

# ENGINEERING & MINING JOURNAL PRESS

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Entrance to adit, San Jose mine, Guanacevi camp, Durango, Mexico. San Marcos outcrop in background

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

July 22, 1922



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## The Search for New Mines

**T**HE CONTROVERSY as to the promise of finding new mines rages out at every opportunity. The engineer remarks, or writes, or testifies somewhere, that mines are getting harder and harder to find; and the man on the spot, who is hunting for mines, or who has mines to sell, promptly confounds the pessimistic one by citing examples: was not such and such a mine discovered last year, or the year before; and is it not certain that others will be found?

Controversy is futile; both contestants are right; it will always be possible to discover new mines, or to reopen and rework old mines at a profit, through better business management or metallurgical or geological skill. But the percentage of such opportunities will most certainly be a dwindling one in the future, just as it has dwindled so greatly in the past. There was a day, in the early halcyon days of the West, when a well-known mining enterpriser uttered his famous dictum, "To hell with a mine that won't stand bad management!" Those days are legendary, and in spite of brilliant renewals of mining glory as at intervals a great new camp is discovered, or a great promise of a new camp, even if a promise unfulfilled unfolds itself to the public, the inevitable result of intensive search and unbelievably efficient and swift exploitation makes itself steadily felt.

"The old order passeth, changing to the new,  
And God fulfills Himself in many ways."

Nevertheless, it is true that we cannot afford to miss the prospector. Even if his numbers are fewer, he should all the more be encouraged. His services cannot be duplicated. Neither the engineer nor the geologist can undertake to do his work or fill his place, or stop the gap he would make were he not active. Assuredly, there is hope for his searchings. There are many nooks in mountain and desert yet to be thoroughly examined, and even, especially in the North and South of the continent, lands unexplored or only half explored. But his major activities will expand in ever-increasing circles away from the old seats of intensive mining. In Cuba we know of a systematic prospecting party which is now being conducted—the prospectors happen to be college students studying engineering; but they are not so much doing engineering work, as just plain prospecting.

Geologists have been studying prospecting problems attentively, to see if they can lay down rules to narrow and concentrate the search of the ore-hunters. Mr. Augustus Locke, for example, has studied oxidized iron outcrops—gossan—to ascertain whether it is possible to separate the gossan which overlies copper-bearing pyrites and the gossan which overlies worthless pyrites. We believe that geology may thus help, little by little, the prospector as it has done so very distinctly and greatly in the past. Then there is the study of instru-

mental detection of geologic differences, even if not always actual orebodies—a study still in its infancy, but which we may with reason expect will gradually be developed.

It is, of course, altogether unlikely that any instrument will suddenly be developed to "locate gold, silver, oil, buried treasure, and Scotch whiskey," as has so often been idiotically claimed; and one is justified and on a firm basis in scouting such fakes, but, on the other hand, it is quite likely that the old dip-needle survey, so effective in locating certain iron deposits in the past, will be reinforced by other and finer instruments, which in the hands of skilled engineers will supplement the geological knowledge derived from a study of the exposed rocks and the painstaking prying of the prospector. With these new aids of geology and instrumental surveys of all kinds will go an increased use of the drill, thus directed: its long fingers will feel out in depth when the eye of the prospector shall have covered all there is to see on the surface. And such systematic work will entail expense, and more and more the standards of ore hunting will become increasingly complicated, the process organized, large-scale, and backed by groups.

In a garret of a certain New England farm house that we know (one of many such) stands a spinning wheel and simple carding apparatus. From sheep's back to the Yankee's back the whole was handled and manufactured by this farmer and his wife, his sons and daughters, not so long ago.

Those of the present generation who wish to engage in the pursuits of their fathers must travel to Lowell or some such great manufacturing center, where they may run a machine which performs a certain small part in the sheep-to-man transformation of the wool: ten thousand hands do what one hand did then; and do it efficiently and swiftly.

## Our Family of Readers

**A** CERTAIN "prospect" approached by our circulation department as a possible subscriber, reacts violently and unfavorably and with sulphurous profanity. He sends in a clipping from our Discussion department—a clipping signed with the full name of the writer—and proceeds to vituperate the *Journal-Press* for the sentiments therein contained. The clipping referred to the prospector; it may accordingly be inferred that our prospect is at one and the same time a prospector, confusing as this may appear to him, when what he is looking for is a good prospect, and there he is all the time! But the writer of the communication in Discussion which our prospect-prospector (in view of his language we are tempted to use the superlative, and say prospectest, of which the negative form would be prospect non est, which would also appear to be the case)—the writer and signer of this article, for which

he is condemned, did not say what the prospect thought he did, nor anything like it—moreover he wrote in language reasonably plain.

And this brings us to what we want to say—that the *Journal-Press* is designed for intelligent mining men, from the prospector to the capitalist. And it does not want on its subscription list a man who does not know that signed articles in Discussion give no hint whatever of editorial policies and opinion; and also cannot read intelligently and comprehendingly a printed letter written in fairly simple English. Not if we see them first. If we could remove from our "prospect" list men of this type, it would save us much time and money.

We do not strive to be a "high-brow" publication but we do strive most decidedly against being "low-brow". We do not pretend to serve any interest, prospector or "mining magnet," as our correspondent would spell it, in the sense of truckling to these interests, or being paid by them, through subscriptions, advertisements and favor. We serve the mining industries, from top to bottom impartially, with the standards and ideals of the retained engineer, not the retained lawyer. And in this we differ, for example, from the Mining Congress; and it is well to understand clearly this difference in comparing policies. We are frank, as the Mining Congress is frank, in our statement of point of view and sense of responsibilities. We can make it clear to Californians by saying that our standards and methods of action are those of Hoover rather than of Johnson—the engineer rather than the lawyer.

We write and publish for clever men, for thoughtful men, for broad men, for tolerant and fair men. We fetch and carry for no one and for no group. If you expect anything else, and feel that you have been "stung" after you have paid four dollars, and we print something that pinches your petty corns, don't hesitate in getting out of the fold; because if we saw you first we certainly would throw you out. Our circulation department, however, is necessarily largely a mechanical organization, and you will get a lot of communications that—if you are not wise to the ways of the world—will look as if we would lie down and die for four dollars, when as a matter of fact our price is considerably higher.

### An Engineer's Patents

**T**HE DEVELOPMENT of improved apparatus, the evolution of new processes, and the perfection of existing methods and designs are features of engineering work which, essentially, imply and involve creative effort. To one with initiative and perseverance will come sooner or later a desire to take what is considered by the novice as a short cut to fame; he will seek to secure a patent. In many instances the application is refused, in some it is granted; but in few cases does the effort lead to anything but disappointment and financial loss.

The object of this editorial is to impress an important fact on those who are inclined to seek legal protection for their ideas—that patenting is essentially a business. It is a business of which the average technologist or engineer has no knowledge whatsoever; it is a business in which, alone and unaided, he has little chance of succeeding. These are blunt facts, which will be unpalatable to men of genius—to those above the average of mental mediocrity.

The customary methods of obtaining a patent appear

so simple to the novice that wealth and position seem near at hand even before the application is made. But the zealous investigator seldom thinks of crediting others with hard work and extensive research on the same problem. His first disappointment may come when an expensive search reveals several prior patents. He accepts the verdict with resignation, perchance to find a few years later that some one else has applied for protection of the same idea and has succeeded. Aggrieved, he upbraids his attorney, who replies with evasion and legal jargon.

The inventor, if he would be rewarded, must be represented by a patent attorney who is expert, zealous, and honest. The search for prior patents must be thorough and painstaking; moreover, it must be carried out with a considerable degree of technical skill. The need for experience and integrity in such preliminaries indicates that the patent office fees are of secondary importance.

Having established the originality of the idea, the next task is the wording of the application. This involves consummate legal adroitness and commercial foresight—attributes foreign to the average technologist. The need for attention to the minutest details in an endeavor, seldom successful, to obviate subsequent complications and legal tangles would be unnecessary were all concerned to observe the Sermon on the Mount. Unfortunately, however, the lone technologist or engineer finds himself opposed at every turn by wealthy corporations and alert business men, who have the means to retain the best legal and technical talent available, to prove that the inventor is the last man who should benefit in consequence of his personal initiative and effort.

Should the quarry elude his pursuers and secure the coveted patent, he is confronted usually with the need to take out several more, to protect himself against the depredations of the unscrupulous. These secondary patents are invariably of considerable importance; they indicate that craft and cunning are needed to supplement simple initiative and honest inventive effort.

Having secured protection at a substantial cost, the inventor is now equipped with a right to fight all comers. In this his chances of success are small unless his resources are almost unlimited. At every turn he is confronted with the need for financial backing and honest co-operation.

A well-known metallurgist, whose name has been connected with one of the most protracted patent cases of recent years, advised a number of prospective mining engineers that they should forego any thought of patenting ideas unless they were prepared to develop the commercial application on a business basis. The suggestion was sensible, but it will be heeded by few. The temptation to succeed where others have failed is strong.

It is essential that the inventor be represented by some one who will play the game to the limit of human ingenuity. Not that success in patenting connotes dishonesty, but the aim should be to forestall the machinations of the unscrupulous by attention to each and every detail, however unimportant some of these matters may appear to those unversed in the technicalities of patents and patenting.

The inexperienced scientist or engineer has no chance whatever of beating an astute attorney representing an opponent of commercial standing. How, then, can the non-commercial technologist or engineer with ini-

tiative reimburse himself for his effort? It may be suggested that his first step should be to secure honorable advertisement by the publication of a full and complete account of his discovery. The second is to take early advantage in some way of the improved results that will follow the operation of the idea on a commercial scale. This latter suggestion also comes from the metallurgist to whom reference has already been made; it is an opinion based on wide experience.

Unaided by influence or capital, the inventor has little hope of achieving success. This is often due to over-specialization and a lack of catholicity of interest. The narrow curricula at many universities is responsible to a great extent. Edison's views on general culture and mental scope have been ridiculed in some quarters; but critics would do well to recall the fact that his success has been cumulative, following the financial gain that resulted from the sale of an idea for a stock ticker. This was in the nature of a potboiler, enabling him to develop his talent in electrical matters. Engineers should bear this example of success in mind.

### The Adventure in Mining

AT A RECENT MEETING, in London, of the Selukwe Gold Mining Co. it was announced by the chairman that an offer had been made by "American friends" to purchase the Selukwe company's interest in a Canadian mining enterprise, "but, being adventurers, while appreciating this proposal, we declined to sell, as we cannot thrive merely by getting our money back." That was a miner-like answer, and in accord with the speculative spirit that is essential to successful mining. "Adventurers" is a good word; it used to be applied to the shareholders in the Cornish tin mines and it was used earlier by the Hudson's Bay Co. Even to this day the annual meeting is called in the name of "the adventurers trading in the Hudson's Bay territory." Mining enterprise is essentially a speculative venture, or an adventure, and it is more successful when approached courageously and sanely with eyes wide open than when it is undertaken as an investment or "a manufacturing proposition," the last a phrase common in wild-cat prospectuses.

### The Tariff Problem

OUR LUKEWARM or even downright chilly editorial attitude toward those who would clap a high tariff on everything has naturally disappointed many small groups who would profit by a tariff on their particular mineral product. The public is, however, a larger one. Would they profit with foreign competition shut out but no market at home? Exclusion of foreign products alone will not mean prosperity for them; it will be also necessary to have a lively domestic demand; otherwise, the prices of their product will fall in spite of the tariff, or, indeed, they will not be able to sell it at any price.

The Old Guard of the present administration (of which administration we are in general admirers and supporters), by making their chief drives on a high and inflexible tariff and on the bonus, two economically unwise things at the present juncture, are beginning to note with alarm the multiplying rocks and bell-buoys and red danger lights in the channel through which they are steering the Ship of State. These warnings are not

coming from the Democrats, who are complacent and happy, hoping that both the high, inflexible tariff and the bonus go through, in which case they confidently expect a Democratic landslide in 1924. The danger signals come from Republicans: one, the last and most unmistakable, comes from the conservative Senator Edge, of New Jersey, who stated in the Senate that he cannot support a tariff bill which is framed along lines so hard and fast that it may cause a national disaster.

Protection is a sound principle; like nitroglycerin, it is a useful servant in expert hands. Its application is a science; in the hands of politicians and lobbyists it is nitroglycerin in the tonneau of a joy-rider.

It has been proposed by one group to make any tariff enactment flexible, subject to alteration at the discretion of the President, who would probably lean mainly upon an enlarged and strengthened Tariff Commission. This is as it should be; but tariff duties put on piecemeal and helter-skelter in the interests of petty groups will cause unmerited hardships to all of us. Any legislation that will depress general business in this country—as a general, inflexible, high tariff will certainly do under existing conditions—will deal a body blow to our struggling mining industries, for the reviving markets for mineral products will again be prostrated. We cannot have a tariff on our own particular back yards without submitting to the hampering tariff on all and sundry. Individual struggle with blindness to the national situation will not get Tom, Dick or Harry anywhere. Therefore, we emphatically disapprove of the Mining Congress campaign for a high tariff on everything—even on cyanide, in order to be consistent; for we foresee, with Senator Edge, only disaster to mining resulting from this universally applied principle. We have had lean years enough in mining since the war; let us beware how we throw monkey-wrenches into the machinery of reconstruction.

### Fiat Money or Silver Dollars

MUCH of the world's supply of silver may come from North America, but a great deal of the output finds its way eventually to the Orient. Silver producers need feel no alarm at the attempt of the South China government to circulate fiat money in place of the silver dollar, to the use of which the Oriental has been accustomed for generations. Neither need they pin much faith on the psychological effect of the utterances of Dr. Sun Yat Sen, the former president, who, according to press reports, was recently taken prisoner by the United China forces. A sample of the economic philosophy of Dr. Sun is as follows: "We have found," he is reported as saying, "that it is not essential to provide a cash reserve nor to promise to redeem paper money on demand. Those notes are not immediately redeemable. The security for them is the work which we have done with them. We do not put them into circulation by paying troops or campaign expenses with them, but pay for labor on public works, such as roads for instance. The road built by the issue of the notes is then security for them, and they can eventually be redeemed out of the returns to the community from such public works. We have found this to be thoroughly practical finance." The fallacy of this line of reasoning was shown by later events, for the unbacked paper money was refused by everyone, all demanding standard dollars of silver.

## The Herrin Affair

BY T. A. RICKARD

ON MY WAY to the office this morning I read several accounts of the Herrin massacre. It made my blood boil. According to press dispatches, this is what happened: A small surficial coal mine in Williamson county, Illinois, was being operated in opposition to the Union, which had called a strike. The owners of the property had engaged a number of guards, described by one of the miners as "tough fellows sent by a Chicago detective agency". The miners themselves had been provided with arms, and a machine-gun is said to have been placed in position. The last item I doubt. The whole force at the colliery was about sixty. On June 20 at an assembly of strikers in the town of Herrin a telegram was read from John L. Lewis, president of the United Mine Workers of America, in which the men at the mine were described as "common strike-breakers". Inflamed by this suggestion, and by drink, a crowd invaded two hardware-stores and demanded arms; on being refused, they bound and gagged the proprietors, and then seized "everything in the nature of weapons and explosives". More guns and ammunition were obtained, in a manner not described, at the neighboring town of Marion. Thereupon, late in the afternoon, a mob of several hundred men proceeded to the mine. After desultory firing during the night, the attackers blew up the pump-station and captured the food-supplies they found in a railroad-car. Two of the mob were shot by the defenders. At sunrise the white flag was hoisted. According to one version, the strikers "went over the top" and took the position by assault, but this is only the pseudo-heroic rot of an imaginative reporter. None inside the mine, which was of the 'strip' or 'open-cut' type, had been killed at that time. As soon as the employees and guards surrendered they were "tied together in groups of three and six", and driven along the road. Many of the mob were "reeling drunk". One victim says: "First they struck us with their fists and then as they tasted blood they started in to hammer us with the butts of revolvers. McDowell, the superintendent, who was crippled, headed our line. It seemed to me everybody took a crack at him". Fifty-two men, whipped into line by clouts and curses, were forced, more dead than alive, to march between flanks of "enraged and moonshine-crazed men". At the head was "the limping mine superintendent, blinking from his swollen eyes, trying to ward off blows". When these battered prisoners were ordered to run into the fields, and broke away, they were hunted by "wild groups of the strikers, now transformed from guards of prisoners to man-hunters, beating the brush for human quarry". And women were present to sanction these horrors! "In the road, near the mine, six men tied together and terribly mangled by bullets and clubs, were lying in a scorching sun, while hundreds of men and women laughed at their pleas for water, made in the name of God". Estimates of the killed range from 33 to 75, the smaller number being more probably correct. Only one more touch was needed to complete this infamy perpetrated in the name of Labor, and it was not missing: "The

hospital was carefully guarded, all doors being locked to prevent possible attack on the wounded men". One of the victims was an ex-soldier; when he crossed the sea to keep the world safe for democracy he did not dream of the day when he would be engaged in a caricature of warfare and go to his death at the hands of a murderous mob acting in the name of a democratic principle.

During the perpetration of these atrocities, and for several days afterwards, the officers of the law did nothing. On June 23, three days later, the Sheriff and other county officials announced coolly: "The trouble is over, and there is no need for troops". The Sheriff himself remarked, "As long as they do not operate the mines, the men will remain peaceable". As if a man had no right to work, and as if it were not the Sheriff's duty to protect him, if necessary, when he went to work! The Governor of the State telegraphed to the Sheriff: "I insist on prompt action and impartial enforcement of the law . . . Troops are being held in readiness". But as the Sheriff did not ask for the assistance of troops, none were, or could be sent. The Coroner's jury found that the death of 19 non-union men was due to "the act, direct or indirect", of the officials of the coal company; they branded the butchered superintendent a murderer because it was alleged that he had shot one of the attacking mob.

On June 24 Senators Myers and Bursum, speaking before the Senate, blamed the State officials for their failure to uphold the law, and, more specifically, for allowing either side to take the law into their own hands. As Senator Myers said: "There can be no free America as long as American citizens cannot work where, when, and for whom and at whatever price they choose without seeking the consent of an invisible government". It is clear also that, as soon as a strike or a lock-out is called, the carrying of arms, even for sport, should be placed under embargo. If the local authorities are unwilling or too weak to take such action, then either the State militia or Federal troops should be utilized for the purpose. The Constitutional proviso (Amendment II) for "the right of the people to keep and bear arms" refers to "a well regulated militia". Nobody should be allowed to carry arms except the officers of the law. The hiring, by employers, of armed guards, nominally detectives, really ruffians on the edge of the criminal class, is a bad feature of strikes, because it encourages and excuses the use of murderous weapons by the men on strike. To acquiesce in such methods is to flout democracy and acknowledge the failure of representative government.

It is announced that the Secretary of Labor, after consultation with the President, has declared "that those responsible for the Southern Illinois mine disorders should be prosecuted to the fullest extent of the law". The Administration should be held to this undertaking. It is more important to enforce the law than to produce coal; it is more essential that democratic government be honored than that either wages or dividends be increased.

## DISCUSSION

### Revision of the Mining Law

#### The Mining Scout and the Prospector

##### THE EDITOR:

Sir—My attention has been directed to the recent examination of Horace V. Winchell by Representative Rhodes, chairman of the Mines and Mining Committee, as published under "News from Washington" in your issue of June 24.

There is too much food for discussion in the several questions and answers to undertake a general criticism at this time; one point merits immediate consideration. As a side remark, preliminary to the point in mind, it strikes me that, in legal parlance, the questions are rather "leading." Also, in his reply: "Numerically, so far as I have any record of their views, the prospector is *multitudinous* (my italics). . . ." Mr. Winchell's answer is noticeably inconsistent with his effort to prove that prospectors are a class of the past. Mr. Winchell admits that the prospector still is "multitudinous," and we must recognize the fact, that *were there a market for "prospects,"* or even for partially developed mines, there are a great many others who would take the field, prospecting.

To the point in mind. Mr. Winchell's answer:

"There are within my acquaintance perhaps twenty exploration companies who have raked this country north, south, east and west, from Alaska to the Rio Grande, searching for more mining. They started with the determination to examine everything and anything anybody could put up to them with a chance of discovering some mineral, but have been unable to find anything."

"Determined to examine everything and anything anybody could put up to them." What does "anybody" put up to them? Perhaps I meet as many of the "scouts" and "field men," representing these "twenty exploration companies," who pass through this section, as any one man does. In answer to the above question, let me ask: Who is anybody? "Anybody" is not the prospector. Too often "anybody" is some "tin-horn" promoter who hangs about the "mining hotel" of the town; who has an option, or can get an option on some "prospect" at a low figure, hold on to it indefinitely without obligation to make improvements, or develop, provided he can put such a deal over on some prospector. He generally doubles or trebles the option price, in offering it.

Does "anybody" know whom these "field men" represent? Does "anybody" know these "exploration companies," their standing, their head offices, what they want, where to find them, who is back of them, financially?

As a matter of fact, the average prospector is at his job in the hills, or working at some neighboring mine or ranch for a grub-stake. There are numerous prospectors today. We do not always find them in the hills, on their prospects, or loafing about old mining camps. True, one may find only "one or two or three in camp," these days. Camp conditions have changed,

old social conditions vanished, but the prospector is in the hills just the same.

As to the "scout," the "field man," for these exploration companies, who is he? How familiar with the territory to which he is assigned? What is his average age? What, his familiarity with "prospectors," their attitude, their temperament? Where does he get his dope, on which to start "investigation" into what "anybody" has put up to him?

In the first place, he is, I venture, a young graduate engineer, lacking in practical field experience, with little, more likely no operating experience, inexperienced in the wilds and immature in his practical, mining geology, observation and deductions; he has been trained to guard against "salting" and his mind has been steeped with suspicion against "everything and anything anybody could put up to him." He does not approach the work with a spirit that inspires the confidence of the average prospector, or "mining man," should either cross his trail.

"The scout" is generally assigned to some section of the west, "from Alaska to the Rio Grande," of which perchance he never heard, in a technical way. He heads for the "mining center," listens in on mining talk and hears of this and that mine (?), or promotion, gets a line on it, and others of the same class and starts out, in his auto, to investigate what "anybody" has put up to him. These classical propositions are, ninety-nine times out of one hundred, some notorious proposition which has gained publicity from repeated, wild attempts at promotion, the "high spots" in all mining sections. One might think that, with these as starting points, he would get into touch with *something* in their vicinity. He does not; his schedule is prearranged, to a large extent, and he replies, "My time is limited," should "anybody" suggest that he look at something "off the line."

As suggested above, the real prospector is not loafing around the hotel towns, so does not see the "scout." The prospector is obliged in these times to work for a grub-stake; whereas, in the earlier days, some enterprising local merchant, banker or capitalist was ready to grub-stake him. The "scout" fails, utterly, to make contact with the prospector.

There are resident engineers and reputable "mining men" in most sections, who are familiar with the boys in the hills and what they have in their prospects. The "scout" may come in contact with men of this class. But, what incentive is there to give of their time, their years of investigation, of effort and expense, to a traveling "scout" for an unknown "exploration company," on his mere word that he represents some such. Invariably, the "scout" is reticent as to who is "back of him." This is why "they have been unable to find *anything*." The system is wrong, is futile. But that is another story.

The revision of the mining laws is imperative, in the interest of the investor and the public, as well as

in the interest of conservation of expenditures and of the resources of the country. Fundamentally, the extralateral right must be abolished. There is not today, and never was, any excuse for a freak title such as afforded under the present law.

There is no rational reason for truckling to the "big location" of British Columbia or the "little location" of Mexico. This is the United States. We have been accustomed to the 20-acre mining claim as the unit. Fortunately it fits closely with the "legal subdivisions" of the land surveys.

There is no valid reason why a prospector can not find "Government corners" as easily as the timber cruiser, the land looker, the homesteader, or the man hunting out coal and oil lands, under the Government surveys. These corners can be more readily found than the average "location corner," as put up according, or not according, to law, by the average prospector.

There is no reason why the mineral lands of the people should not be dispensed, under the General Land Office, just as is a homestead, a desert entry, a coal claim, or any other, legal subdivision of the Government lands; recorded in the same manner, and save the cost of survey, advertising and platting. In unsurveyed areas, let the same course be pursued as in a squatter's right, locating with the points of the compass, north-south and east-west, pending adjustment when the surveys are made. The most of the Government land is now surveyed, and work on the balance is making good headway, even in the rugged, mountain sections. The majority of mines are not in the most rugged sections, as some would have us believe.

To carry out the above suggestion it will be essential to modify the rules and regulations of the General Land Office as applying to mining locations. But there is no necessity of going to extremes, such as imposed in the bill drafted by the Ingalls Committee. Don't hurry. We have waited years for a mining law and better wait a few months more than to be saddled with most of the onerous conditions imposed by that bill.

It is imperative that location (filing) be permitted without "discovery." This is so with coal lands and with oil lands. There can be no valid objection to such a provision; in fact it is essential to the development of our mineral resources, as yet not much more than scratched. Under the present law, it is often necessary for the prospector or the agent of an exploration company to *perjure himself*, as on the deposits of Bisbee, Ariz., Tintic, Utah, and in other camps of the west, in order to open up what have proven immensely valuable ore deposits.

Why should the Government impose upon the citizen the necessity of committing perjury, in order to develop our resources?

As to the tenure of holding, while prospecting, it is a matter for careful consideration and investigation. The argument on which are based the terms and lease-payments of the proposed new law, namely, that the "prospector" no longer exists, is absolutely fallacious. Given the chance to market his mines, it will be found that there are many prospectors, and, by the same token, there will be many more to enter the field.

I do not propose discussing the rental fees, merely saying that they are not right; that they are not approved by business men of the mining sections and benefit only the impractical prospecting-exploration companies which are trying to work out their own sub-

stitution in place of the prospector and the small, individually, personally-interested, prospecting syndicates, throughout the mining districts. The exploration company can not do it. Why? Simply because, in the last analysis, they have to fall back on the man in the hills for their starting point. Give him a chance, a market for his discovery, or his partially developed mine, and any one who has the money and really wants a mine, will have no trouble in finding it, anywhere from "Alaska to the Rio Grande."

Under "Discussion," in the same issue of the *Engineering and Mining Journal-Press*, Mr. Van Wagenen takes Mr. Brunel to task on "Dealing with Prospectors." Mr. Van Wagenen is absolutely right.

In closing let me urge the substitution of the half of the legal subdivision of forty acres, that is, twenty acres, as the unit mining claim; let it be described as any other legal subdivision is described, without the necessity of survey for patent. Let this be filed upon, recorded and the patent be granted as in the case of any and all other Government lands. Let the prospector have the right of location without discovery and with reasonable restrictions as to time and work in which to make a discovery, with additional time, upon discovery, for development work. Allow him additional claims covering the dip of his vein, lode, deposit, bed or mineral occurrence, just as the mining companies of the Michigan copper range bought lands over the dip, where the lodes run northeast-southwest and dip at 35 to 40 deg. from the horizontal—the most extreme situation to be met. Similar conditions exist throughout the West, beside those involving deposits of ore, in limestone, which never show at the surface.

Let the provisions for work to be done, necessary to patent, the price per acre, etc., remain as, or nearly as they are. A time limit, after discovery and the necessary work has been done, should be set, within which to proceed to patent. This will redound to the benefit of prospecting and the development of the country's mineral resources. The present law, permitting \$100 worth of work, year after year, ties up the country, keeps prospectors off and suppresses development.

Give the "multitudinous" prospector and small prospecting capital a chance—a market for the result of their efforts. The "twenty exploration companies," by Mr. Winchell's admission, are a failure.

Helena, Mont.

L. S. ROPES.

## Antimony Oxide

THE EDITOR:

Sir—In a recent issue of *Engineering and Mining Journal-Press* we were interested to read an article on antimony oxide, which is described as a new Australian substitute for white lead. The article is liable to give readers the impression that the importation of oxide of antimony for this purpose is a new venture.<sup>1</sup> This, however, is hardly the case, as Messrs. Cookson & Co. for whom we are United States selling agents, have been importing large quantities into this country for the past three years. This oxide is made in England and marketed by us under the trade name of "Timonox," and we can safely say it has passed the experimental stage, as it is being imported, in commercial quantities, by several of the large paint and varnish houses in this country.

New York City.

EDWARD HILL'S SON & CO.

<sup>1</sup>The article referred to was reprinted from the Trade Supplement of the *London Times*.





General view of San Pedro, Guanacevi, looking east from Soto Hill

## The Camp of Guanacevi

Much of Noted District's Patented Area Still Unexplored, Despite Production of Over Half Billion Pesos to Date—Present Workable Limit 450 Ft.—Cheaper Power and Rail Communications Needed

BY ALBERTO TERRONES BENITEZ

**T**HE CAMP of Guanacevi is situated in western Durango on the eastern slope of the Sierra Madre. The topography of the district is rugged, the altitude varying from 1,900 to 2,600 m. above the sea. Guanacevi proper forms the eastern and lower end of the camp, and San Pedro the western and upper end. The country is crossed by the Guanacevi River, running from west to east, with its many tributary arroyos. The climate is temperate and healthful. The rainy season begins in June and ends in October, the rest of the year, except December and January, being dry.

