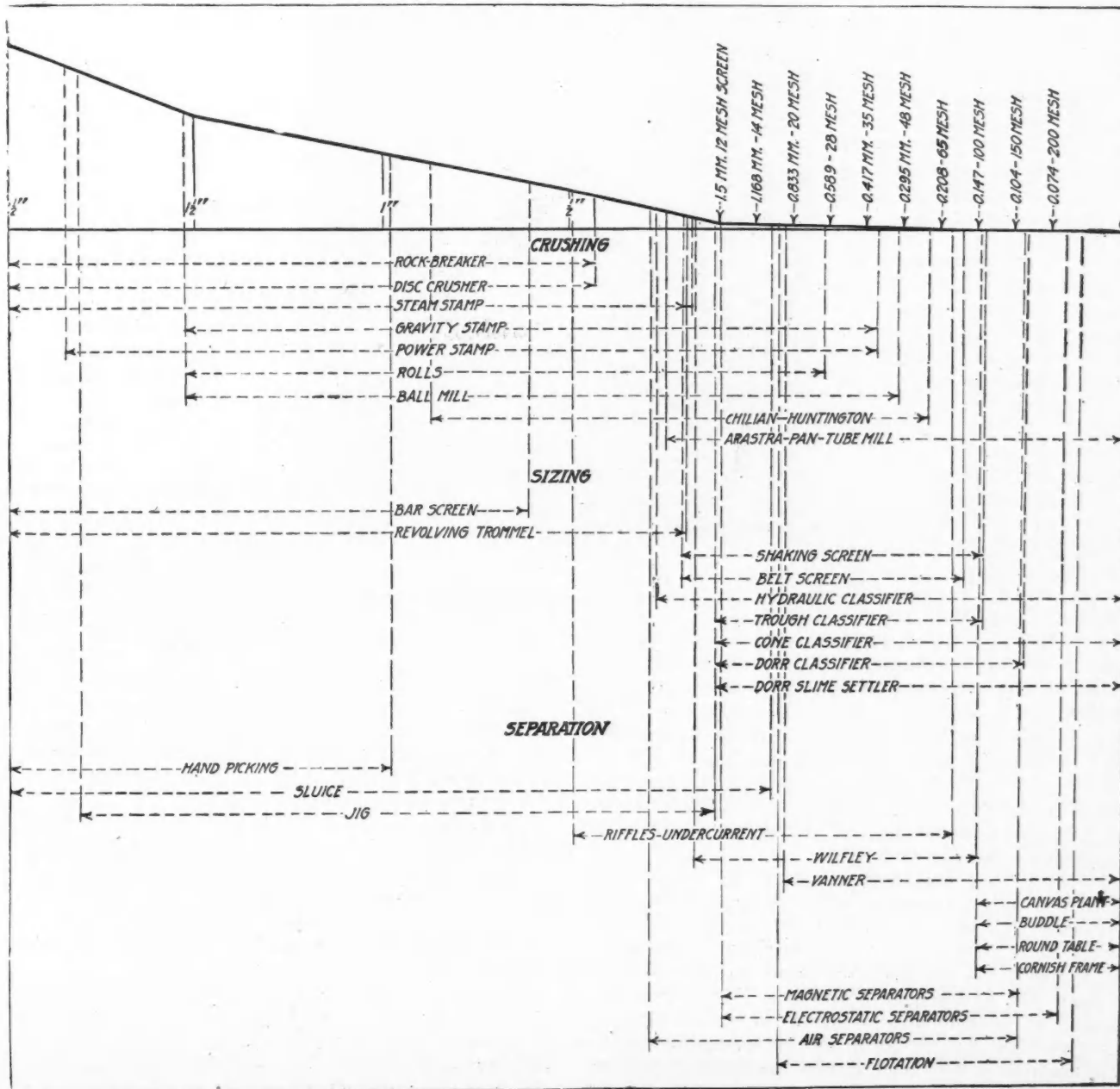
BY GEORGE J. YOUNG

Written for *Engineering and Mining Journal*

In the accompanying cut a diagram is shown which illustrates the approximate limitations of size of material fed to and delivered from crushing and grinding machines, classifiers, and separators. It is, of course, not to be considered as exactly accurate or comprehensive or to take into consideration the practices prevailing under abnormal or subnormal circumstances, but the chart will be found useful as a guide to average operations.

The Pace That Kills

When the late T. S. Austin was superintendent of the El Paso plant of the A. S. & R. Co. he became thoroughly accustomed to the policy of eternal vigilance. The type of intermittent-tap lead furnaces employed there also kept subordinate employees rather busy. Upon being transferred to the Aguascalientes plant, Mr. Austin endeavored to familiarize himself as rapidly as possible with all the technical details of the plant and also with the precise duties and normal activities of each and every man and boy on the payroll. Scurrying about under the guidance of his predecessor, he reached the tapping floor and inquired, "Who looks after things here?" A gesture indicated a Mexican who at the moment was languidly rolling a corn-husk cigarette as he strolled from one furnace to the other. "What is he doing now?" demanded Austin, nervously. "Nothing," was the reply. "Nothing, eh? Who is that fellow lying there half asleep?" "Oh, that is Pedro, Juan's helper."



APPROXIMATE LIMITATIONS OF SIZE OF MATERIALS FED TO AND DELIVERED FROM ORE-DRESSING MACHINES

Leaders in Metallurgical Practice

Arthur L. Walker

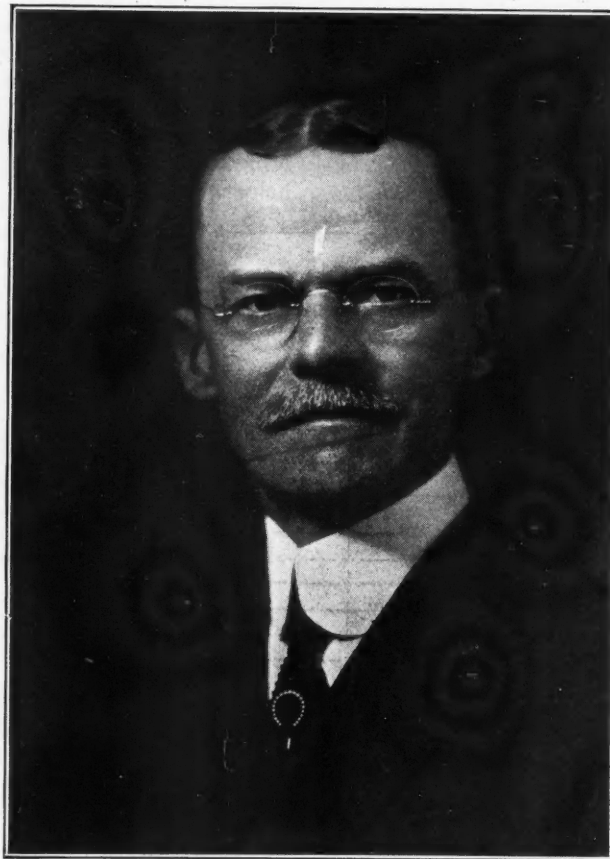
IT IS rather strange what little things influence young men in the selection of their careers. Were it not for the fact that Arthur L. Walker, after graduating from Morris Academy back in 1879, had been intimately acquainted with a member of the victorious Henley crew of Columbia University, his decision to attend the Columbia School of Mines would have been problematical. However, no one doubts that he would have exhibited in any other career the same amount of inventive capacity and general ability that he has displayed in mining and metallurgy. Upon being graduated from the School of Mines in 1883 he was tendered a position by Prof. Pierre De P. Ricketts as assayer for the Old Dominion Copper Co. at Globe, Ariz. In those days it took seven days to make the trip to the West, two days of which were spent in stage-coach travel, and despite hazy notions as to just where Arizona was, he jumped at the chance to work on the attractive Western borderland. After service for three years with the Old Dominion Copper Co. as assayer, chemist and underground engineer, Walker resigned to accept a position with the Silver King company, only to return to the Old Dominion Copper Co. a short while later as the new superintendent of the enterprise—inwardly admiring the company's courage in appointing so young an engineer to this responsible position. Yet (mining companies take note), during the six years of his stay there an entirely new smeltery was built, an aerial tramway—the first in the Southwest—erected to connect mine and smelter, and other extensive improvements were made.

In 1893 this young engineer went to Baltimore to take charge as general manager at the Baltimore Electrolytic Refining Co., now the Baltimore Copper Works, and while there invented the first successful machine used to supplant the old laborious hand lading of casting copper—the Walker casting machine. There were many difficulties to overcome in designing and introducing this machine, but the result was most satisfactory, and the machine is now used all over the world. Considerably more than one-half of the copper that is now pro-

duced in the world is cast on these Walker machines.

The next jump was to Perth Amboy, N. J., where Mr. Walker was placed in charge of the copper operations of the Guggenheims. Inventive talent again asserted itself—this time it was the idea of combining

the advantages of the series system and the advantages of the multiple system for electrolytic copper refining that yielded what is now known as the Walker system of electrolytic tank and conductor arrangement, a plan that was first introduced in 1902 at the Perth Amboy Electrolytic Refinery and which has been adapted in all but one refinery subsequently built. In 1906 Walker was elected a director in the American Smelting & Refining Co. and a member of the executive committee. His duties were very general, but carried him to operations principally on the Pacific Coast. Two years later he severed connections with the American Smelting & Refining Co. to accept the chair of metallurgy at Columbia University, bringing to the School of Mines the benefit of the wealth of experience he had accumulated in twenty-five years of practical asso-



ARTHUR L. WALKER

ciation with mining and metallurgical work. Professors as a class are often accused of being too theoretical and of subordinating the practical aspects of their teachings, but Prof. Walker's record is quite a contrast to such generalization. In the war he was first consulting metallurgist to the Chief of Ordnance, then attached to the Small Arms Division, and later to the Metallurgical Branch of the Inspection Division.

Prof. Walker claims that, to him, the two outstanding achievements of his professional work are his position as general superintendent of the Old Dominion Copper Co., when only twenty-four years old, with the eminently successful operating results under his régime, and the special inventions he was able to introduce in copper metallurgy.

Oh, yes! Prof. Walker has always been interested in athletics—his particular hobby being the great American pastime. He organized a ball team at Globe, and he plays golf. Incidentally, his son Arthur L. Walker, Jr., is able to meet almost anyone at the game.

BY THE WAY

Cuba Prosperous

More than the high prices of sugar and the presence of great numbers of thirsty American tourists is responsible for the superlative degree of prosperity that is being enjoyed in Cuba, declares D. F. Hewett, who has just returned from the island, where he made examinations of manganese properties for the War Minerals Relief Commission. The additional reason for this prosperous state of affairs is the entry of new capital into mining. In Cuba, a tax is levied upon production only, and many Americans who object to the taxation policy pursued at home are making investments in Cuban mining properties.

Canitopsis

The supply of tin cans is below normal and probably the smallest, relative to demand, it is said, that the country has ever experienced. Our predicament is really becoming serious. The tin can has played an important part in our national life, and we have taught the world to use it. Called a wasteful people, we have nevertheless shown man how to preserve his surplus fruits and vegetables. To the engineer, prospector, and miner and to him who seeks the uttermost parts of the earth, the can has especial significance. To him, sordid and rusty though it be at times, it is the symbol of existence, and after he has passed along it remains a monument to his passing. Take the wings of morning, pierce the Barcan wilderness, wherever it may be, and the cans will be found mutely dotting the landscape, their metal once won from earth now cast aside to be resolved to earth again. The desert whirlwinds swirling through the abandoned camps make of them their plaything, and their clanking furnishes a rude music, which there is none to hear. The can, too, has played its part in the world of metallurgy and in the precipitation plant has aided in recovering copper from the waters of the mine. Thus the can through silent service has won for itself honorable mention. When we read, therefore, that the supply is diminishing, we wonder if it, too, like so many other things of recent years, is to become scarcer and scarcer until finally it disappears. Then, perhaps, we shall be taking our food in pellets, and the question of containers will be of less importance.

Inaugural Exercises; or, Arizona on Tiptoes

"An eager and expectant crowd stood about the well site of the United States Oil & Refining Co., in the Bowie oil basin last Sunday, to witness the inaugural exercises that set in motion the new Imperial Ideal Standard rig that all southeastern Arizona confidently expect to unlock nature's treasure vault and shift Arizona into the column of oil states," said a Bisbee daily recently.

"All day the stream of visitors came and went and all day the big machine worked with the even and smooth precision of a perfect mechanism, and every one who saw it knew at a glance that it was fit for the job and put away from his thoughts any brooding doubt that the public will get a run for its money.

"Five hundred feet of water was bailed from the well,—the accumulation of two months while the rig was be-

ing set up—and as the bottom of the 860-ft. hole was reached the slush water carried visible evidence of liquid oil that rode down the slush ditch into the sump. This phenomenon has marked the last 200 ft. drilled in the well, before suspension of work, to a greater degree than was exhibited Sunday, as the pressure of 500 ft. of water had tended to chill the oil and retard its flow into the well. Drilling was begun Monday morning, and, as the ponderous bit smashed its way downward, cutting new ground, larger quantities of oil appeared in the slush as work advanced—this is the hopeful factor.

"Representatives of the important towns of southeastern Arizona made up the list of visitors. They appeared more than satisfied with what they saw and went home to impart their confidence to their local communities. Manager Washburn was tireless in his efforts to entertain his guests and tell them everything they wanted to know. He indicated that it would be his fixed policy to encourage visitors to the well and keep no secret from the public. He says that only some cataclysm of nature can balk the progress of the work and he looks for a speedy proving of the Bowie oil basin."

The Divining Rod Again

Evidence continues to pile up that there is money in divining rods. We have had this hunch for a long time, but have hesitated to give voice to it lest some unprincipled person should see a copy of the issue in which the tip was given and should attempt to turn our surmise into cash. We exercise great care in these matters, having the welfare of others at heart. But the news seems to have got around anyway, so there is no longer any need for us to keep silence. Let the innocent beware! If they would lose their money, let them invest in such devices.

A Riddle

"Congress is now made up of 531 men, endowed by their Creator with such mental powers as He intended them to have, and with such breadth of view, sanity and judgment, and knowledge of world affairs as their earthly environment has vouchsafed," said George A. Post, chairman of the railroad committee of the Chamber of Commerce of the United States. "Ninety-six of them sit in the Senate, and 435 sit in the House of Representatives. While the numerical size of Congress has increased, from time to time, its quality is about the same as it has always been."

In the light of the recent Congressional adjournment and the political effort to defend or criticize the status of legislation, can this safely be regarded as a condemnation of our national legislators, or should it lead us to believe that, after all, even a dilatory Congress is not going to get us into trouble if history can safely be taken as a precedent?

The Basement Complex

Modern children are precocious, and it is only natural that they should pick up words and phrases used by their elders. The seven-year-old daughter of an erstwhile geologist, playing with a bedraggled but cherished kitten, was asked what her pet was called. "Well," she replied, with a pedantic air, "there is considerable divergence of opinion. Daddy calls her a segregation from an intrusive magma of doubtful genesis; mother refers to her as the basement complex; sister Bessie insists that she is a typical example of secondary impoverishment; but I just call her my dear little Kitty."

CONSULTATION

Native Quicksilver

"Has native quicksilver ever been mined in the United States? It is our impression that the source of the metal is rare."

Although native quicksilver is an ore, it furnishes a relatively insignificant supply of the metal. Over 95 per cent of the domestic quicksilver comes from the bright-red sulphide of mercury, cinnabar, a very rich quicksilver mineral. In the native form quicksilver usually occurs as tiny globules—small amounts have frequently been found in mining exploration and occasionally in cavities of considerable size.

Cadmium Prices

"Will you please tell me how the present price of cadmium compares with its value for the past five years? Has this metal any broad application, or is its use in the manufacture of fusible alloys the principal one?"

The present quotation of \$1.40 to \$1.50 per lb. for cadmium is merely nominal. There is little business being done in this minor metal. As it is obtained mainly as a byproduct from zinc and lead refining, the supply of the metal is mainly dependent upon the output of those two major metals. Present quotations are about 25c. higher than the average for 1919 and about equal to the price during 1916, 1917, and 1918. The value was around \$1.20 in 1915 and 90c. in 1914.

Cadmium's chief use is in alloy manufacture—mainly in fusible alloys—and as a substitute for tin in solders. The compounds of cadmium are used in paints and pigments and as salts to give luster to glass and porcelain.

Mining Oil Shales

"We are interested in the development of the oil-shale industry and intend to undertake the mining of the shale. Can you give us any information regarding the features of this particular variety of mining?"

When the oil-shale industry is developed, mining will necessarily have to take place on a large scale and will have problems peculiar to itself to solve. Open-cut methods, or quarrying, will be found satisfactory in some conditions, along the general lines of practice in this country. Underground mining will no doubt find wide application, and the method used will possibly follow coal-mining practice, as the conditions are similar. Not much mining or experimentation has been done, and there is little to guide in planning an attack on the problem. Standard methods of coal and metal mining will probably find applications, with modifications necessitated by the characteristics of oil shale. In coal mining the matter of fines usually defines the method of mining used, but in oil-shale mining there is no restriction as to fine material, as the substance will necessarily have to be crushed for redistillation purposes. However, the problems of ventilation will resemble those of coal mining—gas and dust explosions must be guarded against. The best type of drill and the most appropriate explosive remain to be determined

for this embryonic industry. The physical character of the shale is such that percussion drills do not seem to work advantageously. In general, oil-shale mining will resemble coal mining more than metal mining. Incidentally the problem illustrates the consanguinity existing between the oil industry and mining.

Lithopone

"Will you kindly inform me as to how barytes is used in lithopone and what other substances combine to make up the composition of that material? Is lithopone of much commercial importance?"

Lithopone is a useful pigment manufactured from barytes and zinc. It is essentially an interior dull-finish wall paint, and has both advantages and disadvantages when compared with its rival pigments, zinc oxide and white lead. It is not affected by sulphur or hydrogen sulphide as white lead is, and is non-poisonous—a decided advantage. Furthermore, it is whiter than white lead. However, as an exterior paint, lithopone is not as satisfactory as other materials, owing to its tendency to discolor under direct sunlight, producing checks and a chalky surface. Mixtures of lithopone with other pigments such as zinc oxide are said to have removed this difficulty.

Lithopone is usually made by mixing and heating a solution of barium sulphide with a solution of zinc sulphate obtained from the chemical treatment of barytes and zinciferous products, respectively. A reaction takes place with the formation of a precipitate containing about 70 per cent barium sulphate and 30 per cent zinc sulphide intimately mixed, which is heated to a high temperature and quenched in water, rendering the powder more opaque and white. The process is a delicate operation and its success is dependent greatly upon careful manipulation. Some of the zinc sulphide is converted to the oxide in the heating process, usually from 1 to 10 per cent. Naturally, with a manufactured compound such as lithopone, trade secrets concerning the manufacture of the product are often carefully guarded.

The composition varies widely, and frequently another material, such as flake white, is added to enable the manufacturer to claim exceptionally meritorious qualities for his lithopone. Although there are many trade names for the pigment, such as Ponolith, Zincolith, and others, a graduation such as is indicated in the following table is frequently used:

	Zinc Sulphide	Barium Sulphate
Green Seal	1 part	2 parts
Red Seal	1 part	3 parts
Blue Seal	1 part	4 parts
Yellow Seal	1 part	5 parts

Green Seal is the best grade of the product, and the others follow in the order named. The lithopone industry is still in an infant state and is an important barytes consumer. It has been estimated that about half of the domestic production of crude barytes enters into the manufacture of lithopone.

THE PETROLEUM INDUSTRY

The Petroleum Section of Engineering and Mining Journal

THERE has been some question as to how far the old subscribers of the *Engineering and Mining Journal* found the Petroleum Section interesting and approved of it. The Petroleum Section was initiated on account of the frequent close and common interest between metal mining and petroleum mining, as expressed in our editorial of April 24, 1920, and with the belief that most of the metal-mining men were interested in the petroleum industry.

To get statistical data upon the situation, questionnaires were sent out to a representative and varied list of subscribers. To those subscribers the following questions were put:

1. Have you any interest in the Petroleum Section of the *Engineering and Mining Journal*?
2. If you are interested, is your principal interest in the metal mining or petroleum mining?
3. Do you approve of the Petroleum Section in *Engineering and Mining Journal*?
4. Would you be interested in seeing the Petroleum Section of *Engineering and Mining Journal* expanded, provided the amount of space and attention and metal mining is not reduced?

The answers received were carefully studied. A tabulation shows that 75 per cent, in answer to question 1, were interested in the Petroleum Section; 20 per cent were not interested; and 5 per cent were indifferent.

Of the 75 per cent who are interested in the Petroleum Section, it is illuminative to note that three-quarters of these, or 75 per cent, are interested principally in metal mining, only 10 per cent are interested primarily in petroleum, and 13 per cent are equally interested in both. These figures support, even more strikingly than we had anticipated, the close connection of metal and oil mining, and prove that most of our old subscribers find in the Petroleum Section something which touches their business or their interests at one point or another.

In answer to question 3 as to whether the subscriber approved of the Petroleum Section in *Engineering and Mining Journal*, we find even a larger proportion, due to the fact that many who are not interested in petroleum approve of the Petroleum Section; so that only 10 per cent disapprove of the Petroleum Section and 90 per cent give it their emphatic approval or their tolerance.

In regard to question 4, dealing with the expansion of the Petroleum Section, we find that there is a general feeling of satisfaction with the present size of the section; nevertheless about two-fifths of all the replies favor the expansion, providing it were not at the expense of the other mining interests. The general trend of votes, therefore, was in favor of very cautious expansion, if any were undertaken.

Of those in question which expressed an interest in the Petroleum Section, about 37 per cent were mining engineers; 19½ per cent mine executives; 13 per cent lawyers, bankers, brokers, capitalists, investors, metal

merchants, and persons in general business; 13 per cent metallurgical engineers, chemists, and assayers; 11 per cent mining men; 4½ geologists; and 1½ per cent college professors.

The Scramble for Oil

Under the above heading, the *Compendium*, published in London, discusses the British petroleum policy, as follows:

"That country which controls the petroleum supply will control the trade of the world." So said the chairman of the Standard Oil Co. to the Foreign Trade Convention at San Francisco a fortnight ago, not without a note of regret that the British were the first to recognize this fundamental fact. It is as true today that the future lies with oil as that in the past the industrial greatness of Britain has been built up on coal. But coal is king no longer. The war, government control, and the miners have effectively dethroned it. It has become too scarce and too dear to hold undisputed sway. Very soon the world will no longer turn its eyes to Britain for coal, but rather to the tropic lands for oil.

There are no illusions on the subject among the leaders of British trade and industry. They see clearly that coal has a rival. With equal clarity they see that Britain's commanding position in trade is lost if she cannot secure oil wells commensurate with her coal measures. The world scramble for oil has already commenced, only, however, to find that Britain has been there beforehand. Thanks to the initiative of private enterprise, this country has secured over a wide area the rights to supplies which will to some extent, if not altogether, adequately safeguard her maritime and trading interests for a generation to come.

There is no need to retell when and how these oil fields have been opened up—that in Mexico, Central America, Trinidad, Persia, India, Burma, Egypt, the Straits Settlements, Russia and Rumania, British companies have acquired and are operating oil fields on an ever-extending scale; that the Anglo-Persian Oil Co., only latterly assisted by the government, has secured and is developing immensely valuable resources in South Persia, and that now North Persia is to be exploited. All this is well known. What is new and what has, unfortunately, raised a political controversy at home and abroad is the action of the government at San Remo in establishing its claim on the oil fields of Mesopotamia, in association with the Royal Dutch and Shell group.

Briefly stated, the position is this: In the peace settlement, Great Britain was given mandatory rights over Mesopotamia, which was formerly Turkish territory and in parts of which great oil fields were supposed to exist. But, before the war, a company in which Dutch, British, and German interests were represented received oil concessions expected to be of considerable value from the then Turkish government. The question of dealing with these concessions after the war naturally arose, and, though it was admitted that the German interests must no longer be considered, those of the Dutch were in a different category and must be recognized.

Then France was admitted to have a special interest in the Mosul area, which brought another group of interests into the case. Hence the understanding which has just been arrived at between the government and the Shell and Royal Dutch companies for the exploitation of the Mesopotamian oil fields. The exact detail of the arrangement have not yet been announced, but the broad fact that they sufficiently safeguard British interests may be accepted without hesitation. In the East, therefore, with Mesopo-

tamia and Persia added to the far-reaching resources of these companies, large supplies of oil are insured for this country, and in the west, as is known, such supplies have been in existence for years.

The Colombian Petroleum Law of December 29, 1919

To the Editor:

I have read with considerable interest the authoritative and timely study by J. W. Thompson of the recent Colombian oil legislation and your editorial comment which appeared in *Engineering and Mining Journal* of May 22. I have had occasion myself to go into this matter extensively and to examine the new law in its original, Spanish version.

I find that in certain important respects Mr. Thompson's article does not cover the ground as fully as, to me, seems desirable for a clear understanding of the conditions as now fixed by this law and which deserve to be discussed freely in the best interests both of Colombia and of the American investors.

I am advised that some American oil operators who are new to this field have taken exception to sundry features of this law, and it should be remembered, in this connection, that a large portion of the prospective oil resources of the country already have been acquired by powerful, foreign corporations under more liberal concessions that are not affected by the present law.

From a private communication on the subject I quote an abstract of the more important, novel features of this law:

Oil deposits, in public and private lands *alike*, when not alienated through an earlier government oil concession, are subject to the regulations of this new law and to payments to the government, as *royalties* on the gross output of oil (from both public and private lands), and, also, as *rentals* for the surface of the ground occupied on public lands. Classifications and provisions are:

Land Classification:

- A. Public lands, "terrenos baldios," and all lands, including grants of lands recovered to or repurchased by the government, but not lands under navigable waters.
- B. Private lands held under grants from the government of later date than Oct. 28, 1873.
- C. Private lands under grants of later date than Oct. 28, 1873, and antedating Oct. 28, 1903.
- D. Private lands under grants antedating Oct. 28, 1873.

Exploration for Oil:

- On Class A lands, on "terrenos baldios," permitted without license.
- On all other Class A lands, permitted only under government license.
- On Class B and C lands, permitted only under government license and after previous notice to actual land owner.
- On Class D lands, permitted without license, but only after filing a sixty days' advance notice with the Minister of Public Works.

Exploitation of Oil:

- On Classes A, B and C lands, permitted only under government concession or contract.
- On Class D lands, permitted only after filing notice of exploration, as above, and map of location, report of operations, and other details, within one year after beginning operations, with the Minister of Public Works.

Licenses for Exploration:

Issued for tracts of not less than 1,000 hectares and not more than 5,000 hectares. (One hectare approximates 2.5 acres.) Licenses cannot be issued to one applicant for more than three tracts in each department, and in frontier districts not more than one to each applicant.

On lands of Class C actual owners of the land have preference in the issue of licenses during the years 1920 and 1921.

The government may retire or cancel licenses at any time, and licenses do not convey any legal title or claim whatever.

Concessions or Contracts:

- Size of tracts and number for each concessionaire, the same as for licenses.
- Duration of contract, twenty years, with a renewal period at the option of the government for another ten years.
- Bond: A minimum bond of \$20,000 required for each concession.
- Transferable only with the approval of the government and not at all transferable to foreign governments or foreign corporations in which foreign governments are interested financially.
- On lapse and forfeiture of contract, all machinery and all other installations within the area of the concession become the property of the Colombian government without payment.
- Forfeiture of contracts will be declared for a number of the usual causes, such as non-payment of royalties, rentals, or other charges, and also for failure to prove commercial deposits of oil within five years after date of contract, and for suspension of operations, without legal cause, during one entire year.
- Concessions cannot be taxed by departments and municipalities.
- Contracts do not need approval by Congress.

Payments to the Government—Royalties on the gross output of Oil:

For Lands in Classes A, B and C	
Zone.	Base Minimum Per Cent.
A. Atlantic Coast frontier	20
B. Ecuadorean frontier	20
I. Within 200 kilometers of the coasts.....	10
II. Within 400 kilometers of the coasts.....	8
III. Beyond 400 kilometers of the coasts	6
For Lands in Class D.	
I. Within 200 kilometers of the coasts.....	8
II. Within 400 kilometers of the coasts	6
III. Beyond 400 kilometers of the coasts.....	4

The above minimum base royalty applies to the first period of ten years; after which, for each subsequent ten-year period, the minimum base royalty will be increased by one "unit." Whether this "unit" means the entire base royalty or only 1 per cent, is difficult to understand. Possibly the official English translation may make this point clear. If it should be the former, it must be considered as excessive and confiscatory.

Annual rental on Area Covered by Concession:

Cents per Hectare.	
On lands of Class A. First year	10
Second year	20
Third year	50
Fourth year	\$1
After the fourth year until the expiration of the contract, \$1 per hectare.	

Indemnities to Land Owners:

- On lands of Classes B and C, according to stipulations of the Colombian Mining Law, Chapters 12 and 13.
- On lands of Class D, according to private agreement.

Rights of Foreigners:

- Foreign governments and foreign corporations in which foreign governments are interested cannot acquire oil concessions.
- Foreign individuals and foreign corporations can only acquire oil concessions by declaration of submission to Colombian jurisdiction.

Rights of Private Land Owners:

Oil-bearing lands in private ownership which have not been developed within twenty years of the date of this law, will be penalized by a special land tax of \$5 per hectare, until explored and developed, if proved oil bearing.

General Working Conditions:

The government reserves the right of inspection of operations and of records of production, and accounts.

At least 50 per cent of the workmen employed must be of Colombian nationality.

The fundamental novel feature of the law is that the Colombian government now asserts its right of eminent domain over oil deposits in all lands, public and private alike, in accordance with the old European principle of regal ownership to all mineral deposits (from this our own term "royalty" has been derived). This principle has prevailed in all Spanish-American countries since the time of the Spanish dominion as to all deposits of metallic minerals, and the new Colombian oil law now also extends it to oil deposits, by taxing all production a certain royalty, whether from private or public lands, and also by penalizing certain private lands with excessive taxes after a stated period until developed.

There could be no objection on the part of the foreign operator to this principle, as the royalties in a majority of cases are reasonable, if the new law were only consistent, but this is not the case. Though collecting production royalties on oil from all classes of private lands, on certain lands the government alone issues permits for exploration and grants working concessions, and in these cases the actual land owner is not concerned whatever, except in his right to a nominal indemnity for the surface actually occupied. On certain other private lands, however, the government, while collecting production royalty, does not require official licenses and concessions, but leaves the question of permit for exploration and contract or lease for operation to be settled with the land owner. Thus, in this class of land there is established a dual ownership to the oil deposits, which in practice probably will result in the collection of a double royalty, one by the government and another, equally large or larger, by the land owner.

In my opinion, either the royalty principle should apply only to public lands, or, if to all classes of lands, to all private lands alike, with the entire elimination of the land owner in the ownership of oil deposits.

Another unfavorable feature is the uncertain guarantee provided by the licenses and the fact that a license need not necessarily be issued to the first applicant. The original prospector thus may be spending his time and money in locating a tract of favorable oil lands, merely to furnish gratuitous information to a favored third party.

The anti-foreign clauses, as to jurisdiction and nationality of workmen, may also be objected to by many American operators. For myself I believe that these clauses will prove of small practical importance. In the last instance all these matters will rest entirely upon the goodwill of the parties concerned and their disposition to co-operate, and ultimately, also, on the state of friendly relations existing between the respective governments.

However, Colombia is a country that needs the co-operation of foreign capital, and therefore it ought to facilitate, by most liberal legislation, instead of hinder, the

early development of its natural resources, including oil deposits.

OLOF WENSTROM.

Boston, Mass.

NOTE: Our readers, especially those interested in the oil problem in Colombia, are requested to communicate to the *Engineering and Mining Journal* their opinion of the Colombian mining law, that there may be a full discussion.—EDITOR.

Cementation in Sandstone

Deposition of Chemical Compounds From Solution in the Pore Space an Important Factor in Limiting the Extent of Oil Pools

BY ROSWELL H. JOHNSON*

Specially contributed to *Engineering and Mining Journal*

THAT the lateral limitation of many oil pools is the result of a more thorough cementation of the sandstone, rather than the occurrence of water, or a thinning of the bed, or of an increased fineness of the grain, is now well established. It becomes important, therefore, to know as much as possible of the progress of cementation, and especially of its distribution. The literature on the subject is not particularly helpful to the oil and gas geologist, as it has been written principally from the standpoint of the metalliferous deposits.

Thus, in his classic treatise on metamorphism, Van Hise places the greatest stress upon the zone of weathering or solution, which is said to lie above the zone of cementation. It is evident that the cementation is considered as the result, to a large degree, of the deposition of material dissolved in meteoric waters which have descended to lower levels.

As a matter of fact, in most oil and gas reservoirs, the inclosing rock has never been exposed to meteoric water. The oil or sand, when deposited, was covered almost at once by increasing depths of shales and other deposits, so that the deposits in question were taken far below the reach of meteoric waters. As a consequence, the history of the cementation must be worked out from a consideration of the connate and other fossil waters. These waters have produced far more cementation on the whole than that caused in Van Hise's zone of deposition from descending meteoric waters.

RECORDS OF CEMENTATION

The history of cementation falls into five phases:

1. The water which is deposited with the sand (the connate water) may carry material in solution which under some conditions may be deposited as a cement. Geologists know that coquina of quite recent origin will nevertheless be somewhat cemented, and it is probable that the connate water enriched by solution was the active factor. However, on the whole this phase cannot be considered important, for the reason that as the deposit in question becomes covered by a heavier and heavier overburden, the pressure on the water is therefore also increased, which increases its solvent action, so that, instead of deposition taking place, it would appear that cement might be actually redissolved were connate water alone considered.

2. The invasion of fossil water is a second phase. The compacting of the strata, especially the shale, is

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bound to extrude great quantities of water. Such water, in its migration, will, of course, follow the lines of greatest porosity, so that sandstone beds will receive water connate to the shale beds, which would be richer in dissolved material, owing to the less siliceous and more finely divided state of its particles. Cementation in this phase would therefore seem to be greater than in the first phase. However, as the depth from the surface is for the main part increasing throughout this phase, there is the same difficulty met before in that the waters are capable of holding in solution more and more material as the pressure increases.

3. As the heat and pressure become greater with increasing overburden, and stresses make themselves manifest, hydrocarbons are produced and enter the sandstone reservoirs in increasing amounts, there to be held by differential capillarity. Gas is more abundant at first, because thus far Quarternary deposits are found giving gas only where oil has not been contributed from below. Eventually oil, too, invades. But if the beds undergo such a history as to have their contained coal rank higher than 65 per cent in fixed carbon, the end of the invasion is solely by gas. The earliest invasion, as the drift gas of Iowa shows, has relatively more nitrogen and carbon dioxide, thus approaching marsh gas. It is largely of bacterial origin. The gas which follows, termed second-stage gas, ordinarily has some higher hydrocarbons, and the gas entering last (third-stage gas), if the area enter this stage, is more nearly pure methane, as at Poteau and Red Oak, Okla. The importance of this invasion is that water is displaced from the reservoir and cementation thereby arrested. Therefore, to study the distribution of closer cementation, the history of the hydrocarbon-filled volume must be known. This necessitates adding to existing knowledge the paleogeographic record of the formation, the history of its folding and stresses.

IMPORTANCE OF RECORD OF PRIMARY HYDROCARBON LODGMEN

The places of early lodgment of hydrocarbons in the reservoir are of especial importance as indicating greater porosity. In homoclinal reservoirs these are at the original upper end and along the upper portion. They are also in the earliest anticlines. Conversely, ancient basins will be unduly cemented. Domes and anticlines formed only in the later history of a region will find the reservoirs already somewhat cemented, and hence have both the accumulation and the quantity of the hydrocarbon reduced.

Note that, as the percentage of gas relative to oil increases with time, late folds will entrap an excessive proportion of gas relative to oil. Is there not here one of three explanations for "gas-only pools"? The others are individuality of the source bed and the fact that any small dome in a general homocline has its catchment so gas filled as to spill on up the dip much of its earlier trapped oil.

The increasing proportion of gas in late invasions helps to explain some accumulations of gas on basinward sides in some pools where complete gravitational separation has been effected. Mills has shown that the loss of water vapor to gas reservoirs concentrates fossil water density, but this factor is relatively slight in this connection.

4. Phase of Increasing Solution—As the weight of overburden and other stresses increases the temperature

and pressure, the waters become increasingly enriched. This has been shown in the deep Geary well. Cementation, therefore, is not only not increased, but is actually decreased in this stage.

5. Eventually, as drilling is done on land areas, elevation of the reservoir begins. Now, decreased temperature and pressure reduce the solubility and so increase the deposition of the materials which are of very slight solubility. Where the temperature and pressure have been great enough, even quartz is taken into solution in pure water, to be later deposited when temperature and pressure diminish.

The word phase has been used, but these items are not strictly successive phases, as they overlap to some extent and also oscillate as elevation and stresses oscillate. These oscillations are especially important, because the expansion of the gas leads to movement back and forward, facilitating the segregation and the separation of the oil and gas.

Bunker Fuel Oil Required

Fuel-oil tenders have been invited by the U. S. Shipping Board for one-, three-, or five-year periods, beginning Sept. 1. Bids were opened on July 15. The Shipping Board's statement in this connection reads as follows:

The Division of Supply and Sales, U. S. Shipping Board Emergency Fleet Corporation, invites tenders for furnishing such quantities of "C" grade bunker fuel oil as may be required for periods of one, three, or five years beginning about Sept. 1, 1920, for use by all ships under its ownership or control at ports, and in approximate quantities as follows:

Name of Port	Quantities	
	Barrels of 42 U. S. Gallons Month	Year
Boston.....	77,000	925,000
New York.....	775,000	9,300,000
Baltimore.....	125,000	1,500,000
Norfolk.....	290,000	3,475,000
Philadelphia.....	250,000	3,000,000
Charleston.....	33,000	400,000
Savannah.....	100,000	1,200,000
Jacksonville.....	31,000	375,000
Mobile.....	31,000	375,000
Pensacola.....	15,000	175,000
New Orleans.....	96,000	1,150,000
Port Arthur.....	19,000	225,000
Galveston.....	40,000	475,000
Panama Canal.....	125,000	1,500,000
St. Thomas, V. I.....	40,000	480,000
Bermuda.....	10,000	120,000
Ponta del Gada, Azores.....	31,000	375,000
Brest, France.....	83,000	1,000,000
Bizerta, Tunis.....	18,000	216,000
Durban, S. A.....	15,000	180,000
St. Vincent, C. V. I.....	23,000	275,000
Rio de Janeiro, Brazil.....	42,000	500,000

In addition to the above-mentioned ports, tenders will be considered at all other United States domestic and adjacent ports from which bidder is prepared to make delivery.

The buyer agrees to place at the disposal of the successful bidder, tank-steamer tonnage, at the Government time-charter rate of \$6.50 per D.W.T. per month, in the amount necessary.

1. To move crude petroleum from producing terminals to refining centers and,
2. To move fuel oil supplied at any port from successful bidder's nearest refining center to such port or ports.

World's Largest Oil Well

The largest oil well in the world is believed to be in Mexico. It is known as the Cerro Azul No. 7, and is reported to yield 370,000 bbl. of oil every twenty-four hours.

NEWS FROM THE OIL FIELDS

Mexican Oil Law Will Provide Protection

President de la Huerta Says New Decree Will Give More Liberal Interpretation of Article 27

A decree, soon to be issued, will, it is believed, settle the Mexican oil situation permanently and provide protection of the rights of American holders of oil property in Mexico. In a recent interview, President de la Huerta of Mexico stated that the Mexican government will insist upon the principle of national ownership of soil, and added that controversies now existing would be settled in a manner satisfactory to all. He declared this would be done by issuing a decree granting owners of oil properties a five-year period to file claims to land that is theirs either by direct sale or lease. If such claims were not filed within a required period, others would then have the right to file claims to the same property. When claims were finally awarded, the right to drill for oil would become exclusive and perpetual prerogative of claimant.

De la Huerta said the forthcoming decree would supersede those issued by Carranza regime, which oil operators had declared were confiscatory. He said Article 27 of the constitution would not be changed, but this would be given a much more liberal interpretation than in the past. He admitted the Carranza decrees contained many unjust provisions. He said the new decree would give oil-property owners preference in development, whether their property was acquired before or after the 1917 measures were enacted. He said rentals would be charged for the lands, but that the rentals to be fixed would be materially reduced.

De la Huerta will act as judge and final arbitrator. He said the solution above suggested was only his personal opinion, but added his belief that this principle would prevail. He said that there was little doubt General Obregon would agree to this solution. De la Huerta will formulate an oil law which he will present to the Mexican Congress when that body meets next September.

The oil-well supply industry of United States has not been able to keep up in last few years with demands of petroleum industry for drilling equipment, according to the *Wall Street Journal*. In 1919 it is estimated that approximately 30,000 wells were drilled in the United States, and in 1918 the number was 25,700. Based on the estimate of a prominent oil man, the average cost of drilling a well is \$20,000.

Kentucky Oil Fields

From Our Special Correspondent

Latest reports from Bowling Green, Warren County, state that the well completed recently by Jorstatter and associates in the Davenport pool is believed to be the biggest producer in the field. It is estimated by reliable oil men to be larger than the famous Tarrant well in the same pool, and only about 500 ft. away. The Tarrant well is said to be yielding \$25,000 worth of oil a month.

The Big Sandy district of Eastern Kentucky is showing a creditable production. In the Johnson-Magoffin field, several new wells have been developed, producing from 20 to 75 bbl. per day from the Weir sand at a depth of about 1,000 ft. The Cumberland pipe line has been taking oil from this field for several weeks. One of the best of the late discoveries was the Bed Rock Oil Co's Griffith No. 3 which started flowing when the sand was entered. Along the Magoffin-Morgan border, an advance test drilled by the Kenton-Morgan Oil Co. on the Howard farm is rated as a 100-bbl producer. In Floyd County, the Upper Big Sandy country, the first well to be drilled through the corniferous sand has just been completed on Bull Creek at a depth of 2,400 feet. This deep sand showed two pay streaks and is considered a profitable strike.