The history of the camp has been traced as far back as 1616, when the Tepehuan Indians revolted and killed three missionaries, Ludovicus Hieronimus, Johannes Fontes, and Johannes del Valle, at a place called El Zape. By that time Guanacevi was already famous as a mining camp and had attracted the attention of the adventurer Spaniard. In his trip across Mexico, Humboldt visited it. His companion, J. Bautista Patoni, decided to remain in the camp, where he worked at the Nuestra Senora mine, among others; the house where he lived is still called "*La Patonena*."

### PRODUCTION WORTH OVER HALF BILLION PESOS

Official statistics show that from 1836 to 1906 the camp produced ores to the value of 500,000,000 pesos; from 1906 to date, despite the unsettled conditions, its output has been worth nearly 10,000,000 pesos. One ton of ore from the Barradon oreshoot, in one of its big bonanzas, was worth \$60,000, just for the gold contents.

The maximum area ever patented was 4,000 *per-tenencias*, forming about 1,500 claims. At present there are 1,124 claims that have been denounced, their titles not being issued as yet. They are being paid on nearly 800 patented claims.

The camp is almost virgin; only one-fourth of the patented area has been explored and developed. Taking

in consideration the present improved means of exploration and development, and the new treatment processes, the camp has the same outlook as 100 years ago. It has been affected by the general financial depression.

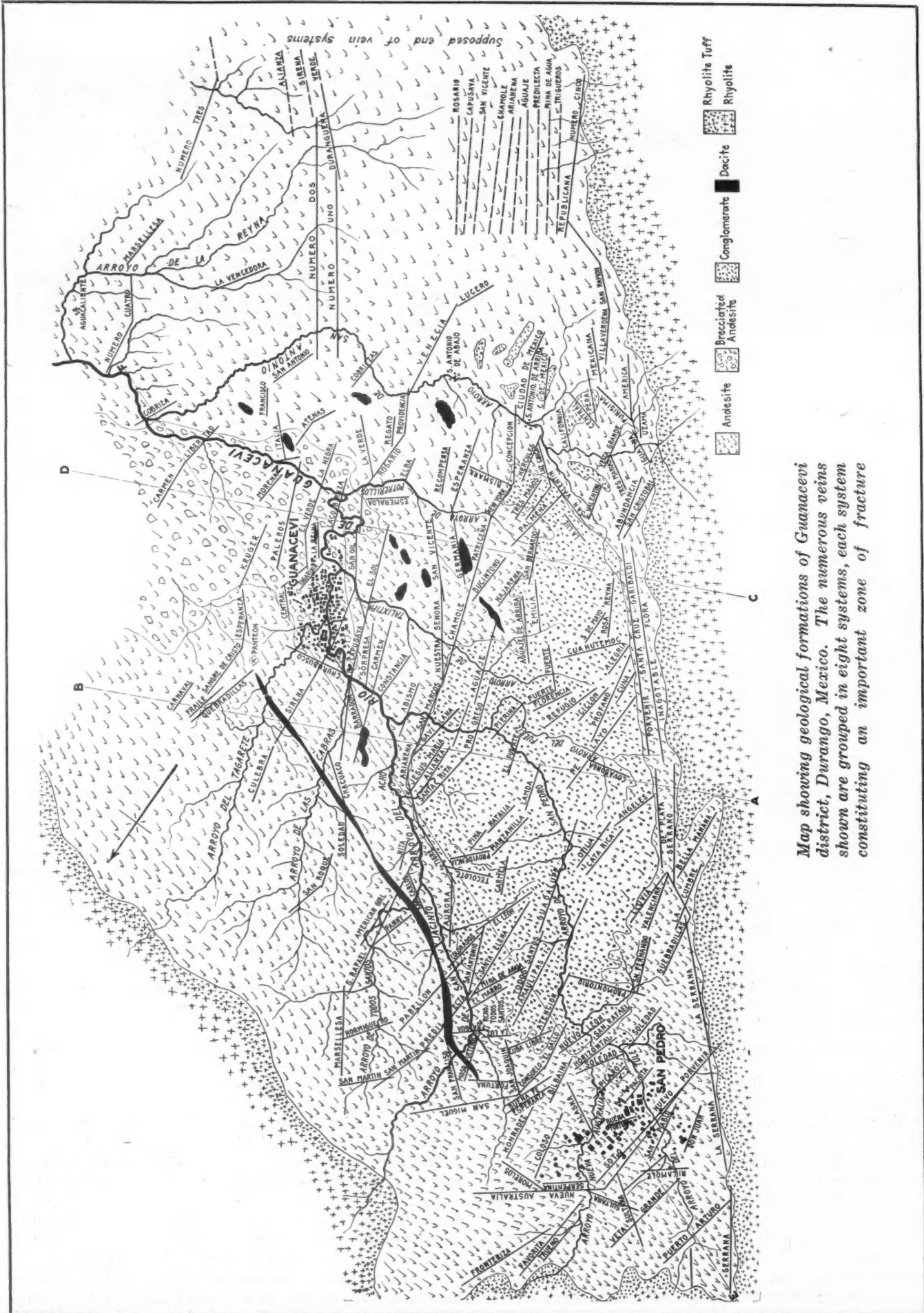
From Guanacevi to the nearest railroad terminals the distances are: To Tepehuanes (via Durango-Torreón) 95 km.; to Rosario (via Parral-Jimenez) 115 km.; and the Paraje Seco (Parral & Durango narrow-gauge), 120 km. From New York the camp may be reached in about a week.

As to natural resources, there is water enough for all necessities. Pine, oak, and cedar grow abundantly in the mountains near-by. The ranches around Guanacevi supply the camp with plenty of corn, beans, cattle, dried meats, and lard. Vegetables and fruit trees are grown in the camp itself. Other foodstuffs and drygoods are shipped from Parral or from Durango. Banking facilities have been accorded to all important mining operators by Juan Leautaud's firm in the city of Durango.

The visible foundation of the Guanacevi geological structure appears to be a conglomerate or old lake-bed formation, folded in an anticlinal shape and protruding in the center of the camp. This is held by some to be a breccia, though others consider it a conglomerate. Overlying this are Tertiary eruptive andesitic flows, covering most of the camp. These flows were subsequently cut by intrusive dacite dikes which outcrop on top of nearly all the Guanacevi hills.

One part of the andesite is brecciated and unaltered, and reaches its maximum depth in the eastern part of the camp (Guanacevi proper); the other portion, which is kaolinized, appears in the upper part of the camp (San Pedro). Overlying the andesitic flows is found the rhyolite, the most recent rock in the camp.

At the contact of the conglomerate and the andesite have been found the richest orebodies in the camp. Paralleling the contact the andesite was fractured and

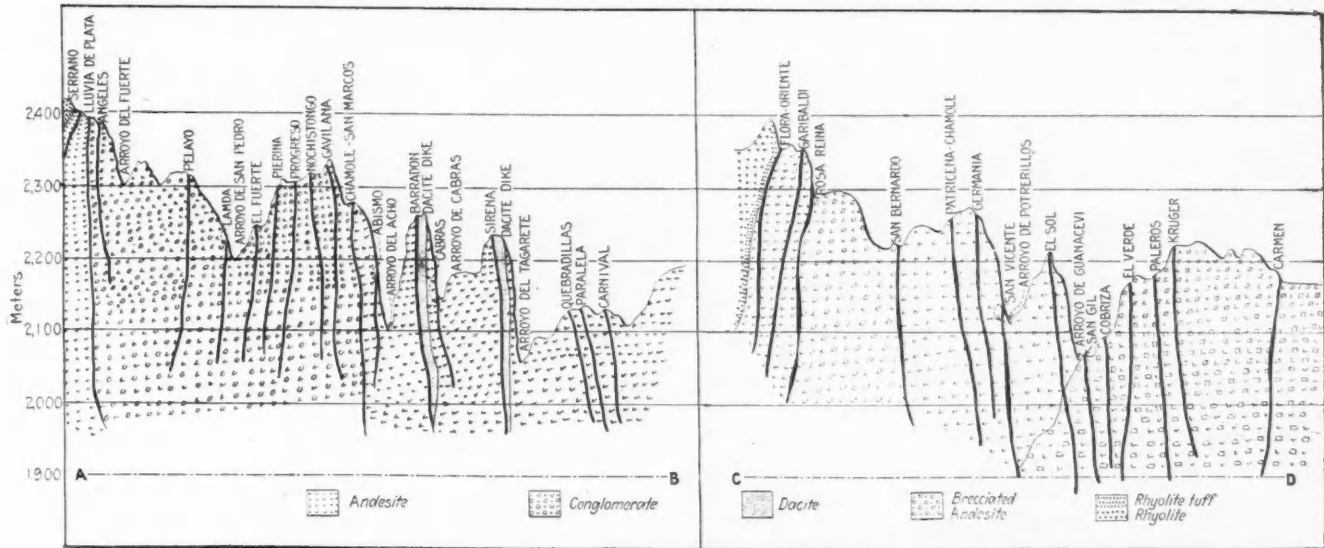


Map showing geological formations of Guanacevi district, Durango, Mexico. The numerous veins shown are grouped in eight systems, each system constituting an important zone of fracture

the fractures subsequently were mineralized (Soto, Nuestra Senora, Sirena, Barradon, and Paleros veins). The San Pedro andesite, wherever the feldspar has been kaolinized, constitutes valuable ground. The veins in the conglomerate, away from the contact, are of no importance. The Guanacevi andesite occurs in three forms, brecciated, acid, or basic. The richest veins

vein systems in the camp appear to converge toward the southeast.

The veins are generally those of the replacement type, the matrix being quartz and silicified andesite, carrying silver, with subordinate values of gold, copper, and lead. The principal silver mineral in the camp is stephanite, though a few of the veins carry argentite

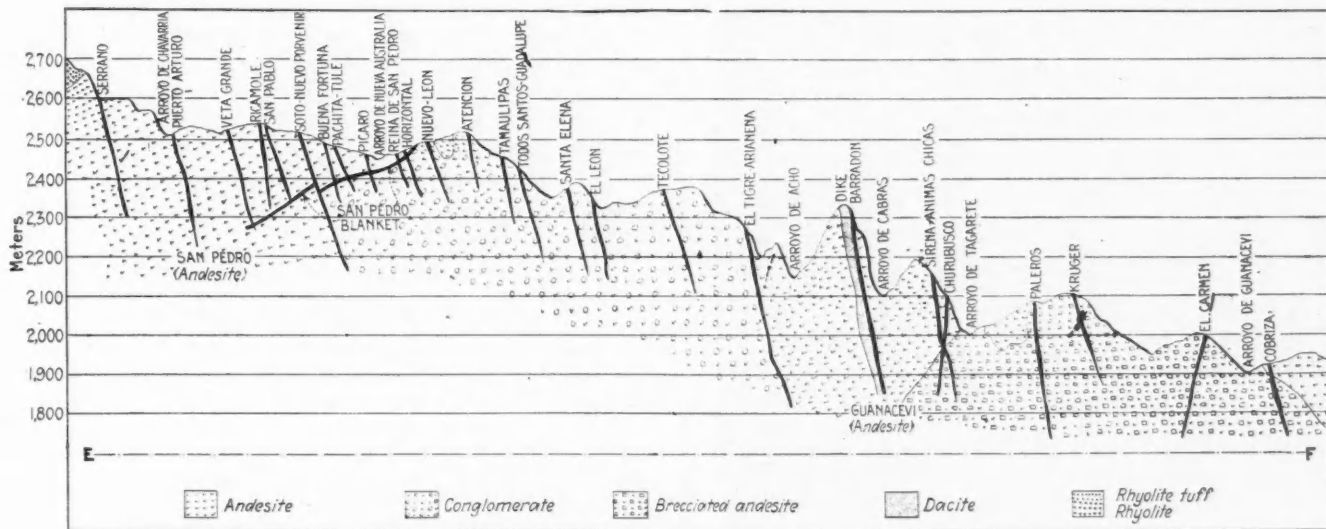


Left. Geological section along line A—B on map on opposite page. Right. Section along line C—D.

are found in the acid andesite; in the basic (dark brown or purple) andesite the veins are barren. The rhyolite tuff marks the ends of the mineralized country, which covers an area of 4,800 hectares or 11,856 acres.

The orebodies at Guanacevi may be classified as veins, blankets (*mantas*), and pockets (*bolsas*). The veins, of which there are several systems, each system constituting an important zone of fracture, strike north 10

in major quantities, as for example, the Predilecta, Aguaje, and Mexicana. The rich bonanza shoots (*clavos*) contain proustite, pyrrargyrite, and native silver. Copper ore (*bornite*) is found in the Paleros-Verde veins. The Buena Fe group, near San Pedro, is noted for the large quantity of sphalerite (*metal chivoso*), which is barren of values. Manganese ores (pyrolusite and rhodonite) are found at the Santa



Geological section along line E—F on map on opposite page

deg. west on the average, and generally dip to the east: they are undoubtedly the most important orebodies. The blankets, noted for their high-grade ores, are found along the conglomerate-andesite contact. The pockets, of varying form, are ordinarily found in the conglomerate. These two latter types of orebodies have been exploited only in the rich San Pedro mines. All the

Cruz, Garibaldi, and Predilecta mines. In San Pedro the veins traverse a soft, grayish or white kaolinized andesite, whereas in Guanacevi proper they cut through a greenish andesitic breccia. The vein material in San Pedro is soft, especially at the contact; and that of Guanacevi is hard, because the matrix carries more silica.

As regards their mineral composition, the orebodies may be classified as cupriferous and non-cupriferous, their character being influenced by the geological depth at which they were originated. Veins in eastern Guanacevi, which down to the explored horizon cut through brecciated andesite, contain a quantity of copper carbonate, chalcopyrite, and erubescite (bornite); these minerals are not found in the veins where the country rock is plain andesite or conglomerate. In general terms, it may be stated that the eastern Guanacevi region is rich in copper and lead, the silver and gold values not being high; the central region is rich in gold, some of the mines producing high-grade silver ores; and the western region (San Pedro) is rich in silver but poor in gold.

#### WORKABLE DEPTH AT PRESENT 450 FT.

At a depth of 150 m. the veins become too poor to be worked under the present circumstances. This implies that the enriched zone is not deeper than 450 ft. As a rule, workings in the developed mines have been stopped at the primary sulphide zone. With the present available means of exploitation, treatment processes, and sources of power, no attempt has been made to develop the mines below the enriched zone. High-grade shoots, as an exception, have been found in the Chamole



Flotation plant, Soto mill, San Pedro, Guanacevi

and Barradon mines at a depth of 1,000 ft., there being no evidence that these mines have been bottomed.

The famous bonanza mines are: Soto, Nueva Australia, Mexicana, Barradon, Sirena, Chamole, Capusaya, San Jose, Arianena, Predilecta, and Desengano.

The oldest mines are: Sirena, Barradon, Quebradilla, Capusaya, Santa Cruz, Soledad, Chamole, Nuestra Senora, Aguaje, and Soto. As a general rule, all the mines make water, this more abundantly in San Pedro.

Silver values per metric ton vary from 80 kg. to 500 g. The gold content varies from 1 kg. to 4 g. The minimum shipping grade at present is 4 kg. of silver per ton, and about 25 per cent lead and 10 per cent copper. Milling ore is not lower than 500 g. of silver per ton.

The capacity of the camp (by vein systems) has been, on an average, as follows: Paleros system, 200 tons per day; average grade 1.5 kg. silver, 6 g. gold, 5 per cent copper and 8 per cent lead. Rosario-Sirena system, 200 tons per day; average grade 2 kg. silver and 6 g. gold. Nuestra Senora-Chamole system, 200 tons per day; average grade 1.5 kg. silver and 6 g. gold. Trigueros-Predilecta system, 200 tons per day; average grade 2 kg. silver and 5 g. gold. Santa Cruz-Serrano system, 400 tons per day; average grade 2 kg. silver and 5 g. gold. San Pedro system, 300 tons per day; average grade 4 kg. silver and 4 g. gold. Total, 1,500 tons per day.

As stated before, only one-fourth of the patented area has been explored and developed; by developing the rest of the camp the above-stated output could be increased possibly to twice as much. Assuming that the camp be worked at its maximum capacity, its life would not be less than twenty years.

#### FEW MINES DEVELOPED SYSTEMATICALLY

The only mines where development has been carried on systematically are the Paleros, Soto, Predilecta, Barradon, Aguaje, and Garibaldi. The rest have been worked under the *gambuzino* plan (by contractors). Hand drilling is most commonly practiced. Air drills have been employed only in the Soto mine. All the mines are equipped with steam power plants which burn wood.

The only mills in good condition are the Soto mill (concentration, flotation, and cyanidation), capacity 250 tons per day; the San Rafael mill (concentration, flotation), capacity 25 tons per day; and the Anita mill (concentration, flotation, and cyanidation), capacity 25 tons per day. Generally, the old stamps have been discarded in the camp and ball mills substituted.

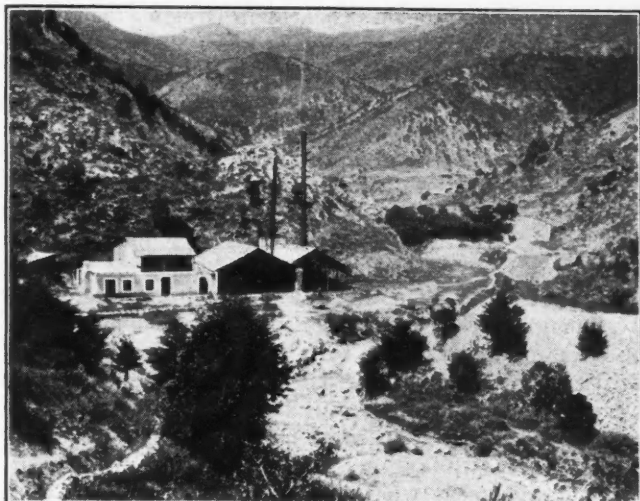
The mills in ruins are the Wilson, Rosario, Capusaya, Trigueros, Barradon, Arianena, Santa Elena, Coloradas, Chamole, and Casas.

In olden times, ores were smelted at Capusaya, Sirena, and Trigueros; but the only things left of the smelters are the smokestacks.

#### FLOTATION WILL MAKE LARGE TONNAGE AVAILABLE

On the dumps and in the upper zones of nearly all the veins there is an enormous tonnage of oxidized ores that could be treated at a profit by cyanidation. As already explained, the great bulk of the vein material consists of pure sulphides, and is well suited for the flotation process. In view of this fact, some of the mills have been equipped for both of these processes, the combination of which works well in the camp.

Under past and present economic conditions only enriched oreshoots could be worked profitably. As already stated, the enriched zone at Guanacevi has an average depth of 300 ft.; the deeper primary sulphide zone is too poor to be worked profitably under existing conditions. With electric power and transportation facilities, available depths could be worked at a profit below the enriched zones, provided improved treatment processes were introduced. As regards cost, the power problem is of vital importance in the camp, and will be



*Fanny mill, Guanacevi*

discussed further. In short, it may be said that the camp has great possibilities under improved economic conditions—namely, cheap power and railroad communication.

The mill extraction ranges from 75 to 85 per cent. The flotation cost should be reduced by installing larger mills. The present power cost is out of proportion: Steam engines are used, burning cord wood, the price of which now is \$12.50 Mexican per cord and is increasing every day. The cost of power in many operations is as much as 50 per cent of the actual treatment cost.

On an average, mining is cheaper in San Pedro than in Guanacevi. Pumping and timbering expenses are higher in San Pedro, owing to the fact that the mines make more water and the country rock is softer, but to compensate for this, only a small amount of explosives is used and hardly any drilling is needed. In Guanacevi proper, the country rock and the vein matter are extremely hard.

#### POWER COST HAMPERS OPERATIONS

One of the reasons why Guanacevi has not attracted the attention it deserves is the high cost of power. Up to the present, the only available source of power has been the steam engine, burning cord wood. The price of wood is 12.50 pesos per cord in the dry season, and goes up to 20 pesos in the rainy season. So far, the timber has been cut for a radius of fifteen miles, and this makes the price of wood higher and higher every year. Wood has to be stored during the dry season (from January to June), as sometimes, even when paying 20 pesos per cord or more, it is impossible to find freighters during the rainy season. These circumstances complicate the power question to such an extent that the resumption of activity in the camp is not advisable, unless the mine operators turn to a cheaper and more reliable source of power. The present cost of developing a horsepower is from 400 to 500 pesos per year.

Gas plants would also bring down the power cost to at least 50 per cent of what it is now. The price of charcoal is 25 pesos per ton, and for a radius of fifty miles there is plenty of oak to be had. The cost of producing power, at the present price of cord wood, for a steam plant generating 475 b.hp., or approximately 4,000,000 hp.-hr., would be 240,000 pesos, or 6c. Mexican per hp.-hr. With a gas plant using charcoal, the cost of

the same power should be 140,000 pesos, or 3½c. Mexican per hp.-hr.

There are hundreds of veins in the camp; dozens have produced bonanzas and contain a large tonnage of low-grade ores. With the event of cheaper power, Guanacevi would possibly rival the Santa Barbara and the Parral mining camps.

Power might also be obtained by extending the Conchos power line from Parral to Guanacevi. The immediate consumption would probably be not less than 900 hp. per year. The power company would undoubtedly hesitate in making the investment, but it would probably pay the operating companies at Guanacevi to finance the enterprise.

#### RAIL COMMUNICATIONS NEEDED

Freighting is regularly done from Guanacevi to Tepehuanes by wagons, mules, and burros, the rates being from 30 to 40 pesos per ton. Freight could also be handled by mules and burros through either the Rosario or Paraje-Seco terminals at a cost of 30 pesos per ton. The maximum capacity of a wagon is two tons. Mules can easily carry up to 150 kg., and burros not over 90 kg. The roads are not in good condition, but the Soto Mines Co., which is operating at San Pedro, has succeeded in running a Ford automobile on the Tepehuanes road, making the trip in six hours. On horseback or on coach one day and a half are required to reach Tepehuanes, and about the same time to Rosario.

The mine products are shipped to the various smelters at Asarco, Torreon, Chihuahua, El Paso, Monterrey, and Aguascalientes. The railroad freight rates are figured on the assumption that every ton of ore or concentrates is worth 50 pesos, final settlement depending on the smelter liquidation.

When the International R.R. Co. first laid out the line to the north of the city of Durango, it was intended to build the road as far as Guanacevi, but for some unknown reason the company stopped construction at Tepehuanes. At a later date, the line from Tepehuanes to Guanacevi was relocated by F. A. Andros, chief engineer of the Mexico Western Ry. Co. (formerly Nazas Valley & Pacific R.R. Co.).



*San Rafael mill, Guanacevi*

The railroad engineers, in figuring the volume of traffic, referring to the ores ready for freighting at Guanacevi, presented the following data (Feb. 5, 1918):

	Metric Tons
Shipping ores .....	31,500
Concentrates from tailings .....	24,500
Concentrates from dumps .....	245,000
Ores in sight, ready for shipment.....	300,000
Total ready tonnage.....	601,000

According to the report of the chief engineer of construction of the Mexican National Railways (Feb. 5, 1918), one of the reasons why he recommended the construction of the railroad to Guanacevi, was "Because the construction of this extension is a very important factor for the development of our transportation system, bringing into activity some of the richest regions of this country, which would otherwise remain unexplored and undeveloped."

A timber company owns the Parral & Durango narrow-gage railroad that starts from Parral to the west and runs into the State of Durango as far as Paraje Seco, seventy miles from Guanacevi. This road has been located to San Pedro, Guanacevi, transversing the timber lands in the Sierra Madre.

#### GUANACEVI PRESENTS AN OPPORTUNITY

In concluding, it may be said that the Guanacevi mining camp is still in its early stage of development. Up-to-date methods of mining and treatment have not been regularly employed in the camp. The camp, moreover, has been deeply affected by the general financial depression. Resumption of operations, however, is not advisable unless cheaper sources of power are introduced. Railroad communication would also be a vital factor for the development of Guanacevi. Taking into consideration the extent of the camp, its interesting geology and strong mineralization, with electric power and railroad communication the scale of operations would probably equal that of Parral, with a minimum life of twenty years. It should be noted, also, that cyanidation and flotation are the treatment processes most fitted for Guanacevi ores.

The Mexican government is well disposed to encourage mining in this country.

#### Oregon Metal Mines Have Light Output

The conditions in metal mining in Oregon are by no means satisfactory at present, according to Charles G. Yale, of the U. S. Geological Survey, as several of the most important properties continue closed or have materially restricted operations. The receipts of bullion from Oregon at the U. S. Mint at San Francisco, smelters, and refineries for the first six months of 1922 amounted to \$171,074 in gold and \$2,113 in silver, which is a decrease in gold of \$101,979 and in silver of \$1,614 from the receipts for the first six months of 1921. These figures do not, of course, show all the gold taken from mines in Oregon so far in 1922, for much ore is shipped to other states for treatment. The total production of gold in Oregon in 1921 was \$882,000.

The decided falling off in gold is due largely to the conditions in the dredging industry. The Oregon Dredging Co. is entirely inactive. The Sumpter dredge continues operations, but equipment trouble cut the production to less than half of that in the first half of 1921. From the Powder River dredge, at Sumpter,

usually the largest gold producer in Oregon, the returns for the first half of 1922 have been 30 per cent less than for the corresponding period in 1921, and dredging on this famous property will come to an end in August, 1922, for the ground is worked out.

The Oregon Dredging Co., at Bridgeport, Baker County, has sold its mining property to the Superior Dredging Co., of Salt Lake City, Utah, and is inactive this year. The Gold Reef Mining Co., operating the Queen of the West mine, at Cornucopia, shut down in January for lack of power but resumed operations May 27, though the operations consist of development work only, mainly on a tunnel to tap the Red Cross mine, of which about 3,000 out of 5,000 ft. has been cut. The Cornucopia Mines Co. is still suffering from the effects of the war, but will resume milling at the end of the year. On the Stalter and Mayflower group, at Greenhorn, development work is being done. The National Mines Co., at Haines, is now owned by a new company, the Elkhorn Mining and Milling Co. The Bay Horse mine, 10 miles from Huntington, is still steadily working 25 men and shipping 25 tons of 50-oz. silver ore daily. Sidings, surface trams, ore bins, and other equipment have been added this year, and the main tunnel is to be driven farther in on the orebody. The mine is owned by the U. S. Metal Co., of Spokane, Wash., and makes a large output of milling ore. A small mill is to be installed on the Bushwacker group, at Medical Springs. The Blue Mountain Mines Co., at Bourne, working the old E and E mines, has completely reconstructed its milling plant. The Imperial Eagle Mining Co., at Sumpter, has kept an average of eighteen men at development work in 1922, retimbering Eagle No. 3 tunnel and drifts and changing the mill. The mill has been run only to make concentration tests of ore taken out in opening the mine, but the property in June was about ready for steady production.

#### Production of Clay in 1921

The output of clay mined and sold as clay in the United States, in 1921 was 1,716,746 tons, valued at \$6,025,300, or \$3.51 per ton, according to the U. S. Geological Survey. This was a decrease of 45 per cent in quantity and 48 per cent in value as compared with 1920. These figures represent only clay sold as clay by the original producers; they do not include the much greater quantities of clay burned into clay products by the producers themselves.

The production of kaolin, the clay that is used in making high-grade pottery and porcelain as well as paper and other products, was 162,726 tons, valued at \$1,579,163, a decrease of 39 per cent and 45 per cent, respectively, as compared with 1920. The clay of largest production and value is fire clay. The sales of fire clay in 1921 amounted to 1,195,861 tons, valued at \$3,560,373, a decrease of 49 and 52 per cent, respectively, as compared with 1920. The output of every kind of clay as classified by the Geological Survey in its statistical report decreased in quantity and value in 1921 as compared with 1920.

The imports and exports of clay also decreased in 1921 as compared with 1920, and the decrease was proportionally greater than the decrease in the domestic production. The total imports of clay were 208,915 tons, valued at \$1,974,685, a decrease of 48 per cent and 51 per cent, respectively. The imports of kaolin, the chief clay imported, were 162,906 tons.

## Some Problems in Mine Accounting

The Science of the Expert Accountant Must Be Differentiated From Mine Bookkeeping, so as Properly to Show the Actual Status of the Property — Definitions of Capital — The Responsibility of the Mine Accountant to the Industry and to His Employer

By GEORGE E. H. GOODNER

Certified public accountant, Munsey Building, Washington, D. C.

**A**CCOUNTING is a science in that it is a logical and orderly arrangement by accounts of the activities of the industry which it serves so that there are always reflected the proper relations existing between the several units and branches of the industry and the part each plays in the whole. This relation is reflected not in maps, pictures, and curves, but in dollars and cents—and money talks. Anything short of this is mere bookkeeping. That there has been too much bookkeeping and not enough accounting in the mining industry is clearly apparent to those who have been involved in the economic situation in the last few years. Bookkeeping is mechanical—done according to rules learned at school—but accounting, as stated, is the analysis of these accounts by an alert mind and the grouping of them in the proper relation so as to show the true condition of the industry. Many a board of directors has awakened too late to the realization of the fact that their manager is a failure when he, they, and the relying public thought he was a wonderful success, because and only for the reason that they were keeping books and not accounts.

It is my purpose in this article to discuss briefly the capital account of a mining corporation; first, what it is, and, second, its preservation through proper accounting methods, with some allusions as to why it should be accounted for and preserved.