Nevada Corporation Closes Books

From Our Special Correspondent

The hopes of a number of business men and residents of Elko, Nev., who recently incorporated the Elko Oil Corp., were dashed when Prof. Frederick J. Pack, of Utah, informed them that there was an entire lack of indications pointing to the existence of oil on their holdings at Adobe Flat, six miles north of the city. It was believed that there were good possibilities for the finding of oil in the field and those interested deposited \$100 each for the purpose of determining the merits of the holdings. The company will return to its members the amounts paid in, less expenditures to date, and with the disincorporation of the company, one of the cleanest oil promotions will come to an end.

Professor Pack stated that his report of the Elko field by no means indicated a lack of oil in other sections of Nevada. It is his belief that Nevada has better indications of oil than Utah, where oil was found some years ago along the San Juan river, and more recently at Moab, though the well at the latter place does not show oil in such quantity as to justify hope of commercial exploitation.

State of Texas Awarded Stevens County Lands

Gulf Production Co. Pays Royalty on Oil Produced—News from Other Counties

In the case "The State of Texas vs. The Gulf Refining Co. et al.," the Fifty-third District Court recently awarded the state 160 acres of oil-bearing land in Stephens County, valued at \$8,000,000, and royalty amounting to \$80,000. P. K. Shuler, of Waco, a plaintiff, was awarded \$200,000 as his share of the royalty on oil produced from this land by the Gulf Production Co., as he holds the mineral lease.

In Mitchell County, the well of the Underwriters Oil & Gas Co., two miles west of Westbrook, has oil standing 160 ft. in the well. It is believed that to the southwest, between this well and the McDowell well in Glasscock County, twenty miles southeast of Big Springs, an oil field will be opened. Oil standing in the McDowell well was not appreciably lowered by bailing. Later, it is claimed that several hundred barrels of oil daily are being produced by swabbing.

Seven wells are being drilled in Brewster County. The Presidio Oil & Gas Co. will test its well for oil, a showing having been obtained near 1,700 ft. In Pecos County, the Montezuma Oil Co., of California, will drill for oil, having leased a large acreage.

The total oil produced in the state of Texas during the month of June was approximately 8,000,000 bbl. Divided into sections, North Texas and Central West Texas produced about three million bbl. each, and the Gulf Coast about two million bbl. During the month 522 completions were made, and of these 340 were productive, making an initial daily production of 72,000 bbl. as compared with 139,000 bbl. initial production for wells completed during May.

The largest producing well in the Texas coastal fields completed during the week ended July 3 was the No. 3 Jones-Stateland of the Humble Oil & Refining Co. at Goose Creek, flowing 1,000 bbl. daily. This well is on submerged land, and is over 2,200 ft. deep. At West Columbia, three producing wells were completed during the week, No. 37 Hogg, Texas Co., making 550 bbl. daily from 3,000 ft.; No. 38 Hogg, same company, making 300 bbl. from 3,285 ft., and the No. 4 Marmion, Crown Oil & Refining Co., pumping 100 bbl. from 3,425 ft.

At least two wells at Goose Creek now drilling are reported to be below 3,700 ft. The deepest oil-bearing stratum found in the field so far is 3,400 ft., but rock salt has not yet been struck and there is a possibility that deeper oil may exist.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

Geologists as Expert Witnesses Are in Scientifically False Position

Dr. Ransome Suggests the Court Call in Unattached Experts Paid From the Public Treasury

In an editorial in the current number of *Economic Geology*, Dr. F. L. Ransome discusses at length the question of geologists as expert witnesses. He mentions the tendency toward disapproval of the present practice and adds:

"Nor is disapproval confined to the lay public; many judges, sorely tried by the conflict in testimony that should be impartial, have been tempted to exclaim with *Mercutio*, 'A plague o' both your houses!' and some have even instructed the jury to disregard the expert testimony entirely. Unquestionably, the modern practice in mining lawsuits of employing numerous highly paid geological experts on each side, has enormously increased the costs of the litigation, not only by the fees paid but by greatly swelling the bulk of the testimony and by protracting the hearings."

Dr. Ransome points out that the frame of mind of a scientific investigator and that of an expert witness who is retained by one party in a controversy are fundamentally different and opposed. He qualifies this situation by stating:

"In view of the fact that many eminent and honorable men of science have accepted positions as expert witnesses, it is not justifiable to assert roundly and without qualification that such acceptance is morally wrong. Certainly, the intent of wrongdoing has usually been absent, and many such witnesses may have been thoroughly convinced of the inherent righteousness of the cause espoused. Nevertheless, I believe that it must be admitted that the geologist who becomes an expert witness for one side in mining litigation places himself in a scientifically false position."

Dr. Ransome sums up the case as opposed to the practice as follows:

"It is admitted that such work is not only profitable but is often intensely interesting, and may give opportunity for scientific observations of value. The temptation to engage in it may be very strong. Can a man who cherishes the highest ideals of scientific work afford to yield to it, under the existing practice of employing expert witnesses? Opinions on this question will differ, but my own belief is that in general he cannot. . . . It has been said that a witness before he undertakes a case may be sure of his ground. As a rule no geologist can tell in advance what all the developments in a suit will be, and it is doubtful whether a

geological expert witness can escape being a partisan witness when he is employed by one of the litigants with the obvious intent that he shall help to win the case."

Dr. Ransome is inclined to favor the plan "that the judge himself, on any issue involving expert scientific knowledge or opinion, should call in one or more experts, such expert or experts being merely additional to those called by the litigants." Such unattached experts would presumably be paid from the public treasury, as part of the official expenses of the trial. He observes that "there is nothing in the proposal to prevent each party to the suit from having its own geological experts in court or from having its evidence prepared under the direction of geologists, who need not appear as witnesses. It is believed that the tendency would be to keep the litigants' geologists out of court proceedings, and in any event their number should be limited to three or less on a side."

Congress Grants a Pittance

The Sterling-Lehlbach bill which provides for the retirement of Government employees has just become effective, and those in the Federal service above 62, 65 or 70 years of age, according to the branch of the service, are to be retired on a pay which is pitifully small, especially for those who have occupied responsible positions. After thirty years of service retirement is on the basis of 60 per cent of the salary, but a maximum of \$720 per year limits the retirement pay. Those who have been fifteen years in the service retire on a 30 per cent basis, but here again the maximum retirement pay is limited to \$360 per year.

It is certainly gratifying to know that Congress has at last recognized the principle of retirement provision for superannuated civilian employees. However, it is not pleasant to consider the situation of a technical expert who has been in the service for thirty years and under the new law required to surrender two and one-half per cent of his basic salary, being provided with the munificent (?) reward of \$60 per month when he retires for old age. The professional men of the country cannot look with any degree of satisfaction on such an arrangement.

It is incumbent on our technical men and organizations to get busy and see that a more nearly adequate arrangement is made for the retirement of specialists. Particularly for those in technical and other professional lines the retirement should be upon a basis comparable with the dignity of the position which they have occupied. This is essential to restore the Federal services to self-respect and reliability.

Liquid Oxygen as Explosive Its Development Before and During the War Traced and Discussed

Advantages and disadvantages of liquid oxygen explosives are discussed by George S. Rice, the chief mining engineer of the U. S. Bureau of Mines, in Technical Paper 243, just issued. Mr. Rice's report goes minutely into the development of liquid oxygen explosives during the war. The paper describes the results of experiments conducted by the Bureau at its explosives testing station near Pittsburgh, Pa., and gives an account of the methods of use as developed in Germany, observation on its use by the Germans for destroying French iron and steel plants, and an abstract of a German military paper on instructions for using liquid air explosive.

During the war the growing scarcity of glycerine and ammonia greatly increased the cost of dynamite. This caused the Bureau of Mines to investigate the possibilities of liquid oxygen explosives, which do not require nitrates. Results of the preliminary testing begun in April, 1917, were decidedly favorable. Mr. Rice, while in Europe, in 1919, as a member of a committee to observe progress in post-war industries, paid special attention to liquid-oxygen explosive. The Germans were found to have used the explosive, known as "oxyliquit," extensively in non-gaseous coal mines, in excavating subways and tunnels, in quarrying, and in iron mines, as well as for destroying French steel plants.

The explosive was first tested at a coal mine in Germany, in 1897, following Linde's invention of his liquefying apparatus in 1895. Trials made in driving the Simplon Tunnel are said to have been favorable.

In 1900, Claude, of France, patented the rectification principle. Linde, in 1902, designed his rectification apparatus. Both types of apparatus are extensively employed in liquefying gases. In 1904, Dewar, of Great Britain, invented the Dewar flask—a container for liquefied gases. Further development of liquid oxygen for blasting purposes was inconsequential until the war began.

The Allied countries, being able to import nitrates from Chile, did not take up its use, but if the war had continued the United States would probably have been compelled to do so. The method will now have to depend on its merits and on commercial conditions.

The experiments of the Bureau of Mines have shown that a liquid oxygen explosive can be prepared which has a blasting strength greater than 40 per cent straight nitroglycerin dynamite. This was shown by tests in the stand-

ard testing apparatus of the Bureau, as well as in blasting.

The procedure adopted was to place a No. 6 detonator in the inner cartridge, a cheesecloth sack containing carbonaceous material. The cartridge is soaked in liquid oxygen ten to fifteen minutes in an improved container devised by the Bureau. The cartridge, frozen stiff, is slipped into a pasteboard container, placed in the hole, a wad of cotton placed on it, a brass tube inserted, and clay tamped around the tube. The hole left by the tube provides an outlet for evaporating oxygen, until the shot is fired.

The advantages, as compared with dynamite and black blasting powder, are lower cost per ton of material blasted, elimination of dangers in transportation, from premature ignition, misfires, or unexploded sticks in ore or coal, in handling and thawing, or in storage magazines.

The disadvantages are: the liquid oxygen, because of its rapid evaporation, must be used quickly after charging, thus limiting the number of shots. A liquefying plant must be maintained near the mine. The explosive cannot be used in gaseous coal mines.

Its introduction into mines is difficult, because miners are not accustomed to it. The method offers great possibilities for lessening blasting costs in non-gaseous coal mines, and in metal and mineral mines using a chamber method where only a few shots are fired at one time. The chief cost is that of the oxygen, but there is hope of a decided reduction in cost through promised improvement in liquefying machines.

Manitoba Branch of Canadian Mining Institute Elects Officers

At the annual meeting of the Manitoba branch, C. M. I., the following officers were elected: Prof. R. C. Wallace, chairman; W. J. Dick and B. Stewart McKenzie, vice-chairmen; J. S. DeLury, secretary-treasurer; and L. G. Thompson, assistant secretary. J. W. Harris, G. B. Hall, E. W. Jackson, R. C. W. Letts, A. M. Stewart, R. Kerr and J. A. Campbell were elected to the council.

Engineering Section of National Safety Council held its summer meeting in co-operation with the Western Society of Engineers recently in Chicago, Ill.

The morning session heard the reports of the committees on education, on safeguarding machinery at the source, and on codes. In the afternoon all the discussion centered about safety for power-press operators, and the fundamentals of a safety code for metal-working power presses.

An informal dinner was held at Hotel La Salle in the evening. Among the speakers were W. G. Nichols of American Manganese Steel Co., who spoke on "The Engineer and Production," and S. J. Williams, whose subject was "Safety and Engineering Efficiency."

Holmes Safety Association Awards Gold Medals

Presentation Next September at Denver
—Three Lost Their Own Lives
but Saved Others

The Joseph A. Holmes Safety Association announced on June 29, the award of gold medals and diplomas to four Western miners and to the nearest surviving relatives of three others who lost their lives in attempting to rescue other miners from death. The formal presentation of the medals will be made by Dr. F. G. Cottrell, director of the United States Bureau of Mines and president of the association during the First Aid and Mine Rescue contest at Denver, Col., next September. The men who will be awarded gold medals and diplomas and the deeds they performed are as follows:

John L. Boardman, of Butte, Mont., safety engineer for the Anaconda Copper Co., who lone-handed saved three miners from death by gas in the West Colusa mine during a fire in the Leonard copper mine adjoining. He entered the gas-filled mine four separate times to save life.

Daniel Bionvich, of Biwabik, Minn., employee of the Balkan Mining Company, who drove his electric locomotive through smoke and gases in the burning Belgrade mine three times, bringing out helpless men. A fourth time he descended the shaft ladder and brought out a fellow-worker.

James Collins and **James Dilimirk**, both of Mullen, Idaho, employees of the Gold Hunter Mining & Smelting Co. While endeavoring to reach two entombed men in the mine, they themselves were caught by a cave-in, buried to the shoulders, and imprisoned for fifteen hours. The other two entombed men were finally brought out alive after fourteen days.

The following three miners sacrificed their lives in trying to save others:

Michael Conroy and **Peter Sheridan**, of Butte, Mont., both employees of the North Butte Mining Co., started down into the mine to save their fellow-men from the burning Speculator shaft, but before they reached the men at the 2,200-level the fresh air which had been coming down the shaft reversed, allowing hot and poisonous gases to come up the shaft. When the cage was hoisted to the surface, the bodies of the two brave men were found on the cage burned to a crisp.

James D. Moore, another miner at the same North Butte Mining Co. fire, collected seven men to bring to the surface, then he was driven back by smoke. He led them into a blind drift, built a bulkhead against the gases and kept up the spirits of the eight men until rescued. Sixty hours after the completion of the bulkhead, rescuers wearing apparatus found the barricade and broke through and found six men alive, though Moore and one other were dead. The six men were brought safely to the surface; they all gave credit to Moore for saving their lives.

The awards were decided upon by a committee of the Association, composed of James W. Paul, representing the Mine Inspectors' Institute of America; William Green, of the United Mine Workers of America; and John Turner, of the Mine, Mill and Smelter Workers. Others who participated in the making of the awards were James Lord, United Mine Workers of America; George S. Rice, American Institute of Mining Engineers; David White, National Academy of Sciences; O. P. Hood, Society for the Promotion of Engineering Education; Arthur E. Holder, representing Samuel Gompers, President of the American Federation of Labor; Charles D. Walcott, vice-president, and David T. Day, secretary of the Association.

Company Stores Barred on Rand —Only Act of Parliament Can Legalize Them

The institution of the company store is meeting difficulties in South Africa. The London *Financial Times* recently printed the following:

"From the onlooker's point of view it seems a pity that the appeal in the test case as to the legality of the Rand mining companies supplying goods to their native employees on favorable terms should have been dismissed. Only action by the Union Parliament could now legalize the innovation. The following is a report of the original hearing:

"In the South African Supreme Court (Transvaal Provincial Division) case—Isaac Feinstein vs. the Modderfontein Deep Levels and the Native Recruiting Corporation—in which application has been made for an interdict against respondents on the ground that they were interfering with him by trading on mining ground, Sir John Wessels, in the course of his judgment, said: "The essential idea underlying trade is buying and selling. We may say with certainty that if a person buys and sells with the intention of making a gain out of his transaction he is carrying on a trade. He may, however, be carrying on a trade even though he does not contemplate a profit. If a charitably disposed person sets up an establishment for baking and selling bread to the poor at cost price he is certainly carrying on the trade of a baker." The Judge came to the conclusion that respondents were carrying on a trade or business, saying, "The company sells the goods at cost price because it is to its advantage to do so. It keeps its natives contented by enabling them to get the goods cheaper. This advantage is a gain to the company."

"His Lordship further held that the goods sold by the company to their employees were not incidental to mining. An interdict was granted restraining the respondents from trading in such goods as shirts, trousers, socks, tunics, blankets and similar articles, with their native employees. Costs were granted to the applicant."

Book Reviews

Mining and Preparing Domestic Graphite for Crucible Use. By George D. Dub and Frederick G. Moses. Paper; 6 x 9; pp. 80. Published as Bull. 112 by the U. S. Bureau of Mines. For sale by the Superintendent of Documents, Washington, D. C., for 20c.

The graphite industry in this country normally cannot compete with that in Madagascar and Ceylon. There the deposits are large and of very high grade; also labor is cheaper than here. During the war, domestic graphite production boomed, on account of a shortage of imports, but since that time many companies have suspended operations, though many are still making money, recent reports from Alabama being particularly encouraging. Alabama and New York have the principal deposits, production from the former ranking first. Alabama is under the disadvantage, however, of being at some distance from the principal market, and from the low grade of the deposits, as the average extraction is only 19 lb. of No. 1 flake per ton. Pennsylvania has produced some graphite, and Texas contains large high-grade deposits which could be worked at a profit if marketing conditions were better.

Mining, concentrating, and refining methods are described in this book. Open-pit mining is general in Alabama, but underground working also is carried on in New York. After crushing, the ore is concentrated by one of several methods: skin flotation, the pneumatic process, the log-washer process, tabling, the Huff electrostatic process, and froth flotation. The log-washer plant is the cheapest to install and to operate. The concentrates are dried, ground in a buhr mill and screened, the graphite remaining on the screen. To treat 10 tons per hour, a complete plant would cost from \$40,000 to \$70,000.

Tests conducted by the Bureau showed that two other finishing processes might be used: (1) Treating the crude concentrates in an electrostatic separator, followed by grinding in a buhr mill and screening. (2) Grinding the wet concentrates in a pebble mill, followed by froth flotation, drying the flotation concentrates, regrinding in a buhr mill, and screening. Each type of concentrates was found to be a problem in itself.

E. H. R.

A Vocabulary of Russian-English and English-Russian Mining Terms. By C. W. Purington. Cloth; 4 x 3½ in.; pp. 128. J. B. Lippincott Co., Philadelphia, Pa.

This little book contains about 1,600 words, compiled as a result of the author's engineering experience in Siberia. It should be helpful to those who have occasion to carry on work in Russia without a good knowledge of

the language, and to those who are called upon to translate English-Russian engineering matter. Russian characters are of course used in spelling the words in that language. We do not know the price of the book, but, being very small, it is probably inexpensive.

Technical Papers

Natural Hydrocarbons—In its *Reports of Investigations* for May, 1920, the Bureau of Mines discusses the occurrence, mining, treatment and utilization of the natural hydrocarbons, such as gilsonite, elaterite, wurtzilite, grahamite, and ozokerite. A bibliography is appended.

Western Australia Statistics—The Pocket Year Book of Western Australia, for 1920, has been issued by S. Bennett, government statistician, Perth, presumably free of charge. It contains 117 pages of miscellaneous statistics, and is of vest-pocket size.

Sulphur Smoke—"Sulphur Dioxide as a Factor in the Smoke Problem of Salt Lake City" is the title of one of the mimeographed Bureau of Mines *Reports of Investigations* for May. (6 pages.) A considerable number of SO₂ determinations are given. Some of the samples were collected with an airplane.

Zinc—"Zinc in 1917" has reached us. A list of smelters is given and general data pertaining to the industry. The pamphlet is published by the U. S. Geological Survey and will later be incorporated in "Mineral Resources."

Lead Smelting—The June issue of the *Bulletin of the Institution of Mining and Metallurgy* (No. 1 Finsbury Circus, London, E.C. 2) contains twenty pages of discussion of Rigg's paper on Broken Hill practice which we reviewed on June 19.

Belgian Metallurgy—The May 15 number of *Revue Universelle des Mines* (16 Quai des États-Unis, Liège, price 5 frs.) contains a 50-page illustrated article on the metallurgical industry of Belgium before, during and after the war.

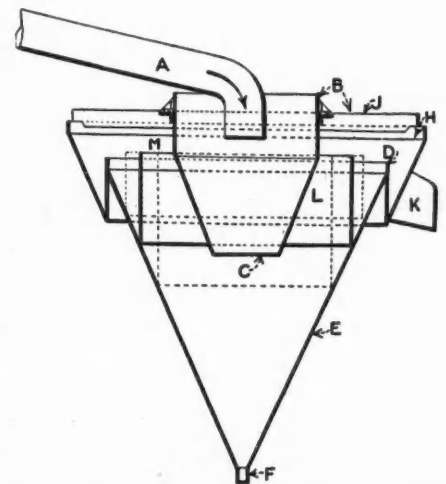
British Mineral Production—A brief history of the mineral production of the British Empire, by Frank Merricks, occupies twenty-seven pages in the May *Bulletin of the Institution of Mining and Metallurgy* (No. 1, Finsbury Circus, London, E. C. 2). Complete statistical tables of the value of the principal minerals produced by each of the various dependencies from 1893 to 1917 are appended.

Carnotite—Some hints to the prospector and a description of conditions in the Utah-Colorado carnotite fields are given in an illustrated article in the *Salt Lake Mining Review* for June 30. (Salt Lake, Utah. Price, 15c.)

Recent Patents

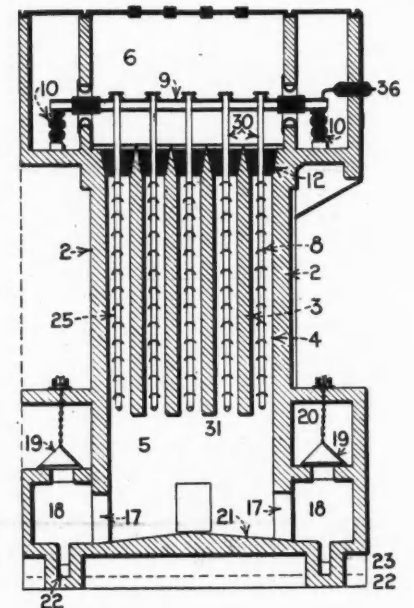
1,339,683. **Upward-Current Separating Process and Device.** Charles Allen, El Paso, Tex. Filed July 3, 1917.

A method of varying the upward movement of a liquid carrying solid particles overflowing the top of the tank in a settling device by varying the length of the overflow periphery, whereby the velocity of the overflow of the liquid over the overflow lip is controlled.



1,339,480. **Art of Separating Suspended Particles from Gases.** Walter August Schmidt, Los Angeles, Cal., assignor to International Precipitation Co., Los Angeles, Cal. Filed Aug. 27, 1917.

In the art of precipitating suspended particles from gases by electrical action, the method of maintaining a clean



electrode surface for receiving the precipitated material, which consists in distributing a liquid in a film, over a porous surface constituting a receiving electrode.

MEN YOU SHOULD KNOW ABOUT

H. G. Ferguson is examining potash deposits in the vicinity of Silver Peak, Nevada.

Elmer A. Holbrook, assistant director of the United States Bureau of Mines, took the oath of office on July 10.

C. F. Kelley, president of Anaconda Copper Mining Co., is in Butte on an inspection of the corporation's properties.

A. K. Knickerbocker, of Cuyuna, Minn., has been examining properties in the Batesville, Ark., manganese district.

G. C. Martin will make geologic surveys and investigations of mineral resources in the lower Yukon and Kuskokwim regions of Alaska.

A. G. Burritt, geologist, of Salt Lake City, Utah, has recently completed examinations of oil lands in Fremont, Sweetwater and Lincoln counties, Wyo.

J. B. Tyrrell, mining engineer and geologist, of Toronto, has gone to the Rice Lake gold district of Manitoba, to examine the Gold Pan and other properties.

Harold A. Linke, mining engineer, 226 Dooly Building, Salt Lake City, Utah, has just returned from an examination of oil lands in western Utah near Great Salt Lake.

Robert Linton, president of North Butte Mining Co., 120 Broadway, New York City, is in Butte, Mont., making his periodical inspection of the company's property there.

Bart L. Thane recently passed through Seattle on his way to Juneau, Alaska, where he will visit the property of the Alaska Gold Mines Co., of which he is managing director.

Frank A. Hughes, consulting engineer, of Philadelphia, Pa., has gone to Arizona to make examinations in the interests of the Arizona United Mining Co., Johnson, Cochise County, Ariz.

John E. Bergh, of Sturtevant & Bergh, mining engineers, Salt Lake City, Utah, has gone to Chesaw, Washington to commence development on a mining property in that district.

Frank L. Hess, of Washington, D. C., has returned from his trip to South America for private interests; but will not resume his work with the Geological Survey until later in the summer.

W. C. Hudson, mining engineer, returned to New York City recently from Ecuador, where he had been during the last two years as exploration engineer in the interests of the South American Development Co.

Charles William Wright, mining engineer, of 28 Via Parlamento, Rome, Italy, and his brother, C. A. Wright, who was formerly with the U. S. Bureau of Mines, sailed from New York for Italy on July 8.

E. P. Mathewson, consulting metal-

lurgist, who has been studying the Granby smelter at Anyox, B. C., left there about July 1. After a brief vacation in Montana, Mr. Mathewson will return to New York City about July 17.

John L. Malm, of the Malm-Wolf Co., sailed on July 6 from New York for England and the Continent. Mr. Malm will visit metallurgical establishments in England, Belgium and France before returning to New York early in September.

Thomas Turnbull, of Crosby, Minn., superintendent of the Croft mine, has been appointed Cuyuna Range superintendent of the John A. Savage properties, the Croft and Sagamore, to fill the vacancy caused by the death of John F. Murphy.



JAMES M. HILL

J. M. Hill, who has been placed in charge of the San Francisco office of U. S. Geological Survey, was born in Chicago, Ill., Feb. 14, 1884. His education was obtained in that city. He was graduated from the University of Chicago in 1906, and there attained the senior scholarship in geology. In addition to post-graduate work in the University of Chicago, he studied at Armour Institute and at the Michigan School of Mines. Practically all of Mr. Hill's experience has been with the U. S. Geological Survey, which he joined thirteen years ago. He has done geological reconnaissance work in practically all the Western states and has been engaged in several detailed geological studies in the West. Since 1912 he has been attached to the Mineral Resources Division of the Survey, and most of that time he has spent in specializing in platinum, gold, silver, and other precious metals.

J. B. McIntosh, superintendent of construction at the Murray plant of the American Smelting & Refining Co., has resigned to accept the position of chief mechanical and construction en-

gineer for Cia. de Real del Monte y Pachuca, Pachuca and Hidalgo, Mexico, and left for Mexico on July 15. Mr. McIntosh acted as civil engineer for the Anaconda Copper Mining Co. for many years, having a prominent part in the construction of the Washoe smelter. In 1907 and 1908 he was engineer in charge of construction for the company's Tooele smelter, but resigned to go to Bisbee, Ariz., where he directed the preliminary work on the Clarkedale smelter. For the last eight or ten years Mr. McIntosh has been attached to the engineering division of the Utah department, A. S. & R. Co., and has executed several notable improvements in that company's plants.

OBITUARY

Enos A. Wall, mining man of Salt Lake City, Utah, died there on June 29 at the age of 81 after a long illness. Mr. Wall was one of the prominent mining men of Utah for many years, being particularly identified with the Utah Copper Co. holdings which brought him great wealth. He was born at Richmond, Ind., on June 23, 1839, went to Colorado in 1860, and in 1863 was prospecting for gold in Montana where he engineered the short-cut from Fort Bridger, Wyo. In 1889 Wall, whose inventive mind had already produced a number of new designs in mining machinery, recognized the possibility of concentrating and recovering value from the low-grade copper ores at Bingham Canyon and he at once started to secure the property which later formed the foundation of Utah Copper Co. prosperity. The law suit over the finances of that company, which he started in 1906, was later withdrawn and it passed under the Guggenheim interests. In recent years he had undertaken the rejuvenation of an old Park City property.

SOCIETY MEETINGS ANNOUNCED

Nevada Section, American Institute of Mining and Metallurgical Engineers, has postponed indefinitely the meeting previously scheduled for June 25-26 at Tonopah, Nev. Probably the session will be held in November.

It has just been definitely announced that Third International Mining Convention at Nelson, B. C., will be held on July 20 to 24. The officials in charge of arrangements plan that, in addition to a very interesting program and mineral exhibits, there shall be an enjoyable and instructive excursion to the leading mines of the Slocan district. Those interested should address Fred A. Starkey, Associated Boards of Trade, Office of the Commissioner, Nelson.

THE MINING NEWS

LEADING EVENTS

Flotation Inquiry Resumed in San Francisco

Latest Testimony Before Federal Trade Commission Reveals Little Not Already Known

The Federal Trade Commission hearing in the Minerals Separation case, transferred from New York to San Francisco, was resumed on July 6 and continued until July 10, Commissioner Huston Thompson presiding. G. R. Hawkins and C. R. Porter appeared as counsel for the commission and Alfred A. Cook for Minerals Separation, with C. B. Allen as secretary.

E. H. Nutter, the chief engineer for the flotation company, was the first witness. He testified as to his duties and to the work of his technical staff. Some of the sources of information were given, whereby lists of probable infringers were compiled. Some of the company's instructions to field employees were made clear, and the practice of maintaining a complete file of clippings was explained. Licensees were given the benefit of any new ideas secured by Minerals Separation as part of the service for which they paid. No entrance to licensee's plants was demanded without permission. Mr. Nutter mentioned the matter of charging infringers a double royalty for the period of infringement and defended the company's policy by saying that it would be unjust to licensees if those who had not taken out licenses were treated no better than those who had evaded payment for the privilege of using the process. The relation of the favored licensee was also explained.

J. A. Pearce, a metallurgist of Berkeley, then testified as to the restrictions which he encountered from the Minerals Separation company, when he attempted to introduce a flotation machine of his own invention. W. B. Shores of the Stimpson Equipment Co. told of his attempts to introduce Janney flotation machines into the mill of the Engels Copper Co. and of the opposition encountered from M. S. James L. Freeman of Chicago testified as to the royalties paid to Minerals Separation for the use of their process on Alaskan gold ore.

Cordial relations had always existed between his company and the flotation concern, according to D. E. Paxton of the Engels Copper Co., who said that the success of his company depended upon the use of the flotation process. However, he considered that under the present circumstances the royalties to Minerals Separation were burdensome.

Theodore J. Hoover testified concerning his employment with the de-

WEEKLY RÉSUMÉ

The Federal Trade Commission holds hearings in San Francisco reviewing flotation litigation. The testimony presented reveals little that has not been disclosed by court procedure elsewhere, although much information is forthcoming from both sides. The Northern Minnesota Ore Co. transfers its manganese operations from Cuyuna, Minn., to Batesville, Ark., due to prohibitive Minnesota mining costs and a small manganese market. The Minnesota mines are permitted to be flooded. The mines of the Dolores Company, at Dolores, Chihuahua, Mexico, are to be opened after an inactive period of five years. Extensive repairs and remodeling will be necessary.

The Colorado Experiment Station of the U. S. Bureau of Mines, which was recently removed from Colorado, will find its new home in Reno, Nevada, where extensive experimentation is planned. Rare-metal work is to be continued, and a comprehensive scheme is advanced covering work upon Nevada's most pressing mining and metallurgical problems. More War-Minerals' Relief awards are made. U. S. Bureau of Mines plans a non-metallic experiment station in the South.

fendant company and introduced the Sulman and Picard manuscript on the theory of flotation by surface tension. After argument by counsel this was allowed to go into the record. The witness believed the Minerals Separation royalties to be excessive and their restrictions on the publication of information in connection with the development of flotation, onerous. Being criticised for his ethical position in publishing information obtained while in the employ of M. S., he stated that he considered it a public service for him to make known such information. On cross examination, Attorney Cook introduced the terms of Mr. Hoover's employment contract and showed that Hoover was in the employ of the Miami Copper Co. from July, 1919, to April, 1920.

The general phases of the situation were discussed by T. A. Rickard, who gave the opinion that Minerals Separation had only contributed to the development of flotation, and that much of the work had been done by others. W. B. Shores was then recalled and testified as to the comparative tests of Janney and M. S. machines and related what he considered unfair statements of Minerals Separation relative thereto. J. B. Quigley and A. Roberts of Minerals Separation told of their field duties and instructions.

The whole hearing really developed little which was not known before.

The five Dominion Steel Corporation interests headed by J. H. Plummer, who issued a call for proxies to oppose consolidation with other companies in British Empire Steel Corporation pending fuller information, were recently dropped from the directorate.

Minnesota Company Transfers Activities to Arkansas Field

The Northern Minnesota Ore Co. closed down its Northland mine, an underground manganese property north of Cuyuna, Minn., on July 10, and allowed the shaft to fill with water. No mining had been done since October 28, 1919, but the shaft and drifts had been kept unwatered. No ore has been shipped, and property has a stockpile of about 5,000 tons. Inability to sell the ore at satisfactory prices is given as reason for the shutdown. The company has purchased 600 acres of manganese land in the Batesville district, Arkansas, and will transfer its immediate activities to this field. The property lies about 1½ miles east of Cushman, in Sec. 10-11-14, and Sec. 15-14-7. A power scraper will be used in the shallow clay areas, where chert is absent, and mining will be done by hand. At the same time the company will carry on intensive prospecting with the idea of blocking out a steam shovel area and later erecting a washing plant.

Dolores Company to Open Chihuahua Mines

The mines of the Dolores-Esperanza Co. at Dolores, Chi., on the Mexico Southwestern railroad, will be opened within a short time after an inactive period of five years, according to a recent announcement by the officials of the company in El Paso. Extensive repair work will be undertaken before the opening of the mines, including timbering and repairs to equipment. A modern power plant will be constructed at Madera and power will be transmitted to the plant by means of a power line.

A special session of the South Dakota State Legislature was recently called by Governor Norbeck. Matters of importance are to be taken up, among which is that of state-owned and operated industries. The state-owned power plant utilizing the waters of the Missouri near Mobridge has been investigated by engineers and their report will be acted upon at this session. The project will call for an expenditure of about \$3,000,000. The state-owned cement plant is another industry which has been thoroughly investigated but the site for the plant has as yet not been decided.

The electrical engineering department of the University of Arizona lately received a number of electric motors as gifts from the United Verde Copper Co. and the Ray Consolidated.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Colorado Station To Be Moved To New Home at Reno

Many Varied Problems To Be Solved
in Connection With Mining Activ-
ities in Nevada

The experiment station of the Bureau of Mines, which has been located for a number of years at Golden, Col., has been moved to a definite location at Reno, Nev. In the future, the station will be known as the Rare and Precious Metals station. The station is to be conducted in co-operation with the University of Nevada, which has obligated itself to construct a new building for the housing of the station. This building is to be erected at a cost of not less than \$30,000 and is to follow plans drawn up by the Bureau of Mines. The construction of this station will embody the experience of the Bureau in the conduct of its various experiment stations.

The location of the station at Reno was not made until the ground had been gone over very carefully by Dorsey A. Lyon, the supervisor of stations. Mr. Lyon spent several weeks in the West engaged exclusively on the problem brought out by the necessity of moving the station from Golden.

It is admitted that Nevada has a long list of problems which are in urgent need of the attention which can be given them at this station. The results of this work will have an application over a much wider field than the state of Nevada. The problems, which are regarded as being in need of immediate study, are as follows:

1. A study of mining methods in narrow veins and the determination of the limiting factors of the various methods with regard to inclination of vein, pitch of ore shoot, strength of walls, width of vein, etc. Especially good opportunities are presented for the study of this type of mining in Nevada. In some cases, as many as three different mining methods are in use simultaneously in the same mine.

2. An investigation of diamond drilling in Nevada porphyry and the invention of a suitable drill for this purpose. At the present time it is practically impossible to use the diamond drill in western Nevada because the porphyry has alternate hard and soft streaks that render its operation uncertain and expensive. Other states have the same problem in individual instances but it is more serious in Nevada than anywhere else.

3. An investigation of the cyanidation of silver ores with a view to reducing the losses. This would be a fine problem for Nevada since Nevada is the greatest producer of straight silver ores in the United States. Low extractions mean great annual losses. They are due in some cases to unknown factors, as at Rochester where but 88

per cent can be obtained in place of 93 per cent, at Tonopah, and to known factors such as the presence of manganese which reduces the extraction at Candelaria and elsewhere. There is no other station doing work of this character.

4. Discovery of a cheap method of extracting lead and silver from low grade oxidized ores. There are great quantities of such ores throughout Nevada, as for example in the neighborhood of Eureka.

5. Investigation of processes for the extraction of oil from shale.

6. Discovery of a cheap method of extracting copper and silver from low grade oxidized ores. There are immense quantities of such ores throughout Nevada and in Mono and Inyo Counties, California, which would be tributary to the Reno station.

7. Commercial methods of treating low grade lead-zinc sulphide ores like those at the Simon Lead mine. These ores are fairly widely distributed in Nevada and in adjacent parts of California.

8. Investigation of methods for the extraction and recovery of all metals of value in base ores, i.e., ores containing gold, silver, copper, lead, zinc, and iron.

9. Slime settlement, use and conservation of lime, regeneration of cyanide, problems of fouling solutions, improved methods of precipitating silver, and of treating material swept up on tailing ponds.

10. Treatment of antimonial and arsenical ores carrying gold and silver. A large amount of this type of ore is reported to exist at Manhattan and at Northumberland, Nevada.

11. The treatment of low grade silver-lead ores. These are said to occur in large amounts at Eureka, Nevada, also in the Yellow Pine district in Clark County.

12. Treatment of the concentrate produced in such mills as those at Tonopah. A similar problem would be the treatment of flotation concentrate.

13. Treatment of complex sulphide ore which is found at Buckhorn, Nevada. A large tonnage of about \$8 or \$10 ore is reported in this camp which has resisted all attempts to work it.

14. Leaching of oxidized copper ores. These occur in large amounts in the following districts: Ely, Yerington and Luning, and in smaller amounts in many other districts of the State. The best figures from the Ely district indicate that over 30% of the copper entering the concentration passes out in the tailing. As this plant in normal operation treats per day as high as 15,000 tons of ore running nearly 2% copper, a loss of 30% of this copper would amount to a loss of between \$30,000 and \$40,000 in a single day. If this ore problem could be successfully solved, it would save in one day and in a single copper mining plant in Nevada approximately the whole cost of operating the Mining Experiment Station for a whole year.

15. Concentration of mercury ores. Applicable to several small districts for example, Battle Mountain, Winnemucca, near Rochester, and Mina.

16. Increased recovery from sulphur ores. Applicable to Sulphur, Nevada, and near Cuprite.

17. Production of rare metals. Applicable to platinum from Goodsprings and Bunkerville.

18. Conservation in the concentration of tungsten ores. Applicable to mills in the following districts: Lovelock and Mill City (three mills), Mina (one mill), Ely District.

19. Study of the utilization of the non-metallic resources of the State.

20. General investigations of waste in metallurgical industries in the State.

21. General study of co-operation between the small mine operators in the State.

22. Study of the methods used in crushing ores and a comparison of results secured by different machines.

It is pointed out that a few thousand dollars annually applied successfully to the solution of such problems as the above would result in the addition of many millions of dollars for the mining industry.

Recent War-Minerals' Relief Awards

Awards recommended by the War Minerals Relief Commission for the week ended July 3 are as follows: (The claimant, the mineral, the amount recommended and its percentage relationship to the amount claimed are shown) T. F. Adams, manganese, \$393.10, 11 per cent; Paga Mining Company, manganese, \$5,002.70, 43 per cent; Dubakella Mining Company, chrome, \$2,981.80, 68 per cent; Cypress Chrome Company, chrome, \$2,738.73, 73 per cent; J. A. Nichols, chrome, \$592.81, 29 per cent; Shiell and Prattie, \$662, 100 per cent; Haynes and Mullen, \$867.78, 37 per cent.

On July 1, the War Minerals Relief Commission had acted on 880 claims in which the total amount asked of the government was \$9,621,363.90. The administrative expenses of the Commission to that date aggregated \$261,786.68, or 2.72 per cent of the amount of the claims handled.

To meet the demands of its work, the Bureau of Mines is strengthening the chemical side of its investigations. This work will be conducted principally by O. C. Ralston, the superintendent of the experiment station at Seattle; L. H. Duschak, at Berkeley, Cal.; C. M. Bouton, at the Salt Lake station; Dr. Thomas B. Hine, at Tucson, and Dr. S. C. Lind, at Reno.

Non-Metallic Experiment Station for the South

Chapel Hill, N. C.; Atlanta, Ga.; Birmingham, Ala.; Tuscaloosa, Ala., and Knoxville, Tenn., are contenders for the non-metallic experiment station which is to be established in the near future by the Bureau of Mines. Each of the places mentioned claims to be situated advantageously in regard to non-metallic raw materials which are becoming of increasing importance with the rise of the chemical industry.

Mid-Year Production Reports

The mid-year reports on metal mining in the western states will be issued by the Geological Survey during the week beginning July 19. These reports will give estimates of production for the first six months of the current year. In the past, these estimates have come within one or two per cent of the exact output as shown by the final figures. It is expected that the estimates will show a very considerable falling off in both gold and silver production.

Vocational Plans Under Way

Plans are maturing rapidly for the vocational rehabilitation of persons disabled in industry. This activity is made possible by a law enacted at the recent session of Congress. It provides that the Federal Government shall pay half and any state that elects to co-operate must pay the other half. During the first year, the Federal appropriation is limited to \$500,000. This is increased to \$750,000 the second year, with \$1,000,000 as the maximum amount in the third year.

NEWS BY MINING DISTRICTS

ARIZONA

Tucson—Complaints are made that the State land-lease law in a number of instances has been operating to the detriment of the miner, though every lease is given subject to any rights there may be upon the land in the way of mineral, including oil. It is said that a lease for grazing may be uncomfortable for the miner who happens to be working a claim within the tract that may be inclosed and stocked. The miner must make proof that he has mineral, and that his claims may be excluded from a lease—this proof often is expensive.

In Oro Blanco district, near the Mexican line, there has been a return to pioneer processes in the working of gold ore from decomposed croppings. J. C. Holden has a claim he calls the Grubstake, from which he is making about \$10 a day by the primitive method of crushing in a mortar and washing in a gold pan. There is available only a seep of water and washing can be prosecuted only a few hours each day. In the same section other miners, similarly operating, pack their ore to a creek at a distance and there wash it.