### DEFINITIONS OF CAPITAL

The term capital is used in various ways, but in general it means the money or equivalent invested in the business. It may be either owned or borrowed; it may be both. When used only in the first sense it clearly represents the difference between the value of the assets and liabilities. When including borrowed money, capital then becomes the amount just stated plus the amount borrowed, or substantially the value of the assets. When the borrowings are repaid from earnings the capital becomes owned. In this definition of capital the popular conception is comprehended; that is, the present worth of assets is recognized. This has been until recent years the general understanding as to the meaning of capital, and, from a practical and commercial standpoint, no doubt is correct.

The United States Revenue Act of 1917, however, brought into being a new idea of capital—invested capital—which is arrived at in the same manner as commercial capital, except that the properties or assets must be valued at cost instead of at present worth. There are, of course, adjustments to be made in this figure to conform with statutory invested capital, but we are not concerned with them in this article. This leads, then, to the fact that in present-day accounting there are two kinds of capital to deal with—Present Worth or Capital Invested and Cost or Invested Capital. The latter would seem to be of little importance now since the repeal of the excess-profits tax law as of Dec.

31, 1921, but it will be a live question for some time to come in the mining industry, owing to the fact that so many of the tax returns for the years 1917 to 1921 inclusive are yet unaudited and unadjusted.

Now that I have in general outlined what capital is, it is pertinent to proceed with the second phase of the subject—its preservation.

### DIFFERENTIATION OF INVESTED CAPITAL AND CAPITAL INVESTED REQUIRED

Capital must be preserved or accounted for. If it kept the original form in which it was paid into the corporation there would not be much difficulty, but the original investment changes into other forms of property and from one kind to another until the accountant has a complex task to reflect it in his statements properly. Present-day accounting requires that the books reflect both the invested capital and the capital invested. I have said that capital was invested in various properties and the investment is constantly changing. This is true, so that the problem is further complicated in that there must be shown at all times the total of these two kinds of capital, cost and present value, as well as the capital in each different account, asset, or property.

Out of all the assets on the balance sheet let us consider the mine without the plant or physical property and further remove complications by ignoring for the time being the item of development and simplify the matter still further by leaving out of consideration any value for surface land. Then, as mine account, there is left just the mineral or ore in place. In former days all these items were often carried under one head called plant or property, but not so any more. The business world of today as well as Uncle Sam wants to know what is back of that account. I have personal knowledge of one of the large railroad systems of the country that for twenty-five years had carried practically all its assets in one account called "Property Account." There had never been any attempt to show costs or actual present worth values of separate items. In this account were its roadbeds, rights of way, rolling stock, stations, office buildings, shops, equipment, coal mines, oil lands, timber lands, and agricultural lands. As the company had not been in serious financial straits during this time it had encountered no great difficulties with this arrangement until the Government wanted to know what was in the account for the purpose of determining invested capital. It was a gigantic task to go back over those years and analyze and restate that account so as to show both cost and present worth, but that is what had to be done.

### ONE WAY OF PRESERVING CAPITAL

Suppose the corporation invested \$1,000,000 in a certain mine. That was its cost and its worth at the date of its acquisition based upon well-defined dimensions showing ore estimates of 2,000,000 tons, so that

the value of the ore in place was 50c. per ton. The accountant has no trouble so far. The book entry is simple. However, this is capital that we are dealing with and that must be accounted for. It is capital in the form of real estate or ore which is not going to be sold *en bloc*, but is going to be mined and sold by the ton. Often a mine account stands at original cost or at an appreciated figure on the books while the company goes on mining and selling ore and reporting all the proceeds as profit until the ore is exhausted, when it is discovered that there is a big asset account on the books of a mine but no mineral left. This is the way some companies preserve capital.

There are three ways of accounting for mine capital—viz., taking it as cost in the case of sale *en bloc*, as a loss in case of destruction of the mine, or as depletion when the ore is mined and sold in units such as tons. Leaving the former two out of consideration, we expect to account for the capital in this case through depletion. There is a unit lost of 50c. per ton, so that for every ton mined and sold there must be laid aside as return of capital 50c. before any profit is realized. There are cases where the ore is mined and piled in dumps awaiting an advantageous market. Should an entry be made on the books in such a case?

One of the distinct operations of the business is the conversion of a part of the mine or real estate into personal property or ore. If the definition of accounting as a science that must at all times reflect the relations existing and the changes due to the activities of the company is correct, then an entry must be made. It is then proper to charge the ore dump with an amount equal to 50c. per ton and to credit the mine account with the same amount; or, better, to create a reserve for depletion which is credited with the amount. The question whether the amount added to depletion reserve in this case is an allowable deduction from gross income in determining taxable net income in the year in which the ore is removed or in the year in which sold will be controlled by the law applicable or by the regulations promulgated by the Commissioner of Internal Revenue. Nevertheless, in either case the books must account for it as of the time when it occurred. Practically, the mine is depleted this amount and the dump pile augmented the same amount. When the latter is sold, its cost is returned as capital before there can be any profit.

#### PRESENT WORTH CAPITAL NECESSARY TO SHOW ACTUAL VALUES

After three years' operations in which 1,000,000 tons of ore is removed from the mine, development shows ore reserves remaining to the extent of 5,000,000 tons. One-half of the cost, or \$500,000, still remains to be accounted for, so that the new cost unit for future removals will be 10c. per ton instead of 50c., in order to preserve the original capital or cost and spread it over the life of the mine. But here another condition confronts the accountant. He is told that this ore in the ground is worth 60c. per ton instead of 10c., and his books must reflect this also. This is present-worth capital, which is legitimate and must appear to show actual values in financial statements and satisfy creditors for the protection of the company. Now, the accountant has both kinds of capital in the same asset. One is cost or invested capital and the other is present worth (cost plus appreciation), or capital invested. Every time a ton of ore is extracted now the two kinds

of capital must be accounted for—10c. for cost and 50c. for appreciation and sales, or stockpile charged with 60c.

At this point we should digress long enough to distinguish between cost and unrealized present worth or appreciation. The 10c. per ton is cost. The 50c. is purely appreciation unrealized, and can be realized only as the ore is converted into cash or the equivalent when removed and sold. Theoretically the company's capital has been increased by \$2,500,000, and practically so, but in fact there remains only one-half of the same property that originally cost \$1,000,000. If the company should not operate for a time and the ore should decrease in value it might happen that the company would never realize this appreciation, but when it sells at 60c. or more per ton, the 50c. becomes realized appreciation.

There is another position that is taken and well argued from the standpoint of the excess profits tax law—namely, that cost per ton once fixed can never change and that in our case there is 50c. to be accounted for as cost in every ton of ore that is mined until the total cost capital is extinguished, after which the entire proceeds of sale become realized appreciation. From a strict interpretation of the law on invested capital, this version probably has the best of the argument, but we will, in this article, adhere to the former and more practical view.

Now, at the end of three years there is a mine cost account of \$500,000 (\$1,000,000 less depletion of \$500,000 to date) and a mine appreciation account of \$2,500,000, or total present worth of \$3,000,000. Whether these values are consolidated into one account or are kept as two separate accounts, the accountant is confronted with the fact that as long as invested capital is a requirement, he must be able to render each separately. In addition, he must keep the depletion deductions separate, for he has now to carry two surplus accounts; one a surplus from earnings based on cost, and the other a surplus from earnings based on appreciation, which latter is realized appreciation. To illustrate: Suppose that during the ensuing year 300,000 tons of ore is removed. Thirty thousand dollars applies against cost and \$150,000 applies against appreciation, so that at the end of the fourth year the accounts appear thus:

Mine cost .....	\$1,000,000.00
against which there is a credit account	
Depletion reserve .....	\$530,000.00
and an account	
Mine appreciation .....	\$2,500,000.00
against which there is a credit account,	
Realized appreciation reserve .....	\$150,000.00
and a further credit account appears,	
Appreciation surplus .....	\$2,500,000.00

which was created at the time the appreciation of the mine was written on the books. From this situation it may readily be seen that in computing surplus for invested capital purposes the \$150,000 realized appreciation is included and the \$2,500,000 excluded, whereas in computing surplus for capital invested the whole \$2,500,000 is included as if already realized. If stock had been issued for the \$2,500,000 appreciation, the item would not appear as surplus but as issued capital stock, which would have to be excluded from invested capital.

It is not desired to pursue this accounting technique further in this article, although there is hardly any limit to the suppositions that might be injected to increase the complexities. The reduction of the tons of ore to ounces or pounds of different metal content, with a



constantly changing ratio or percentage in the determination of depletion, would greatly complicate matters.

What has been said of the mine account is also true to some extent of other capital accounts. The setting up of development charges and depleting them over the operations further involves the process. The handling of the plant and equipment account and depreciation of same produces similar problems. Additions to property, discoveries, abandonments, lease and royalty agreements, and losses all have to be dealt with, and each has its own peculiarities.

What is capital and what is expense? How long will the mine last? How much capital has to be retired and accounted for this year? When will the plant become obsolete? Has development cost reached normal? These and hundreds of other questions have to be met and their answer satisfactorily reflected in the accounts of the company.

Suppose that the appreciation mentioned above and the determination of ore reserves occurred on March 1, 1913, the date of the incidence of the Income Tax Amendment to the Constitution—the beginning of the "Christian Era in Taxation," as it has been called. Now, suppose at a later date that new values are assigned to the remaining ores in the mine. It becomes necessary to differentiate between depletion on the March 1, 1913, value and the new value because of the difference in handling and taxing dividends of the company, depending on whether they are from earnings and depletion of appreciation, or depletion reserves of March 1, 1913, values. As long as income tax is a feature—and it seems to have come to stay—the fair market value on March 1, 1913, and depletion upon this value will be a requirement in the case of properties acquired prior to that time.

There will be a later redetermination of values and tonnages for commercial purposes if markets change and subsequent development reveals additional ores. Thus the same accounting problems are present even though invested capital is no longer a consideration. If the property is acquired after March 1, 1913, and cost is the basis of depletion, the same complications will arise as soon as it becomes necessary to revalue the mine and to re-estimate the ore reserves. It is vital to a mining company in present-day financial conditions to show its true worth each year and the sinking-fund assets that balance off its reserves, as well as to preserve its basis for tax purposes. In the case of a discovery, similar accounting perplexities arise, and again the accountant is called upon to carry dual values and reserves. When all these conditions exist at once it may truthfully be said that mine accounting possesses possibly the most complicated labyrinth of accounting problems known to the profession.

#### IMPORTANCE OF THE MINE ACCOUNTANT

Enough has been said to indicate the real responsibility of the accountant to the industry and the relation of his endeavors to the welfare of his company. Capital must be accounted for before there can be any profit. At the end of an operation there must be left intact, apart from distributed earnings, the original capital plus increases, in order to be able to reinvest in a new operation.

The importance of reserves can readily be seen as a means of preserving capital, for at all times they reflect the amount of capital already consumed, dissipated, or converted. We must look to other resource accounts

in the form of liquid assets and semi-liquid investments to find the sinking-fund accounts that at all times should balance off the reserves. When the original capital account is restored by a new investment, these liquid assets disappear by the amount of the new investment, and the corresponding reserve is likewise reduced.

No attempt has been made in this paper to enter into an elaborate discussion of the various complicated situations that arise. Only general fundamental principles have been attempted, but it is believed that enough has been said, with the proper application, to clear up some of the difficulties now encountered by accountants and managers in the mining industry.

### Metal Mining Active in Arizona

The mines and smelting plants of Arizona showed marked activity during the first six months of 1922 after a period of small production for nearly a year, according to V. C. Heikes, of the U. S. Geological Survey. Even if the smelters should be worked at full capacity for the remainder of 1922, they could not possibly make an output so large as that of some past years, though they might easily exceed the output of 1921, which was valued at \$29,563,472. The copper produced in Arizona amounted to 185,034,194 lb. in 1921, valued at \$23,869,411, against 558,256,302 lb. in 1920, valued at \$102,719,160. Most of the output of copper in 1921, which was less than that in any year during the last nineteen years, was produced during the first three months of the year, after which all the larger mines except the Miami and New Cornelia were closed. By June, 1922, the mines had resumed production, though they were not making their normal output. Though the price of copper has not increased greatly in 1922, the smelters at Douglas, Hayden, Miami, Globe, and those near Jerome were working at a moderate rate. The United Verde Copper Co. has made noteworthy improvements at the plant during the period of idleness, and a new smelting plant is promised for the Magma Copper Co., whose mine is at Superior, in Pinal County.

### Nevada Increases Silver Production

The production of silver in Nevada in 1921 was 7,083,782 oz., a decrease from 7,745,093 oz. in 1920. The output of silver from Tonopah was increasing early in 1922 and the opening of new orebodies was most encouraging, according to the U. S. Geological Survey. In 1921 the Tonopah district produced 4,623,901 oz. of silver, and the largest silver producers of the state were the Tonopah Belmont, West End, Tonopah Extension, Tonopah Mining, and Rochester Silver mines. All these mines are increasing their production in 1922. The Tonopah Divide mine, in Esmeralda County, was active early in the year, and the various custom mills at Tonopah and Millers were in operation. At Virginia City production continued from the Consolidated Virginia, Ophir, and other mines, and the construction of the 2,500-ton mill of the United Comstock was progressing rapidly. The construction of the Candelaria mill, in Mineral County, was also being completed, and rich silver-lead ore was shipped from the Hudson mine in Nye County. In Lincoln County, which produced 264,304 oz. of silver in 1921, the shipments of ore were curtailed, but they improved somewhat when the freight rate was reduced.

## Metallurgists of Note

G. D. DELPRAT

BY P. R. MIDDLETON

ONE of the most prominent figures in Australian metallurgical circles is G. D. Delprat, who, as general manager of the Broken Hill Proprietary Co., Ltd., was largely responsible for the establishment of that company's iron and steel works at Newcastle, N.S.W. Mr. Delprat was born in Delft (Holland), in 1856, and after finishing his education at the local high school, went to Scotland to serve his apprenticeship as a construction engineer. During spare hours he attended lectures in chemistry and physics at St. Andrews University and further pursued these studies at the Amsterdam University. For a period he worked under the eminent physicist, Professor Waals. His first important position was as chief metallurgist for the Tharsis Sulphate of Copper Co. in Spain, and after four years in that capacity he was placed in charge of the mines and works. In 1885, Mr. Delprat joined the Bede Metal & Chemical Co., a corporation operating many large mining properties, and in 1888 the general management of the company was placed in his hands. He remained with this company until 1898,

when he accepted the position of general manager of the Broken Hill Proprietary Co., Ltd. This company was operating very profitably on an ore containing silver, lead and zinc, but although a high-grade silver-lead concentrate was produced, the zinc passed with the gangue to the tailings dump. Mr. Delprat at once realized the possibilities of recovering this discarded metal and after operating an experimental plant, he patented a flotation process in which no oil was used, the reagent being sodium bi-sulphate in a hot solution. After considerable difficulties had been experienced this process was placed on a commercial basis and in May, 1903, 50 tons of zinc concentrates had been produced from the discarded tailings. This was the first parcel of zinc concentrates ever produced by flotation. The "Delprat" process, like all other flotation processes, had its litigation troubles, the cause of which was a prior patent taken out in November, 1901, by the late C. V. Potter, covering the use of sulphuric acid as the reagent. After spending four years in the courts,

an agreement was made between the parties, by which the Broken Hill Proprietary Co. obtained the use of either the Delprat or Potter patents. Owing to sulphuric acid being substituted for sodium bi-sulphate, the process became known as the "Potter-Delprat"

process. After a number of years of profitable operation, the Broken Hill Proprietary Co. found itself with a large surplus of capital but slowly decreasing ore reserves and it was largely due to the enterprise of Mr. Delprat that the company extended its activities and established the iron and steel works at Newcastle. The confidence of the directors of the Broken Hill Proprietary Co. in Mr. Delprat's ability was shown by their expenditure of about \$20,000,000 upon a venture which was regarded by many people as something too big for Australia. Mr. Delprat has shown that this confidence was not misplaced and the Newcastle works have been in successful operation for about six years and under normal conditions provide employment for approximately 6,000 men. In March, 1921, Mr. Delprat resigned the position of



G. D. DELPRAT

general manager of the Broken Hill Proprietary Co., but is still retained by that company as consulting engineer and in addition has a private practice with offices in Melbourne, Victoria. He is also chairman of directors of Roylands Bros., Australia, Ltd., a firm manufacturing wire netting, fencing wire, nails, etc., with works at Newcastle, N.S.W.

Mr. Delprat has placed his extensive experience to good effect in the administration of the affairs of the Broken Hill Proprietary Co., and Australia has to thank him for the development of a flotation process which, if not the original discovery, opened the way to the profitable recovery of zinc from Broken Hill ores. The full benefits have not yet been derived from the Newcastle works, but the name of Delprat will always be remembered in the Australian iron and steel industry.

Mr. Delprat was one of the original members of the executive committee of the Australian Institute of Science and Industry and is also a life governor of the Melbourne Hospital.

## Pulverized Coal at the Bunker Hill & Sullivan Smelter

Use of Powdered Fuel in Northwestern Lead Smelter Proving to Be More Economical Than Oil — Plant Operates with Minimum Amount of Attention — Safety Precautions Taken

BY HENRY MACE PAYNE

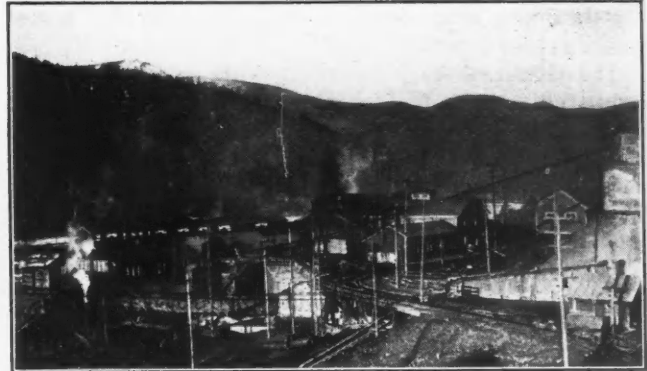
**F**OR the purpose of securing absolute heat control, and the substitution of slack coal for fuel oil, the Holbeck system of burning pulverized coal was installed by the Bonnot Company at the Bunker Hill & Sullivan smelter about four years ago.

The coal is brought by screw conveyors from the storage bins onto a belt conveyor running under an electromagnet, and discharging into a weighing hopper. After it has been dried in a 4 x 30-ft. drier, another screw conveyor carries it to two 1-ton hoppers supplying the Bonnot pulverizers, whose capacity is 1½ tons per hour. The pulverized product is then drawn by a suction fan into the main storage bin and settled by a specially designed collector. The speed of all these screw conveyors is automatically regulated by an air-float valve controlling the speed of the conveyor-motor. When additional burners are opened, more air is supplied and the air-float valve immediately speeds up the screw conveyors, thus increasing the supply of fuel.

### PULVERIZATION KEPT UNIFORM

The coal, principally from Rock Springs, Wyo., is crushed until 85 per cent of it will pass through a 200-mesh screen. This coal averages about 10 per cent moisture, 42 per cent volatile matter, 42 per cent fixed carbon and 6 per cent ash. The crusher is so arranged that the fine product passes on through the suction line while the coarser particles fall back for re-crushing. Thus, through absolute uniformity of the coal, and an automatic supply of air, the mixture is kept constant. The main distributing pipe carries 50 cu.ft. of air to every pound of pulverized coal, and 150 cu.ft. of air additional is supplied at the furnace by an auxiliary blower to effect perfect combustion. This gives the added advantage of running a rich mixture through the pipes and thus reducing the danger of coal-dust explosions. The burners are plain castings, easily replaced, and varying from 3 in. to 9 in. in diameter. The pressure on the main line is 10 oz.

Experience over a considerable period has shown that 7 lb. of coal will do the same work as 1½ gal. of fuel oil on the Dwight & Lloyd sintering machines. On the retorts the average quantity of oil used per charge is 44 gal., and 680 lb. of coal is required. To refine one ton of lead 215 lb. of coal is used. Based on a cost of \$1.75 at the mine, with freight amounting to \$5.25,

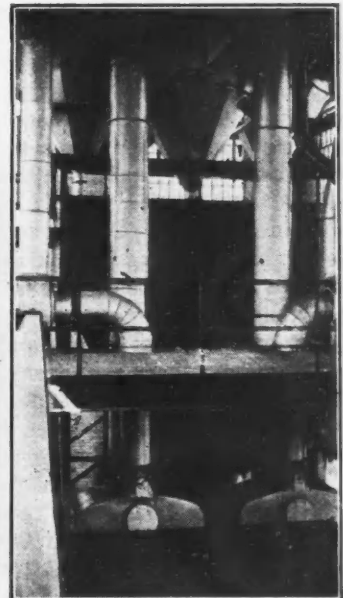
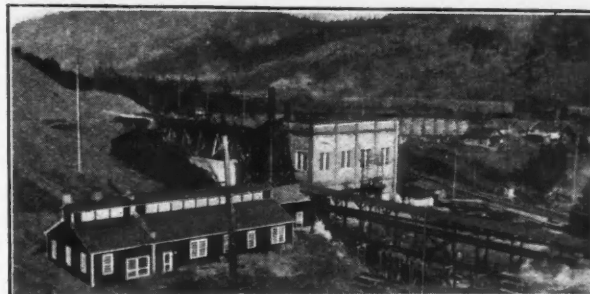
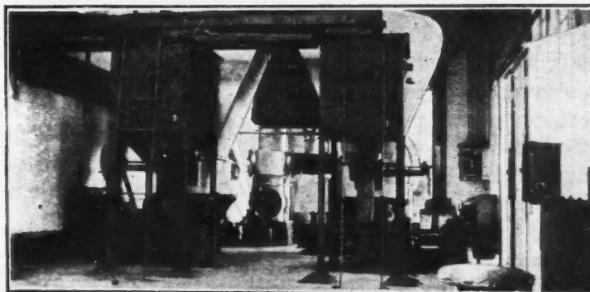


The Bunker Hill & Sullivan smelter, Kellogg, Idaho

unloading and bin-transfer costs of \$0.19, and pulverizing costs of \$0.05, fuel at the point of consumption may be estimated at \$7.24 per ton. The cost of pulverizing is on a basis of 30 tons per day, and varies with the tonnage involved. Above 30 tons per day little extra cost is involved.

### PRECAUTIONS TAKEN AGAINST EXPLOSIONS

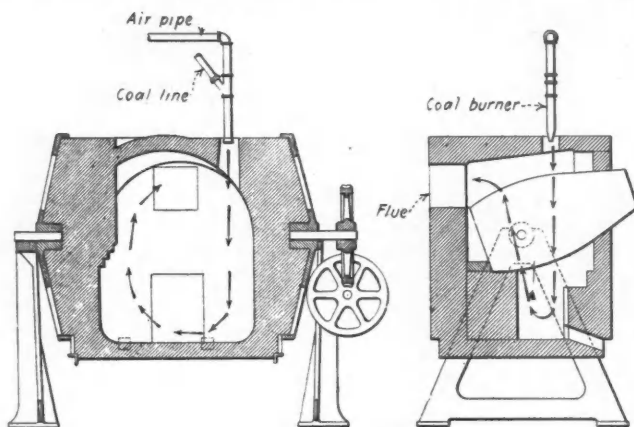
In February, 1921, a dust explosion occurred which did slight damage to the plant, but which almost entirely removed the roof of the pulverizing house. Since that time this roof has been rebuilt with hatchways similar to those of a freight vessel, so that a similar explosion would find vent without material damage. On numerous occasions the storage pile has been found to be hot, but so long as the excess of oxygen reaches the pulverized coal at the furnace, and a rich mixture is fed through the supply line, no trouble has resulted.



Interior and exterior views of pulverizing plant

It was found necessary to re-design the retorts, as experience has shown it to be much more economical to inject the powdered coal into the top of the furnace than into the bottom as was provided for in the original design, for the reason that the ash forms a liquid mass of slag under heat, and consequently does not cut out the brick on the side of the furnace as when the coal entered at the bottom. Since changing this practice, repairs on the brick work have been decreased at least two-thirds. It was also found necessary to enlarge the flues and build them so that they may be cleaned while in operation.

The time necessary to retort with coal is  $4\frac{1}{2}$  hr. as compared with 8 hr. for fuel oil. Coal is also used for heating the large cast-iron kettles holding 100 tons of lead, as well as for running the reverberatory furnaces and zinc retorts. One of the anomalies of the operation is the cleanliness of the entire plant. Although pulverized coal has been used for four years,



Retort fired by pulverized coal

and the coal as taken into the storage bins is one-inch slack and is then crushed, the inside of the buildings, which was painted white at the time of installation, is still clean and bright, and has been neither cleaned nor painted during that time.

#### SLAG IS GRANULATED

Experience has demonstrated that chilled iron mullers last longer than those of manganese steel. The rollers last for about six weeks, and the grinding mullers used in pulverizing the coal have an average life of two months. The fine ash passes up the stack; the slag is cleaned out about once a week by playing a hose on it with cold water, and then raking out the broken glass slag.

There is always 25 per cent excess coal in the main feed line supplying the burners, which settles out and returns through collectors into the main supply. This provision is a part of the scheme to keep the coal in constant movement and in a rich non-explosive mixture.

Measurements made over a considerable period indicate that a 25-deg. bend in any of the feed pipes, regardless of size, produces frictional resistance equal to 150 ft. of straight pipe of the same size. The present driers reduce the moisture to about 3 per cent. It is felt that even better results would be obtained if this could be brought down to 1 per cent, but the location of the driers is such that it is impracticable to enlarge them.

Although the economies to be obtained through its

use were the prime consideration in introducing pulverized coal, the decision was hastened by the action of the Government during the war in conserving fuel oil for Government purposes. Up to the present time the net saving has been about 25 per cent. It is confidently expected, however, that as experience indicates various refinements in the practice and equipment, this saving will reach 50 per cent.

It has been conclusively shown that pulverized coal gives a hotter fire at less cost. In the Dwight & Lloyd machines the muffles lasted six months with oil and only two weeks with coal. On a basis of 8c. per ton of material with oil, this cost is now 6c. and will ultimately be reduced to 4c. This change in intensity of heat has brought about many correlative changes in smelter practice and equipment. To some extent, the concentration of silver in zinc crust in the Parkes process of lead refining is dependent upon the rapidity with which the zinc is condensed when the crust is retorted. By inserting a 4-in. soil pipe transversely in a cast-iron or graphite condenser, Superintendent Donaldson of the silver refinery has found that the period of retorting may be cut down 25 to 50 per cent.

#### SMELTER PRACTICE DESCRIBED

The lead bullion comes from the blast furnace in 3-ton pots transported by an electric crane, and is dumped into 100-ton kettles in the refinery. Here, heated by pulverized coal, it is brought up to a temperature of 950 deg. F. when the dross is skimmed off and pressed in a modification of the Howard press. The bullion is then cooled in an air blast by inserting in it a  $\frac{3}{4}$ -in. pipe. This cooling is continued until the surface lead "freezes", at which time the copper dross is skimmed, leaving the bullion only .07 of 1 per cent copper. The bullion is again heated to 800 deg. F. when it is pumped through a concrete launder into the softening furnace.

The softening operation varies from 18 to 24 hr. according to the antimony content of the bullion. After the antimony is eliminated by oxidation and slagging (the slag running about 70 per cent lead, 10 per cent antimony and arsenic and 20 per cent oxygen), the material is tapped into 100-ton desilverizing kettles at which time the zinc is added and the seconds from the preceding kettle. The zinc skim is taken off at 1,000 deg. F. and is pressed in a modified Howard press, the zinc skim going to the retorts and the desilverized lead to the refining furnaces where the saturated zinc and the last traces of antimony are volatilized and slagged off. The entire process of desilverizing the lead requires about eight hours.