Patagonia—A late rainstorm exposed very attractive croppings on open ground immediately south of the famous World's Fair mine. The ground has been located by Frank Huntington, Edward T. Sheehy, and Frank Powers and the claim has been named the Hiram Johnson, possibly because the vein trends into the nearby Roosevelt mine. The new vein is about 25 feet wide and carries high copper values in bornite.

Clifton—The American Silver Corp., which for two months has been operating the Socorro property at Mogollon, N. M., has ordered discontinuance of all activity, throwing out of employment a large force of men, headed by D. B. Scott.

Willcox—The 50-ton mill of the Dives Co. at Dos Cabezas is operating steadily with two shifts and a third shift is to be added. A force of 25 is employed, under Frank F. Friant.

Bisbee—The Phelps-Dodge and Calumet & Arizona Cos. are making special inducements to employees for homebuilding. Money for homes is loaned for gradual repayment within 100 months, at 6 per cent interest.

Miami—The wonderful vegetable garden system of the Inspiration Co.'s employees has been damaged to possibly \$20,000 by a late hailstorm, according to expert W. A. Sandige, in charge. Melons were about ripe and were ruined by hailstones that drove through their sides. There also was large damage to tomatoes, corn and peppers.

Yuma—Very rich silver ore is being exhibited here by D. M. DeLong, taken from the Black Rock and Silver Glance mines, north of Yuma, on the western side of the Colorado River, across from Picacho. At 200 ft. dept in the Black Rock the ledge is 12 ft. wide and at 350 ft. depth 30 ft. wide.

Nogales—The Animas mines at San Javier on the Mexican West Coast are reported bought by the United States Smelting, Refining and Mining Co. of Boston. The same corporation operates the Real del Monte mines in the Mexican State of Hidalgo and mines in Arizona, Utah and California.

Jerome—A mill of at least 50-ton capacity is to be built on the property of the Verde Mines Co., seven miles south of Jerome. Mill runs made on the company's ores gave returns of from \$25 to \$40 a ton in gold and silver. A double-compartment shaft is to be sunk, to cut the ore on the dip at 600 feet, probably in sulphides. President W. F. Burns has been in charge at the camp.

Kingman—The 400-level of the Catherine mine has been flooded and operations will be concentrated on the 300-level until proper pumping facilities have been provided.

Crosscutting in the Thumb Butte has cut the main vein and also has found a heavy flow of water.

United American has drifted nearly 200 ft. on a vein of milling ore believed to be a continuation of the Tom Reed orebody.

Arizona Mossback stockholders have authorized issuance of \$500,000 in bonds to cover the cost of installing a mill on the property at Oatman.

The Arabia property in Union Pass is reported taken over by the El Tigre corporation, operating in Sonora, south of Douglas.

Activity is promised this fall on the well-known White Hills mines, northwest of Chloride.

Safford—The Grand Reef mine in the Aravaipa mining district of Graham County, owned by Richard V. Dey of New York has been purchased by the Aravaipa Leasing Co., which is controlled through stock ownership by the American Lead and Zinc Co.

Morristown—The Plomo King mine is hauling in lead-silver ore for shipment to the El Paso smelter. Recently the property was equipped with a hoist and compressor. A shaft is being sunk to a depth of 300 ft. The shipping ore comes from ground opened up last winter.

Kelvin—The Ray Verde Copper Co. developing the Tillman copper group in the Ripsy mining district, nine miles south of here is installing a hoist and compressor. The old shaft has been abandoned and a new one is to be sunk. Albert Hoch is in charge. The No. 1 diamond drill hole on the old Kelvin Sultana property now being prospected by the Ray Boston Copper Co. has reached a depth of slightly over 1,200 ft. It is expected that the ore shoot will be cut in the next 200 ft.

Ray—The Ray Lead Development Co. has resumed operations. About forty men are employed at present.

CALIFORNIA

Engelmine—John Reinmiller, former superintendent of the Engels Copper Mining Co., has recently taken over the Milcaller group, located about two miles northwest of the upper mine of the Engels company in Plumas County, and is developing a vein in which the average values are high. A winze being sunk on the vein is now down 65 feet and it is all in ore that averages

eight per cent copper, four ounces silver, and \$2 gold per ton. The full width of the vein at this point is not known as all four sides are in ore of the same grade.

Sutter Creek—The 3,500-ft. shaft of the Old Eureka group has been completed and a station is now being completed on the 3,000 level. Extensive developments are planned, promising veins have been exposed, and rich orebodies are indicated.

Tuolumne—The sinking contract let by the Central Eureka Co. is nearly finished, and the company reports that several promising veins have been uncovered. The ore production continues to amount to about \$40,000 monthly.

The Grizzly mine has been dewatered and preparations are being made to sink the shaft an additional 100 ft. It is now down 1,650 ft. A 4-ft. orebody has been exposed at the bottom of the incline shaft.

Grass Valley—In the Grass Valley district the new wage scale went into effect on the first of July, and the labor situation is already showing signs of improvement. The new scale ranges from \$4.75 for muckers to \$5.25 for timbermen, with an extra 50c. daily when the work is unusually hard or hazardous.

Redding—The Shasta Zinc & Copper Co. is to erect a zinc-oxide and zinc concentrator plant at Delamar. Recent reports from the Bully Hill mine state that a large deposit of high-grade zinc ore has been exposed in the lower workings of the Rising Star shaft. The ores also carry much copper and some gold and silver.

The Mammoth Copper Co. is doing considerable development work on the orebodies recently uncovered, and is replacing the tonnage depleted by heavy drains during the war.

IDAHO

Kellogg—Raising is in progress from the main tunnel level of the Nabob Consolidated mine, near Kellogg. The raise has attained a height of 20 ft. and will be continued to the next level above, which is 220 ft. higher than the main tunnel. The work will be completed in six weeks.

The Orogrande Gold Mining Co. near Stites has increased the capacity of its mill to 500 tons daily. The designed capacity was 300 tons. Changes and improvements will be made in the method of ore dressing.

Workings of the Baltimore vein of the Silver Triumph Mining Co. in the Coeur d'Alenes have been entered for the first time in 30 years, ore containing 39 ounces in silver to the ton, 20 per cent lead and 18 per cent zinc. The discovery is 60 ft. from the surface. The old workings honeycomb the ground on two tunnel levels. The orebody between the main tunnel level and a point 150 ft. deeper is 6 ft. wide and gives promise of a greater width. Development in several parts of the

mine disclosed mineralization that exceeds expectations.

MICHIGAN Copper District

Calumet—The coal situation continues to be the most important problem for every copper mine in Michigan. The mines now are running from week to week. The solution of the problem is in no wise helped by the knowledge that there is no hope for any reduction in coal prices and that there is doubt that coal in sufficient amount may be secured even at the present prices. To add to the general pessimism there is the continued shortage of labor and the fact that there is little evidence in copper shipments of any great demand for the product of the mines.

Wolverine is showing a slight improvement in contents this month, and the rock, which is being sent to the Wolverine mill, averages 20 lb. to the ton. Wolverine No. 4 shaft is shut down temporarily although the tonnage is increasing from No. 3. The Wolverine stamp mill is out of commission for a few weeks so that repairs can be made to the rock bins. Meanwhile ore is being stamped at the Mohawk mill. The bulk of the ore is being obtained from the 38th level and the four levels above, including footwall arches and pillars. It is no longer necessary to handle the extra water which has been coming through from the South Kearsarge as Wolverine now is holed through to North Kearsarge.

The Seneca shaft is approaching the fifth level. The third and fourth level drifts are being pushed to the proper limits in order to secure greater lateral distance before further stoping is done. Under existing metal conditions this is a consummation not entirely objectionable. The Gratiot shaft development is showing much barrel and small mass copper.

MINNESOTA Cuyuna Range

Cuyuna—The Merritt mine has been fully unwatered, and two shifts have been placed at work. A third shift will be added soon. The company has sold its season's output of high manganese ore to the Carnegie Steel Co., averaging from 18 to 20 per cent.

The Hanna Ore Mining Co. will construct a new concrete block engine house and change house at the Feigh mine. New equipment will include an electrically driven drum hoist, an air compressor and a generator and two 125-hp. boilers for auxiliary power.

Mesabi Range

Nashwauk—Operations have been resumed at the Pearson and will be conducted on the day shift only for the present although it is expected to put on the double shift later. The Pearson was one of the first operations in this district but has been idle for a number of years. Two years ago it was taken over by Clement K. Quinn and associates who are now operating

it. The mine equipment includes a washing plant.

Gilbert—The old Mariska mine has been leased by the Mariska Iron Co. from Robinson & Flinn and dewatering will be commenced soon. New equipment will include electrical machinery and additional buildings as well as a new washing plant designed to handle 1,000 tons per 24 hours. The headframe will be remodeled to adapt itself to washing practice so that the ore may be conveyed through the plant or shipped direct or stockpiled. The Mariska was opened by the Republic Iron & Steel Co., in 1907, and abandoned by them in 1911 after making a total shipment of 133,685 tons.

MISSOURI

Southeast Lead District

Labor shortage is quite a serious factor in St. Francois County and all the large mines are more or less crippled for lack of full crews. The Leadwood property of the St. Joe Co. and the Elvins property of the Federal Lead Co. are running at about 50 per cent capacity.

The St. Joe Lead Co. is drilling in Crawford County, near Westover, some forty miles west of Bonne Terre, where they have optioned a tract on which the "Bonne Terre" limestone outcrops. They have also optioned the Schulte tract, near Fredericktown, in Madison County, where considerable lead and mixed copper-cobalt-nickel sulphides have been found. The property is near the North American mine.

The Milford tract on Big River which adjoins the Desloge mine has been purchased by Jack Elledge, who will drill soon.

The Annapolis Lead Co., at Annapolis, on the main line of the Iron Mt. R.R., recently lost its new shaft at a depth of 60 ft. through caving and this is now being recovered and concreted. Work on the surface plant is proceeding slowly as it has been decided to delay completion until the orebody has been developed by the new shaft.

The Picher Lead Co. have purchased the Fisher lead mine, near Anaconda, Franklin County, where a small but rich shallow run of sheet lead ore has been found on each side of a draw, the pay streak showing 6 to 16 in. of solid galena.

A new shaft is being sunk at the Beulah pyrite mine, in Franklin County.

MONTANA

Conferences Between Company Officials and Labor Elements at Butte—Wisconsin Mining Students in Montana

Butte—The Metal Trades Council at a conference of the different mining companies presented their demands for what amounts to an all-round increase in wages of \$1 a day and five and a half days as a week's work. The representatives of the companies operating in this district listened to the demands of the men and at the conclusion C. F. Kelley, president of the

Anaconda Copper Co., speaking for all companies, said that the increase asked could not be granted as conditions in the metal market were such as not to warrant any change from the wage scale and working conditions existing under the contract at the present time. The representatives stated that they would report the decision of the companies to their respective unions. Before the contract can be terminated by either side 30 days' notice must be given. The organizations asking for increases include the machinists, engineers, pipe-fitters, blacksmiths, electricians and other metal trade crafts. One of the leaders in the metal trades council has stated that there would not be any strike. The men would stay on the job, he said, but would govern themselves in the amount of work performed by the wages received.

The 500-ton mill being erected at the property of the Boston & Montana Development Co. is expected to be in operation by early this fall, according to the announcement of Manager John D. Pope. The machinery is practically all in position and the work of enclosing the building is now going ahead.

In view of the close relations existing between the Davis Daly Co. and the Butte-Ramsdell Co. it seems to be generally accepted that the option given a short time ago on the latter property is in favor of the Davis Daly.

Benjamin B. Thayer, vice-president of the Anaconda Copper Mining Co., and Mrs. Thayer are at Swan Lake, the guests of Mr. and Mrs. C. F. Kelley, at their summer home.

A party of Wisconsin mine students from the University spent a week in this city going through the leading mines of the district in both copper, silver, zinc and manganese and later went to Anaconda where they spent a couple of days looking through the big Washoe smelter and other plants of the Anaconda Co. From here the party went into the Coeur d'Alene district to inspect the lead and silver properties.

The mines in the Phillipsburg district are turning out 500 tons of manganese a day which is being shipped east. In addition to the manganese the district is producing about 400 tons of silver ore a day, and altogether in the various mines employment is given to about 1,000 men, which makes this old-time mining district assume a lively aspect.

Between the treatment of ore of the company's own mines and the custom ore received the Washoe smelter is working about 60 per cent capacity. The zinc and manganese ore is treated at the plants at Great Falls.

The Davis Daly miners in the Colorado have cut through into the Butte-Ramsdell ground to follow a rich body of ore uncovered within 30 feet of the Colorado-Butte-Ramsdell dividing line. There is an arrangement with the management of the Butte-Ramsdell

whereby the Davis Daly people can follow the orebody, which is said to be rich in both copper and silver. The Colorado is hoisting 150 tons of ore a day and having it treated at the East Butte smelter.

NEVADA

Talapoosa—Major W. H. Ferguson has let two contracts for some preliminary development work which he has started on the Talapoosa mine, located about sixteen miles east of the Comstock. There is a large mineralized area at the Talapoosa of much promise, which has never been prospected at depth and it is the intention of the company which Major Ferguson represents to do this. In about two months it is expected to have a considerable force employed and extensive operations under way.

Nevada Douglas—Henry I. Moore, manager of the Nevada-Douglas Consolidated Copper Co.'s mine in the Yerington district, states that the refinancing of the company has been completed, the bonds all sold, and active operations will begin within the next few weeks. The erection of a flotation plant has been considered, but negotiations for treating Nevada Douglas ores in the Bluestone plant are under way and if successful it is probable that the Nevada Douglas company will install a reverberatory furnace to treat the concentrates from both mines.

Spruce Monarch—The Spruce Monarch mine at Spruce mountain in Elko County is shipping an average of 50 tons a day of ore that nets the company \$30 per ton, according to Sam C. Soupcoff who has recently visited the property. This is coming from a new orebody on the 450-ft. level which has been drifted on for a distance of 175 feet. The ore is hauled to Tobar on the Western Pacific R.R. and goes to the smelter at Murray, Utah.

Gold Circle—The Gold Circle Queen Mining Co. is crosscutting to the vein on the 315-ft. level, which will be reached within a few feet if there has been no change in its dip below the 230 level. If the improvement noted at the latter level is found on the 315-ft. level the company expects to build its own mill for treating the ore.

Virginia City—D. Hayden Collins, of Pittsburgh, Pa., who is interested in the Standard Metals Co.'s mine near Reno, Nev., has bought the Virginia Silver mine near Virginia City, Nev.

Dun Glen—The Buena Vista Del Oro company has commenced operations on the property which it acquired last fall. They have completed a wagon road and are said to be arranging for the building of a 100-ton mill.

Mina—Crosscut 701 on the seventh level of the Simon Silver-Lead Mining Co. property, Simon district, Mineral County, has penetrated an orebody 30 ft., according to the last report received from the mine. Indications point to this orebody being the down-

ward extension of the ore opened at the surface north of the Copper shaft and not the principal orebody developed on the fourth, fifth and sixth levels.

Drillers sinking the well to develop water for milling purposes report the hole which will take a 12-in. casing, down a distance of 455 ft. when work was stopped to allow the men to celebrate the holidays. Water struck at 151 ft. rapidly rose to the 130-ft. level where it continues to stand.

NEW MEXICO

Lordsburg—A. J. Stockridge, who has a lease and bond on the Ben Hinds gold property known as the Rocky Trail, has purchased a complete 50-ton concentrating mill from F. Fornfelter of Lordsburg, N. M. The mill will be moved to the mine and set up at once.

Brock, Weston & Kern are down 170 ft., showing a four-foot vein with a 12-in. streak of very high grade carrying gold, silver, lead and copper. They will move the old Brock mill to a point in the valley just below the mine and distant three miles. Concentrating tables to complete the mill will be purchased at once.

Central—Juan Padilla, who is operating a property owned by Clark Rodgers and Col. H. H. Betts at Lone Mountain shipped 10 cars of silver ore to the El Paso smelter during June.

Tyrone—The old Telegraph mine on the Gila River, 30 miles southwest of here, is being worked by Dorsey and Spencer. They are working on an old shaft that showed valuable ore in the early operations. The inaccessibility of the property prohibited the handling of anything but the highest grade in those days, consequently great quantities of low-grade ore are looked for in the present operations.

Silver City—Some good silver indications have been struck at the bottom of the Silver Spot shaft. It was necessary to stop work on account of an inrush of water. This is being satisfactorily handled by a 200-gal. sinker.

UTAH

Increased shipments from most Utah camps, as well as the somewhat larger dividend returns made during the first six months of 1920, as compared with the same period of 1919, are reflecting the better prices being received for silver, lead, and zinc, and this in spite of the handicaps of high costs and labor shortage. Dividends from Utah mines for the first half of 1920 were \$5,706,171, as compared with \$5,586,083, a gain of \$120,083. A larger amount of low-grade ore with silver content than usual was shipped, and it is hardly likely that since the drop of the metal to a somewhat lower level, so much ore of this character can be utilized. Park City shipped 53,443 tons of ore and concentrates as com-

pared with 35,368 tons the first six months last year, but a part of this increase must be laid to more favorable operating conditions, as the camp did not suffer any inconvenience comparable to the I.W.W. strike of 1919 year. Tintic, which last year did not suffer from I.W.W. activities to any appreciable extent was this year handicapped somewhat by the switchmen's strike of two weeks and a smelter embargo of about two weeks on some of the mines, so that shipments are a very little lower than last year, the difference in favor of the first six months of 1919 amounting only to 95 cars, when 3,632 cars of ore were shipped as compared with 3,537 thus far in 1920. Returns from Bingham are not yet in, but shipments are expected to show a small increase.

royalty is naturally higher than when the miners must seek out their own ore, in some cases up to 75 or 85 per cent, and the groups working in each stope are privileged to oust any of their number who does unsatisfactory work and take in another miner. The plan is practically, as it works out, in the nature of extra compensation for efficient work, and is said to be proving profitable to both the company and the men. This mine during the first six months of 1920 shipped 981 cars of ore, being by 407 cars the heaviest shipper in the district.

Summit County

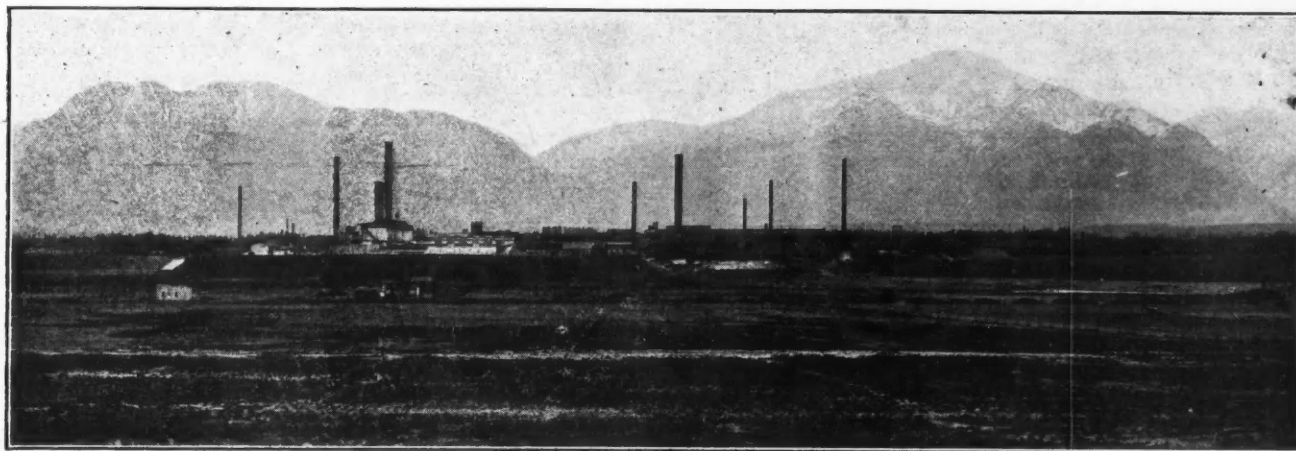
Park City—The Naildriver Mining Co. reports that the ore of shipping grade they recently opened has widened to 3 ft. There are good showings

silver-lead ore on three levels and in three veins," says W. E. Seelye, vice-president of the property. "On the No. 2 level ore has been followed for 127 ft. The maximum value of the high grade is 106 ounces of silver and \$60 in lead to the ton. About 85 per cent of the values of the mine are silver. The width of milling and shipping ore is from 5 to 9 feet on one level. Four carloads of ore have been shipped to the smelter and several hundred tons of milling and shipping ore are on the dump, ready to be sorted for shipment."

CANADA

Ontario

Kirkland Lake—Work has been started on the excavation for the



INTERNATIONAL SMELTING CO.'S PLANT, TOOELE, UTAH

Juab County

Tintic—Tintic Standard Mining Co. during the first six months of 1920 shipped 574 cars of ore. In June 100 cars were shipped, and the tonnage could be considerably increased if more miners were available. A part of this ore is coming from the lowest or 1,450-ft. level of the mine, and a winze will be sunk below this level, preparatory to further shaft sinking later. At the south end of the property, in which a shaft was recently sent down, drifting is being done on the 1,000- and 1,200-ft. levels. One of the drifts on the latter level, which has 1,200 ft. still to go, will connect with the large stopes now productive and is driven chiefly for ventilation, although it is expected that ore will be developed before reaching the stopes in question. Good progress is being made in building the experimental mill for low-grade ores. Shipments from the camp for the week amounted to 148 cars, as compared with 149 cars the week preceding. There were twenty shippers.

The Chief Consolidated Mining Co. is granting some of its old employees the privilege of working in stopes under a co-operative plan whereby the miners are allowed to work the ore under a group leasing system. The

on the 900-, 700-, 600- and 500-ft. levels. The company has entered into a hauling contract, and it now expects to ship up to 200 tons of ore weekly. Work intermitted for a few days at the Ontario Mining Co. property, due to the breakdown of the large compressor and to make other repairs, was resumed after the holiday over the Fourth of July, and conditions at this property are as usual. The Judge Mining & Smelting Co. is opening a store which will sell goods to its employees at cost. The Silver King Coalition Mines Co. is working 190 men and could take on more if they were available.

WASHINGTON

Spokane—The shipment of ore has been resumed from the Roosevelt mine, in Stevens County.

A concentrating mill has been installed on the Lead Trust mine and placed in commission. The plant is of 75 tons daily capacity and designed to dress lead ore. Operations have disclosed ore 6 to 14 ft. wide on two levels. One of these levels is 200 ft. above the mill and the other 350 ft. Values are mainly in ore of milling grade.

"The Silver Mountain Mining Co., four miles east of Daisy, has opened

foundation of the Ontario Kirkland mill. It is hoped to have the foundations completed before the winter sets in. Drifting on the 450-ft. level is being pushed as the ore shows greater enrichment than at the upper levels.

At the Wright-Hargreaves mill construction work has reached an advanced stage and some of the heavier machinery is now being installed. Owing to shortage of electric power, steam equipment is being used for underground work.

The shaft on the Ridgewood property is down 200 ft., at which level a cross-cut is being driven to cut the 12-ft. vein opened up on the 100-ft. level.

Gowganda—This camp has come increasingly into prominence owing to recent rich discoveries on the Trethewey locations. There are now 16 properties being operated. The mill of Reeves-Dobie Mines, Ltd., with a capacity of from 25 to 30 tons daily, will be altered to increase its capacity to 50 tons.

South Lorrain—At the Keeley mine No. 3 shaft is being put down to 400 ft. Drifting on Wood's vein at 230 and 300 ft. has opened up a considerable tonnage of milling ore. The new mill of about 80-ton capacity is nearing completion.

West Shining Tree—The Wasapika Consolidated has decided to offer 2,000,000 shares of treasury stock, par value \$1, for subscription at 10c. per share "in view of the speculative nature of the enterprise." Some 200,000 shares have been taken up during the last few months at this rate, mostly by President George B. Rogers, to provide funds for current expenses. The new offering is being made to raise about \$50,000 for the installation of a mill capable of treating 50 tons of ore per day.

Beaver House Lake—Samples of remarkably rich ore from the find recently made at the Argonaut gold mine have been received at the head office of the company in Montreal. President J. H. Rainville states that the vein in which the find was made has been opened for a length of nearly 900 ft. and is still carrying heavy gold content. The new 12-drill compressor and electric hoist are in operation to sink to 500 ft.

Butt Township—The Mining Corporation of Canada has taken an option on eight mining claims supposed to carry pitch blende, staked last fall by Hamilton, Flynn and Rankin. They surround the McConnell property, where pitch blende occurs in encouraging quantities. The claims are now being explored.

Cobalt—The Kerr Lake Mining Co., Ltd., has let a contract to Dominion Reduction Co. for the treatment of between 75,000 and 100,000 tons of low-grade milling ore.

The mill of the Peterson Lake Silver Cobalt Mining Co. has been closed down temporarily owing to shortage of power.

British Columbia

Placer Law Amendments Effective—Alice Arm Growing—Copper Ore Discovered Near Usk

By ROBERT DUNN

Victoria—The amendments to the Placer Mining Act of British Columbia, passed at the last session of the Provincial Legislature, came into effect on the 1st of July. Holders of placer leases, however, have until the 1st of January, 1921, to make such arrangements as are necessary to hold their property. They may do one of two things, viz., pay up arrears on their leases and continue annual payments as laid down by the old Act or consolidate the arrears and pay a proportion of the whole amount together with the current annual fees. Those failing to do either one or the other will be dispossessed of their holdings, the act as amended providing for automatic forfeiture of their leases under such circumstances.

Stewart—Arrivals from Stewart, B. C., declare that there is no mining boom in the Portland Canal District but that there is much solid development. Nine diamond drills now are in operation, two on the Premier, two on the Northern Light Group, one

each on the 49 Group, the Big Missouri, the Mother Lode, one on Goose Creek and one on the B. C. Exploration Company's property, Marmot River. It is stated that the snow is rapidly disappearing from the higher reaches and that there still is employment for good miners.

Activity is apparent through the country contiguous to the Bear River Valley. Men are engaged in putting the line of the Canadian Northwestern Ry., owned by Sir Donald Mann, in shape for operation, and a gas locomotive has been bought, together with some rolling stock, in order that the transport of supplies to the various camps may be undertaken as soon as the repairs to the road render it feasible.

Some of the mining operations in this section that may be instanced are the development of the Q. & L. Group

complete hydro-electric plant at Trout Creek adjoining their large Wolf property three miles up river from the Dolly Varden mine.

A concentrator and cyanide plant will also be constructed, if present tests prove satisfactory.

An important strike of high-grade silver ore has been encountered in the North Star mine adjoining the Dolly on the north and a large ore body has also been recently discovered on the Royal Group adjoining the Dolly on the south. This property is under option to Capt. McLennan of Vancouver.

Several properties have been optioned or purchased from the original owners during the past month. The season has been late and snow still covers many of the properties at about three thousand feet elevation. There is no boom but a very healthy and normal growth is noticeable.



PROSPECTING IN NORTHERN ONTARIO (BLACK FLIES AND MOSQUITOS TOO SMALL TO BE VISIBLE)

held under bond by J. Tretheway, of Cobalt, consisting of surface stripping which has resulted in the exposure of a vein carrying good values and the driving of a tunnel on the vein the ore of which on assay gives returns in galena, zinc-blende, and silver; the opening of the Red Top Group by G. Seivert; further work on the Tower Mountain Group by K. P. Matheson, who found promising leads of silver-lead galena last year; the exploration of the Goose Creek Group by the Algonic Development Co., who have it bonded; the development of the L. L. & H. on Bitter Creek; and the vigorous development of the Lakeview Group, Glacier Creek, by P. Welch, of Spokane, and H. J. Fletcher, of Seattle, Wash.

Alice Arm—The Taylor Mining Co. Ltd., successors to the Dolly Varden Mining Co., are now hauling two hundred tons of ore per day from the mine to tide water and this amount is expected to be increased steadily as fast as new rolling stock and development will permit. The company have let a contract for the installation of a

Usk—High-grade copper ore is reported to have been discovered on Nicholson Creek, near Usk, northern British Columbia, by Albert Baxendale, a prospector. As a result the Crescent Group of mineral claims has been staked. Stripping is said to disclose a fissure vein, one foot to six feet wide, for a distance of 700 feet carrying bornite and chalcocopyrite, much of which is of sufficient high grade to ship.

Slocan—That the Utica mine will be re-opened at once and put on a shipping basis as soon as possible is announced by C. F. Caldwell, vice-president and managing director of the Utica Mines, Ltd. The old Sunset property, situated near the Utica, also is to be developed. The latter has not been worked for fifteen years. During its operation over \$500,000 worth of ore was shipped, some 2,000 tons averaging \$250 a ton at the former price of silver. It is proposed to continue the existing crosscut to strike the vein at new depth. The mine, it is hoped, will be shipping by fall.

Work on the Evening Star mine, Dayton Creek, is proceeding with satisfactory results. The crosscut being driven at depth has reached an advanced stage, its face now being somewhere near the line of the shaft and below it. The workings will be unwatered before an attempt is made to connect the two. As the workings radiating from the shaft are quite extensive the latter work will take some time. Hugh Sutherland, of Winnipeg, Man., formerly executive agent for the Canadian Northern Railway, is the owner of the Evening Star and also of the Silver Nugget, in the same vicinity, which is to be developed.

Ainsworth—Construction of another unit of the power plant of the Florence-Silver Mining Co. at Ainsworth

Another deal is reported in connection with the Granite-Poorman mine, Eagle Creek, it being stated that a syndicate has been formed to take over the property from the Vincent Development Co. As a result the Granite-Poorman property will resume operation immediately, a crew of men already having been put to work.

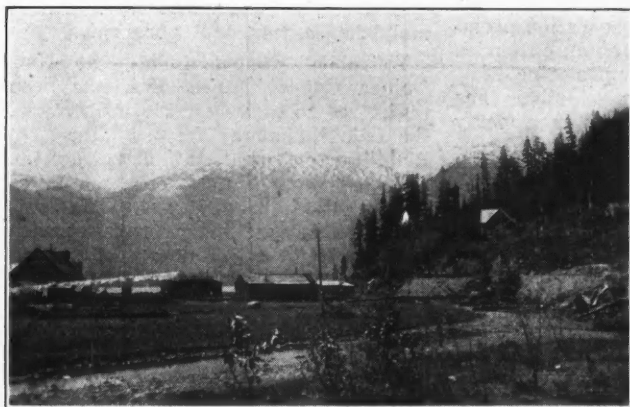
A preliminary map of the International Boundary Region between Portland Canal and Stikine River, Alaska-British Columbia, has been issued by the International Boundary Commission of the United States and Canada. During the present summer there is to be a slight change in the line near Gracey Creek, south of the Unuk River, and on the other portions additional monuments will be erected.

MEXICO

Coahuila

Sierra Mojada—Sierra Mojada district is the terminus of the Mexican Northern Railroad, 125 km. from Escalón, Chihuahua. This camp has been a constant producer of lead silver and limy silver ores, for the past thirty years. A geological examination by a prominent American firm of mining geologists, several years ago, revealed the presence of zinc ores and since that time, the camp has produced zinc carbonate ores in increasing quantities. In common with all mining camps located off of the main line of the railroad, Sierra Mojada has suffered lately for lack of transportation facilities.

American Smelting & Refining Co.,



VIEWS OF THE VILLAGE OF ALICE ARM, BRITISH COLUMBIA

has commenced. About 60 men are employed, the mine operating two shifts and the mill one. There is reported abundance of ore in sight.

Trail Smelter—Receipts at the Trail smelter for the seven days ended June 30 were 8,755 tons, as follows:

Mine	Gross Tons
Anna mine, Slocan City.....	26
Emerald, Salmo.....	34
Electric Point, Boundary, Wash..	205
Florence, Princess Creek.....	117
Josie, Rossland.....	370
Mandy, Le Pas.....	313
Maestro, Ainsworth.....	11
North Star, Kimberley.....	125
Providence, Greenwood.....	49
Stemwinder, Fairview.....	2
Loon Lake, Loon Lake.....	22
Lookout, Skagway.....	27
Company Mines.....	7,354

Nelson—The Florence Silver mine, near Nelson, B. C., is in operation and the installation of another unit for the power plant is under way. The mine is working on a two-shift and the concentrator on a one-shift basis. There is said to be an abundance of ore in sight, both the Fisher and Replacement veins looking splendid.

About 150 tons of mill feed is coming down daily, and it is expected that the mill will be able to ship 300 tons of concentrates a month.

Manitoba

Flin Flon—J. W. Callinan of Pittsburgh, who has been associated for some time with the development of the Flin Flon copper mine, states that the work of exploration has proceeded rapidly this spring with about 140 men employed. William Koerner is engineer in charge and associated with him is Thomas Tighe, both of whom were formerly with the Inspiration Copper Co. The work is being done under contract by E. J. Longyear & Co. Two shafts are being sunk to a depth of 400 ft. Flin Flon Lake will be drained to Ross Lake by a tunnel 4,700 ft. long and having a drop of 50 ft. Much depends on arrangements for a smelter and railroad connections. The Manitoba government has agreed to build the railroad on receiving assurances that a smelter of at least 2,000 tons daily capacity will be erected. A conference will be held in August by the engineers acting for the W. B. Thompson interests when it is expected that a definite policy as regards the building of a smelter will be adopted. In the meantime search for a suitable water power is being made and several are in view, one having 34,000 and another 60,000 hp.

In the Herb Lake section three gold properties are under development. Two of them have machinery installed, and the third is under active development by hand.

operating the Trinidad claim of Cia. Minera La Trinidad, S. A., are shipping limy copper ores to their Asarco smelter at Velardeña, and to their Number 3 smelter, at Monterrey.

Cia. Minera La Parreña, S. A., operating the San Salvador, Parreña, Nuevo Almaden and Encantada claims, are shipping several thousand tons per month to the Mapimi and Torreón smelters. It is stated that this company has discovered the continuation of the Trinidad ore shoot in the Nuevo Almaden claim.

Cia. Minera La Constancia, S. A., of Saltillo, continue to operate on a reduced scale, in spite of their large and important holdings in the camp. This company is shipping to the Torreón and Monterrey smelters of the Cia. de Minerales y Metales, S. A.

Hilario Martinez and associates, of Monterrey, have leased the Exploradora claim of Cia. Minera La Exploradora, S. A., and are shipping several hundred tons of 4 per cent copper ore containing good silver values, to the Torreón smelter.

Cia. Metalurgica Mexicana continues to make a good production of silver ores from its Veta Rica claim. This company has entered the ranks of the zinc producers and shipments will start shortly.

The operators of the Sierra Mojada district await with interest the decision of the railroad authorities, concerning the completion of the railroad which

was to connect Sierra Mojada and Cuatro Ciénegas. This road, begun under Carranza, would make the Sierra Mojada mines as close to the Monterrey smelters as to the Torreón and Chihuahua smelters. It should also decrease the cost of fuel, due to shorter distance to the Coahuila coal fields.

Zacatecas

Zacatecas—At present only two concerns are actively engaged in milling operations, the Fresnillo Mining Co. and the Bote Mining Co.

Fresnillo lies some 20 miles north of the State Capital and, in the epoch of the Patio process, was the largest of its kind in the world. Toward the end of 1919, the Mexican Corporation, Ltd., Hugh Rose was then general manager, acquired interests in the old Fresnillo company and this now ranks as one of the units of the Mexican Corporation. In 1917 with S. N. Cook in charge, reconstruction of the plant was commenced, and operations resumed toward the end of 1918, with an approximate capacity of 300 tons daily.

This camp ranks first in size and capacity in the state, and since the conclusion of arrangements with the Mexican Corporation, it promises to rank as one of the large plants of the world. Construction of an entirely new modern 1000-ton mill is being rapidly pushed and further units will probably be added. A standard gage track has been laid between the station of Fresnillo on the Mexican Central Ry. and the property, a distance of approximately 7 miles. The new equipment will consist of stage gyratory crushers, Sturtevant ring roll mills and rod mills, with Dorr agitators and a combined counter current agitation and Butters filters, Merrill presses and zinc dust precipitation. Power will be electrical throughout obtained from steam turbine plant and generators. The nature of the ore deposit is peculiar for Mexican silver-gold deposits, being simply a hill of mineral several hundred feet high. It is well developed, several million tons are in sight, extraction is by open cut system with gravity tramming to mill. The ore is low-grade silver carrying a small proportion of gold and is economical and amenable to cyaniding.

S. N. Cook is manager and T. S. Butler superintendent.

The Bote Mining Co. is one of the oldest concerns in the district; operations were suspended in 1914 due to conditions in the country and were resumed in 1919. Dump ores exclusively are being milled, little or no mining being carried on at present. The mill equipment consists of gyratory and jaw crushers, roughing rolls and slow-speed Chilean mills, Wilfley concentrators, agitators and Kelley filters. Electrical power throughout is generated by producer gas engines of the Koerting type. Enlargements to this mill are contemplated.

La Fé Mining Co., Ltd.'s large new plant completed and barely tried out prior to the general disorganization in

1914, is still inactive with no indications of a resumption of operations. E. A. Strout is manager.

The customs mill belonging to the San Cristobal company is still idle and in an abandoned condition; the same applies to the City Customs mill of Cia. Metalúrgica y Beneficiadora de Zacatecas, although indications are that the latter may shortly resume operations.

Veta Grande—This famous old camp a few miles north of Zacatecas, has been optioned to a group of Spanish capitalists, but work is limited to the extraction and shipping of small lots of argentiferous lead ores. These properties have been examined in turn during the past few months by several of the prominent Anglo-American and Anglo-Mexican corporations in Mexico without, however, anything being done.

An Anglo-Mexican corporation prominent in Mexico has taken an option on the famous old Los Campos mine.

The attractive price of silver has induced several of the smaller property owners to resume development and considerable new ground has been taken up. More active development in the copper belt is also evident; the largest of the copper mines, the Magistral, is still closed down through litigation; the Parroquia, belonging to W. C. Palmer and the San Roberto belonging to C. Bently, are showing greater activity. A new local company, the Piedras Negras Mining Co., are acquiring and developing properties in a limited way.

The inability of operators to obtain a sure and steady supply of fuel is hindering development in the district. Metallurgically, the silver-gold ores are not refractory to treatment, and by concentration and cyaniding render up between 80 to 90 per cent of their values. High power costs and unavoidably high consumption of cyanide are the great drawbacks. Zinc, lead and copper ores carrying varying silver values are also exported.

AUSTRALIA

New South Wales

Broken Hill—In deploring what he termed "the record strike of the world" at the half-yearly meeting of the Broken Hill Block 10 Co., held in Melbourne on May 31, chairman Alex. Campbell, expressed the hope that the commission appointed by the New South Wales Government to seek a way out of the existing labor troubles, would find some reasonable solution and that the wheels of industry would revolve again before long. In his opinion, if the Barrier mines were nationalized, or handed over to the labor section to operate for themselves, the properties would never be made to yield sufficient money per week to equal one half of that which the companies now offered to the workers. So far some £2,000,000 wages had been lost to the employees through the strike, apart altogether from non-production losses to investors and to the states directly concerned, New South

Wales and South Australia. A round table conference is now being held in Sydney.

Kingsgate—Kingsgate Molybdenite, a Victoria company, acquired an area of land at Kingsgate, N. S. W., containing 54 molybdenite pipes. One or two have been worked to depths approaching 500 feet without showing any signs of cutting out. After long delays the mill is now capable of treating over thirty tons of ore per day, but drought is still restricting operations. For every 1,000 tons of matrix mined 400 to 500 tons of milling ore is produced, containing approximately 0.5 per cent bismuth and 1 per cent molybdenite. The first run with the new mill was not a financial success, but the material was low-grade, and included a large proportion of hoppers. The percentage extraction of molybdenite was 53.8 per cent.

Astrolabe Copper Field—The New Guinea Copper Mines, Ltd. has been registered to take over the property of the Laloki (Papua) Copper Mines, No Liability, on what is known as the Astrolabe copper field, eighteen miles from Port Moresby, Papua. The company has entered into a contract with the Electrolytic Refining & Smelting Co., Port Kembla, for the purchase of 6,000 tons of pyritic ore per annum from the Laloki and Dubuna mines. The railway from the Laloki mine to Bootless Inlet, a distance of fifteen miles, is in course of construction. This will be the first railway in the Commonwealth's island territory of Papua. Up to December 31 the Laloki Co. and spent £60,681 on development, viz., £50,168 at Laloki, £9,973 at Dubuna, and £540 at Mt. Chalmers (the old Great Fitzroy mine in Queensland). Percy R. Osborne is general manager.

TASMANIA

Risdon—It is officially stated by the board of directors of Electrolytic Zinc Co. that within a few weeks the output of electrolytic zinc will be increased from 100 tons to 140 tons per week by the use in portion of the new plant of an extra 1,750 hp. of electric energy to be supplied under arrangement with the Tasmanian government hydro-electric department. The construction of the first half of the new 100-ton-per-day zinc plant is being steadily advanced, and work on the buildings and plant for the treatment of by-products and the development of subsidiary industries is also proceeding. Further consideration has been given by the directors to the production of caustic soda, chlorine, and chlorine products. It is the intention of the board to proceed as soon as practicable with the production of 6,000 to 8,000 tons annually of caustic soda, with a corresponding quantity of chlorine and chlorine products. For this purpose the company will use the plant of the present 10-ton zinc plant which has been found to fit in with the requirements of the new industry.