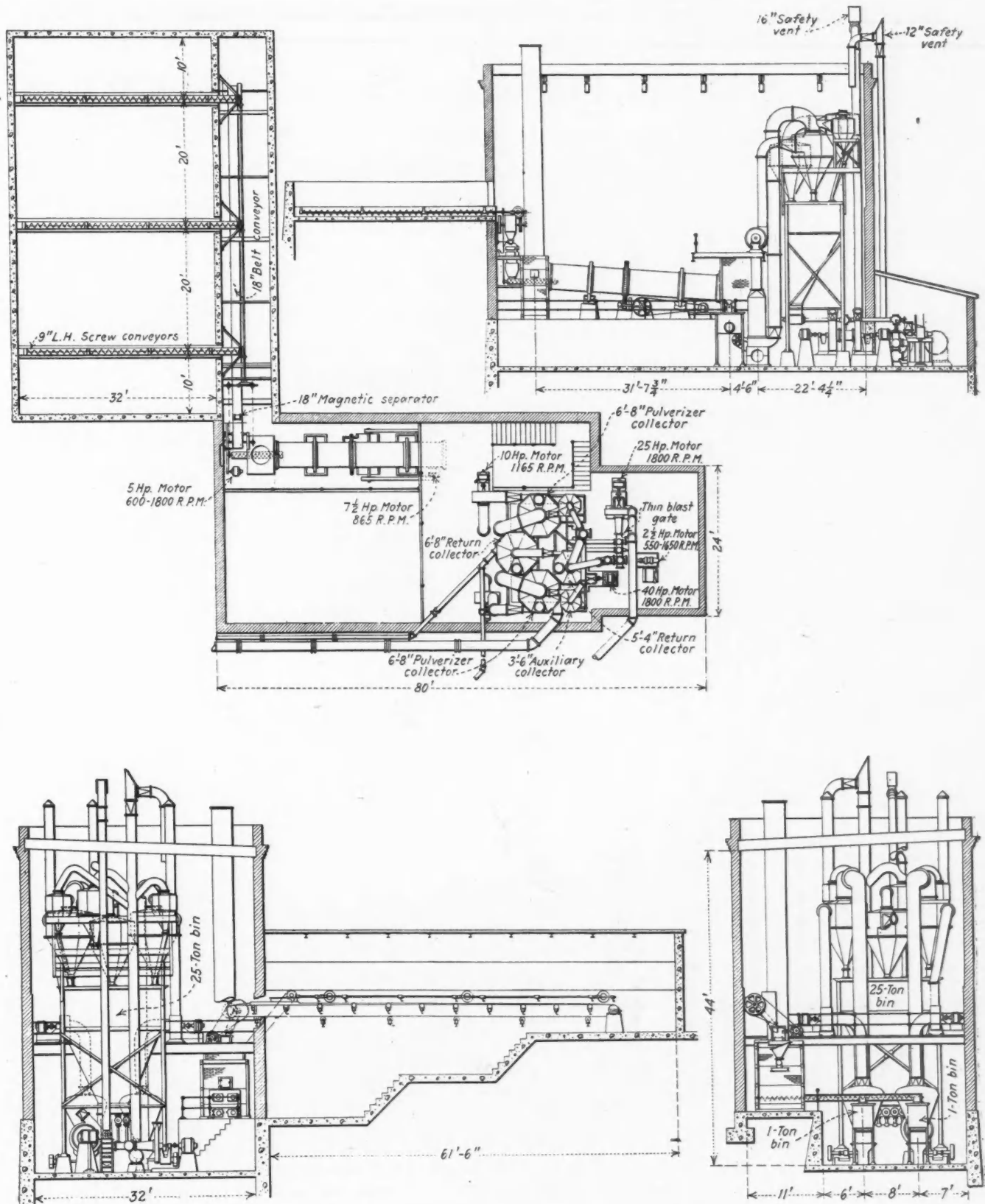
#### LAUNDERS ACT AS HEAT INSULATORS

The concrete launders are made of three parts beach sand and two parts cement, mixed with very little water, and finished off with an ordinary bottle as a finishing tool. Concrete acts as an insulator, no lead sticks, and molten lead pumped through 100 ft. will not lose over 25 deg. F. Being open, in the form of a trough, the passing material is visible at all times.

The entire plant may be said to run almost automatically. The return air with any pulverized coal not caught by the dust collector goes into the air intake pipe and returns into circulation. The pulverizers will prepare enough coal in 8 hr. to run the entire plant for 24 hr. One man and his helper operate the entire coal preparation during this 8-hr. period, the remain-

ing sixteen hours being wholly automatic. Pulverized coal heats all the furnaces and refining kettles, and operates the boiler for the copper sulphate plant. It is certain that there can be no question of the

success of the Bonnot equipment at the Bunker Hill smelter. It not only permits the use of a relatively low-grade fuel, but actually cuts the cost of operation from one-quarter to one-half.



Side views and plan of coal pulverizing plant

## THE PETROLEUM INDUSTRY

### Diamond Drilling for Petroleum

Diamond Drills Used Advantageously in Prospecting for Oil, and in Deepening Partly Completed Wells—A Few Producers Drilled with Diamond Equipment  
—Economy of Method Remains to Be Determined

BY ERNEST R. LILLEY

A CORRESPONDENT from the Panuco district of Mexico recently reported: "The Cortez Oil Corporation's diamond drill No. 1 is drilling at 2,160 ft. in blue shale; No. 2 diamond drill is at 800 ft. in a similar formation. No. 7 drill of the Panuco-Boston is a 1,000-bbl. fluid well showing 8 per cent

pleted by the Panuco-Boston Co., a subsidiary of the Atlantic Refining Co., of Philadelphia, late in 1921 emphasized the possibilities of the method.

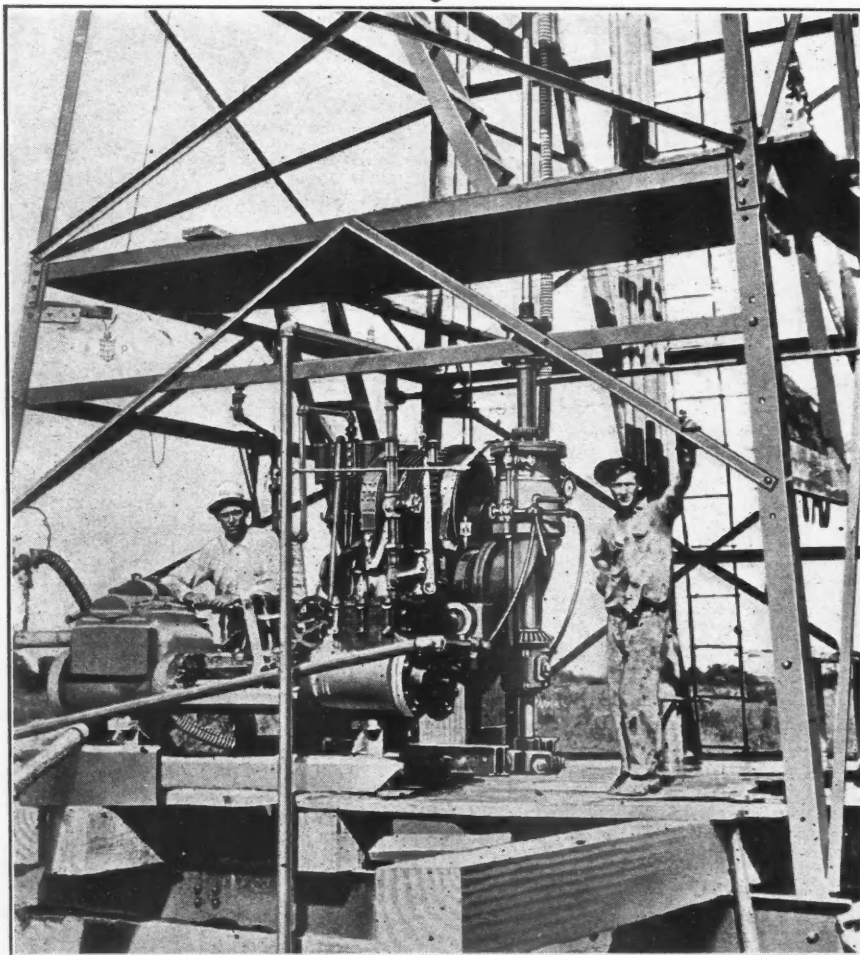
When one considers the nature of the work which the diamond drill had, up to this time, been called upon to do, a lack of attention in the technical press does not

appear strange. Drilling of small shallow holes to assist the geologist to outline more completely the structure and a few jobs of deepening wildcats, which had been given up by rotary or other drills, were the only chances given the diamond. The failure to investigate the merits of drilling systems other than the rotary and cable was due to the peculiar manner of growth in the industry of petroleum production, and contrasts greatly with the rapid development of refinery appliances. It was due primarily to two things, the rapid discovery of new fields and apparently limitless production, and the survival for many years of the small producer in contrast to the early growth of the large refiner. Today this period in production is ending; new oil is not easy to find; large companies, with large resources, are, especially in foreign fields, succeeding the small operator with limited means.

Whereas in the past the operator was lucky if he possessed funds sufficient to complete one well, which was usually so shallow that its value as a test of the presence or absence of oil was extremely small, the large operator of today condemns only the territory which has been tested by three or four holes to a depth of 3,500 ft. or more. The oil man finds four points of interest in his investi-

gation of the possible extension of the use of the diamond drill in oil field work, namely, its utilization for: (1) Prospecting structure; (2) deepening old wells and partly completed wells; (3) wildcat drilling; and (4) production drilling.

The value of the diamond drill in the first class of



Courtesy Sullivan Machinery Co.

Large-size diamond drill in the oil fields

water at 2,250 ft." Such reports seem to indicate that diamond drilling in the oil industry has already passed the experimental stage, and that cable and rotary drills are likely to find in the diamond drill a competitor of importance. Although many holes had been drilled using this equipment, the 1,200-bbl. producer com-

work is unquestioned. The Marland company alone is running three drills for this purpose in connection with its surface work. It has been found indispensable for accurate work in areas where drift or soil cover the strata of which the geological structure is being investigated, as it gives in the form of a core, usually of 1 in. diameter, an accurate record of the succession of strata as complete as if the overburden had all been removed and the rock itself examined. Three or four such tests drilled to a depth of 100 or 200 ft. will greatly lessen the chances of error which the geologist takes when he relies on surface indications alone. The drills used are identical with those which have been used for half a century in coring orebodies and coal beds. Where only soils and soft rocks are to be penetrated, drills using hand power have been found practical, but usually a machine driven by a small steam or gasoline engine is preferred. The total cost is comparatively low, as progress is rapid and the drill is handled by a small crew, and is easily moved about because of its compact nature and light weight. The total cost of five 200-ft. tests would probably be less than one-twentieth of that of a single deep, dry hole.

#### DIAMOND DRILLS HAVE BEEN USED FOR DEEPENING

In work of the second type the large-sized diamond drill comes into its own. In a speech before the American Association of Petroleum Geologists recently, R. D. Longyear said:

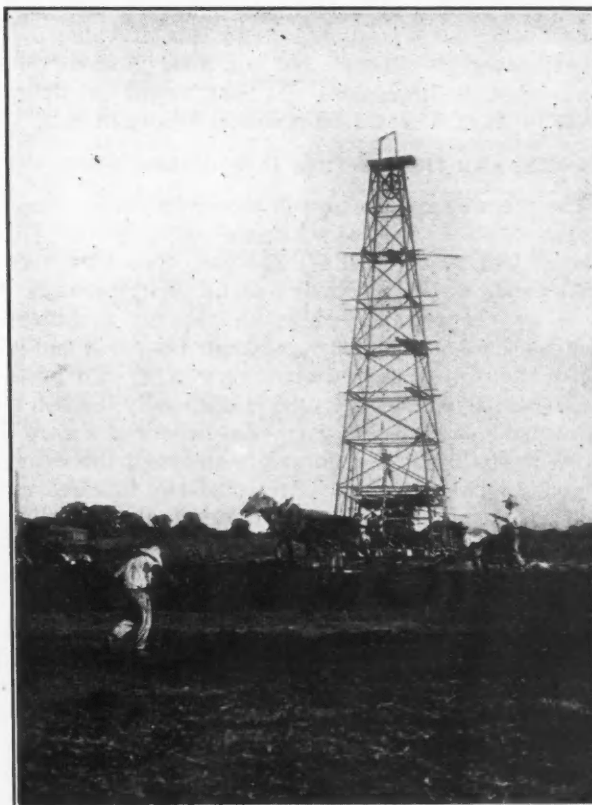
"Four holes were recently taken over by a diamond-drilling contractor for completion after they had been abandoned by a cable-tool drill. One of the holes, drilled near Ferndale, Washington, started with a diameter of 18 in., and at a depth of 2,100 ft. had to be cased with 4-in. casing. The hole was then continued with a small string of tools to 2,400 ft. At this point it became necessary to underream, but the tools were soon lost and could not be recovered. The diamond drill was then installed. A hole was drilled alongside the tools and continued to 3,603 ft., finishing with a diameter of  $2\frac{7}{8}$  in. Another well was started by cable tools with a diameter of  $15\frac{1}{2}$  in. and was reduced to 4 in. at 2,026 ft. The diamond drill completed it to 2,826 ft., with a diameter of  $2\frac{7}{8}$  in. Another cable-tool drill near Pincher Creek, Alberta, had to use so many strings of casing that it was reduced from  $15\frac{1}{2}$  to 4 in. in 1,500 ft. Again the diamond drill took over the hole and completed it to 3,000 ft. The fourth hole was started 10 in. in diameter and had to be changed to a diamond hole at 700 ft. when it had been reduced to  $3\frac{1}{2}$  in. in diameter. In spite of the large number of strings of casing used in these four wells, all four of them had fresh or salt water flowing from the inside casing when taken over by the diamond drill."

In all of these the primary cause for changing to the diamond was the size of the hole, although in one the tools had been lost also. It may also be expected that the use of the diamond will become common in wells where the hole is still large, but where, because of loss of tools or partial collapse of casing, much time would be lost before resumption of drilling could be secured with the ordinary tools. In such cases the smaller diamond bit might easily drill by the seat of trouble, side-tracking the tools or drilling up part of the casing in extreme instances. Further possibilities of the use of the diamond bit along this line are suggested by the frequent need, particularly in the Gulf Coast and Oklahoma fields, of deepening old wells in order to reach a lower sand which has just been discovered in a nearby or offset well. As today most wells are completed with  $5\frac{3}{8}$ -in. casing, deepening calls for the use of small, un-

economical tools, the long underreaming job, or the drilling of a second well, starting with a larger hole and more casing. If the diamond, whose maximum efficiency is attained on small holes, be called in, the upper sand may be cased off and the hole completed without delay.

#### DEVELOPMENT OF THE LARGE DIAMOND DRILL

Before discussing the field of possible development along the other lines suggested, it seems advisable to describe in some detail the large size diamond drill and its manner of operation in oil drilling. Considered mechanically, diamond drilling is merely a devel-



Ugarte No. 6, the first producing well put down by diamond drill in Mexico

opment of the rotary process. Historically, this development antedates the oil-field rotary by a quarter of a century. The long line of hollow drill rods extending from the surface, where they are given the rotating motion, down to the cutting bit into which the diamonds are set, differs in no way from the smaller sizes of rotary rods. That the cutting edge should be eight or more diamonds, instead of a steel fishtail or Hughes revolving bit, does not alter the principle of operation.

#### DESCRIPTION OF THE DRILL BIT

The point of greatest interest about the drill is naturally the bit with its circle of diamonds. The bit itself is merely a hollow cylinder of soft steel, into one end of which the diamonds may be set. The accompanying illustration shows the stones set to give two cutting edges, an outer and an inner, the diamonds themselves projecting  $\frac{1}{2}$  to  $\frac{3}{4}$  in. beyond the metal. The soft steel is worn away very slowly, all the work being done by the diamonds, which are at the same time making the core within the inner circle. The setting shows eight stones in place, although more can be used

if desired. The stones are of the black, opaque, non-crystalline variety, known as carbons, and are at present secured only from Brazil. Good stones weigh from 2½ to 3 carats, and are valued at \$125 per carat, or from \$300 to \$400 each, making an eight-stone bit worth from \$2,500 to \$3,000. As a single loose stone in the bit will tear out all of the rest if it falls out while drilling and may cause the loss of three or four or even all of the carbons, the setting is entrusted to only the most experienced men. Setting is accomplished by drilling and cutting holes of suitable size and shape in the soft steel bit and then drawing the metal close around the diamond with caulking tools. A run of 400 ft. before resetting is not uncommon in soft shales, sandstones, and limestones. The loss of value to the bit will average between \$50 and \$60. For very hard sandstones or limestones the cost might be doubled, while in clays it would be probably less than half.

#### SINGLE- AND DOUBLE-TUBE CORE BARRELS ARE USED

The recovery of the core is accomplished by the core barrel. Two types of core barrels are in use, the single tube and the double tube. The first type differs from the second, which is illustrated, in that its walls are made by the cylinder to which the bit is attached, whereas those of a double-core barrel hang free and have no function other than that of recovering and protecting the core. The single tube is commonly used in ore-bodies and in consolidated rocks where the core remains undisturbed and unbroken although the cylinder surrounding it is making upward of two hundred revolutions per minute. In coal testing and in all but the deepest oil wells, the double tube will be needed as poorly consolidated, easily fractured sedimentary rocks would soon be reduced to a pulp by the revolving cylinder, and would be carried off by the circulating water. The second, freely hanging, non-revolving cylinder must be used in such cases. It can not, however, be used on extremely deep wells, because of its lack of strength and ability to resist high rock pressure. The core barrel in either case is usually made to handle from 30 to 40 ft. of core, although in the first Panuco-Boston test a 13-ft. barrel was used. This necessitated frequent raising of the tools to the surface to remove the core and slowed down the drilling. The actual breaking and lifting of the core from bed rock is accomplished by a small circular wedge, called the core lifter, placed just above the bit itself, which becomes operative immediately upon pulling the rods.

As the drill rotates with approximately twice the speed of the ordinary rotary and cuts at about the same rate, it is evident that considerable frictional heat will be developed. This together with the necessity for removal of the cuttings, made it necessary, early in the history of the diamond drill, to develop a water-circulation system. The water is supplied under varying pressures, just as in the rotary system, by surface pumps connected to the hollow drill rods. The circulation, in the case of the double-tube core barrel, is indicated by the arrows in the accompanying illustration, the water laden with cuttings passing up the hole outside of the drill rods. Prior to the use of the diamond in oil-field work only clear water was supplied to the bit, but it has been found possible, by using larger drill rods, to handle successfully some rotary muds. It may be stated that the cuttings secured in the wash are of no value for the identification of strata.

In the rotary system, the weight of the drill pipe rests largely upon the bit while drilling. As the diamond fractures easily, and if badly fractured becomes useless, it is necessary to supply some means of sustaining the weight of the rods in deep drilling and of preventing sudden jars or strains such as might be expected while drilling in cavernous limestones of Mexico or in the cherty and flint-laden rocks of Kansas. This problem has been overcome by the vertical hydraulic cylinder through which the drill rods are made to pass, and to the piston of which they are connected. While drilling at great depths, water is forced into the cylinder below the piston with the full hydraulic pressure of the pump, thus forming a cushion upon which the weight of the drill rods rests.

Pressure gages above and below the piston enable the operator to see what weight is resting on the bit and to regulate as he desires. The normal weight left unsupported by the cylinder water and sustained by the bit is the weight of about 900 ft. of small drill rods. While the upper portion of the cylinder is kept full of water to prevent jarring, it has special additional work during two periods of drilling; first, when drilling at shallow depths; and, second, when drilling through high pressure gas sands. In the first, through the introduction of water under pressure into the upper half of the cylinder, the diamonds may be forced downward with a force equivalent to that of 900 ft. of rods. In the second, it becomes possible by combining the downward force of the water in the cylinder and the weight of the rods in the hole not only to prevent blowouts but to continue drilling against the pressure. An average of 40 ft. per day was attained in this way by one well at Panuco while drilling against a pressure of 480 lb. Thus throughout the whole drilling period, the bit is at the instant command of the driller, a thing not possible when using other equipment.

While no wells have yet encountered pressures making its use necessary, one manufacturer has patented and sold a special pressure-handling device, consisting of a packing box and rod brake or clamping device, which is attached to the casing head and which can be thrown into use the instant the pressure becomes too great for the hydraulic cylinder. If the tools are to be removed it is possible with the flush-joint drilling rods to allow the tools to pass slowly through the control and to remove the rods in sections.

#### SUNDRY PROBLEMS MUST BE SOLVED

In using the diamond drill it is necessary to overcome water, caving, and gas just as in ordinary rotary work. The methods used up to the present on oil wells, and others in similar formations, include mudding, cementing, and casing. The first of these has proven only moderately successful. The type of mud which can be handled by the flush-joint drill rods of 2½-in. outside diameter is not of sufficient weight and consistency effectively to seal off water or gas sands. It is true that, because of the greater speed of the revolving bit, the force with which the mud is thrown against the sides of the hole gives it a greater power of penetration, but this is hardly sufficient to balance the lack of density. Heavy coarse muds can only be handled satisfactorily by the recently developed 3½-in. bit and rods. F. A. Edson suggests that larger waterways in the bit would make the use of such muds possible. While some gain might be secured, it would have to be



at the expense of the core or strength of the drill. It seems possible that diamond drillers, who are forced to use the smaller sized rods, will find the solution of their problem in the use of special muds such as a pure kaolin or an iron-oxide mud, as both of these give high density without excessive viscosity.

The term "cementing" in the diamond-drill field refers to the use of cement alone to shut off water. If a thin stratum of water sand is encountered it is drilled through until an impervious stratum is reached. The extent of the sand is known from the core. The distance between the impervious rock above and the bottom of the hole is reamed with a special expanding underreamer, to a diameter an inch or so greater than that of the flush-joint casing which must later pass by. Cement is now introduced under pressure, forced into the sand as far as possible, and allowed to settle. The cement, after three or four days, may be drilled through with perfect safety; and because of the smooth action of the diamond, the collar sealing off the sand will remain unbroken after the drilling. This method cannot be expected to prove successful in sealing off sands where high water or gas pressure is present.

The use of casing in diamond drilling is more undesirable than in any other type of drilling. Even the manufacturers of the drills themselves do not expect to be able to make a practicable drill capable of making a hole larger than 6 in., which means a limited number of strings of casing. The reason is merely one of cost, no mechanical difficulties being known. This does not mean that the diamond will be unable to reach the same depths in soft rocks as are now reached in hard rock; its smooth motion and ability to handle water sands in other ways do not encourage caving. In addition it must be remembered that the flush-joint casing reduces the hole at about half the rate of ordinary casing.

**FISHING JOB COMPLETED IN SEVEN HOURS**

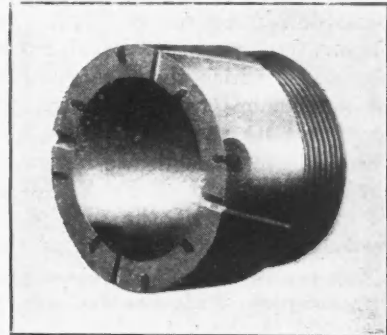
Fishing problems can apparently be handled more easily with this system than with the others if the fishing job on the first Mexican well is typical of what may be expected in other cases. Here, at 2,100 ft., the top of the core barrel was twisted off. A screw tap was attached to the rods and threaded into the inside of the core barrel; the whole episode from break to recovery occupied only seven hours. As the rods while fishing are under the same delicate control as while drilling, the recovery should be accomplished with the same degree of ease in most cases.

The crew on a deep well ordinarily consists of seven men: the diamond setter, who also acts as foreman, two drillers, and four helpers. In foreign work the drillers and the setter will be sent out from this country, the helpers being secured locally. As the wear on the machinery is slight, the most important items of the cost of drilling are, the pay of crew, transport charges, and diamond wear and replacement. The cost of carbons has already been spoken of. The crew cost will be about the same as for the other methods. As to transportation, the cost will be in direct proportion to the weights of machinery used or about as follows:

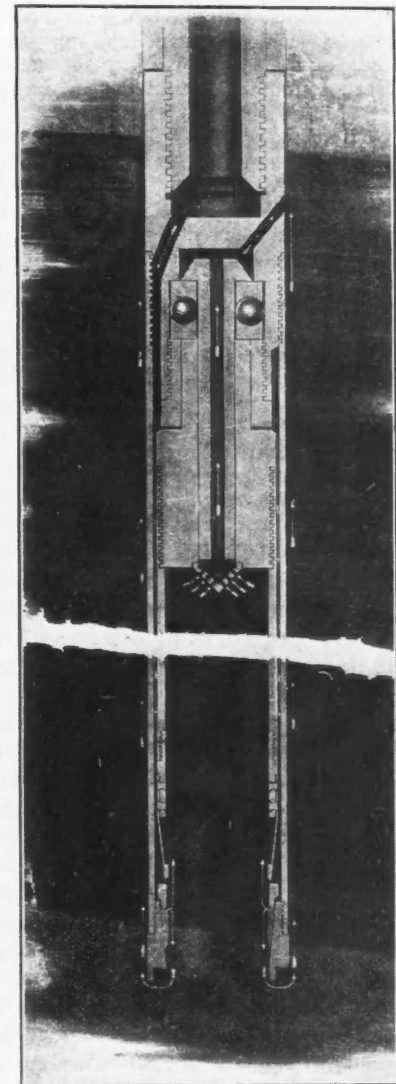
Type of outfit	Weight of Equipment, Tons
Cable, including casing for a 3,500-ft. test.....	250
Rotary, including casing for a 3,500-ft. test.....	350
Rotary and cable, including casing for a 3,500-ft. test..	400
Diamond drill, including casing for a 3,500-ft. test....	70

Although no comparative figures are available it seems that in wildcat drilling the diamond drill will prove capable of completing all except the most shallow tests with a considerable saving, possibly as much as 40 per cent in tropical countries. On wells drilled with cable tools to a depth of less than 1,000 ft. the cost is slightly lower than can be expected of the diamond. The degree of speed to be attained is still a matter to be determined by experience and will probably be found to vary. It appears likely that, for wells drilling between 1,000 and 3,000 ft., a cutting speed of about 10 ft. per hour might be expected. As the core must be removed every three or four hours, and, as this operation takes from 1½ to 2 hours, the maximum speed to be secured on the double-shift or two-tower basis will be between 100 and 150 ft. per day. It is probable that, as in the drilling in Mexico, the diamond will not be used for the upper section of the hole. Instead, while drilling through the soft surface formations, a fishtail bit will be attached to the drill rod and the core will be dispensed with. In such cases speeds of from 150 to 200 ft. per day should not prove uncommon. In a similar manner, the speed while drilling in the deeper sections could be greatly increased by the use of a diamond-studded center in the bit. In this case the core is not recovered but is drilled up and flushed out with the rest of the cuttings. This method of gaining speed is of value only in offset drilling where speed is more desirable than information regarding the strata.

To return now to the discussion of the value of the



An eight-stone bit



A double-tube core panel making core

diamond to the oil man, considering first its possibilities in wildcatting. Its greater mobility when compared with other types has already been indicated, and its effect on costs would seem in itself a sufficient reason for its use in many cases. However, in the first successful well and in most of the others that have been drilled up to the present, mobility was not the factor that was considered most important. The information which the core gives to the wildcatter is of so much more value than that which the other drills give that its use in this kind of work often would be justified even though the cost were increased by 50 per cent. The report of F. A. Edson, who was in charge of the drilling of the first Panuco well, more than proves the claims of its value in this work. He says:

"To the surprise of every one about 85 per cent of core was obtained. This was due both to the large size of the core and to the flat bedding of the rocks. Probably no feature of the drilling attracted as much attention as the core. It was a new and satisfactory experiment to both operators and geologists to be able to see and handle the rocks which were actually producing the oil. Sometimes the gas could be seen bubbling out of the core. Many of the cores contained fractures which, when broken open, were found to contain drops of oil. As the drill reached greater depths the fractures contained more and more oil, until at about 1,850 ft. they began to give actual production. The well came in rather gradually from that point, until at 2,153 ft. enough oil was struck to bring the production up to 1,200 bbl.

"It was observed that these fractures occurred in zones. The drill would penetrate 20 or 30 ft. of fractured ground and then go back into solid rock again. This would continue for 50 or 60 ft. and then another fractured zone would be encountered. This information would have been very important had it been desirable to shoot the well. The shooter would have known, almost to the inch, just where to put the shot, as he could have judged much more accurately as to the amount of explosive required. In general it is hard to overestimate the practical value of the information to be obtained from such cores. The ordinary practical oil operator can obtain more information from them than the trained geologist does now from a microscopic study of well cuttings."

While considerations of mobility and information are of sufficient importance to promise a bright future for the diamond drill in exploration work, and in drilling in inaccessible regions, other factors such as speed, control, oil recovery, and the cost of the equipment itself must be considered in production drilling. As far as speed is concerned, it would seem that this drill can average somewhat less than the rotary in rotary country, somewhat higher than the cable in hard rock, and has a distinct advantage over both in localities where both hard and soft rocks occur, because of its ability to use the small fishtail in addition to the regular bit. Patented devices, based on mechanically sound principles indicate a control of high pressures and the prevention of blowouts to a degree possibly greater than that attained today with other drilling methods.

The size of the hole which reaches the producing sand will generally be smaller than that now given by the rotary and standard tools. Whether or not the size will be too small for commercial recovery of the oil is an open question. A flow of 1,200 bbl. daily from the 4-in. hole of the first Mexican well was accomplished so easily as to give the impression that a much greater flow could have been obtained. If the hole goes below the 4-in. size, it seems probable that at least two problems must be faced. In the first place, unless the gas pressure is very heavy the escape of the

oil from the sand to the hole will be slow, because of the small area of its walls. In addition, if the oil be saturated with solid paraffin or asphaltic material, the tendency to gum up and fill up the pore space in the sand surrounding the hole will be marked. It is theoretically possible to ream the hole to a larger size or to shoot the well. Neither reaming with a hole full of oil nor shooting in a small hole filled with oil and gas are particularly desirable undertakings. In the second place, if the well is small and must be pumped, it should be remembered that the amount of oil which accumulates between pumping periods in the bottom of the hole is almost directly proportional to the size of the hole.

#### PRACTICABILITY OF DIAMOND DRILLING FOR PRODUCTION IS YET TO BE DETERMINED

If the estimates on costs which I have seen are reliable, the diamond has a slight advantage over the other methods as used today in a large number of fields. This advantage in the fields having good transportation facilities is not important; it would be more than lost if the cost of carbons increases slightly.