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

July	Sterling Exchange	Silver			July	Sterling Exchange	Silver		
		New York, Domestic Origin	New York, Foreign Origin	London			New York, Domestic Origin	New York, Foreign Origin	London
8	394	99½	94½	54	12	393	99½	92½	53½
9	394	99½	91½	52½	13	392	99½	93½	53½
10	394	99½	92½	52½	14	390½	99½	93	53½

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

July	Copper		Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.	
8	18.60	45.00	48.75	8.10	8.10	7.70	
9	18.60	46.50	50.00	8.10	8.10	7.70	
10	18.60	46.50	50.00	8.10	8.10	7.70	
12	18.65	47.25	50.50	8.10	8.10	7.75	
13	18.65	46.25	49.75	8.10	8.10	7.80	
14	18.65	45.75	49.25	8.10	8.10	7.85	

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 l.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

July	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3 M	Spot	3 M	Spot	3 M
	Spot	3 M							
8	89½	91½	105	249	256½	33½	34½	41½	43½
9	87½	92½	105	258½	263½	33½	35½	42	43½
10	...	...	...	...	...	...	...	...	...
12	91½	93½	105	264½	271	34½	36	43½	44
13	90½	93	105	266	271½	34½	36½	42½	43½
14	90	92½	105	265½	271½	34½	36	41½	43

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, July 14, 1920

A better feeling is in evidence throughout the market, although sales are in anything but large volume. Transportation is improving slowly, and some shipments can be made today that were impossible a week ago. No new strikes of any moment have been reported, and the labor situation gives evidence of improvement in the fall. Immigrants are coming in larger numbers. Many large industries are laying off men, the woolen companies in New England, for example, and the automobile industry in

Detroit. Agents of the larger mining companies are having better success in securing men in the large industrial centers. It is true, many wish to take vacations and others to work in the harvest fields, but by the first of September labor conditions in the mining districts should be better.

Copper

Buying has been on a larger scale than for two or three months, but has not reached the volume of the last buying movement, nor is it likely to. Producers are obtaining their asked price of 19c. delivered, but are willing to

sell at this price regardless of the point of delivery. However, this price cannot be considered as firmly established, for business has been lost at this figure. Wire mills have been the chief buyers. Most of the metal sold has been for third-quarter delivery; for fourth-quarter delivery, ¼c. premium is being asked.

One big producer reports foreign inquiry and sales excellent, England, France, Germany, and Italy being in the market. It has been a long time since sales have been made to Italy, and the general opinion was that her stocks were ample.

Lead

No marked change has occurred the last week in the lead market, and conditions continue quiet. The tendency for the St. Louis price to be as high or higher than New York continues. The reasons for this were mentioned last week. July and early August metal seem to be scarce in the vicinity of St. Louis, and it is extremely doubtful if much could be obtained at the prices which we quote. Most of the metal now being sold is for September delivery, but the price differential between prompt and future lead is not as great as it was. Offers of lead for prompt delivery went begging in New York yesterday at 8½c. One fairly large cancellation has freed some metal, which has eased the market.

Zinc

The firm undertone continues, but business is quiet, especially for Prime Western. Brass special commands about 20 to 25 points premium, which is considerably greater than it was six months ago, and electrolytic is also in demand. No runaway market can be expected, for London today is more than a cent below St. Louis parity, the equivalent being about 6.70c.

Tin

Prices have shown an upward tendency, but little business has been done. Manipulation seems to account for the London variations, which are not always reflected in the local market. Fluctuations here are the result more of an extremely narrow market; Chinese No. 1 particularly seems entirely independent of London. Almost no electrolytic has been sold.

Straits tin for future delivery: July 8th, 48.75@49c.; 9th, 49.75@50c.; 10th, 50@50½c.; 12th, 50.50@50.75c.; 13th, 49.75@50c.; 14th, 49@49½c.

Arrivals of tin in long tons: July 3d, Straits, 150; China, 75; 6th, Australia, 200; 7th, Hongkong, 125; Singapore, 425; Liverpool, 50; 8th, Singapore, 50; London, 200; 12th, Liverpool, 25; London, 75.

Silver

The silver market continues dull and quiet, with only moderate demand from London, mostly for account of India Bazaar buying. The fluctuations in price have been quite out of proportion to the amount of business done, the very smallness of the business perhaps making the market unusually sensitive.

Reports from India are that the monsoon conditions are favorable, and if the rainy season continues, and good crops are assured, the demand for silver from India may bring about some improvement in price.

On the other hand, the China market continues dull, with exchange rates unchanged and at a level which does not warrant silver purchases by China banks at current quotations.

If the negotiations for the international loan to China are successful, this should help the demand for silver from the Chinese banks.

The demand for silver in the arts in this country continues dull.

Mexican Dollars—July 8, 71½; July 9, 63½; July 10, 69½; July 12, 70½; July 13, 70½; July 14, 70½.

Gold

Gold in London on July 8th, 104s. 1d.; 9th, 104s. 1d.; 12th, 104s. 3d.; 13th, 104s. 6d.; 14th, 105s.

Foreign Exchange

Sterling has weakened. Other foreign funds have been quiet. On Tuesday, in units to the dollar, francs were 11.92 and lire, 16.77. German marks, 2.58c. New York funds in Montreal, 13½ per cent premium.

Other Metals

Aluminum—Ingot, 33c. per lb., with 32@32½c. open market for 98@99 per cent virgin.

Antimony—Market continues weak. Spot, 7½c. per lb.; Cookson's "C" grade, 14c. Chinese and Japanese brands, 7½@7¾c. W. C. C. brand, 9c. Chinese needle antimony, lump, firm at 9@10c. per lb. Standard powdered needle antimony (200 mesh), 10@12c. per lb.

Bismuth—\$2.70 per lb., 500-lb. lots. Market quiet.

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

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

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

Magnesium—Crude, 99 per cent or over pure, \$1.75 per lb., for the metal in 100 lb. lots and over, 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@80 per oz.

Platinum—Market weak at \$80@85 per oz.

Quicksilver—Market weaker; \$90@92 per 75-lb. flask. San Francisco wires \$85. Firm.

Ruthenium—\$200@220 per troy oz.

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—About 52 per cent alumina content, less than 2 per cent iron oxide, 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 the 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.

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. June ore shipments were 9,233,566 tons; it is expected that July shipments will show an improvement.

Manganese Ore—75@80c. per unit, 50 per cent Mn content, c.i.f. Atlantic seaport; chemical ore (MnO₂) \$75@85 per gross ton.

Molybdenum—85 per cent MoS₂, \$1 per lb. of contained sulphide.

Tantalum Ore, guaranteed minimum 60 per cent tantalum 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 \$2.50 per lb. of metallic vanadium content.

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., July 10—Zinc blende, per ton, high, \$51.10; basis 60 per cent zinc, premium, \$46; Prime Western, \$45; fines and slimes, \$45@40; calamine,

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

basis 40 per cent zinc, \$35. Average settling prices: Blende, \$43.02; calamine, \$34.47; all zinc ores, \$42.92.

Lead, high, \$98.95; basis 80 per cent lead, \$95@90; average settling prices, all grades of lead, \$97.37 per ton.

Shipments for the week: Blende, 9,404; calamine, 118; lead, 1,521 tons. Value, all ores the week, \$556,830.

The mines all resumed operations this morning, though some were very short handed. The miners who dispersed to the harvest fields have not all returned. Operators are expecting more to return tonight and tomorrow.

Efforts of sellers to spring the market by holding out against \$45 basis until 11 o'clock today are reported a maneuver to prevent price reductions. It is reported that a number will not resume night operation in the mines.

Platteville, Wis., July 10—Blende, basis 60 per cent zinc, \$49.25 base for high-grade. Lead ore, basis 80 per cent lead, \$90 per ton. Shipments for the week: Blende, 1,653; lead, 30 tons. Shipments for the year: Blende, 37,680; calamine, 2,240; lead, 3,364; sulphur ore, 988 tons. Shipped during the week to separating plants, 2,060 tons blende.

Non-Metallic Minerals

Asbestos—Crude, No. 1, \$1,800@2,500; 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, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax. Freight rate from mines to Sherbrooke, Quebec, over Quebec Central R.R., 20c. per cwt.; from Sherbrooke to New York, 27½c., carload lots; freight to New York for crude No. 1, f.o.b. Thetford mines, \$8.45 per ton, carload lots.

Barytes—Crude, 88 to 94 per cent barium content, \$10@12 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. Crude, not less than 98 per cent, \$11@11.25 per ton, f.o.b. cars, Missouri; floated, \$28 per ton in bbls.; \$26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

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

China Clay (Kaolin)—Crude, \$9@12; washed, \$12@15; powdered, \$18@22; bags extra, per net ton, f.o.b. mines, Georgia; crude, \$8@12; ground,

\$15@40, f.o.b. Virginia points. Domestic lump, \$10@20; powdered, \$25@30; imported lump, \$25@35; powdered, \$30@60, f.o.b. New York.

Feldspar—Crude, \$7.50@8 per gross ton, f.o.b. Maryland and North Carolina points; \$7.50@10 f.o.b. Maine; ground, \$22@30, car lots, f.o.b. Baltimore; ground, \$22@30, f.o.b. North Carolina points; \$17 to 20 per ton, No. 1 ground, f.o.b. New York State; \$21@23 per ton, ground, f.o.b. Maine.

Fluorspar—Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, \$25 per ton, f.o.b. Kentucky and Illinois mines; ground, suitable for acid, chemical or enameling purposes, \$60. Lump, \$17.50, f.o.b. Tonuco, N. M.

Graphite—Crucible flake, 85 per cent carbon content, 8c. per lb.; 88 per cent, 9½c.; 90 per cent, 10½c., all f.o.b. New York; 80 per cent, 5c.; 90 per cent, 10c.; 30 per cent (dust polish grade), 1c.; 50 per cent (dust facing grade) 2c.; f.o.b. Ashland, Ala. Mexican, amorphous, \$45 @ \$55 per short ton; Korean, 3½c. per lb.; Madagascar, 8c.; Ceylon, 4¼@15½c.

Gypsum—Raw crushed rock, \$3.50@4 per ton; raw ground fine, \$4@4.50; calcined stucco, \$9, all f.o.b. works. Containers extra. Wholesale, plaster of paris, carload lots, \$3.75 per 250-lb. bbl., alongside dock, New York.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, \$1.60@1.65; 2@8 in., \$1.55@1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, \$1.65@1.75 per net ton, f.o.b. Howellville, Pa.

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.

Dead-Burned—\$32.50 per net ton, Chewelah, Wash.; \$50@60, Chester, Pa. (Magnesite brick—See Refractories.)

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; ground, \$85@100 per ton, Philadelphia.

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

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, \$13; 75 per cent, \$11.50; 75@74 per cent, \$11; 70 per cent, \$8.35; 68 per cent, \$7.85; 68@66 per cent, \$7.60. There is no price schedule for spot for domestic uses.

Pumice Stone—Imported, lump, 4@50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrates—Spanish, fines, per unit 12c., c.i.f. Atlantic seaport; furnace size, 16½c.; run of mine, 12@14c.; domestic, fines, f.o.b. mines, 12@14c.

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—\$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, \$8.50@9; rubber grades, \$9@15, all f.o.b. Vermont. California talc, \$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. Imported, \$60 @ \$70; Canadian, \$10@20 per ton.

Mineral Products

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

Nitrate—Soda, \$3.85 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.

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, 19@20c. per lb. of chromium contained; 4 to 6 per cent carbon, 20@21c. f.o.b. works.

Ferromanganese—For 76@80 per cent, \$225, freight allowed; Spiegeleisen, 18 to 22 per cent, \$75, f.o.b. furnace.

Ferromolybdenum—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, \$2.50@3 per lb. of contained metal, f.o.b. works.

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—70 to 80 per cent W, 85c.@1.10 per lb. of contained tungsten, f.o.b. works.

Ferro-uranium—35-50 per cent U, \$7 per lb. of U contained, f.o.b. works.

Ferrovandium—Basis 30-40 per cent, \$6.50@8 per lb. of V contained, f.o.b. works.

Metal Products

Copper Sheets—No change in Jan. 7 price of 29½c. per lb.; wire, quoted 22½c.

Lead Sheets—Full lead sheets, 12½c.; cut lead sheets, 12½c. in quantity, mill lots.

Nickel Silver—Unchanged at 39½c. per lb. for 18 per cent nickel.

Yellow Metal—Dimension sheets, 26½c.; sheathing, 25½c.; rods, ½ to 3 in., 23½c.

Furnished by Foote Mineral Co., Philadelphia, Pa.

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

Refractories

Bauxite Brick—56 per cent alumina, \$145 per 1,000, f.o.b. Pittsburgh.

Chrome Brick—\$85@90 per net ton, carload lots, eastern shipping points.

Chrome Cement—45 to 50 per cent Cr₂O₃, \$50 per net ton, and \$55 in sacks, carload lots, eastern shipping points.

Clay Brick—First-quality fire clay, 9-in. shapes, \$45@53 per thousand, Pennsylvania, Ohio, and Kentucky works; second quality, \$40. First quality, St. Louis, \$45; New Jersey, \$75.

Magnesite Brick—\$90@100 per ton, eastern shipping points; 9-in. straights, \$90@100; 9-in. arches, wedges and keys, \$95@105; soaps and splits, \$110 @ \$120.

Silica Brick—Nine in. and 9-in. sizes, per 1,000, \$51@55, Birmingham, Ala.; \$50@55, Mount Union, Pa.; \$55, Chicago district.

Iron Trade Review

Pittsburgh, July 13, 1920

The iron and steel industry is complaining more loudly of car shortage, as to shipments of its products rather than the securing of raw materials, and blames the decreased supply of open-top cars on I. C. C. Order No. 7, relating to car preference to coal mines, but on the other hand the coal operators claim they have experienced little if any increase in their car supplies.

Production of steel ingots in June was at the rate of about 42,400,000 gross tons a year, against rates of 41,050,000 tons in May, 37,550,000 tons in April and 45,200,000 tons in March, the last named being the highest rate since October, 1918. Production in the half year was at the rate of 42,100,000 tons a year.

Pig Iron—The market is one of prompt shipment only, consumers being interested solidly in deliveries, not in making commitments for the future. Bessemer, basic and foundry all remain quotable at \$45, Valley, freight to Pittsburgh being \$1.40, but a higher price might be paid occasionally by a consumer in particular distress, for immediate shipment. The production of coke and anthracite blast furnaces in June, according to *Iron Age*, amounted to 3,043,540 gross tons, or an average of 101,451 tons per day, as compared with 2,985,682 tons, or 96,312 per day in May.

Steel—The market is quiet, with large stocks of unshipped billets and sheet bars at mills. Quotations are practically nominal at \$60@65 for billets, \$65@70 for small billets and \$75 for sheet bars.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 4½c. per lb., in 250-lb. bbls. . . .

Connellsville—Furnace, \$17@18; foundry, \$18@18.50. . . .

Gold Movements

Their Recent Trend and Purpose—Marked Effect Upon the Gold Reserves—Interesting Relation Between Trade Balances and Bullion Movements—South America And the Orient Still Consuming United States Gold

THESE are two principal methods of settling a debt in a foreign country; the first is through the medium of buying "foreign exchange" and the second by the shipment of gold or silver coin or bullion. This latter method is almost exclusively used in settling international trade balances. It is a certain way of assuring the payment of a debt in a foreign country, but the incidental trouble of packing, carting, and insuring heavy shipments of bullion makes it an expensive expedient. At present the embargo on gold exports from foreign countries is prohibitive. Large banking houses are usually the only parties indulging in this mode of settlement. Nevertheless in view of the importance of gold movements upon foreign exchange, upon the gold reserve, upon the gold premium, and upon the policy of deflation which is being followed by many nations, their significance is marked and interesting.

The United States is the only country that has directly maintained the free gold market, and it is able to do this only by allowing the free movements of gold to and from this country. Other countries have taken advantage of this fact in frequently insisting upon payment in gold—witness the great drop in our gold reserve during the last twelve months. But preventing this condition through an embargo upon gold would immediately place our own currency on the same level with the depreciated currency of other nations.

Trade Balances and Bullion Movements

In 1919 it was noticeable that our largest gold exports were made to the Orient. The following important table strikingly brings out the close relationship between our gold and silver exports to the Orient and the adverse trade balance of the United States; that is, the excess value of the goods imported into, over those exported from, the United States:

RELATION BETWEEN U. S. ADVERSE TRADE BALANCES AND BULLION SHIPMENTS TO THE ORIENT IN 1919

Country	U. S. Excess of Exports Over Imports, 1919	Silver Shipments	Gold Shipments	Total Bullion Shipments
India.....	\$240,633,415	\$92,661,317	\$28,756,570	\$121,417,887
China.....	48,638,789	74,117,074	62,783,480	136,900,554
Japan.....	43,488,620	3,946,453	82,098,015	86,044,468
Dutch East Indies.....	5,016,067	.....	7,365,111	7,365,111
Philippine Islands.....	.....	.....	100,000	100,000
Totals.....	\$337,776,891	\$170,724,844	\$181,103,176	\$351,828,020

The Far East is spoken of as the great silver-consuming sponge, yet the gold absorption in 1919 from the United States was greater than the silver consumption.

The table indicates that with a total adverse trade balance in the Orient of \$337,776,891 in 1919, there was shipped to the Far East \$351,828,020 in bullion as a counterbalance. Thus the bullion exports for the year exceeded the adverse trade balance by \$14,051,129. That the individual shipments do not balance, illustrates a general feature of gold movements—considerable gold and silver may be exported from the United States for the settlement of adverse trade balances accumulated by other countries, such countries using their credit to purchase gold here and ship it to the Orient, or frequently to South America.

The Purpose and Results of Gold Movements

The normal effect of gold movements is to bring foreign exchange rates back to mint par. Thus, bankers who engage gold for shipment to a foreign country do so to create balances against which more foreign exchange can be sold, and, by adding to the supply, pull the rate down. In normal times the cost of shipping gold limits the foreign exchange rates within so-called "gold points," a few cents greater or less than the mint value of the currency.

Often gold movements are undertaken to strengthen home gold reserves, and in such event the condition of the foreign exchange rate is a secondary consideration—as it was at the beginning of the war—and conversely the exports of gold often imperil the gold reserve.

Effect Upon the Gold Reserves

The recent heavy imports of English gold into the United States have had a perceptible effect upon the gold reserves of the United States and England. Lately the gold reserve of England dropped to the lowest point in half a century, due partly to this condition, and at the same time the gold reserve of the United States increased. At the end of April our gold reserve stood at \$1,937,000,000, whereas \$1,972,000,000 is recently reported. In June, 1919, the gold reserve was \$2,202,000,000, but as the embargo on gold exports was then lifted, the gold reserve gradually declined, due to the insistent demand for payment in gold and the desire of the United States to strengthen exchange rates in several countries, until a few months ago, when it began to increase again.

Recent movements of gold to and from the United States are indicated by the following table:

IMPORTS OF GOLD			
From	March	April	
United Kingdom—England.....	\$9,368,700	\$48,353,408	
Canada.....	6,370,387	364,492	
Dutch East Indies.....	494,530	107,298	
Mexico.....	334,384	388,492	
Central American States.....	109,313	94,833	
Philippines.....	106,714	150,049	
Colombia.....	1,002	766,606	
Other Nations.....	199,992	.....
Totals.....	\$16,985,222	\$50,225,178	

EXPORTS OF GOLD			
To	March	April	
Argentina.....	\$23,345,000	\$29,850,000	
Uruguay.....	9,750,000	2,000,000	
China.....	3,457,179	1,764,950	
Mexico.....	3,365,960	1,269,467	
Hongkong.....	2,169,785	4,235,045	
British India.....	1,453,673	1,533,300	
Dutch East Indies.....	1,000,000	2,302,956	
Japan.....	555,766	.....
Canada.....	425,348	461,783	
Other Nations.....	1,526,515	706,078	
Totals.....	\$47,049,226	\$44,123,579	

Our heaviest gold imports are coming from England and Canada and the largest exports are going to South America and the Far East.

England's Heavy Shipments

Although in March the exports of gold from the United States exceeded the imports by \$30,064,004, in April the direction of the movement was reversed, the excess of imports over exports being \$6,101,599, which is the first time in a year that the imports of gold have exceeded the exports. Detailed figures for May and June (not yet available) are expected to show even greater "favorable" balances. The unusually heavy gold shipments that have been coming to the United States from England as part of England's financially courageous policy to extend her credit regardless of her slim gold reserve account for the excess of gold imports. This British attitude will also aid in restoring a free gold market in London, a result that would beneficially help sterling exchange. England's large gold exports to the United States have also been considered part of the plan to pay off the Anglo-French loan maturing next October.

That England is shipping the greatest percentage of her gold exports to the United States is shown by the following figures of the gold movements during April, 1920.

MOVEMENTS OF GOLD FROM THE UNITED KINGDOM

Country	Imports	Exports
United States.....	£520	£6,032,895
British India.....		1,620,213
Argentina, Uruguay and Paraguay.....		1,419,721
Straits Settlements.....	5,246	1,204,763
Transvaal.....	3,190,547	
Others.....	421,659	428,150
Totals.....	£3,617,972	£10,705,747

In spite of England's relative small gold reserve, there is a marked excess of gold exports over imports. Considering the financial position of the country and the heavy gold exports that have recently taken place, it is not strange that the gold reserve fell during July to the lowest point in half a century, 8½ per cent.

The Indian demand for gold has always been a big factor in drawing gold from London, but, as the demand has slackened, greater amounts of gold can move to the United States. The free gold movements to and from India were restricted until recently by the British government, the ban being lifted in June.