In conclusion, I may call attention to the wide scope of the drilling which is being carried on today as evidence of the rapid development of the diamond drill in oil work. I know personally of wells being drilled in Mexico, Alberta, Washington, Oklahoma, and San Domingo; and I have heard of many others which have been completed in the past year. As a means for outlining structure, for deepening and for wildcatting, the diamond drill has undoubtedly come to stay. Whether it can be economically used for drilling in producing fields is a question yet to be solved.

#### Slow Distillation Gives Better Shale Oil

Experiments conducted at the Salt Lake City, Utah, station of the Bureau of Mines, in the course of oil-shale investigations, indicate that the stationary and revolving type of small shale retorts give equivalent results in yield and quality of oil when the progress of destructive distillation of the shale particles is identical in both. This work requires elaboration, as in the Boulder, Col., laboratory the assay retort has always produced oil superior in quality to that made from the same material by the larger rotary.

Experiments with both "refluxing" and "continuous" types of condensers demonstrate that the latter type is the most efficient, though the relative superiority of the condensation principle is yet undetermined. Tests show that oils produced by the complete distillation of the shales at a low temperature, which condition accompanies slow distillation, are superior to those produced by higher temperature distillation, the best oils being formed at a temperature not exceeding 460 deg. C.

By heating a pulverized shale sample for a long period at a uniform temperature, slightly below the initial oil-yielding temperature, it was found that 80 per cent of the oil-forming material of the shale was rendered soluble in carbon bisulphide. The extractable substance so obtained is not shale oil, but will break down into shale oil when subjected to a temperature of approximately 390 deg. C. A light oil having an end point of approximately 275 deg. C. was produced directly from the shale retort by cracking the oil simultaneously with its evolution from the shale, with a loss of 25 per cent but with a distillate superior to any from shale oil.

## SOCIETIES, ADDRESSES, AND REPORTS

### The Nelson Convention

Canadian and American Mining Men Meet to Discuss Mutual Interests  
—Industry in British Columbia Reviewed by William Sloan  
—Several Interesting Technical Papers Presented

BY T. A. RICKARD

THE International Mining Convention was in session at Nelson, in the Province of British Columbia, on July 3 and the four days following. Those of us who arrived by the lake steamer from the South the evening before were met at the dock by a kilted band of Scottish pipers, of whom the town (population, 6,000) has every reason to be proud. The next morning a procession headed by the Lieutenant-Governor of the Province and the Minister of Mines proceeded to the Armory, and again the stirring notes of the bagpipes echoed among the forest-clad hills. Mr. S. S. Fowler, a Columbia School of Mines graduate, long and honorably identified with mining in the Kootenay region, presided at the opening session, which started with an address by Mr. Walker C. Nichol, the Lieutenant-Governor, who referred to the prominent part played by the operators of Spokane in the development of the Kootenay mines and expressed the friendly feeling entertained toward them by the people of British Columbia. He stated that the average per capita production per annum of the mines in the Province had averaged \$61.75 during the last six years, the average annual output being \$36,331,561, with an average population of 523,000. Next followed the Minister of Mines, Mr. William Sloan, who has been at the head of the department for six years and has made an enviable record. He is highly esteemed by the mining fraternity. In his speech of welcome to the delegates, he stated that the fact of facing similar mining problems gave rise to these international conventions, which were helpful to the people on both sides of the line. "Your sons and our sons went overseas together to fight a common enemy. We know that they can be relied on in the future to be jointly the bulwark of common peace and progress." The Mayor of Nelson, Mr. C. F. McHardy, tendered the visitors the keys of the city and the key to his cellar, apologizing for the fact that it contained only ginger-ale. Here I may add that Nelson is said to be inhabited chiefly by the Scotch, some so by birth, others by absorption. This opening session was short and to the point. A flower-show aided in giving a beautiful background to the speakers'

platform, and, of course, the flags of the two countries were splendidly in evidence to remind the audience among other things, that the national holidays of July 1 in Canada and of July 4 in the United States were being celebrated jointly. In the afternoon there was an excursion on the lake and in the evening the present writer delivered an address on "The English-Speaking Peoples."

Next morning the Minister of Mines reviewed the mining industry of British Columbia in a paper full of interesting information. He expressed the opinion that all signs pointed to a revival. Even under unfavorable conditions, the Province had done well. In 1921 the annual production of metals and minerals was \$28,066,641, a decrease of 21 per cent as compared with the previous year. "If this seems serious, it is only necessary to hold these figures up against those of some of the mineral-producing sections of the United States in order to obtain the proper perspective as to our position: In Arizona, a drop of 77 per cent in 1921; in Montana, 75 per cent; Utah, 55 per cent; Washington, 70 per cent; Nevada, 50 per cent; New Mexico, 77 per cent; and Oregon, 43 per cent." He referred to the extent of the Province—372,000 square miles—and the large part of the Pacific highlands of North America that it included. "Our share in this great belt will prove to be not less than that of Mexico or the United States." He expressed keen satisfaction at the recent announcement by the Consolidated Mining & Smelting Company of Canada that rates on zinc ores would be more favorable henceforth, on account of metallurgical advances made in the treatment of such ores at the Trail smelter. A geological survey of the iron ores of the Province had been started, he said, by Dr. G. A. Young, professor of geology in McGill University, under the joint auspices of the Geological Survey of Canada and the Mining Department of British Columbia. The purpose was to aid "those having in view the establishment of an iron and steel industry" capable of supplying the Pacific North-West. He referred to the system of lectures to prospectors and others that had been initiated, this useful work being done during the winter months

by the Resident Engineers in the six Mining Divisions. Last year the aggregate attendance at these lectures was 3,000. "British Columbia's development depends not only on those of the present, but also, on the generations to come, and I am in hope that the practice of lecturing on rudimentary mineralogy by Government engineers will become a recognized part of the education in this Province." He expressed the further hope that mineralogy might become a part of the curriculum in the public schools, "because ours is a mining country." Cabinets of rare minerals had been placed at various points to assist the detection of valuable ores. Such a collection was to be found in Nelson; it would assist in the discovery of "those minerals of economic value that have not been found here up to the present." The finding of rich gravel at Cedar Creek in the Cariboo district promised profitable work for the individual miner with rocker and sluice-box. There was an increase of interest in alluvial mining in the Omineca and Peace River districts. Mr. Sloan referred to the principal lode mines, and more particularly to the silver mines of the Slocan. "But it is a mistake to build only on the precious metals, lucrative as such properties are when the ore-content runs sufficiently high. After all, the permanent foundation of the industry is in the development of the copper, lead, zinc, etc. They are the industrial metals, and while for the present the world is badly crippled industrially, they are going to come into their own."

Next, the president of the Convention, Mr. Fowler, spoke on mining in the Kootenay region, which covers one-thirteenth of the area of British Columbia, but has produced a quarter of the tonnage and a half of the value of ore from lode mines in the Province during the past 35 years. As against an average of \$8 from the lode mines of the Province, those of the Kootenay have averaged \$17 per ton, making a total of \$200,000,000 from 12,000,000 tons. The Sullivan mine, in the East Kootenay, owned and operated by the Consolidated Mining & Smelting Company, had ore-reserves, Mr. Fowler said, two or three times as much as the total output of the Kootenay in the past. Last year the tonnage in the district tributary to Nelson had been only a quarter of what it had averaged for 14 or 15 years; the cause of the depression was intensive stoping during the war and slack development since then. The district was attractive to miners in many ways; among others for the plentiful supply of water-power on a small scale;

there were a thousand creeks that would yield from ten to a hundred horse-power each, and the Government rental on these was only 25 cents per horse-power per year. He referred to the pretty homes and attractive settlements overlooking the lake, and to the numerous schools that the Government had established amid the forest-clad mountains, thereby enabling a miner's family to live with him near where he worked. The education of the children is the foundation of good citizenship. He noted an improvement in management and the better use of technical men, as compared with former days. An excellent technical paper was then read by Mr. J. P. McFadden on the treatment of the ores of the Rosebery and Surprise mines in the Slocan. It described a method of flotation, on a silver-lead ore containing iron carbonate and iron pyrite. The use of copper sulphate, in the proportion of  $\frac{3}{4}$  pound per ton of ore, proved effective for differential flotation, there being a gain of six points in the zinc concentrate. The most notable results were on low-grade ore. For example, on a feed containing 12 ounces of silver, 1.1 per cent lead, and 9.8 per cent zinc, a concentrate was obtained containing 45 ounces of silver, 3.3 per cent lead, and 45 per cent zinc.

In the evening of the same day the delegates were guests at a banquet, when several rousing speeches were made, notably by Judge J. A. Forin, Archdeacon Graham, and Mr. Nichol Thompson. The goodwill that exists between the neighbors on the two sides of the unfortified frontier found expression in many felicitous phrases, as well as songs.

The next day another good technical paper was read, on lead-smelting practice at the Trail smelter, by Mr. J. Buchanan. Mr. S. G. Blaylock, the general manager of the smelter, made a few remarks, chiefly to welcome the delegates to the plant on the excursion scheduled for the afternoon. He made, moreover, an important statement concerning the production of electrolytic iron from the pyrrhotite gangue of the Sullivan ore by means of the Perrin-Eustis process. The product can be rolled to the thousandth of an inch and folded a hundred times when only as thick as a piece of paper. The resistance to corrosion is greater than that of pure zinc, so that the galvanization of kitchen utensils becomes unnecessary. The electrolyte is ferric chloride, the sulphur is removed in the metallic state, and a diaphragm cell is used. A sample was placed on exhibit. This announcement prompted Mr. Nichol Thompson, of Vancouver, to acknowledge that the experiments had been made on his initiative. There was enough pyrrhotite, he said, in British Columbia to supply an iron and steel industry, apart from the known deposits of magnetite and hematite in the Province. Mr. Robert Hedley congratulated the smelter technicians on their important research, as did also Professor H. N. Thomson, professor of

mining and metallurgy in the University of British Columbia. Alderman Woodside of Vancouver spoke for the Chamber of Mines, describing the good work it is doing, and Dr. Clark gave information concerning the 15,000 square miles of 15 per cent bituminous land in Alberta. In the afternoon an excursion was made by train to Trail, where the delegates and citizens of Nelson were enabled to see the largest smelter in Canada and one of the best equipped metallurgical plants in the world. Here copper, lead, and zinc are refined electrolytically. A supper was served in the copper-rod mill, sundry speeches of welcome and congratulation bringing the proceedings to a close. Mr. Fred A. Starkey, the indefatigable secretary of the Convention, proposed a vote of thanks, which was seconded by the Mayor, Mr. McHardy. Several of the visitors spoke, notably Mr. Nichol Thompson, who is always earnest and interesting. He pleaded in behalf of a duty on copper rods, acknowledging that although formerly a free-trader, he recognized that he was living in a big country with a small population, which needed protection for its infant industries. Several references were made to the new smelter-rates on zinc ores and a general feeling of goodwill between the local mining fraternity and the smelter management was evident—even before supper.

The Convention was a pleasant affair, and interesting in many ways, but the attendance, especially from south of the line, was disappointingly small, as compared with the other meetings of the same series. The fact that it was a busy and hot season may have been one reason. The previous meetings were held at Vancouver in 1919, at Seattle in 1920, and at Portland in 1921. No announcement has been made of a place or date for the next International Mining Convention, so, perhaps, it will be dropped for a year.

This convention is "International" in the sense that it is Canadian and American, its field of activity covering British Columbia and the Yukon on one side, and Alaska, Washington, Oregon, and northern Idaho on the other. It has done much to promote goodwill and the exchange of information between the mining men of the Boundary country, and it will be a pity if it is dropped. The one fly in the ointment has been the discussion of tariffs and the passing of resolutions on the subject, when, of course, the Canadians have refrained from voting on proposals for an American tariff on any metal or mineral, and the Americans in attendance have refrained similarly from expressing any opinion on a proposed Canadian tariff. It will be well, in future, if such subjects are taboo. At the same time any sensible man must regret that commerce across the one international line that has no fort or sentry should be hindered by tariffs, most of which are not of national usefulness. How much better it would be if an agreement could be reached for each country to produce the things

it is best suited to produce and to buy those things that its neighbor is best fitted to supply? Let the Canadians, for example, send us paper-pulp and let us send them magnesite and tungsten! Infant industries, however, begin to squall as soon as one indulges in such talk, so it may be best to avoid the question of tariffs between us Canadians and Americans.

### Safety Congress Program Arranged

#### Nine Papers to Be Presented at Sessions of Mining Section.

Many of the problems of accident prevention will be considered by the Mining Section of the National Safety Congress, which is to be held in Detroit, Aug. 28 to Sept. 1, as previously announced. The program of the sessions has been completed and provision has been made for a thorough discussion of the various phases of industrial and public safety which will be dealt with by the speakers.

Nine papers are to be read at the sessions of the mining section. These are: "Maintaining Safety Interest at Mines"; "Mine Hygiene and Sanitation," by Dr. R. R. Sayers, Chief Surgeon of the U. S. Bureau of Mines; "The True Causes of Mine Accidents," by W. W. Adams, statistician of the Bureau of Mines; "Mine Fire Prevention and Fighting," by Joseph W. Reed, director of safety, Consolidation Coal Co.; "Mine Rescue Training and Operation," by D. J. Parker, U. S. Bureau of Mines; "The Use of Telephones in Mines," by D. E. A. Charlton, *Engineering and Mining Journal-Press*; "Underground Transport," by Prof. H. H. Stock, University of Illinois; "Hoisting Equipment at Mines," by Rudolph Kudlich, U. S. Bureau of Mines; and "The Installation and Operation of Aerial Tramways," by F. C. Carstarphen, American Steel & Wire Co., Trenton, N. J.

All meetings will be held in the Cass Technical High School. Practically all available space has been taken for the safety exhibit, which will be held in a hall adjoining the auditorium.

### Second Series of Lectures on Petroleum Announced

New York University has announced a second series of lectures on petroleum to be given at the Wall Street division of the School of Commerce by Ernest R. Lilley, consulting petroleum geologist. Stressing those points which are of vital importance to the oil producer or consumer, the lecturer will, in this series analyze the development of the industry up to the present, discuss its future problems both here and in foreign countries, and indicate its relation to other industries with which it is actively competing. Special attention will be paid to the history of the several great corporations which today dominate the world's petroleum industry. The subject outline follows: "The Price Situation;" "Mechanism of the Oil In-

dustry;" "The Development of American Oil Resources;" Mexico and South America—Problems in Foreign World;" "Old World Oil Fields;" "Development of the Standard, Dutch Shell and other groups;" "Petroleum in International Trade and Politics of Today;" "The Natural Gas Industry;" "The Shale Oil Industry in America;" "The Natural Asphalt and Related Industries;" "Oil versus Coal and Water Power;" and "The Future of the American Petroleum Industry."

### Ontario Mining Association Meets in Porcupine

#### A. F. Brigham Guesses at Hollinger Consolidated's Value

The Ontario Mining Association held its third annual meeting in Porcupine, July 6, 7 and 8. Very satisfactory progress was reported to have been made during the year. The officers elected for the coming year were: C. V. Corliss, of the Mond Nickel Co., president; J. P. Bickell, of the McIntyre Porcupine Mines, Ltd., first vice president; and George Cowie, of the Algoma Steel Co., second vice president.

At the annual dinner, given by the McIntyre Porcupine company, A. F. Brigham, manager of the Hollinger Consolidated Gold Mines, stated that the value of the Hollinger was \$150,000 per foot of depth, and that there was no reason why this should not hold for 3,000 ft. to which depth the company was now preparing to go. This, in the opinion of the management, places a gross value on the property of \$450,000,000.

### Plan to Celebrate Locating of First Claim in Utah

The mining committee of the Salt Lake Commercial Club and Chamber of Commerce has under consideration the holding, in conjunction with the Utah State Fair Association of an "intermountain exposition and sexagenary jubilee" to celebrate the locating of the first mining claim in Utah sixty ago. The Utah State Fair Association has offered the use of the race track and amphitheatre for exhibits.

Some of the proposed features are an industrial parade; hard rock drilling contests, both by hand and machine; unloading contests; safety first contests; mine rescue work; an actual mine and mill in operation; placer mining; oil well drilling; and mining camps in full blaze of old time activity.

### Hoover to Speak at Exposition of Chemical Industries

Among those who have consented to speak at the National Exposition of Chemical Industries, which is to be held in the Grand Central Palace, New York, Sept. 11 to 16, is the Secretary of Commerce, Herbert Hoover. Mr. Hoover will address the Salesmen's Association of the American Chemical Industry, whose annual convention will be held in conjunction with the Exposition.

## MEN YOU SHOULD KNOW ABOUT

Spruille Braden arrived in New York from Chile on July 11.

Franklin W. Smith, of Bisbee, Ariz., was recently in San Francisco.

Philip Wiseman is expected at Los Angeles on his return from New York.

Roger Luckenbach, of Brooklyn, N. Y., was in San Francisco early in July.

Clyde Heller, president of the Tonopah Belmont Development Co., is in Tonopah.

John T. Reid has returned from New York to his office in Lovelock, Nev., for the summer.

Benjamin F. Tibby is doing professional work at the Premier mine in British Columbia.

Frank M. Manson, manager of the Western Ore Purchasing Co., is in San Francisco on business.

H. Foster Bain has returned to Washington from a visit of inspection to the Alaskan coal fields.

John M. Nicol recently left San Francisco for Arizona. He expects to go from there to New York.

E. K. Soper, manager of the Trinidad Tarouba Oil Development Co., has recently returned to New York from Trinidad.

Frederic R. Weekes will spend the next two or three months on professional business in the West and Northwest.

J. J. Hussey has been appointed manager of the Noranda Mines, which has holdings in Cobalt and Kirkland, Ontario.

L. K. Armstrong attended the recent mining convention at Nelson, B. C., and went later to the Crow's Nest coal field.

E. W. Hopkins, of Ironwood, Mich., and P. S. Williams, of Ramsay, Mich., have returned from a business trip to Cleveland.

F. M. Merrilees, for the last two years construction engineer for the Shasta Zinc & Copper Co., which is operating at Winthrop, Cal., resigned his position on July 15.

L. D. Gordon, president and general manager of the Round Mountain Mining Co., has returned to Round Mountain from San Francisco.

Donald B. Gillies, manager of mines of the McKinney Steel Co., recently made an inspection tour of the Gogebic Range properties of their company.

Alan M. Bateman, editor of *Economic Geology*, has left for a short trip to visit the properties of the Utah Copper Co. and the Nevada Consolidated Copper Co.

S. S. Rumsey, and W. S. Tarr, of Duluth, were on the Gogebic Range

several days in connection with the sinking of a new shaft by the Oliver Iron Mining Co.

W. C. Mendenhall is making an extended inspection trip. He will visit U. S. Geological Survey parties engaged in field work in Montana, Wyoming and Utah.

John Kiddie, mines superintendent at Morenci, of the Arizona Copper Co., recently absorbed by the Phelps-Dodge Corporation, is touring the mining districts of British Columbia.

John V. Richard, who has been examining mining property in Idaho, Montana, British Columbia, and Oregon for the last two months, has returned to Los Angeles, Cal. His present address is 969 Westchester Place.

Francis J. Webb, Lake Superior district manager, and Robert Walker, superintendent for the Republic Iron & Steel Co., have been on the Gogebic Range inspecting the scraper methods of mining in use there, with the view of introducing them in their own mines.

L. D. Ricketts was elected president, John C. Greenway, vice president, and John F. Bankard, secretary and treasurer of the Erupcion Mining Co., at a meeting of the directors held in El Paso, to succeed E. F. Knotts, president, and C. A. Kline, secretary and treasurer, resigned.

W. J. Loring, president and managing director of the Carson Hill Gold Mines, has erected a rustic cabin on Jackass Hill in Tuolumne County, Cal., which is an exact replica of the one in which Mark Twain spent the winter of 1864-65, while panning gold in the hills, and stands on the same site. After its dedication, Mr. Loring presented the cabin to Tuolumne County by which it is to be kept as a literary shrine in memory of America's greatest humorist.

Mining and metallurgical engineers visiting New York City last week included: I. E. Waechter, of Cleveland, Ohio; John V. Harvey, of Sioux City, Iowa; Paul M. Tyler, of Washington, D. C.; and Harry H. Stoek, of Urbana, Ill.

## OBITUARY

Arthur B. Emmons, of Newport, R. I., died at his home on July 12. Mr. Emmons was born in 1850. He received the degree of Ph.D. in geology from the University of Leipsic, Germany, in 1874.

H. F. Hansen, of the geological staff of Cia. Mexicana de Petroleo "El Aguila," S. A., died at Tampico of typhoid fever on June 26. Mr. Hansen was a graduate of the Missouri School of Mines, and was formerly employed by the Minas Dolores, at Matehuala, Mexico.

## THE MINING NEWS

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

### Leading Events

**T**HE Oliver Iron Mining Co. will sink a \$500,000 shaft on the Gogebic Range, in Michigan. Steel and concrete lining will be used.

The St. Joseph Lead Co. has taken an option on the famous Mine La Motte, in Missouri, on which diamond-drilling will be done.

Secretary Fall has widened the scope of War Minerals Relief awards by an opinion sent to the Commission.

Minerals Separation, answering a patent complaint, denies that Sulman & Picard defrauded Jacob D. Wolf.

Twenty per cent increase is reported in South African gold production for May as compared with April.

Arizona copper mining companies will co-operate to finance an hydro-electric power project in the Salt River region near Phoenix, Ariz.

The Cresson Gold Mining Co., of the Cripple Creek district, Colorado, has distributed a \$220,000 dividend.

The Miami Copper Co. in June broke previous production record at its mine in Arizona.

The construction of a branch railroad 25 miles long will be the first step in developing iron-ore deposits in southern Utah. Work is to be done by a newly formed iron and steel corporation of which the Columbia Steel Co. of California is a nucleus.

#### New \$500,000 Shaft Started by Oliver Iron Mining Co.

Will Have Six Compartments, With Steel and Concrete Lining

The Oliver Iron Mining Co. has received authorization to begin work on a half-million dollar shaft to be sunk at the Royal mine between the Davis-Geneva and Puritan mines on the Gogebic Range in Michigan. The shaft is to be sunk in the granite south of the footwall, and will be vertical. It will have two skip compartments, two for cages, and two for pipes and ladders. This differs from the company's former practice in having one more cage compartment. This change was made because the shaft will be a deep one, probably 3,000 ft., and it will be necessary to have more than the one cage to handle men and timber. The shaft will be lined with steel and concrete, and will have a steel head-frame with independent ore pockets. The hoists will be electric driven from the company's own power lines which are nearby. It is understood that building railroad spurs and other preliminary work will begin at once, and that construction will soon commence on the permanent surface equipment so that it can be used in sinking the deeper part of the shaft. Temporary sinking equipment will be used for the first thousand feet or more.

#### Rand Gold Output Increases in June

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

London, July 17—The Transvaal Chamber of Mines reports that the total gold output in the Transvaal during June totalled 675,697 oz.

#### Nevada Consolidated Mill Practically Total Loss

First reports regarding the extent of the damage to the Nevada Consolidated concentrator at McGill, Nev., by fire on July 9 indicated that only part of the plant was destroyed and that production would be continued at approximately half capacity. As a matter of fact the entire main building was burned and the output of concentrate has ceased. The crushing plant which was housed in a separate structure is intact, as is the smelter and the various shops, the power house, and other auxiliary buildings. If it is decided to rush the work of putting a few units into shape for operation, probably three months will be required. If on the other hand, permanent construction with steel and concrete is to be used, nine or ten months will elapse before production on a considerable scale can be resumed. High-grade ore may be smelted direct in the interim.

#### Yellow Pine Mine in Nevada Resumes

Operations have been resumed at Good Springs, Nev., by the Yellow Pine Mining Co., for many years one of the premier lead-zinc producers of Nevada. Ore-treatment tests have been made with the volatilization process in co-operation with the U. S. Bureau of Mines. The method developed is expected to solve the metallurgical problems affecting treatment of medium-grade ores. The Yellow Pine paid several dividends during the war period, when lead and zinc ores commanded high prices, and extensive reserves of profitable material are reported to be in sight in the lower workings.

#### St. Joseph Lead Co. Options Mine LaMotte

Famous Old Missouri Lead Mine Will Be Prospected Again

The famous Mine LaMotte property in Madison County, Missouri, where more or less activity in lead mining has been carried on for over 200 years, has been optioned by the St. Joseph Lead Co. Six diamond drills will be shipped from Bonne Terre to give this property another test, although it is the most thoroughly drilled land in southeast Missouri. The shallowest occurrence of disseminated lead in southeast Missouri occurs on the Mine LaMotte property and the ten shafts that have been sunk to date are only 75 to 170 ft. deep; the mines make little water as compared to the heavy inflow of the much deeper mines of the Flat River district of St. Francois County. The Mine LaMotte orebodies are smaller and not so rich as in St. Francois County and are usually located along faults, which also is unique in southeast Missouri. The property was successfully operated by the Rowland Hazard estate from about 1875 to about 1895 and usually produced 3,000 tons of pig lead per year at a profit of \$50,000 to \$60,000. Under the Hazard administration the mine had four operating shafts, an efficient 100-ton mill and a small smelter, but as it had no rail connection, all the supplies had to be hauled three miles to the Iron Mountain Railroad.

The firm of Daugherty & Albers of New York, purchased the property for \$600,000. They capitalized it at \$3,000,000, and launched a stock promotion scheme that ended in disaster. Under Daugherty & Albers, the old mill was replaced by a new 500-ton mill. A cobalt

and nickel extraction plant was erected that proved a failure and a switch was built from the Iron Mountain Railroad.

Several companies subsequently took over the property, who attempted to operate it on a large scale and intended to work the disseminated orebodies by stripping from 50 to 100 ft. of barren limestone. This ended in failure. These last operators also attempted to recover low-grade "sand-carbonates" by washing the surface clays, which carried small but erratic amounts of carbonate of lead. The property has been idle for several years and it will be highly interesting if the St. Joseph Lead Co. finds sufficient lead to warrant re-opening. Trivial amounts of copper, nickel, and cobalt occur in the sandstone underlying the lead-bearing Bonne Terre formation, but thus far their extraction has not proved a commercial success. There are over 30,000 acres in the property, of which about 5,000 acres is covered by lead-bearing limestone.

### New Railroad Branch to Iron Mines in Southern Utah

It is announced in Salt Lake City that one of the first steps in the exploitation of the iron and coal deposits of southern Utah, by the new corporation of which the Columbia Steel Co. of California is a nucleus, will be the building of a new branch railroad from Iron Springs near Cedar City, to the Union Pacific main line to Los Angeles. The junction point will be the town of Lund, and the road will be 24.6 miles long.

### Arizona Mining Companies Help Finance Salt River Project

The Inspiration, Miami and Magma mining companies are reported to have joined in the subscription of \$4,200,000 toward a \$6,000,000 hydro-electric project that is planned by the Salt River Valley Water Users Association. The installation will supplement the Roosevelt dam and the present hydro-electric works along Salt River, which generate 25,000 hp. Of this Inspiration latterly has been taking 10,000, on what may be called an "overflow" contract. Under the new order, Inspiration and Miami have, according to President F. A. Reid of the association, signed contracts for 1,200,000 kw.-hr. per annum and want 2,000,000. Magma, at Superior, has been taking 1,000 kw. and now wants 5,000. Ray and Hayden are not included, though the power charge is attractive— $\frac{3}{4}$  of a cent per kw. Even at this rate the Association expects to get a gross income of \$3,000,000 per annum from the sale of the 75,000 hp. that will be available on completion of the works. These designs have been approved on behalf of the Inspiration company by Quentin, Code & Hill, of Los Angeles. They will include two dams on Salt River, below Roosevelt, at Mormon Flat and at Horse Mountain. An additional 40,000 hp. may be generated by the Association on the Verde river.

### Wolf's Allegation Against Sulman & Picard Denied by Minerals Separation

Charges of Broken Contract Groundless, Says Answer—Matter Adjudicated in London Seventeen Years Ago

Answering the complaint of Wolf's Mineral Process Corporation, alleging infringement of patent No. 787,814, dated April 18, 1905, and covering certain processes for concentrating ore by the use of oil, the Minerals Separation North American Corporation denies all of the material charges. The allegation that Sulman & Picard had used information obtained while in the employ of Jacob D. Wolf in developing the basic froth-flotation invention revealed in patent No. 835,120, and that they had defrauded Wolf by so doing is declared to be false. The answer sets up the fact that this point was finally and for all time adjudicated against Wolf some seventeen years ago in the High Court of Justice at London. This judgment was rendered in May, 1905, in the suit which Sulman & Picard commenced for the purpose of compelling Wolf to pay the balance due under his contract with them. In this suit Wolf set up as a counterclaim the charges that his assignee repeats in the pending suit.

It is claimed by Minerals Separation that patent No. 793,808 is for a process wherein air and oil are injected into an ore pulp, the oil coats the mineral, and air bubbles float the mineral to the surface, at which the oiled mineral forms a skin or film, floating by surface tension. The element of air-bubble buoyancy is here present, but the formation of froth is totally absent. This patent, the defendant says, has been considered by the courts in this country and held not to anticipate the froth-flotation process patents.