World's Gold Production Decreasing

Preliminary figures showing the production of gold throughout the world in 1919 have been made by the U. S. Geological Survey. The production in the United States was \$58,285,196; Canada is reported to have produced \$14,687,000; India, \$10,028,000; Australia (not including New Zealand or the Islands), \$29,268,000; the Transvaal, \$171,640,123; Rhodesia and West Africa, \$18,631,070. There was probably a large decrease in the production of gold in Russia and Siberia in 1919. Some increase was probably made in the output of Central America and South America, which, however, was doubtless offset by decreases in the output of other countries. The incomplete returns now available indicate that the world's production of gold in 1919 was between \$345,000,000 and \$350,000,000. The world's production in 1918 amounted to \$380,924,500.

Information received during the first six months of 1920 indicates a still further decrease in the production of gold in the United States and that the output for the year will probably be less than \$50,000,000. The production in Alaska, Colorado, California, Oregon, and Montana will be much less in 1920 than it was in 1919, because water is very short for placer mining and many stamp mills are closed. Canada as a whole may increase its output, although the production of the Yukon districts will be smaller than last year. The output of Russia can not be estimated. That of Australia will show a decrease. That of South Africa and South America will probably show no radical decrease. Indications point to a decrease in the world's production of gold in 1920 not so great as in 1919.

Latest Rand Gold Production

During June, the gold production of the Rand, in South Africa, amounted to 715,957 oz., an increase in output over the May figure, 699,041 oz. A table summarizing production since 1917 follows:

RAND GOLD OUTPUT 1917-1920
(Fine Ounces)

	1920	1919	1918	1917
January.....	670,503	676,059	714,182	782,634
February.....	625,330	636,728	659,759	721,321
March.....	707,036	712,379	696,281	787,094
April.....	686,979	694,944	717,099	742,778
May.....	699,041	724,995	741,217	729,385
June.....	715,957	702,379	727,696	759,724
July.....		725,497	736,199	757,890
August.....		706,669	740,210	756,658
September.....		698,558	708,206	738,231
October.....		723,722	679,764	751,290
November.....		677,970	658,701	722,839
December.....		650,191	641,245	722,419

Current rate of production is below the war rate, despite the effect of the "gold premium."

COMPANY REPORTS

Alvarado Mining & Milling Co.

Silver; Mexico

The annual report of the Alvarado Mining & Milling Co. for the year 1919 shows a surplus, after payment of taxes, and reserves for depreciation and depletion, of \$411,307. This is equal to 45c. per share earned on the \$4,452,515 capital stock outstanding on Dec. 31, 1919. Gross earnings amounted to \$2,741,774, from which was deducted mining costs, development expenses, and other charges amounting to \$1,225,875 and taxes totaling \$220,749, leaving an operating profit of \$1,295,150. Further deductions due to a contract adjustment with the American Engineering & Operating Co. and to miscellaneous items, resulted in giving a net profit of \$941,038. Allowing \$442,787 as a reserve for depletion, and \$86,944 as a reserve for depreciation, the surplus remaining amounted to \$411,307.

During the year the company paid all of its floating debt, other than current operating accounts, and has arranged for the conversion of the \$852,500 first mortgage 6 per cent convertible gold bonds. The par value of capital stock was changed from \$5 a share to \$20 a share and the shares were reduced from 1,200,000 to 300,000. The report states that the daily capacity of the milling plant will be increased from 600 tons to approximately 1,200 tons, and the mines will be equipped to supply the additional tonnage. The balance sheet shows that current assets are \$931,041 in excess of current liabilities, representing an increase for the year of \$636,064.

In a summary of operations it is stated that development work resulted in the discovery of new and large ore-bodies, which materially increased ore reserves. In the Alfarene and Presena mines large bodies of ore were discovered in the hanging walls, which are being stoped over widths varying from 25 to 60 ft. Development of a new vein in the Las Cruces mine has also begun.

Assets and liabilities are indicated as follows:

ASSETS	
Real estate and mines.....	\$5,534,218
Buildings and equipment.....	1,055,640
American Engineering & Operating Co. stock.....	85,210
Cash and U. S. Government securities.....	313,265
Accounts receivable.....	394,539
Bullion and ores.....	260,609
Supplies.....	198,304
Total.....	\$7,486,835
LIABILITIES	
Capital stock (908,503 shares).....	\$4,542,515
First-mortgage convertible 6s; due 1926.....	852,500
Reserves for conversion of bonds, depletion, and depreciation.....	1,944,146
Accounts payable.....	240,725
Surplus.....	266,949
Total.....	\$7,846,835

Great Northern Iron Ore Properties

Iron; Minnesota

More than 4,000,000 tons of iron ore was shipped from the Minnesota properties of the Great Northern Iron Ore Properties Co. during 1919, and \$6,000,000 was distributed to holders of Certificates of Beneficial Interest, according to the annual report of the company for the year 1919, just made public by the trustees.

This company is a trust created by directors and approved by shareholders of the Great Northern Railway Co. and controls the iron output of ten subsidiary companies.

The Mahoning mine at Hibbing, Minn., produced practically one-fourth of the total tonnage. The receipts from the proprietary companies for royalties and rents made a total of \$5,844,249; administration costs amounted to \$93,616. The report also shows that the trustees have on hand undistributed funds in the amount of \$352,911, in addition to which each of the proprietary companies has ample emergency reserve funds. Since 1906 the trustees have received \$28,002,833 and distributed \$26,625,000 to certificate holders, the administration cost over that period being \$1,024,922.

MINING STOCKS

Week Ended July 10, 1920

Stock	Exch.	High	Low	Last	Last Div.	Stock	Exch.	High	Low	Last	Last Div.
COPPER						GOLD					
Adventure.....	Boston			*75		Alaska Gold.....	N. Y.	1 1/2	1 1/2	1 1/2	
Ahmek.....	Boston	62 1/2	62 1/2	61 1/2	June '20, Q	Alaska Juneau.....	N. Y.	2 1/2	2 1/2	2 1/2	
Alaska-B.C.....	N. Y. Curb.	1 1/4	1 1/4	1 1/4		Carson Hill.....	N. Y. Curb.	28 1/2	27 1/2	28	
Allouez.....	Boston	28 1/2	28 1/2	28 1/2	Mar. '19, 1.00	Cresson Consol. G.....	N. Y. Curb.			1 1/2	June '20, Q 10
Anaconda.....	N. Y.	58 1/2	55 1/2	57 1/2	Feb. '20, Q 1.00	Dome Ex.....	Toronto			*23 1/2	
Ariz. Com'l.....	Boston	11 1/2	10	11 1/2	Oct. '18, 50	Dome Mines.....	N. Y.	10	9 1/2	10	Apr. '20, Q 25
Big Ledge.....	N. Y. Curb.	1 1/4	1 1/4	1 1/4		Golden Cycle.....	Colo. Sprgs.	1		*73	May '20, Q 02
Bingham Mines.....	Boston			9	Sept. '19, Q 25	Goldfield Con.....	N. Y. Curb.	*10	*9	*70	Dec. '19, 05
Calumet & Ariz.....	Boston	59 1/2	57 1/2	59 1/2	June '20, Q 1.00	Hedley.....	Boston			4 1/2	June '19, 10
Calumet & Hecla.....	Boston	315	310	315	June '20, Q 5.00	Hollinger Con.....	Toronto	5.65	5.60	5.60	June 26, BM 05
Can. Copper.....	N. Y. Curb.	1 1/2	1 1/2	1 1/2		Homestake.....	N. Y.	55	53	55	Sept. '19, 50
Centennial.....	Boston	12 1/2	11 1/2	11 1/2	Dec. '18, SA 1.00	Kirkland Lake.....	Toronto	45 1/2	45	45 1/2	
Cerro de Pasco.....	N. Y.	45 1/2	42 1/2	44 1/2	June '20, Q 1.00	Lake Shore.....	Toronto	1.18	1.16	1.17	Oct. '19, 02 1/2
Chief Consol.....	N. Y. Curb	3 1/2	3 1/2	3 1/2	Feb. '20, Q 10	McIntyre-Porcupine.....	Toronto	1.84	1.82	1.84	May '20, K 05
Chile Cop.....	N. Y.	16 1/2	15 1/2	16 1/2		Porcupine Crown.....	Toronto	*29	*27	*28	July '17, 03
Chino.....	N. Y.	21 1/2	29 1/2	30 1/2	June '20, Q 37 1/2	Portland.....	Colo. Sprgs.	1		*60	Apr. '20, Q 01 1/2
Columbus Rexall.....	Salt Lake	1		*44		Reorgan. Booth.....	N. Y. Curb.	*5 1/2	*4 1/2	*5 1/2	May '19, 05
Con. Ariz.....	N. Y. Curb	2 1/2	2 1/2	2 1/2	Dec. '18, Q 05	Silver Pick.....	N. Y. Curb.	*6	*5	*5	
Con. Copper M.....	N. Y. Curb.	2 1/2	2 1/2	2 1/2		Teck Hughes.....	Toronto	*10	*9 1/2	*10	
Cop. Range.....	Boston	40 1/2	38	39 1/2	June '20, Q 50	Tom Reed.....	Los Angeles	1.04	0.90	1.04	Dec. '19, 02
Crystal Cop. (new).....	Boston Curb	*40	*31	*33		United Eastern.....	N. Y. Curb.	3	2	2 1/2	Apr. '20, Q 21
Davis-Daly.....	Boston	9 1/2	9	9 1/2	Mar. '20, Q 25	Vindicator Consol.....	Colo. Sprgs.	1		*18	Jan. '20, Q 01
East Butte.....	Boston	13 1/2	12 1/2	12 1/2	Dec. '19, A 50	West Dome.....	Toronto			*6 1/2	
First Nat'l.....	Boston Curb	1	*90	1	Feb. '19, SA 15	White Caps Min.....	N. Y. Curb.	*11	*9	*11	June '18, 02 1/2
Franklin.....	Boston	2	1 1/2	1 1/2		Yukon Gold.....	Boston Curb			1	
Gadsden Copper.....	N. Y. Curb.			*71		SILVER					
Granby Consol.....	N. Y.	38	38	38	May '19, Q 1.25	Arizona Silver.....	Boston Curb	*20	*12	*20	Apr. '20, M 03
Greene-Can.....	N. Y.	31 1/2	30	31 1/2	Feb. '19, Q 1.50	Beaver Con.....	Toronto	*41 1/2	*40 1/2	*41 1/2	May '20, K 03
Hancock.....	Boston			4 1/2		Coniagas.....	Toronto		12.35		May '20, Q 25
Houghton.....	Boston Curb			*60		Crown Reserve.....	Toronto	*20	*20	*20	Jan. '17, 05
Howe Sound.....	N. Y. Curb.	3 1/2	3 1/2	3 1/2	Apr. '20, Q 05	Kerr Lake.....	Boston			3 1/2	Sept. '19, 1.00
Inspiration Con.....	N. Y.	54 1/2	49 1/2	51 1/2	Apr. '20, Q 1.50	La Rose.....	Toronto	1.37	1.36	1.33	Apr. '18, 02
Iron Cap.....	Boston Curb	9	8 1/2	9	Feb. '19, M 25	McKinley-Dar.....	N. Y. Curb.			*48	Apr. '20, Q 03
Isle Royale.....	Boston	30 1/2	30	30 1/2	Sept. '19, SA 50	Mining Corp.....	Toronto	1.95	1.80	1.90	June '20, Q 12 1/2
Kenecott.....	N. Y.	27 1/2	25 1/2	26 1/2	June '20, Q 50	Nipissing.....	N. Y. Curb.	9	8 1/2	8 1/2	Apr. '20, Q 25
Keweenaw.....	Boston	1 1/2	1 1/2	1 1/2		Ontario Silver.....	N. Y.	6 1/2	6 1/2	6 1/2	Jan. '19, Q 50
Lake Copper.....	Boston	3 1/2	3 1/2	3 1/2		Ophir Silver.....	N. Y. Curb.	1 1/2	1 1/2	1 1/2	Jan. '12, 10
La Salle.....	Boston	3	2 1/2	2 1/2		Peterson Lake.....	Toronto	*12 1/2	*12	*12	Jan. '17, 01 1/2
Magma Chief.....	N. Y. Curb.			*21		Sil. King Ariz.....	N. Y. Curb.			*48	
Magma Copper.....	N. Y. Curb.			29	Jan. '19, Q 50	Temiskaming.....	Toronto			*34	Jan. '20, K 04
Majestic.....	Boston Curb	*20	*18	*18		Trethewey.....	Toronto	*31	*29 1/2	*30	Jan. '19, 05
Mason Valley.....	N. Y. Curb.			2 1/2		GOLD AND SILVER					
Mass. Con.....	Boston	3 1/2	3 1/2	3 1/2	Nov. '17, Q 1.00	Atlanta.....	N. Y. Curb.	*2	*1 1/2	*2	
Mayflower-O.C.....	Boston	6	5 1/2	5 1/2		Barnes-King.....	Butte	1		1.28	Nov. '19, Q 05
Miami.....	N. Y.	22	20 1/2	20 1/2	May '20, Q 50	Bost. & Mont.....	N. Y. Curb.	*62	*60	*61	
Michigan.....	Boston	4 1/2	4 1/2	4 1/2		Cashboy.....	N. Y. Curb.	*6 1/2	*5 1/2	*6	
Mohawk.....	Boston	65	60 1/2	60 1/2	Feb. '20, Q 1.50	El Salvador.....	N. Y. Curb.	2	1 1/2	1 1/2	
Mother Lode (new).....	N. Y. Curb.	6	5 1/2	5 1/2		Jim Butler.....	N. Y. Curb.	*14	*12	*13	Aug. '18, SA 07
Nevada Con.....	N. Y.	13 1/2	13	13	June '20, Q 25	Jumbo Extension.....	N. Y. Curb.	*5 1/2	*4 1/2	*5 1/2	June '16, 05
New Arcadian.....	Boston	2 1/2	2 1/2	2 1/2		Louisiana Con.....	N. Y. Curb.	1 1/2	1 1/2	1 1/2	
New Baltic.....	Boston Curb			3		MacNamara M.....	N. Y. Curb.	1 1/2	1 1/2	1 1/2	May '10, 02 1/2
New Cornelia.....	Boston	17	16 1/2	16 1/2	May '20, 25	Open Mai.....	N. Y. Curb.	1 1/2	1 1/2	1 1/2	Apr. '20, Q 50
Nixon Nev.....	N. Y. Curb.			*9		Tonopah-Belmont.....	N. Y. Curb.	1 1/2	1 1/2	1 1/2	Jan. '20, Q 05
North Butte.....	Boston	18 1/2	17	17 1/2	Oct. '18, Q 25	Tonopah-Divide.....	N. Y. Curb.	1 1/2	1 1/2	1 1/2	
North Lake.....	Boston			*75		Tonopah Ex.....	N. Y. Curb.	1 1/2	1 1/2	1 1/2	Apr. '20, Q 05
Ohio Copper.....	N. Y. Curb.			1 1/2		Tonopah Mining.....	N. Y. Curb.	1 1/2	1 1/2	1 1/2	Oct. '19, SA 15
Ojibway.....	Boston	1 1/2	1 1/2	1 1/2		West End Con.....	N. Y. Curb.	1 1/2	1 1/2	1 1/2	Dec. '19 SA 05
Old Dominion.....	Boston	26	24	26	Dec. '18, Q 1.00	SILVER-LEAD					
Oseola.....	Boston	39	39	39	June '20, Q 50	Caledonia.....	N. Y. Curb.	*24	*22	*23	June, '20, M 01
Phelps Dodge.....	Open Mar.	195	180	195	Apr. '20, Q 2.50	Consol. M. & S.....	Montreal	26	25	25	Apr. '20, Q 62 1/2
Quincy.....	Boston	51	50 1/2	51	Mar. '20, Q 1.00	Daly-West.....	Boston	4 1/2	4 1/2	4 1/2	Apr. '20, Q 15
Ray Con.....	N. Y.	17 1/2	16 1/2	16 1/2	June '20, Q 25	Eagle & Blue Bell.....	Boston Curb			2 1/2	Apr. '20, Q 10
Ray Hercules.....	Boston Curb			*75		Electric Point.....	Spokane	34 1/2	30	30	May '20, SA 03
St. Mary's M. L.....	Boston	42	39	42	June '20, K 2.00	Fed. M. & S.....	N. Y.			13 1/2	Jan. '09, 1.50
Seneca.....	Boston	14	13 1/2	14		Fed. M. & S. pf.....	N. Y.	36 1/2	36	36	June, '20, Q 1.75
Shannon.....	Boston	1 1/2	1 1/2	1 1/2	Nov. '17, Q 25	Florence Silver.....	Spokane			*45	Apr. '19, 01 1/2
Shattuck Ariz.....	N. Y.	9	9	9	Jan. '20, Q 25	Iron Blossom.....	N. Y. Curb.			1	Apr. '20, Q 02 1/2
South Lake.....	Boston			2 1/2		Judge M. & S.....	Salt Lake	1	4.00	1	Apr. '20, A 12 1/2
South Utah.....	Boston			*14		Marsh Mines.....	N. Y. Curb.	*12	*10	*12	Nov. '17, 02 1/2
Superior.....	Boston	5 1/2	5	5	Apr. '17, 1.00	Prince Consol.....	N. Y. Curb.	*12 1/2	*12	*12	Feb. '19, 01
Superior & Boston.....	Boston	3 1/2	3 1/2	3 1/2		Rambler-Cariboo.....	N. Y. Curb.	*12	*12	*12	
Tenn. C. & C.....	N. Y.	10 1/2	10	10	May '18, I 1.00	Rex Con.....	N. Y. Curb.	*7	*6	*6	
Tuolumne.....	Boston	*60	*58	*58	May '13, 10	South Hecla.....	Salt Lake	1		*94	Sept. '19, K 0.15
United Verde Ex.....	Boston Curb	32 1/2	31	31 1/2	June '20, Q 1.50	Stand. S. L.....	N. Y. Curb.	1	1	1	Oct. '17, 05
Utah Con.....	Boston	6 1/2	6 1/2	6 1/2	Sept. '18, 25	Tamarack-Custer.....	Spokane	2.45	2.40	2.45	Dec. '19, K 03
Utah Copper.....	N. Y.	70	67	68 1/2	June '20, Q 1.50	Tintic Standard.....	Salt Lake	1		3.10	June '20, Q 0.10
Utah M. & T.....	Boston	1 1/2	1 1/2	1 1/2	Dec. '17, .30	Wilbert.....	N. Y. Curb.	*4 1/2	*4	*4 1/2	Nov. '17, .01
Victoria.....	Boston	2 1/2	2	2		NICKEL-COPPER					
Winona.....	Boston	*50	*50	*50		Internat'l Nickel.....	N. Y.	18 1/2	17 1/2	18	Mar. '19, 50
Wolverine.....	Boston	16	15 1/2	15 1/2	Jan. '20, Q 50	Internat'l Nick. pf.....	N. Y.			82	May '20, Q 1.50
LEAD						QUICKSILVER					
Hecla.....	N. Y. Curb.	4 1/2	4	4 1/2	June '20, QX 20	New Idria.....	Boston	5 1/2	5	5	Jan. '19, 25
St. Joseph Lead.....	N. Y.	16	15 1/2	15 1/2	June '20, QX 50	TUNGSTEN					
Stewart.....	Boston Curb			*16	Dec. '15, .05	Mojave Tungsten.....	Boston Curb			*10	
Utah Apex.....	Boston			1 1/2	Nov. '18, 25	VANADIUM					
ZINC						Vanadium Corp.....	N. Y.	93 1/2	89 1/2	90	Apr. '20, I 1.50
Am. Z. L. & S.....	N. Y.	15	14	14 1/2	May '17, 1.00	ASBESTOS					
Am. Z. L. & S. pf.....	N. Y.	49	48 1/2	48 1/2	May '20, Q 1.50	Asbestos Corp.....	Montreal	85	82 1/2	87	Apr. '20, Q 1.25
Butte C. & Z.....	N. Y.	9 1/2	7 1/2	9 1/2	July, '18, 1.50	Asbestos Corp. pf.....	Montreal	97 1/2	92	97	Apr. '20, Q 1.50
Butte & Superior.....	N. Y.	23 1/2	22 1/2	23	Sept. '17, 1.25	MINING, SMELTING AND REFINING					
Con. Interst. Cal.....	N. Y.	13 1/2	13 1/2	13 1/2	June '20, Q 50	Am. S. & R.....	N. Y.	63 1/2	60	62	June '20, Q 1.00
New Jersey Z.....	N. Y. Curb.	198 1/2	197	197	May '20, SA 4.00	Am. S. & R. pf.....	N. Y.	92	92	92	June '20, Q 1.75
Success.....	N. Y. Curb.	*5	*4	*5	July '16, .03	Am. Sm. pf. A.....	N. Y.	76 1/2	74 1/2	76 1/2	Apr. '20, Q 1.50
Yellow Pine.....	Los Angeles			1.02	June '20, Q .03	U. S. Sm. R. & M.....	N. Y.	60	57 1/2	60	Apr. '20, Q 1.50

*Cents per share. †Bid or asked. ‡Quotations missing. Q, Quarterly. SA, Semi-annually. BM, bimonthly. K, Irregular. I, Initial. X, includes extra