The defendant further answering on information and belief avers that the said Letters Patent No. 787,814 are invalid and void and of no force and effect for the following reasons, to wit:

(a) That the process alleged to be patented in said patent No. 787,814 had been in public use in this country for more than two years prior to the application thereof.

(b) That the process alleged to be patented by said patent No. 787,814 had been abandoned to the public.

(c) That the process alleged to be patented by said patent No. 787,814 had been patented or described in one or more printed publications more than two years prior to the application thereof.

(d) That the patentee, Jacob David Wolf, was not the sole, original and first inventor or discoverer of that which is patented by said Letters Patent, or any material or substantial part thereof, but that, on the contrary (prior to the alleged invention or discovery by said patentee), the process patented by said patent and all material and substantial parts thereof had been disclosed

in the following printed publications:

*Engineering and Mining Journal*, New York, N. Y., June 23, 1900, Vol. 69, page 742, and pages 742, 743.

*Transactions of the Institution of Mining and Metallurgy*, 1899-1900, Vol. VIII., pages 379 to 395 inclusive, article "Notes on the Elmore Concentrating Process" by Charles M. Rolker, M. Inst. M. M., and discussion.

The defendant further avers that plaintiff is entitled to no relief whatsoever as prayed for in the bill of complaint for the reason that it and its predecessor in interest, Jacob David Wolf, have permitted defendant to carry on its operations for a number of years last past, which operations were well known to the public and to the plaintiff and its predecessor, and were a matter of public record, without notification to defendant of the alleged violation of plaintiff's rights or any action thereon, and plaintiff and its predecessor have thus caused and permitted defendant to build up and establish a business and a system of operations to interfere with which would now cause irreparable and unconscionable injury.

The defendant further denies the equity of plaintiff's bill of complaint and avers that plaintiff is not entitled to an injunction or to an accounting of profits, gains and savings nor to any recovery whatsoever against this defendant as prayed in the complaint.

### Silver Production Three Billion Dollars, Says Mexican Bureau of Mines

Has Averaged \$37,000,000 Per Year Since 1900

The value of the silver mined in Mexico from the first years of the Spanish conquest to January, 1922, reached the enormous total of 6,000,000,000 pesos, or \$3,000,000,000 in American currency, according to a compilation just completed by the Bureau of Mines of the Mexican Department of Commerce and Industry.

According to the data collected two-thirds of the world's silver in the last 400 years has come from Mexican mines. Since 1521, when the Spaniards began the orderly exploitation of silver mines in Mexico, there have been produced large quantities of silver each year. Production has increased regularly during this period, as the improvement in mining methods and extraction processes have rendered it possible to secure a higher recovery.

All told Mexico has produced somewhat more than 155,000 tons of silver, with a valuation of about \$3,000,000,000. Over the four-century period the annual production has averaged 40,000,000 pesos; since 1900 the average has been 74,000,000 pesos, and this includes the ten-year revolutionary period of 1911-21, when silver mining activities were greatly hampered, and in some instances entirely halted. Now that the country is in a more peaceful state, it is expected that production will mount to new high figures.

### Germany Remains Best Foreign Customer for American Copper

Figures for the fiscal year ended June 30 will show that some \$90,000,000 has been realized in the sale of American copper to foreign consumers. Germany has been the principal factor in foreign demand for American copper and will have paid our copper companies more than \$30,000,000, practically all cash, or a total in two years of more than \$50,000,000.

May exports just reported were 58,085,033 lb. against 62,196,956 lb. in the preceding month and 32,259,011 lb. last year. The following figures compare the total exports with those consigned to Germany. The figures are in pounds:

	Total Exports		To Germany	
	1922	1921	1922	1921
January.....	54,802,893	50,783,972	16,289,741	18,801,672
February.....	53,963,197	60,147,053	14,302,424	20,725,169
March.....	72,303,485	36,374,236	26,357,425	19,020,962
April.....	62,196,956	40,256,030	17,983,470	15,837,896
May.....	58,085,033	32,259,011	20,349,878	7,073,597
Total.....	301,351,564	219,820,302	95,382,938	81,459,296

During the first eleven months of the fiscal year there was exported 618,755,232 lb. of copper against 409,236,324 lb. last year. Considerably more than 33 per cent of the shipments were to Germany.

### Tungsten Companies in Tasmania Merge Interests

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

Melbourne, July 13—The South Allnations and seven other mines operating in the wolfram field in north-western Tasmania have decided to consolidate their interests and to form a company with a capital of £500,000. A large modern treatment plant will be erected.

### Operating Profit of \$27,000 from June Operations of Alaska Juneau

The Alaska Juneau Gold Mining Co. during June trammed 207,200 tons of ore, from which 103,800 tons of coarse tailing was rejected and 103,400 tons was milled. The gold recovered amounted to \$112,000, or \$1.08 per ton milled, or \$0.54 per ton trammed. This does not include recovered silver and lead, which is expected to net about \$6,000 per month. The operating milling cost was \$46,000, or 44c. per ton milled, or 22c. per ton trammed. The operating tramming and mining cost was \$36,000, or 35c. per ton milled, or 17c. per ton trammed. The operating general cost was \$3,000, or 3c. per ton milled, or 2c. per ton trammed. The total operating expenditure was \$85,000, or 82c. per ton milled, or 41c. per ton trammed. The operating profit was \$27,000. Expenditure on capital account totaled \$8,500; San Francisco expense, which was about \$2,000 above the normal, was \$17,000. The total estimated expenditure was \$110,500.

### Record Output of Gold and Diamonds from Belgian Congo

Gold and diamond mining has increased greatly in the Belgian Congo since the armistice, and in May it reached the highest point ever known in the history of the colony, according to a recent dispatch. The steamer Anversville left Leopoldville for Antwerp recently carrying 1,600 lb. of gold bullion and several million francs worth of diamonds. Commerce in general has profited greatly by the reduction in wages. Following the economic crisis which obtained throughout 1921 the negro workers are now accepting a diminution of 25 to 33 per cent from the wages which were paid them during the war and in 1919 and 1920.

### Plymouth Consolidated Opens Good Oreshoot Below 3,400 Ft.

#### California Property Profits From Persistent Development

The Plymouth Consolidated Gold Mines, Ltd., operating an important Mother Lode property at Plymouth, Cal., has recently developed a new oreshoot that promises to renew the former prosperity of the mine. At the 3,050 level, a disturbed zone was encountered that continued to the 3,300 level. Ore was found in this zone, but the deposit diminished in size and finally petered out on the 3,400, which produced no ore at all. A quartz lens of low-grade ore extending underfoot at the 3,400 level was the only favorable indication upon the level with the exception of the fact that the disturbed zone had been bottomed at this level. A winze was started at the low-grade lens, which gave out at a point 35 ft. below the 3,400. Sinking was continued and at a depth of 180 ft. below the 3,400, a favorable slate formation was encountered. Assays in spots were obtained that gave returns as high as \$40 per ton. This continued for 20 ft. at which point a quartz vein was struck which has continued 250 ft. below the 3,400. The average of car samples from this new oreshoot is \$15 per ton.

### Miami Copper Breaks Production Record—Cost Low

A new record was established by the Miami Copper Co. of Arizona during June with a production approximating 6,000,000 lb. of copper. Its extraction was likewise the best to date and almost a cent per pound was cut from the production cost, dropping it to about 9c. per pound. With copper selling at 14c. Miami in a single month earned almost a full quarter's dividend requirements.

### Arizona Copper Mines Appraised at \$346,101,615 by Tax Authorities

This Figure Is Exclusive of Mills, Smelters, Railroads and Other Property

The producing mines of Arizona, aside from reduction works, railroads or other collateral property, have been assessed at \$346,101,615, a reduction of about 12 per cent from last year's figures, of \$400,006,941. Only one mine, the Magma, has been raised, and that by only about \$90,000. The Tom Reed assessment was cut about one-half, Inspiration about \$6,000,000, Copper Queen \$6,000,000, United Verde over \$5,000,000, Calumet & Arizona over \$4,000,000, Ray Consolidated over \$10,000,000, United Verde Extension over \$5,000,000, and Miami \$4,600,000. The Arizona Copper Co. was eliminated. Last year it was assessed at \$19,384,589. This year it is assessed with the Detroit or Morenci branch of the Phelps Dodge Corporation, which in the former assessment was valued at \$5,061,936. There was further decrease through the dropping of eleven mines from the producing class of last year. Valuations were estimated on the five-year production basis and thus were maintained at higher figures than had been anticipated. Small mines are assessed in the several counties and are not included in the state list.

The assessments of the leading mines follow: Inspiration, \$63,045,545; Copper Queen (Phelps Dodge), \$51,479,381; United Verde, \$37,895,908; Calumet & Arizona, \$35,668,715; Ray Consolidated, \$31,672,620; United Verde Extension, \$31,562,984; Miami Copper, \$24,330,248; Morenci branch (Phelps Dodge), \$22,515,980; New Cornelia, \$18,673,172; Old Dominion, \$10,170,287; Magma, \$4,442,674; United Eastern, \$3,584,880; Shattuck, \$3,224,299; Arizona Commercial, \$2,213,648; Consolidated Arizona (Southwest Metals), \$2,195,697; Iron Cap, \$2,048,903.

### Harbor Improvements for Milwaukee

A \$4,000,000 improvement at Milwaukee Harbor is proposed, which will include facilities for handling coal and ore in a scheme of terminal development on the Great Lakes for handling bulk freight, providing for its later expansion under modern and economical practice. Federal financing is proposed in the River and Harbor Bill reported by the Senate Committee.

### Sulphur Deposits in Texas to Be Developed

So that sulphur deposits at Hoskins Mound, Texas, may be developed, the Houston and Brazos Valley Railroad Co. has applied to the Interstate Commerce Commission for permission to extend its line thirteen miles from Clute station to the sulphur fields.



## News from Washington

By PAUL WOOTON  
Special Correspondent

### Pittman-Act Silver To Be Converted Into Dollars

Orders to speed up the coinage of silver dollars to replace part of the \$270,000,000 sold during the World War as bullion to Great Britain have been dispatched to the Philadelphia mint. Fifty thousand are to be coined daily and shipped to Washington for deposit in the Treasury vaults. Silver certificates will be issued against them. The mint has approximately 45,000,000 oz. of silver bullion on hand.

### Wisdom of Government Action in Coal Strike Doubted

Intervention by the President in the coal strike apparently was a great mistake. This is becoming increasingly evident, according to generally held opinion in Washington. It is conceded, however, that since such a policy has been initiated there now can be no turning back. As a result of what is regarded as its ill-timed interference, the administration now is confronted with a self-created task entirely comparable in intricacy and dangerous possibilities with the Irish problem. The step having been taken, however, it is believed it would be nothing short of a public calamity were some basis of arbitration not worked out. As a consequence, it is believed that some means will be found for reaching an adjustment for the present coal year. Each side to the controversy, however, expects to see the Government take over certain mines and operate them in the interest of localities threatened with a shortage of fuel.

While it is believed that some form of arbitration is going to be brought about, no one sees how any decision can be reached which will be equitable or which can result in anything more than a truce. Arbitration, especially in view of the President's explanatory letter, means only a central competitive field agreement. More than 300,000,000 tons of annual output were not represented at the final meeting of operators when the deadlock was reported to the President. There is no way whereby the Federal Government can force the non-union operators to fix wage scales. It is apparent that operators in the Kanawha field or even in a smaller subdivision, such as the Windber region in Somerset county, are not going to throw away large investments in efforts to stay non-union, even if the majority of their workers have affiliated with the labor organization.

As the strike enters its sixteenth week, it is apparent that various events have strengthened the union position. Principal among these is the success which has attended the efforts of the railroad shop crafts to interfere with transportation.

### War Minerals Operations May Be Segregated In Claims for Relief

Secretary Fall Submits an Opinion for Guidance of Commission—  
Profits from One Operation Need Not Be Deducted  
from Losses on Another of Same Owner

**A**CTUAL losses in a particular operation involving the production of war minerals are to be allowed in the future without regard to the profits the owner may have made in a separate operation. This action will be taken in compliance with an opinion rendered by the Secretary of the Interior. The ruling upsets the procedure established by the original War Minerals Relief Commission and means the reopening of a number of claims in which profits in one war mineral operation were deducted from the losses in another. The former commission allowed the net loss only.

The ruling was handed down in the case of the Santa Margarita Chrome Company. In view of the Secretary's opinion, the War Minerals Relief Commissioner recommended an award of \$18,720.27. The Secretary's opinion, handed down at the request of Commissioner Robinson, also outlines Secretary Fall's interpretation of the intent of the War Minerals Relief Act. The opinion in part follows:

On Oct. 5, 1918, the Congress of the United States passed a general law under which it was hoped to secure a very greatly enlarged domestic output of certain minerals classed in such act as "necessaries."

By Section 3 of the act, it is provided, among other things, that "The President is authorized to requisition and take over any of said 'necessaries' . . . take over any undeveloped or insufficiently developed or operated idle land, deposit, or mine producing ore, in his judgment, capable of producing said 'necessaries,' . . . and operate such mine or deposit."

It is further provided that the United States shall make just compensation, "determined by the President, for the taking over, use, occupation, etc., . . ." and that "if the compensation so determined be unsatisfactory" in effect the President shall fix an amount of compensation and that the party, if dissatisfied with such amount so fixed, shall receive 75 per cent thereof in cash and shall have the right to sue the United States Government for the full amount which he thinks is the proper compensation.

The Congress of the United States was aware of the fact that had this policy been pursued, there could have been no loss to the individual where the property was taken over; by the Relief Act, therefore, the Congress intended that where the individual was "stimulated" to operate his own property, or to produce an enlarged amount of one of the "necessaries" he should be reimbursed for such losses by the Government.

It may be difficult to ascertain and fix definitely in any case the line of demarcation between the "inducement" offered through Government "stimulation," and the "inducement" offered through the hope of securing war prices for the product, or entire production, of one of these "necessaries." This is peculiarly the case where recompense was sought by the claimant for what he may claim to be losses in the operation of one going concern being operated at the time of his supposed or actual "stimulation" to increase his output; being engaged in production already, and presumably, earning a profit at the time, it is, in the absence of direct evidence and clear proof to the contrary, ordinarily to be assumed that if he attempted an increased output through merely enlarged operation of the same properties, he was "induced" so to do largely because of war prices of the product.

In the case at bar, the "Santa Margarita" claim, the facts disclose the following conditions, to-wit:

A party engaged in the production of a "necessary," operating a going concern, with a contract for the sale of his entire production, came from his home to the City of Washington and held consultations here with Government officials and others, in which a general discussion followed the statement by the Government officials that in the United States a certain number of tons of this particular product had been used before the war and was a "necessary"; that approximately one-fourth of this amount had been and was being produced in the United States; that the remaining approximately three-fourths was produced in foreign countries; that at least the amount which had been used must be procured in some way; that it was impossible to bring the necessary three-fourths from the markets producing them before the war, because of lack of transportation facilities, and for other reasons.

I am informed that under these conditions, the party now claimant himself suggested that there were only two methods by which the necessary increased domestic consumption could be brought about, to-wit: By the construction of railroads or tramways to the richer remaining known deposits of this ore which could not be secured at that time without such construction, because of the prohibitive cost of hauling approximately forty miles or more to a railroad; the other method of increasing production must be by the utilization of the lower grades of these ores which were to be found in more easy access to transportation lines, and which could only be utilized by concentrating the product of these ores.

Now, if this party operating a then going concern at a profit on ores from a certain mine or mines, is "induced"

either to build roads to bring to market the ores which would bear shipment, that is, we will say, the 40 per cent ores, or is "induced" upon the other hand, to erect concentrators or other machinery, and to abstract ores running 15 to 18 per cent, or less, thus converting three tons of rock into one ton of 40 per cent concentrates, at necessarily a very much greater cost than the extraction of one ton of 40 per cent ore; and in such concentration and low grade production more or less heavy losses were incurred, it appears to me plain that the party was not "induced" to enter into such enterprise because of the hope of "war prices" for his product, but because he must have understood that he had some guarantee against loss in an enterprise which he, as a business man, had not entered upon, although the opportunity may have offered itself for many years past.

It would then be clear to me, in such case, until contrary facts are definitely established, that the profits in the original operation, or business in which this party was engaged and had been engaged before the war, should not be charged against this "stimulation" business, at least unless the two operations were so inextricably confused, not only by methods of accounting, but by mechanical confusion of the ores extracted, operation, sales etc., that the profits and loss could not be ascertained.

I must, therefore, disagree, insofar as it seems to be your opinion, that a general hard and fast rule can be adopted in all these cases.

I hope that my views as now communicated, may be of assistance in the consideration and determination of each case as it arises.

It may be that I do not understand your definition of the statutory term "net losses."

I understand that as applied in some cases, this definition is not limited to the ordinarily understood difference between the costs of production, manufacture and sale of a product, and the price received therefrom at such sale, but is broadened to include all operations of a similar character however closely connected or however broadly separated, engaged in by one individual, or one corporation or association, whether through the same percentages of interests in each of such operations, or whether different parties may be associated in one or another of said operations, and that all such operations shall be treated as one operation and that all the profits in either, however, broadly differentiated, so long as the product may be one of the "necessaries" shall be offset against either, any or all losses in any other operation engaged in by the same parties, or some of the same parties.

I cannot agree to this rule as a general and fast rule to be applied by your Commission.

### Two Awards Recommended to War Minerals Relief Commissioner

Subject to the approval of the Secretary of the Interior, Commissioner Ira E. Robinson has recommended the payment of an award of \$107,947.94 to the Hopkins Mining Co., of New York. The claim formerly did not meet the requirements of the "request or de-

mand" feature of the law, but under the amended act the company was able to establish stimulation on an article appearing in the issue of *Engineering and Mining Journal* of June 2, 1917.

An award of \$10,777.69 was recommended in the claim of John J. Everharty, of Los Angeles. The greater part of the award is to cover an expenditure for a road. Commissioner Robinson holds that the road constituted a necessary expense in the development of the property.

### Government Needs Mining Engineers

#### New Procedure for Recruiting Eligible Lists Is Adopted by Civil Service Commission

A new policy governing the procurement of mining engineers for the Government service has been announced by the U. S. Civil Service Commission. In the future in preparing eligible lists of mining engineers, applications for examination will be received during such period as may be necessary to build up eligible lists. Heretofore it has been the custom to announce an

examination on a certain date. It has been found practically impossible to give general circulation to the announcement of examinations. It is believed, once it is understood that examinations can be taken at any time, more representative eligible lists can be secured.

Just at this time there is a shortage of mining engineers in the Government service. There are no fresh eligible lists from which these engineers may be drawn. While the need just at this time is largely for specialists in petroleum and coal, there are vacancies in other branches of mining engineering to fill. The salaries for mining engineers range from \$3,600 to as much as \$5,000. Salaries for associate mining engineers range from \$3,000 to \$3,600, and assistant mining engineers receive \$2,160 to \$3,000. Junior mining engineers receive from \$1,620 to \$2,160.

The Bureau of Internal Revenue is making an effort at this time to secure mining engineers who are qualified to make valuations of all types of mining properties, including oil and gas operations. Applications for that examination will be received until Sept. 1.

## News by Mining Districts

### London Letter

#### Slack Methods Revealed in Operation of Gaika Mine in Rhodesia

BY W. A. DOMAN

London, July 7—A few months ago I wrote concerning the change of control of the Gaika Gold Mining Co., of Rhodesia, when the representatives of the Consolidated Gold Fields were replaced by Stanley Edwards, R. Rawdon Johnson, and Harry W. Edney. Stanley Edwards shortly afterwards proceeded to Rhodesia to investigate affairs on behalf of the new board, with a view to the issue of a circular enabling the shareholders to know the position. This circular has now made its appearance; it contains a couple of reports by A. M. Mackilligin.

These two reports are of a rather remarkable character, especially as dealing with certain aspects of the technical management of the mine. It would appear that no stope assay plans have been kept, and that there was neither a sampler nor a surveyor on the mine. From this fact A. M. Mackilligin draws certain inferences. As no regular stope sampling has been done and no stope assay plans kept, the manager and mine captain have had no idea of the value of the stopes, except "that when plenty of gold is showing they are rich."

Apparently monthly outputs were determined by the former management, and in the event the grade of ore sent to the mill was too high, instructions were given to reduce it. The inference is that unprofitable rock may have been sent to the mill with the dual object of getting down costs and

also of lowering the grade. Mr. Mackilligin does not blame the mine captain, as his view is that in the absence of systematic sampling, the sending of worthless rock to the mill could not be avoided.

Naturally, one of the first reforms Mr. Mackilligin suggests is that a sampler should be constantly employed in sampling the stopes and making assay plans and sections. He disagrees with the manner in which ore reserves have been estimated. He says there are few blocks of ore in the mine really exposed on all four sides, but there is a considerable tonnage exposed on two or three sides, and this he describes as "probable" ore. Only three out of the twenty-six blocks of "ore" in the mine are exposed on all four sides. He also criticises the allowance made for pillars, 10 per cent being estimated in the past, without allowance for pillars in "ore available for stoping," while the figure suggested should be 32.3 per cent of the total.

The Gaika mine is patchy, and all parties agree that it is a difficult one to value. In the past, excess ore has accounted for 75 per cent of the tonnage milled, though much of it, it would appear, has been worthless. A comprehensive development scheme is recommended, which is expected to occupy about twelve months, and Mr. Mackilligin says that if during that time nothing of value has been discovered, it would be well to work out the remaining ore as rapidly and as economically as possible, with a reasonably certain knowledge that nothing of value has been missed or left undiscovered in the mine.

**Johannesburg Letter**

**Gold Production for May is 20 per cent Greater than for April—Output Listed by Mines**

BY JOHN WATSON

**Johannesburg**—The Transvaal gold output for May was declared on June 10 by the Chamber of Mines as being 629,786 oz. fine gold, having a value of £2,897,016. The increase as compared with April is 118,448 oz. which represents an increase in value of £544,861, the selling price having been taken at 92s. per ounce for both April and May. The May output is within 75,000 oz. of a normal month. The individual returns from the various mines are as follow:

	May Output Oz.	Increase over April Oz.
Aurora West.....	2,695	560
Brakpan.....	25,325	11,124
City Deep.....	34,979	7,946
Cons. Langlaagte.....	9,685	1,943
Cons. Main Reef.....	15,855	2,816
Crown Mines.....	49,660	5,672
Durban Road, Deep.....	8,675	492
E. R. P. M.....	26,012	3,015
Ferreira Deep.....	5,359	895
Geduld.....	16,333	552
Geldenhuis.....	12,259	2,099
Govt. G. M. Areas.....	60,940	13,657
Knight Central.....	5,286	513
Langlaagte Estate.....	13,007	1,019
Luipaardsvlei.....	2,492	2,492
Meyer and Charlton.....	6,928	33
Modder Deep.....	23,592	3,031
Modder East.....	8,823	687
Modder B.....	27,549	6,849
New Goch.....	3,763	373
New Kleinfontein.....	10,313	3,467
New Modder.....	43,677	14,876
New Primrose.....	3,862	579
New Unified.....	2,219	393
Nourse Mines.....	13,489	2,068
Randfontein Central.....	31,144	5,346
Robinson.....	4,593	146
Robinson Deep.....	16,154	2,930
Rooipoort U. M. R.....	2,003	85
Rose Deep.....	10,744	862
Simmer and Jack.....	3,300	1248
Springs Mines.....	18,191	4,556
Van Ryn Estate.....	7,678	1,455
Van Ryn Deep.....	25,526	9,241
Village Deep.....	16,548	1,752
West Rand Consolidated.....	9,102	101
Witwatersrand.....	9,850	3,427
Wit. Deep.....	9,803	1,463
Wolhuter.....	6,991	678
Miscellaneous.....	3,299	356
<i>Outside Districts</i>		
Glynn's Lydenburg.....	1,464	1111
Sub-Nigel.....	5,714	117
Trans. G. M. Estates.....	5,414	1208
Miscellaneous.....	4,491	1551

↑Decrease

**MEXICO**

**Sonora**

**Cananea Consolidated Mill and Smelter Are Almost Ready to Resume**

**Cananea**—Work of installing and remodeling equipment at the mine and reduction plants of the Cananea Consolidated Copper Co. at Cananea is rapidly nearing completion. The new roaster dust chamber and stack have been built. The installation of the new reverberatory boilers is about completed. The remodeling of the concentrator equipment has reached a stage where it will be ready for operation in two or three weeks. Considerable work remains to be done to finish the new screening plant and fine-ore bedding system. Development and repair work continues at the mines. No date has yet been set for the resumption of operations, but it should be possible to start by August 1 if desirable.

**CANADA**

**British Columbia**

**Highway Will Be Substituted for Railroad to Rossland—Iron-Ore Deposits Are Being Explored**

**Victoria**—Work has commenced by Dr. G. A. Young, of the Geological Survey of Canada, in the exploration of the iron-ore deposits of British Columbia. He is now examining the "Kitchen" deposits. These contain hematite running as high as 65 per cent iron and there are about 60 claims in the property. At some points the vein shows a width of 20 ft. and it has been traced for twelve miles.

**Rossland**—The I. X. L. mine has been examined by A. G. Langley, resident mining engineer. The property is under lease by Messrs. Shelledy and Hawkins and other local mining men from John S. Baker, of Tacoma, Wash. A vein of the gold ore has been uncovered; it has exceptional promise.

Work is proceeding on the "trans-Pacific" highway out of Rossland, about 300 men being employed. This will give needed transportation, the closing down of the railroad to this point some months ago having given the camp a setback. With a good road, together with the starting of new work by the Consolidated Mining & Smelting Co. in connection with the development of its mining properties, the district should again become prosperous.

**Nelson**—Victor Sontage reports a rich strike on the Mineral Hill claims, East Kootenay. Much work has been done on the property and recent prospecting revealed a rich shoot of galena ore which assays approximately \$200 a ton. The company proposes to drive a tunnel, hoping to receive enough in profit to pay for the construction of a plant to treat the low-grade ore.

**Stewart**—The B. C. Silver Corporation has started work in the Portland Canal District. The construction of a compressor building is proposed. The Big Missouri has been opened again; Harry Howson is in charge of the work.

**Alice Arm**—An order of foreclosure on the Dolly Varden mine property has been granted, counsel for George Wingfield, of Reno. The order includes the Dolly Varden and Wolf claims, the railroad, wharves, boats, rolling stock, and equipment covered by a mortgage of \$200,000 given in 1919 and renewed in 1921. Interest at the rate of 7 per cent has been accumulating. Although papers were served on the Taylor Engineering Co., on the Dolly Varden Mining Co., the Taylor Mining Co., C. M. Rolston, trustee for the bondholders, and H. C. Chiene, trustee for the creditors, none of the parties entered a defence or opposed the motion. It is said that a private agreement has been made between Mr. Wingfield and the Taylor Mining Co., whereby the Taylor company is to have the right to redeem the property under certain conditions.

**Ontario**

**Many Companies in Northern Ontario Are Prospecting With Diamond Drills—Fourth Reorganization For Vipond**

**Cobalt**—The Beaver has purchased a bailing skip to unwater the mine, but there has been no decision made as to proceeding with the work.

The Castle property in Gowganda has made a shipment of 25,000 oz., the first since resuming operations. Underground development has been satisfactory.

The Keeley mine in South Lorrain is producing at the rate of about 50,000 oz. per month.

During June the Nipissing produced silver of an estimated net value of \$193,324 and shipped bullion and customs ore of an estimated net value of \$216,495, silver being taken at 71½c. per oz. The low-grade mill treated 7,244 tons and the high-grade plant 160 tons. The refinery shipped 303,188 fine ounces. There were no new underground developments of importance during the month.

The Crown Reserve is hand-picking its old dump and obtaining from 2,000 to 3,000 oz. per month.

For the week ended July 7 the Mining Corporation was the only shipper from Cobalt, with one 25-ton car.

**Kirkland**—The Montreal Ontario will shortly undertake a campaign of diamond drilling to prospect at greater depth.

Diamond drilling has been started at the Vindicator.

**Porcupine**—The Coniagas has started diamond drills on the Newray, which it has under option. Deep holes will be drilled.

The Hayden is arranging to sink the main shaft to 1,000 ft.

The Rochester, which was drilled last winter by the Nipissing, has been optioned to the Canadian Gold Mines Corporation, in which United States and English capital is interested. A \$10,000 cash payment was made for the option. The company has a capital of \$6,000,000, and now controls 2,400 acres in the Porcupine district.

The Porcupine Crown has found a new vein on the 500-ft. level on the contact between the porphyry and the basalt. Fifty feet of drifting has been done.

The continuation of the Porcupine Peninsula vein has been cut at 600 ft. on the McLeod property, with a diamond drill. It shows a width of 12 to 15 ft.

A special meeting of Vipond shareholders has been called to approve the reorganization which calls for the sale of the company's assets to a new company, to be called the Vipond Consolidated Mines, Ltd., with a capital of \$2,000,000. Of the new capital 1,000,000 shares will be given in exchange for shares in the present company and shareholders will also be given the right to subscribe for 333,334 treasury

shares at 40c. The company proposes to sell to Arthur E. Moysey the shares which are not subscribed by the shareholders, and in consideration of this purchase Moysey gets a two-year option on the balance of the treasury stock.

The Union Mining Co. has taken an option on a group of claims in the Hurricanaw district, Quebec.

The foreclosure judgment of the Porcupine Crown against the North Crown Mines will come into effect August 12 unless in the meantime the Thompson-Krist can secure sufficient money to buy back its property or pays its share of the deficit.

**Sudbury**—Referring to the announcement officially made some weeks ago that smelting would be resumed by the International Nickel Co. at Copper Cliff on Sept. 1, President J. L. Agnew says there has since been no change in the situation. Two furnaces will be blown in requiring a supply of 200,000 tons of ore per month. As there is sufficient ore in reserve to maintain production at this rate for about six weeks or two months the mines will not be re-opened until a later date.

**Matachewan**—About seventy-five men are now employed in the development of electric power at Indian Chute on the Montreal River. The coffer dam and powerhouse are under construction, the generator and the turbines are partly installed. The 16-mile transmission line to the central part of the Matachewan gold area has been surveyed. It is estimated that about 5,000 hp. can be developed, and several units are expected to be in operation before the end of the year.

#### COLORADO

**Cresson Company Distributed Dividend of \$220,000 on July 10**

**Telluride**—The dismantling of the Liberty Bell mill under the direction of B. C. Essig, is in progress.

**Cripple Creek**—Development on the Axtell property has opened a quartz vein, in oxidized granite, 6 ft. below the surface, assaying 20 oz. gold per ton. A shaft is being sunk.

A strike has been made on the 2,600 level of the Portland mine. Pay ore has been opened, selected streaks assaying as high as \$100 per ton, with the bulk of the material averaging about \$7 a ton. A new oreshoot has been opened on the 700 level.

The Cresson Gold Mining Co. paid a quarterly dividend of 10 per cent on July 10, total \$220,000.

The Modoc Consolidated Mines Co. has opened a 4-ft. vein of \$27 ore on the 1,500-ft. level. Selected samples assay as high as \$1,200 per ton.

**Breckenridge**—A new orebody has been opened in the Fredonia mine, assays running as high as 400 oz. silver a ton.

Hydraulic operations have been resumed at the Bemrose-Bostwick placer in Hoosier gulch.

#### ARIZONA

**Copper Queen Options Higgins Group at Bisbee—New Shippers to Humboldt Smelter**

BY J. H. McCLINTOCK

**Bisbee**—An eighteen-month option has been taken by the Copper Queen branch of the Phelps Dodge Corporation on the patented Higgins group of 160 acres, adjoining the Copper Queen Southwest property, with which it is connected by underground work, as well as with the Wolverine. The transaction is with the Thomas Higgins Estate of Los Angeles. The property was located by Higgins about thirty years ago. He tunneled 1,500 ft. and failed to find ore, as did lessees who sank to 400 ft. Later the Letson and Bergquist leases developed rich lenses of ore, that were mined at large profit during the War. Latterly the mine has been worked by the estate, locally represented by J. J. Flanigan. P. G. Beckett, general manager of the Phelps Dodge Corporation, states that no immediate development work is contemplated. The transaction locally is important as presaging exploration of the upper end of the district, above the original workings of the Copper Queen.

Headquarters of the Eruption Mining Co. of Chihuahua have been moved from El Paso to Bisbee, Arizona. L. D. Ricketts was named president at the annual meeting, succeeding E. F. Knotts. J. F. Bankerd is secretary-treasurer. E. F. Knotts, former president, D. B. Smith, former vice president and C. A. Kinne, former secretary-treasurer, were retained on the board, on which was added R. I. Mohler. D. B. Smith remains as superintendent at the mines. The new organization is the same as that of the Ahumada Lead Co., which owns 51 per cent of the Eruption stock.

**Walker**—The Sheldon Mining Co., in order to get its ores to the Humboldt smelter, has started the rehabilitation of the old 8,500 ft. Poland tunnel, that connects the now deserted and dismantled camp of Poland with Walker. Timber has been ordered to the amount of 120,000 ft., as many caves have occurred in the tunnel, which has not been used for years. Tracks will have to be replaced entirely. Ore bins are to be built at the Poland end, to which the Santa Fe, it is said, will reconstruct its eight-mile Poland branch. J. R. Ackerman, general manager of the Sheldon, states that he has a large supply of ore to ship to the smelter, which welcomes it for its iron contents.

**Prescott**—The Humboldt smelter of the Southwest Metals Co. is employing 300 men and is taking ore from a score of small mines, closed for several years for lack of a market.

In the Senator district the Cash mine has been taken over by the Betty O'Neal Mines Co., of Battle Mountain, Nev. N. H. Getchell is manager.

**Ajo**—The New Cornelia company has added about 200 men to the force here. All equipment has been kept in con-

dition for operation; output will be increased to 3,500,000 lb. per month.

**Globe**—Old Dominion has started on improvements to its mill that will increase its capacity from the present 700 to 1,000 tons a day. General Manager W. G. McBride stated that the work will be done by his present mill force at a cost of about \$50,000 and will consume three months, though without interference with the ordinary mill operation. Tyler Humer screens will replace the present shaking screens and more concentrating tables and Callow cells in the flotation section will be added.

**Jerome**—United Verde is now operating a blast furnace and two reverberatories, one of the latter having been blown in lately. The July production is expected to exceed 6,000,000 lb. Work is being pushed on the various auxiliary plants now under construction at Clarkdale.

**Constellation**—Patents have just been issued for the group of claims owned by the Arizona Copper Belt Mining Co. These claims are divided into two groups, the Wren and the Texas, a total of about 300 acres. The latter group adjoins the Monte Cristo silver mines property. A new road having a maximum grade of 10 per cent has just been completed. The property is situated on the route between Wickenburg and Constellation about 15 miles from the Santa Fe railroad.

#### TEXAS

**Four Furnaces Are In Operation at El Paso Smelter**

**El Paso**—The El Paso Smelting Works, under the management of H. A. Eye, is operating one reverberatory copper furnace and three lead blast furnaces. The tonnage for this copper furnace practically all comes from the Chino Copper Co.'s concentrator, very few of the small mines producing copper ore in the Southwest having resumed operations.

The ore for the three lead blast furnaces originates at various points in New Mexico and Arizona, including Bisbee, Tucson, Pantano, Winkelman, Patagonia, Nogales and Globe, in Arizona; and Magdalena, Lake Valley, Hillsboro, Silver City, Gage, Lordsburg and other points, in New Mexico. Scattering shipments also come in from both states from miscellaneous points. There is also an appreciable tonnage from Sonora in Old Mexico, the principal shipper being the Lucky Tiger Combination Gold Mining Co., but a number of producers of higher grade ores are at present shipping through the ports of Nogales, Douglas, and Naco.

**Llano**—Mining of molybdenite ore will soon be started by the Honey Creek Minerals Co. which is installing machinery at its mine near here. It will build a refining plant and laboratory in Llano at a cost of \$150,000, it is stated. Molybdenite ore has been mined on a small scale in the Llano district for several years.

## UTAH

**Park City District Doubles Output for First Half of 1922—Dividends Total \$564,830**

Park City—Shipments for the week ended July 8 amounted to 2,823 tons. Shippers were: Ontario, 1,132 tons; Park-Utah, 718 tons; Silver King Coalition, 592; Judge, Daly, and Daly West, 452; New Quincy, 30. Shipments from this camp for the first six months of 1922 amounted to 70,858 tons of ore and concentrates as compared with 36,347 and 48,212 tons for the same periods of 1921 and 1920 respectively. The output is only about 8,000 tons less than the 1919 production of 79,290 tons. Comparative figures of shipments in tons during the first six months of 1922 and 1921 are as follows:

Company	1st half 1922	1st half 1921
Judge, Daly West, and Daly	25,229	18,354
Ontario	20,428	7,750
Silver King Coalition	19,312	9,583
Park-Utah	5,819	not report'd

Production by the Silver King Coalition has been increased since the starting up of the company's new mill.

In the first half of 1921, the Silver King Coalition paid one dividend of \$182,415. In the same period of 1922, it paid two dividends of like amount, so that the total by this company was \$364,830; the Park-Utah also paid two dividends, amounting together to \$200,000, so that the dividends for the first six months of 1922 amounted to \$564,830, as compared to \$182,415 in the same period of 1921.

Eureka—Tintic shipments for the week ended July 8 amounted to 79 cars, the low output being the result of the Fourth of July recess and of holding back ores, awaiting lowered freight rates. Shippers were: Chief Consolidated, 20 cars; Tintic Standard, 15; Iron Blossom, 9; Colorado, 7; Eagle and Blue Bell, 4; Swansea, 3; Star Con., 3; Grand Central, 3; Mammoth, 3; Victoria, 3; Gemini, 3; Alaska, 2; Dragon, 1; Tintic Drain Tunnel, 1.

## SOUTH DAKOTA

**Tractors Will Be Used to Move Mill Machinery in the Black Hills.**

Lead—The Homestake Mining Co. has started the moving of the old Munford mill from lower Bare Butte Creek to Buckhorn, Wyo., a distance of 20 miles. Two tractors, one hauling four large wagons and the other two, will load the machinery and haul it over the mountain roads practically directly across the Black Hills.

Deadwood—At the Golden Feather mine a large new Marcy mill is now being installed and it is expected this will be ready so that production at the mine can commence by Aug. 1.

It is estimated that 70,000 tons of rich ore now is ready for milling.

## CALIFORNIA

**Carson Hill Company Produced Half Million in Six Months**

*Special Correspondence*

San Francisco—The Carson Hill Gold Mining Co. in Calaveras County produced approximately \$500,000 during the first six months of 1922. This is at the same rate of production as maintained during 1921, the total for that year being approximately \$1,000,000.

The Newtown section of the Grass Valley mining district is attracting attention. The latest entrant into the field is the Newtown Mining Co., which has acquired the Mulcahy Ranch property. Development is planned.

Placer mining on the St. Clair Creek, two miles below Cecilville, Siskiyou County, which has been dormant for several years, shows signs of revival. Several new camps have been established in the vicinity.

### Freight Rates Reduced on Nevada and California Ores

**Low-grade Ores to Utah Smelters Benefit Most**

Announcement has been made of freight-rate reductions on metalliferous ores moving to the Salt Lake valley smelters from California and Nevada points which undoubtedly will result in stimulated development and production at the mines as well as more work for the smelters.

The rates are effective July 28 on open carloads of a minimum weight of 80,000 lb. The rates are reduced on a sliding scale, the largest cuts being made on low-grade ores valued at \$20 a ton and less.

Following are the points of origin, the present rates and the new rates: Chilcoot, Cal., \$20 ore, from \$6.75 a ton to \$3.20; \$30 ore, from \$7.10 a ton to \$3.20 a ton; \$40 ore, from \$7.35 to \$4.60, and \$50 ore, from \$7.60 to \$5.30.

From Constantia, Doyle and Hackstaff, Cal., and Gerlach, Nev., the reductions are: For \$20 ore, from \$6.75 to \$3.20; on \$30 ore, from \$7.10 to \$3.90; on \$40 ore, from \$7.35 to \$4.60; on \$50 ore, from \$7.60 to \$5.30. Rates from Sulphur, Nev., are cut as follows: \$20 ore, from \$6.62½ to \$3.20; \$30 ore, from \$7.10 to \$3.90; \$40 ore, from \$7.35 to \$4.60; \$50 ore, from \$7.60 to \$5.30.

The rates from Winnemucca and Golconda are reduced as follows: \$20 ore, from \$6.25 to \$3.20; \$30 ore, from \$6.87 1-2 to \$3.90; \$40 ore, from \$7.35 to \$4.60; \$50 ore, from \$7.60 to \$5.30.

Corresponding reductions will be made on ore moving to Salt Lake from Rennox, Beowawe, Palisade, Carlin, Wells, Tobar, Elko and Death, Nev.

## OREGON

**Rich Ore in Oregon Mine**

Baker—M. G. Henry has opened two new veins on the 300 ft. level of the Snow Creek mine. A sample assaying \$200 per ton, mostly in gold, was taken from a 10-ft. vein. Other samples ranged from \$112 to \$132 per ton.

## NEVADA

**Tonopah Extension Reaches 2,000 ft. With Victor Shaft—Prince Consolidated Commences Shipping Tailings from Bullionville**

Tonopah—Revised figures for June production for the Tonopah district are \$660,000, which is above normal. Tonopah Belmont bullion shipments are the largest but include considerable custom ore and it is likely that at the present time West End mine production is the largest in the district.

The Tonopah Extension company's Victor shaft has reached a depth of 2,000 ft., and will be continued to the 2,200 level. The result from development work on the 1880 level are satisfactory, and some of the highest grade ore in the mine is coming from this level. At the McCane shaft work is being concentrated on the pump station and reservoir. In the West End a raise-connection from the 960 to the 800 level has been made and an intermediate level started which will develop the vein below the 800. The Belmont company, in addition to its regular work, is sinking the Buckeye shaft from the 1,200 to the 1,400 level in the expectation of cutting the Rescue vein. The Midway reports improvement in the vein being developed on the 1,200 level, and the ore, which averages between \$15 and \$20 per ton, is being shipped to the Belmont mill. All mines in the district were closed on July 4 and 5, the mills on the Fourth only.

Divide—In the Tonopah Divide mine the crosscut on the 1,400 level is out approximately 200 ft. from the shaft with about 30 ft. to go to reach the projected position of the vein. The winze from the 500 level passed out of high-grade ore and at present, at a depth of 60 ft., the ore in the face averages about \$16 per ton. The usual 50-ton daily shipments to the Belmont mill are maintained.

Goldfield—The Silver Pick lease on Red Top ground shipped 400 tons of ore during June, the average value of which was about \$40 per ton. This is only about one half of the May production but the smaller tonnage shipped was due partly to the fact that the waste now has to be hoisted instead of being stored in old stopes, and partly because there was 200 tons of ore in the surface bins at the end of April.

Pioche—Shipments have commenced from the Bullionville tailings owned by the Prince Consolidated Mining Co. Five cars of approximately 50-ton capacity were billed last week, and an average of 100 tons daily will be loaded from now on. The total quantity to be shipped is estimated to be 75,000 tons, assaying \$3 in gold, 15 oz. silver and 18 per cent lead. The material as loaded carries between 15 and 20 per cent moisture. The piles at Dry Valley, about ten miles above on the same watershed, will also be shipped to the International smelter, at Tooele; the tonnage available in these piles is 25,000 tons. The loading is done on contract by scrapers, dump wagons, and

hand shoveling. During June 1,500 tons of ore was shipped over the Pioche Pacific Railroad from the Bristol and Jackrabbit district. The Highland district also sent out several cars of lead-silver ore.

The machinery at the Prince mine will be carefully overhauled preparatory to resumption of operations at lower depth. At the present time five men are working on ore in the upper levels, about two cars being shipped monthly.

Ely—Placer mining in the Osceola district, east of here, has been active this season. A number of nuggets have been found running in value from \$20 to \$70. In Hoggum gulch several valuable pockets were mined, the dirt going 50c. to the shovel. When the water is not available the ground in the Osceola district is dry washed with fair success.

#### WISCONSIN

Cuba City—The National Zinc Separating Co. has been operating its magnetic-separating plant and a sulphuric-acid plant without interruption. Another unit of the acid plant will be completed July 1 which when operating will enable it to increase its output of sulphuric acid 20 per cent.

About 500 men are being employed in mining operations in the Platteville district. Although this is a small percentage of number employed in the years 1917 to 1920, it is not expected that the district will ever develop operations on such a scale and the present monthly production of 1,400 tons of 60 per cent zinc concentrates is about 50 per cent of probable future production.

#### Copper Companies in Southwest Win Oil-Rate Dispute Before I. C. C.

Copper mining companies in Arizona, New Mexico and Cananea, Mexico, have won their case before the Interstate Commerce Commission in the matter of assessing freight charges on crude and fuel oil from Kansas, Oklahoma, and Texas fields. Some time ago the railroads proposed to substitute actual weight per gallon in lieu of the present estimated weight of 7.4 lb. per gal. for the ascertainment of freight charges on crude oil and fuel oil in tank-car lots from Kansas, Oklahoma, and Texas fields to destinations in Arizona and New Mexico and to Cananea, Mexico. The copper producers in the territory affected protested the change, which has been found by the commission, in a recent decision, not to be justified.

In the complaint of the Tulare Mining Co., an examiner of the commission has recommended that the rate on magnesite from Magnesite to Porterville, Cal., for calcining and subsequent shipment is not unreasonable.

Deciding the complaint of the Arlington Silver Mining Co., an examiner recommends that the rules of the railroad governing released rates on ore from Okanogan, Washington, to Bradley, Idaho, are unreasonable.

#### MICHIGAN

##### The Copper Country

#### Calumet & Hecla Is Surveying New Route For Ore-Hauling Railroad—Contract Pay at Ahmeek and Isle Royale Helps Miners

Houghton—Champion mine production is 1,700 tons daily, labor losses having reduced tonnage to 70 per cent of the February and March figures. Fewer men are now leaving Champion and it is believed that the labor movement out of the district has been checked. Champion's underground forces are 70 per cent of normal, while the other two mines of the Copper Range group, Trimountain and Baltic, have 80 per cent.

Calumet & Hecla interests have a surveying party in the field looking into the feasibility of a railroad through the Trap Rock valley from the Ahmeek mine to the mill. The construction of such a road, a project under consideration for several years, would shorten the haul by two to three miles, eliminate at least one long grade and reduce haulage charges materially. The proposed line would serve other mines as well as Ahmeek, including Centennial, Allouez, North Kearsarge and Calumet & Hecla subsidiary shafts to the north of Calumet.

Calumet & Hecla has been able to increase its underground forces according to its needs, in spite of the labor exodus. Production from Nos. 6 and 7 shafts, Hecla, is already back to the 1921 spring basis. No. 3, Hecla, and No. 8, South Hecla, also are producing fully as much as before the shutdown in 1921. The Calumet shafts, Nos. 2, 4 and 5, likewise are producing in larger amounts. Repairs in the Red Jacket shaft, started a year ago, are still under way.

Introduction of the contract system at the Ahmeek and Isle Royale has enabled miners to increase their earnings, thereby checking the flow of men to other industrial centers.

Even though Mohawk has suffered in loss of man power, refined copper production will be held around the 1,000,000-lb. mark per month. Suspension of operations in No. 1 shaft will make possible a larger tonnage from the three operating shafts to the south, where the ground is richer than in No. 1. Men from No. 1 have been transferred to other shafts.

Arcadian Consolidated is now sinking from the 1,100 level in the New Baltic shaft, which will be lowered an additional 150 ft. to test values in the lode both to the north and south at that depth.

#### Menominee Range

#### Carpenter Mine at Crystal Falls Resumes

Iron Mountain—The Clifford pit property of the Republic Iron & Steel Co. will not be worked this year. This is the old Traders property and was worked during the period of navigation for some years past.

Crystal Falls—The Carpenter mine of the M. A. Hanna Co. is again in operation. All ore in stock and all that can be hoisted during the summer will be shipped. The Monongahela will ship ore in stock but will not do any mining this year.

#### Marquette Range

#### Oliver Iron Company Installs New Pumps

Negaunee—C. K. Quinn & Co. is again operating the Rolling Mill mine. Regular shipments are being maintained to the docks from pockets and stock. The Cambria mine of the Republic Iron & Steel Co. will probably not be opened until merger plans now under way are ratified or rejected. A cave-in occurred recently close to the shaft of the Breitung Hematite mine of the Laughlin Ore Co. It was necessary to make repairs to keep the shaft in line. The mine is not being worked at present. Shipments are being made from all of the Negaunee mines that are operating.

Ishpeming—The water has all been drained from North Lake, which lies between the North Lake and Barnes-Hecker mines of the Cleveland-Cliffs Iron Co. It was necessary to do this as it was feared the water would find its way into the workings. The Oliver Iron Mining Co. has installed two large Layne-Bowler pumps on surface at the Angeline mine and constructed concrete bulkheads underground to keep water from reaching the workings of the Section 16 mine. The Angeline, now abandoned, adjoins and receives considerable water from the old Lake Angeline basin.

#### Gogebic Range

#### New Industrial Community Will be Established by Castile Mining Co.

Ironwood—Iron ore shipments from the Gogebic range in June were more than 900,000 tons, and this month they have been at a higher rate. The total should be large.

Pickands, Mather & Co. have issued orders for the Sunday Lake mine at Wakefield to resume operations as soon as possible. The mine has been shut down for some time, but it has been kept in condition to resume production on short notice, and the shaft has been relined with steel sets and reinforced concrete lath.

The Castile Mining Co., of Ramsay, subsidiary of Oglebay, Norton & Co. is asking for bids for the construction of seventy-four houses of frame construction, to be erected between the Eureka and Asteroid mines at Ramsay. It is understood that the company is planning to sink a new shaft in this territory. Oglebay, Norton & Co. has had a landscape architect go over all the properties of its subsidiaries and make plans for their future development in an artistic manner as far as possible. A model industrial community makes for efficiency in operation.

# THE MARKET REPORT

## Daily Prices of Metals

July	Copper, N. Y., net refinery* Electrolytic	Tin		Lead		Zinc
		99 Per Cent	Straits	N. Y.	St. L.	St. L.
13	13.625@13.75	30.375	31.125	5.75	5.45@5.50	5.50@5.60
14	13.625@13.75	30.375	31.125	5.75	5.45@5.50	5.55@5.65
15	13.625	30.375	31.125	5.65@5.75	5.45@5.50	5.60@5.70
17	13.625	30.50	31.25	5.65@5.75	5.40@5.50	5.65@5.75
18	13.625	30.625	31.375	5.65@5.75	5.40@5.45	5.70@5.75
19	13.625	30.75	31.625	5.65@5.75	5.375@5.40	5.75@5.80

\*These prices correspond to the following quotations for copper delivered: July 13th and 14th, 13.875@14c.; 15th, 17th, 18th and 19th, 13.875c.  
The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

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

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

thought it would with manufacturing, a remark that also holds for most of the copper smelters and refiners. Copper business for June was highly satisfactory but July has shown a tendency to fall off. Refined copper from the spring resumption of the mines is coming on the market in increasing quantities. Inquiries are mainly for copper for forward delivery during August, September and October. Prompt copper of which there is a scarcity is not in much demand and only small sales are reported for that class of metal. Export business has been light, Germany is not ready to buy copper on the scale expected because of internal troubles, an industrial strike has affected Italian purchases, and England is more or less inactive in the copper market. Prices realized have netted about 13.90c. refinery.

### Lead

The official contract price of the American Smelting & Refining Co. continues at 5.75c. per lb. New York.

Lead has been sold more freely during the past week than for several weeks with most of the business transacted in the middle western market. Sales were heaviest from last Friday to Monday with consumption well diversified among paint, storage battery, cable and other consumers. Corroding lead was in particular demand in the middle west and over 1,000 tons was sold on a basis of 5.55c. St. Louis. Although earlier in the week producers were able to obtain between 5.45 and 5.50c. for common lead, several hundred tons were offered Monday at 5.40c. and one sale was made of a large tonnage at 5.375c. The New York market has been quieter than it was last week with sales made at 5.75c. seemingly without difficulty, and also at 5.65c., a level at which lead is available today. The general New York price being asked is 5.75c. It is noticeable that the London lead market advanced during the week, probably reflecting the deflection of Mexican lead from the European to the American market.

## London

July	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3M	Spot	3M	Spot	3M
	Spot	3M							
13	63 $\frac{1}{4}$	63 $\frac{1}{2}$	70 $\frac{1}{2}$	153 $\frac{1}{2}$	153 $\frac{1}{2}$	24 $\frac{1}{2}$	23 $\frac{3}{4}$	28 $\frac{1}{2}$	28 $\frac{3}{4}$
14	63	63 $\frac{3}{4}$	70 $\frac{1}{2}$	153 $\frac{1}{2}$	153 $\frac{1}{2}$	24 $\frac{1}{2}$	23 $\frac{3}{4}$	28 $\frac{1}{2}$	28 $\frac{3}{4}$
17	63 $\frac{1}{2}$	63 $\frac{3}{4}$	70 $\frac{1}{2}$	153 $\frac{1}{2}$	154 $\frac{1}{2}$	24 $\frac{1}{2}$	23 $\frac{3}{4}$	29	29
18	63 $\frac{1}{2}$	63 $\frac{3}{4}$	70 $\frac{1}{2}$	155 $\frac{1}{2}$	155 $\frac{1}{2}$	24 $\frac{1}{2}$	23 $\frac{3}{4}$	29 $\frac{1}{2}$	29 $\frac{1}{2}$
19	63	63 $\frac{3}{4}$	70 $\frac{1}{2}$	156	156 $\frac{1}{2}$	25 $\frac{1}{2}$	23 $\frac{3}{4}$	29 $\frac{1}{2}$	29 $\frac{1}{2}$

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

## Silver and Sterling Exchange

July	Sterling Exchange "Checks"	Silver			July	Sterling Exchange "Checks"	Silver		
		New York Domestic Origin	New York Foreign Origin	London			New York Domestic Origin	New York Foreign Origin	London
13	443 $\frac{3}{8}$	99 $\frac{3}{8}$	70	35 $\frac{3}{8}$	17	444	99 $\frac{3}{8}$	70	35 $\frac{3}{8}$
14	443 $\frac{3}{8}$	99 $\frac{3}{8}$	70 $\frac{3}{8}$	35 $\frac{3}{8}$	18	444 $\frac{1}{2}$	99 $\frac{3}{8}$	70	35 $\frac{3}{8}$
15	443 $\frac{3}{8}$	99 $\frac{3}{8}$	70 $\frac{3}{8}$	35 $\frac{3}{8}$	19	445 $\frac{1}{8}$	99 $\frac{3}{8}$	69 $\frac{3}{8}$	35 $\frac{3}{8}$

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

## Metal Markets

### New York, July 19, 1922

Sales of the major non-ferrous metals during the past week have been fair. Copper has had a quiet market but lead and especially zinc have been more active than for several weeks. Tin has also recovered from its inactive state and sales have been brisk. The strike situation still hangs over the prosperity of the metal trades but with a greater interest being shown by the Government in a prompt settlement of the labor controversies it appears that this difficulty is on a way to a solution.

## Copper

Sales of copper for both domestic and export delivery have been light and the market has become easier. Earlier in the week many producers were holding for 14c. delivered and a few sales were made at that level. At the same time, however, copper was pressed for sale at 13 $\frac{3}{4}$ c., the price at which most of the business was concluded of which we have record. Consumers report no difficulty in procuring all the metal they wished at 13 $\frac{3}{4}$ c. and fairly large tonnages are available today on that basis. Many of them state that the coal strike has not interfered as seriously as they

## Zinc

The market has shown a surprising amount of strength and prices have risen faster than for many a day. An important factor in the situation is the favorable statistical position indicated by the July statistics compiled by the American Zinc Institute which show a decrease in stocks amounting to more than 10,000 tons during June. Production for June was 28,547 tons, stocks on hand at the beginning of the month, 40,409 tons and at the end of the month, 29,576 tons. The stocks on hand are barely sufficient for a month's consumption of zinc. That

production has increased is indicated by the rise in the number of retorts operating from 48,765 in May to 52,677 in June. High-grade zinc business has been very satisfactory with many brass mills in the market. The price of high-grade metal has risen from 6¼c. to 6½c. in steps. First to 6¾c. and on July 17, to 6½c. which includes a 30c. per 100 lb. freight allowance.

#### Tin

Sales of tin have improved and been reflected in the price. There is no particular reason for the interest shown by consumers and it is noticeable that tinsplate manufacturers are still out of the market owing to strike conditions. The price of forward tin is about an eighth of a cent above the spot market.

Arrivals of tin in long tons: July 13th, Liverpool, 125; Straits, 20; 14th, Straits, 400; China, 50; 17th, Straits, 90; China, 30; Java, 50; London, 65; 18th, Liverpool, 25.

#### Gold

Gold in London: July 13th, 92s. 9d; 14th, —; 17th, 92s. 8d.; 18th, 92s. 9d.; 19th, 92s. 5d.

#### Foreign Exchange

The rates in the foreign exchange market moved upward irregularly with French and Belgian francs making the best gains. On Tuesday, July 18th, francs were 8.56c.; lire, 4.79c.; marks, 0.22375c.; Canadian exchange ½ per cent discount.

#### Silver

The market has been a very quiet one the last week with a downward tendency caused by the lack of interest on the part of China buyers.

New York prices have ruled slightly lower than the London parity, and the San Francisco market has been extremely narrow at levels only slightly higher than New York.

On July 19 the demand for Frisco improved somewhat at the lower rate.

The market closed uncertain with the future dependent upon China.

Mexican Dollars—July 13th, 53½; 14th, 53½; 15th, 53½; 17th, 53½; 18th, 53½; 19th, 53½c.

#### Other Metals

Quotations cover large wholesale lots unless otherwise specified.

Aluminum—20.10c. per lb. for 99 per cent grade; 19.10c. for 98@99 per cent; 18c. for 94@98 per cent. Outside market nominal at 17.75@18.25c. for 98@99 per cent virgin grades.

Antimony—Chinese and Japanese brands, firm at 5c. W.C.C., 5.75c. Cookson's "C" grade, 7@7.50c.

Bismuth—\$2@2.10 per lb.

Cadmium—\$1.20@1.25 per lb.

Iridium—\$170@175 per oz.

Nickel—Standard market, ingot and shot, 36c.; electrolytic, 39c. Outside market, 31@33c. per lb.

Palladium—\$55@60 per oz.

Platinum—\$90 per oz. Quiet.

Quicksilver—\$55 per 75-lb. flask. San Francisco wires \$55. Quiet.

Selenium—\$1.75@1.85 per lb.

The prices of Cobalt, Magnesium, Molybdenum, Monel Metal, Osmium, Rhodium, Thallium and Tungsten are unchanged from prices given July 8.

#### Metallic Ores

Manganese Ore—29c. per long ton unit, seaport. Small quantities only for prompt shipment.

Iron Ore, Chrome, Magnetite, Molybdenum, Tantalum, Titanium, Tungsten, Uranium, Vanadium, and Zircon ore are unchanged from the quotations published July 8.

#### Zinc and Lead Ore Markets

Joplin, Mo., July 15—Zinc blende, per ton, high \$36.20; basis 60 per cent zinc, premium, \$35@36; Prime Western, \$34@35; fines and slimes, \$33@31; average settling price, all grades of blende, \$33.55. Calamine, basis 40 per cent zinc, \$17.

Lead, high, \$82.95; basis 80 per cent lead, \$75@77.50; average settling price, all grades of lead, \$81.18 per ton.

The tonnage purchased this week was 3,700 in excess of the production, but the shipment was short of the production about 700 tons. Output did not return to normal this week on account of damage from rain and wind.

Suit brought by the mining companies to recover money collected as tax on ore in the bins last winter for school purposes, was tried on July 8 in district court at Miami, and Judge S. C. Fullerton ordered its return. Appeal to the Appellate Court will hold settlement in abeyance.

Platteville, Wis., July 15—Blende, basis 60 per cent zinc, \$36 per ton. Lead ore, basis 80 per cent lead, \$77 dollars per ton. Shipments for the week: Blende, 336 tons; lead ore, 80 tons. Shipments for the year: Blende 8,563 tons; lead ore, 1,094 tons. Shipped during the week to separating plants, 253 tons blende.

#### Non-Metallic Minerals

Barytes—Washed crude, 92 per cent BaSo, guaranteed, \$8 to \$9 per long ton f.o.b. Georgia points; off color ground No. 1 grade \$20, No. 2 grade, \$15.

Feldspar—No. 1 pottery grade active at \$6.50 per ton, North Carolina. Pottery grade in Maine, \$18; No. 2 ground to 90 to 100 mesh, \$10; No. 1 ground to 140 mesh, \$16, f.o.b. mills, N. C.

Talc—200 to 300 mesh, including containers, \$13.50@14.75 f.o.b. New York state mills. In California, 200 mesh, \$16@18 per short ton; 300 mesh, \$25@30, bags extra at cost.

Asbestos, Bauxite, Borax, Chalk, China Clay, Emery, Fluorspar, Fuller's Earth, Graphite, Gypsum, Limestone, Magnesite, Mica, Monazite, Phosphate, Pumice, Pyrites, Silica, and Sulphur are unchanged from the prices published July 8.

#### Mineral Products

Arsenious Oxide (white arsenic)—7.50c. per lb.

Potassium Sulphate and Sodium Sulphate are unchanged from quotations of July 8.

Copper Sulphate—Large crystals, 6.50c. per lb.

Sodium Nitrate—\$2.25@2.65 per 100 lb., ex vessel Atlantic ports.

#### Ferro-Alloys

Ferrocium, Ferrochrome, Ferromanganese, Ferromolybdenum, Ferrosilicon, Ferrotitanium, Ferrotungsten, Ferro-uranium, and Ferrovandium are unchanged from the prices published July 8.

#### Metal Products

Copper Sheets—New York base, 21c. per lb.; wire, 15.625@15.875c. net.

Nickel Silver—27.5c. per lb., for 18 per cent nickel Grade "A" sheets.

Yellow Metal—Dimension sheets, 18.25c.; rods, 15.25c. per lb.

Lead Sheets and Zinc Sheets are unchanged from the quotations published in the July 8 issue.

#### Refractories

Magnesite Brick—\$56 per net ton.

Magnesite Cement — \$35@40 per ton.

Silica Brick—\$33@41 per 1,000, f.o.b. shipping points.

Bauxite Brick, Chrome Brick, Chrome Cement, Firebrick, and Zirkite are unchanged from the prices appearing in the issue of July 8.

#### The Iron Trade

##### Pittsburgh, July 18, 1922.

The finished steel markets in general are decidedly dull, as they usually are in midsummer. Tubular goods are fairly active. The dullness in the market generally is only in respect to the tonnage turnover.

The seriousness of the fuel situation can hardly be exaggerated. The trouble is not that the coal strike, after having lasted three months, has continued a fortnight longer. The new development is the congestion on railroads serving non-union coal fields, particularly the N. & W., C. & O., and L. & N. Congestion began to develop a fortnight before the railroad shopmen's strike of July 1, since when it has greatly increased and little West Virginia and Kentucky coal has been crossing the Ohio river. Many by-product coking plants are affected, and already there has been a little decrease in pig iron and steel production. Steel prices are unchanged.

Pig Iron—On the surface, the market has been weaker, although fundamental conditions, in connection with decreasing coke supplies, point to increased scarcity. Basic has become quotable at \$24, valley, against the \$25 price which ruled strong in May and June. Bessemer is still at \$25. Foundry remains at \$24 and has not been purchased at all freely. Prices are at valley furnaces, with \$1.76 freight to Pittsburgh.

Connellsville Coke—Offerings are lighter. Foundry has sold up to \$11.



# The Outlook for American Smelting & Refining Co.

BY HARRY J. WOLF

WITH steadily improving conditions in the metal industry, gradual hardening of metal prices as their statistical position becomes more favorable, realization of accumulating large potential demand for the metals in the reconstruction and expansion programs in view during the next few years, and increasing activity in mining as demonstrated by increasing shipments of ores from mining camps throughout the country, it is natural to pay more attention to the present speculative possibilities and returning investment qualities of stocks of leading smelting companies.

Whenever the general trend of the security market is upward during a period of industrial recovery, when the fundamental conditions of many leading mining companies are improving, as reflected in earning ability and increasing popularity of the companies' shares in the stock market, and when the technical market position of the shares of a leading corporation indicates that these shares are being absorbed or re-accumulated by speculators, following a severe market reaction, we have a combination of circumstances that is considered by the experienced investor or trader as forecasting an advance in market prices at more than the average rate of advance of the market as a whole.

### COMPANY DEPENDENT ON PROSPERITY OF ITS CUSTOMERS

Under such conditions the initiated investors—who make their commitments wisely and methodically, and ignore the propaganda in the form of news manufactured for general public consumption—review their always-up-to-date fundamental and statistical studies of their favorite investment and speculative issues.

If conditions in the metal industry are gradually approaching normal, it is naturally of interest to review the earnings of the leading smelting company, and decide whether past records of earnings are likely to be duplicated in the near future. The realization that every ton of ore treated by the smelting company must pay its smelting cost plus whatever smelting profit the traffic will bear should be significant, and suggest that the American Smelting & Refining Co. must be increasing its net earnings at a rate that bears some relationship to the increase in activity of the thousands of producers that must pay for the services of this organization.

Furthermore, the smelting company itself is a heavy producer of metallic ores of all kinds, and it treats these ores in its own plants under conditions which enable it to adjust its mining and smelting problems to the greatest advantage.

Its earning ability, dividend policy and financial stability, under normal, abnormal and subnormal conditions are set forth in the following table:

### INCOME AND PROFIT DISTRIBUTION

Year	Gross Income	Net Income	Dividends	Surplus
1912	\$16,759,500	\$11,754,245	\$8,020,000	\$16,759,403
1913	13,429,933	9,756,540	8,020,000	18,495,943
1914	12,825,530	9,031,565	8,017,450	19,510,058
1915	18,245,731	8,053,303	8,002,924	19,560,438
1916	28,117,831	13,015,689	9,133,834	23,442,295
1917	31,602,616	12,495,626	8,982,526	26,955,394
1918	18,311,568	7,707,498	7,602,664	27,060,229
1919	14,695,743	5,595,584	6,681,242	25,974,571
1920	15,747,715	6,674,778	6,662,056	25,987,293
1921	9,481,472	1,591,909	4,168,044	20,322,087

This record alone should inspire confidence in the company's ability to duplicate its past performances during another wave of prosperity. Such confidence is further established as a comprehensive examination is made of the company's past history and growth.

It has been in existence for more than twenty years, during which time its developments and operations have been so extended that it now occupies the leading position in its particular industrial field. It has paid its stockholders cash dividends amounting to over \$118,000,000, on an initial cash investment of about \$47,000,000. During

the past twenty years it has not only returned to its stockholders the entire cash investment with 6 per cent interest, but over \$23,000,000 in excess of the entire cash investment together with 6 per cent interest thereon.

Concurrent with the above performance it has built up a great plant and organization with enormous potential earning capacity in normal times. The following tabular résumé of its activities will assist in imparting a conception of its strategic position in the mining and metallurgical industry, and its possibilities.

### SMELTERS AND REFINERIES

Plant	Locality	Product
Globe	Denver, Col.	Arsenic and cadmium
Pueblo	Pueblo, Col.	Lead
Arkansas Valley	Leadville, Col.	Lead
Durango	Durango, Col.	Lead and copper
Blende	Pueblo, Col.	Zinc
Murray	Murray, Utah	Lead
Garfield	Garfield, Utah	Copper
El Paso	El Paso, Texas	Copper and lead
Hayden	Hayden, Ariz.	Copper
Perth Amboy	Maurer, N. J.	Copper, lead and tin
Baltimore	Baltimore, Md.	Copper
Federal	Federal, Ill.	Lead
Sand Springs	Sand Springs, Okla.	Zinc
Henryetta	Henryetta, Okla.	Zinc
Kusa	Kusa, Okla.	Zinc
Omaha	Omaha, Neb.	Copper, lead and bismuth
Selby	San Francisco, Calif.	Lead, gold and silver
Tacoma	Tacoma, Wash.	Copper, arsenic and sulphur dioxide
East Helena	East Helena, Mont.	Lead
Monterrey	Monterrey, N. L., Mexico	Lead
Chihuahua	Chihuahua, Chih., Mexico	Lead
Aguascalientes	Aguascalientes, Ags., Mexico	Copper
Matehuala	Matehuala, S. L. P., Mexico	Copper
Asarco	Velardeña, Dur., Mexico	Copper and lead
Carrizal	Carrizal, Chile, S. A.	Copper
Caldera	Caldera, Chile, S. A.	Copper

### METAL MINES

Federal Lead	Flat River, Mo.	Lead
Dolores Mines	Matehuala, S. L. P., Mexico	Copper
Bonanza Mines	Bonanza, Zac., Mexico	Lead
Sta. Eulalia	Sta. Eulalia, Chi., Mexico	Silver, lead and zinc
Tecolotes	Sta. Barbara, Chia., Mexico	Silver, lead and zinc
Parral Mines	Parral, Chia., Mexico	Lead and zinc
Veta Grande and Veta	Colorado, Parral, Chia., Mexico	Silver
Velardeña	Velardeña, Dur., Mexico	Silver, lead and copper
Durango Mines	Durango, Dur., Mexico	Iron
Sierra Mojada	Sierra Mojada, Coah., Mexico	Silver, copper and lead
Tiro General	Charcas, S. L. P., Mexico	Silver and copper
Yak	Leadville, Colo.	Silver, lead and zinc
Anganguao	Anganguao, Mich., Mexico	Silver
Premier	Stewart, B. C., Canada	Silver and gold
Diana	Milluachqui, Peru	Silver and gold

### COAL MINES

Bon Carbo	Cokedale, Col.
Cokedale	Cokedale, Col.
Fairfax	Washington
Rosita	Sabinas, Coah., Mexico
San Juan	Durango, Col.

The metal products of these properties during 1921 included 348,888,000 lb. copper, 415,224,000 lb. lead, 14,628,614 lb. zinc, 11,915,954 lb. tin, 1,780,205 oz. gold, and 75,354,443 oz. silver, exclusive of various important byproducts. This production is considerably below normal, and is now increasing. The company also mined 360,952 tons of coal, and produced 100,860 tons of coke. The year's operations involved the services of 7,605 employees and the distribution of \$11,440,480 in wages, excluding operations in Mexico and South America.

According to the last balance sheet, as of Dec. 31, 1921, the cost of these properties, after all deductions for depreciation and ore depletion, stands at over \$128,000,000. Current assets amount to \$57,538,883, and exceed by more than \$1,000,000 the total liabilities, plus the total amount of the bonded debt, plus all the stocks and bonds on the properties of subsidiaries. Net working capital amounts to over \$44,650,000. Asset value behind all outstanding stock is probably greater than the par value of the shares.

### GOOD DIVIDEND RECORD SHOWN

Dividends on the preferred stock have been maintained at 7 per cent per annum for many years. The last quarterly payment on the common stock was 1 per cent, March

15, 1921. The dividend record from 1906 on the preferred and common shares follows:

Year	Preferred Per Cent	Common Per Cent
1906	7	7
1907	7	7½
1908	7	5
1909	7	4
1910	7	4
1911	7	4
1912 (a)	8½	4½
1913	7	4
1914	7	4
1915	7	4
1916	7	5½
1917	7	7
1918	7	6
1919	7	4
1920	7	4
1921	7	1
1922	7	0

(a) Payments made to conform to change in company's fiscal year.

The preferred stock is an investment with attractive speculative possibilities, as illustrated by the fact that it has moved through several 20-point to 30-point swings during the past twenty years. It sold as low as 63½ in 1921, and recently above 98. It was quoted above 109 frequently prior to 1920, and will no doubt reach this level again.

The common stock naturally has been subject to more extensive gyrations, and it is reasonable to suppose that they will continue with the ebb and flow of the speculative tide. These shares were below 30 in 1920 and in 1921. After fluctuating between 55 and 59 in April and the first half of May, 1922, they shot up suddenly to 65-66, and then settled back to 58 during the severe market reaction last month. At the recent level between 58 and 60 undoubtedly the shares are being absorbed by speculators and traders, and by investors who are willing to forego present dividends for the speculative profits which they believe will accrue owing to the tendency of the shares to discount the resumption of dividends on this issue in the not far distant future.

### Prosperity of Fluorspar Industry Dependent Upon Steel Trade

The market for the bulk of the fluorspar sold in the United States depends on the condition of the steel industry, and the demand fluctuates with the production of basic open-hearth steel, according to the U. S. Geological Survey. Most of the domestic gravel and some of the lump fluorspar, together with probably most of the imported fluorspar, are consumed as flux in basic open-hearth steel furnaces and to a smaller extent in other metallurgic operations. From 1916 to 1920 the sales of gravel have constituted between 83 and 89 per cent of the total shipments of domestic fluorspar, but in 1921 these sales constituted only 72 per cent of the total. Fluorspar is also used as a flux in iron blast furnaces, iron foundries, and gold, silver, copper, and lead smelters; it is used also in the manufacture of glass, of enameled and sanitary ware, of sodium fluoride used as a wood preservative, and of hydrofluoric acid; in the electrolytic refining of antimony and lead; and in the production of aluminum.

Information furnished by steel manufacturers who produce about two-thirds of the output of basic open-hearth steel shows that the consumption of fluorspar per ton of steel produced in 1921 ranged from 4.8 to 18.6 lb. and averaged 8.2 lb. These steel companies reported a consumption of 45,631 short tons of fluorspar in 1921, which, on the assumption that the remaining companies consumed a like proportion, would indicate a total consumption of about 68,400 tons for all open-hearth plants, compared with about 117,000 tons in 1920. This group of steel manufacturers also reported stocks of fluorspar on Jan. 1, 1922, amounting to 19,775 short tons, which would indicate total stocks approximating 30,000 tons at all steel plants, as compared with about 66,600 tons in 1920. These reports, therefore, show that the greater part of the fluorspar consumed in 1921 was withdrawn from consumers' stocks.

The total quantity of all grades of fluorspar available for consumption in 1921 was 41,189 short tons, a decrease of 80 per cent compared with 1920.

## COMPANY REPORTS

### Granby Consolidated Mining, Smelting and Power Co., Ltd.

Copper; British Columbia

A report of operations of the Granby Consolidated Mining, Smelting and Power Co., Ltd., for 1921 shows a deficit of \$287,161.64. Production, sales and an analysis of income account follows:

	1921	1920
Copper produced, lb.	29,970,651	25,744,327
Silver produced, oz.	493,283	(a) 1,054,206
Gold produced, oz.	8,838	9,481
Copper sold, lb.	37,104,280	19,464,796
Average price obtained, c. per lb. (b)	12.76	17.85
Average production costs f.o.b. smelter, c. per lb. (c)	11.63	15.94

(a) Includes silver in customs ore. (b) U. S. Exchange. (c) Canadian Exchange

Analysis Income Account		
Gross revenue from operations		\$7,234,519.09
Operating costs		6,309,214.73
Net revenue from operations		925,304.36
Dividends from investments		66,796.00
Total income (before depreciation)		992,100.36
Charges against income:		
Administrative and general expenses	\$164,405.57	
Insurance	63,702.71	
Taxes, 1921—land and mineral	76,951.44	
Exchange and discount	78,126.72	
Interest on bonds	281,732.00	
Interest on bank loans and other accounts	314,343.56	
Total charges against income		979,262.00
Net profit (before depreciation)		\$12,838.36
Less depreciation		300,000.00
Deficit for the year (after depreciation)		\$287,161.64

Balance sheet as of Dec. 31, 1921, follows:

Assets	As at Dec. 31, 1921	As at Dec. 31, 1920
<b>Current Assets:</b>		
Inventories:		
Copper, silver and gold on hand and in transit	\$1,410,472.44	\$2,764,75.84
Metals in process and ore	578,375.69	363,174.48
Materials, supplies and merchandise	1,512,420.82	1,985,048.11
Total inventories	3,501,278.95	5,113,198.43
Accounts and bills receivable	748,405.26	323,450.13
Cash on hand and in banks	33,832.31	66,321.83
Victory bonds and interest		20,884.12
Total current assets	4,283,516.52	5,523,854.51
Fixed assets:		
Mines, mineral and timber lands	15,599,089.18	15,787,739.82
Less allowance for depletion	6,656,526.93	6,679,453.12
	\$8,942,562.25	\$9,108,286.70
Real estate, plant and equipment	10,955,033.72	12,198,845.27
Less reserve for depreciation	2,059,990.83	2,994,795.50
	\$8,895,042.89	\$9,204,049.77
Total fixed assets	\$17,837,605.14	\$18,312,336.47
Shares and securities of other companies	671,634.24	671,634.24
Deferred and prepaid charges	523,662.37	398,534.47
Deficit	145,609.84	
	\$23,462,028.11	\$24,906,359.69
<b>Liabilities</b>		
Current and accrued liabilities:		
Loans from bankers	\$3,883,614.96	\$4,076,019.55
Accounts and wages payable	207,104.83	1,292,842.44
Interest accrued on bonds	47,888.32	48,379.60
Total current and accrued liabilities	\$4,138,608.11	\$5,417,241.59
Taxes assessed by Provincial Government for 1917-1918, payable June 30, 1922	\$368,000.00	
Bonded indebtedness:		
First mortgage 6% convertible bonds	\$1,503,400.00	\$1,503,400.00
Less bonds purchased and in treasury	48,400.00	12,000.00
Total first mortgage bonds outstanding	1,455,000.00	1,491,400.00
Five year 8% convertible debenture bonds	2,500,000.00	2,500,000.00
Total first mortgage bonds outstanding	3,955,000.00	3,991,400.00
Capital stock issued	15,000,420.00	15,000,420.00
Surplus		497,298.10
	\$23,462,028.11	\$24,906,359.69

(Contingent Liabilities—none ascertained)

Total tonnage produced was 950,625 tons. Reserves on Dec. 31, 1921, were 10,761,527 tons of 2.24 per cent copper.

### Amparo Mining Co.

Gold and silver; Mexico

A report of the operations of the Amparo Mining Co. for 1921 shows a net profit of \$309,421.55, according to the following profit and loss account:

EXPENSES	
Cost of mining ore and development	\$435,144.23
Transportation of ore to mill	31,001.51
Cost of milling	309,669.11
Expenses, marketing bullion and concentrates	67,587.58
Taxes, Mexico	126,421.57
Military protection, watchman	18,811.77
Prospecting	2,098.77
Damages and losses	23,588.52
Depreciation charged off	40,264.23
Repairs and additions	27,889.42
General expenses, administration, office, etc.	77,595.47
Shaft sinking fund	26,000.00
Diamond drill fund	10,000.00
Loss, liquidation of bars and concentrates 1920	7,911.02
Amparo Mex. Mining & Develop. Co.	4,521.52
(Expenses incurred in re Piedra Bola Invest.)	3,444.62
	<u>\$1,211,949.34</u>
Depletion of mineral deposits	120,049.16
	<u>\$1,331,998.50</u>
Net profit on operations	332,369.22
	<u>\$1,664,367.72</u>
INCOME	
Sale of bullion, concentrates, slag	\$1,486,134.06
Premium and interest	6,523.67
Gain in shipping expenses and taxes 1920	1,518.88
Surplus, calculation infalsificables and Mex. bank bill	15,201.23
Profit in warehouse	4,649.51
Miscellaneous	304.20
	<u>\$1,514,331.55</u>
Profit on sale of silver certificates	150,036.17
	<u>\$1,664,367.72</u>
Profit on operations	332,369.22
Expenses at Philadelphia office	\$16,944.17
Less, interest on deposits	3,561.28
	<u>\$13,382.80</u>
Less interest on investments	\$12,050.65
	<u>1,332.24</u>
Taxes paid	\$21,615.43
	<u>22,947.67</u>
Net profit to surplus	\$309,421.55
Plant:	
Land, buildings, machinery, equipment, etc.	\$2,513,785.56
Available:	\$243,720.26
Silver certificates	43,880.83
U. S. Bonds, Victory 4 1/2	85,064.25
Accounts receivable, Mexico	81,591.83
U. S. Certificates of Indebtedness	170,000.00
Materials and supplies on hand	185,186.90
Ore on hand and in transit	278,260.62
Investments of contingent fund	150,000.00
Investment insurance fund, Mexico—	
U. S. Victory Loan Cost with commission	14,055.25
Mexico Office fire ins. fund invest	\$2,787.90
Piedra Bola investment	43,198.75
	<u>45,986.65</u>
Miscellaneous:	283,415.99
	<u>\$4,094,948.14</u>
LIABILITIES	
Accounts payable Mexico	84,216.43
Depletion of Mineral Resources	802,065.11
	<u>886,281.54</u>
Capital stock in treasury	\$3,208,666.60
	<u>2,996,800.00</u>
	<u>996,800.00</u>
	<u>\$2,000,000.00</u>
Surplus, 1921 Jan. 1	\$1,021,596.88
Transfer to Contingent fund	50,000.00
	<u>\$971,596.88</u>
Net profit 1921	309,421.55
	<u>\$1,281,018.43</u>
Less dividend	240,000.00
	<u>1,041,018.43</u>
Contingent fund	150,000.00
Insurance fund Mex. office	14,643.21
Mexican office fire ins. fund	3,004.96
	<u>\$3,208,666.60</u>

Balance sheet as of Dec. 1, 1921, follows:

During the year 155,908 dry metric tons was mined and milled at a cost of \$7.28 per ton. Recovery in the mill amounted to 1,125.34 kg. gold and 45,640.21 kg. of silver at a cost of \$1.99 per ton milled. Gold and silver bars were sold for \$1,324,494.77.

### Quincy Mining Co.

The report of the Quincy Mining Co. for 1921 gives the following data:

The product of the mine was 29,021,930 lb. of mineral [concentrates], yielding 16,960,265 lb. of refined copper for which has been realized	\$2,227,994.
Profit on silver	60,744.
	<u>\$2,288,738.</u>
Mining expense	\$1,813,005.05
Opening mine expense	170,766.77
Taxes paid in Michigan	103,657.14
Capital stock tax	10,231.00
Smelting, transportation, etc.	300,397.01
	<u>2,398,056.</u>
Leaves deficit	\$109,318.
Interest receipts	\$6,608.31
Sales of real estate, Hancock, Mich.	5,795.00
	<u>12,403.31</u>
Construction	\$147,029.85
Accident account	24,000.00
	<u>\$96,914.73</u>
Deficit	\$267,944.58
The statement of assets and liabilities in the 1920 report showed a balance on hand, Jan. 1, 1921	\$1,879,265.42
Deduct deficit for year 1921	267,944.58
	<u>\$1,611,320.84</u>
Balance of assets Jan. 1, 1922	\$1,611,320.84

Statement of income and expenditures for 1921, with depreciation and depletion included, and cost of construction and sales of real estate excluded, conforming to the requirements of the Federal Government in regard to income tax returns, in which it is not permitted to charge construction against income, but is permissible to deduct from income the depreciation of equipment and depletion of ore reserves, is as follows:

RECEIPTS	
Sales of copper and silver	\$2,288,738.93
Interest	6,608.31
	<u>\$2,295,347.24</u>
EXPENSES	
All expenses, including accident account and taxes other than Federal income tax	\$2,422,056.97
Depreciation of equipment	184,453.46
Depletion of orebodies	427,025.42
	<u>\$3,033,535.85</u>
Net deficit for 1921	\$738,188.61

The statement of assets and liabilities, exclusive of real estate, mine plant and supplies in use follows as of Jan. 1, 1922:

ASSETS	
Cash, copper and investments	\$1,657,321.40
Accounts receivable	118,135.71
At mine and smelting works:	
Supplies, construction account, etc.	933,680.45
	<u>\$2,709,137.56</u>
LIABILITIES	
Accounts payable	\$727,192.98
Michigan taxes payable Jan. 10, 1922	84,466.75
Opening mine reserve	91,314.00
Fire insurance reserve	116,339.05
Accident reserve	78,503.94
	<u>\$1,097,816.72</u>
	<u>\$1,611,320.84</u>

During 1921 the mine at Hancock, Mich., produced 767,100 tons of copper ore, which yielded 22.12 lb. of refined copper per ton.

### Barnes-King Development Co.

The records of the Barnes-King Development Company show the following operating results for the quarter ending March 31, 1922:

Earnings:	
Shannon property	\$4,860.36
Interest received	1,005.38
	<u>\$5,865.74</u>
Deduct:	
North Moccasin expense	\$2,616.57
Piegan-Gloster expense	1,885.00
Kendall expense	131.52
Strawn development expense, less ore shipment	6,966.90
Miscellaneous expense	476.98
	<u>\$12,076.97</u>
Difference being loss on operations for quarter ending March 31, 1922	\$6,211.23

The above figures include provisions for depreciation on the various plants of the company on the same basis as has been used heretofore.

# MINING STOCKS

Week Ended July 15, 1922

Stock	Exch.	High	Low	Last	Last Div.	Stock	Exch.	High	Low	Last	Last Div.	
<b>COPPER</b>						<b>GOLD</b>						
Ahmeek.....	Boston	64	61	61	Sept. '20, Q	\$0.50	Alaska Gold.....	New York	1	1	1	
Alaska-Br. Col. new.	N. Y. Curb	3	2	2			Alaska Juneau.....	New York	1	1	1	
Allouez.....	Boston	25	25	25	Mar. '19	1.00	Atlas.....	Toronto	*27	*25	*26	
Anaconda.....	New York	53	51	52	Nov. '20, Q	1.00	Carson Hill.....	New York	11	11	11	
Arceadian Consol.....	Boston	3	3	3			Carron Consol. G.....	N. Y. Curb	2	2	2	July '22, Q, X \$0.10
Ariz. Com'l.....	Boston	9	9	9	Oct. '18, Q	0.50	Dome Mines.....	New York	30	30	30	Apr. '22, Q 1.00
Big Ledge.....	N. Y. Curb	*15	*10	*11			Florence Goldfield.....	N. Y. Curb	*11	*9	*11	
Bingham Mines.....	Boston	14	14	14	Sept. '19, Q	0.25	Golden Cycle.....	Colo. Springs	*83	*83	*83	June '21, Q 0.02
Calumet & Arizona.....	Boston	62	60	60	June '22, Q	0.50	Goldfield Consol.....	N. Y. Curb	*6	*5	*5	Dec. '19, 0.05
Calumet & Hecla.....	Boston	275	270	270	June '20, Q	5.00	Gordon Murray.....	Toronto	*30	*29	*30	
Canada Copper.....	N. Y. Curb	*30	*17	*28			Hollinger Consol.....	Toronto	9.36	9.30	9.35	July '22, 0.05
Centennial.....	Boston	10	10	10	Dec. '18, SA	1.00	Homestake Mining.....	New York	71	70	70	June '22, M 0.25
Cerro de Pasco.....	New York	37	36	36	Mar. '21, Q	0.50	Keora.....	Toronto	*10	*8	*9	
Chile Copper.....	New York	23	21	22			Kirkland Lake.....	Toronto	*40	*37	*38	
Chino.....	New York	30	28	29	Sept. '20, Q	0.37	Lake Shore.....	Toronto	2.25	2.17	2.21	Nov. '21, K 0.02
Columbus Rexall.....	Salt Lake	*32	*31	*32			McIntyre-Porcupine.....	Toronto	16.25	16.00	16.10	May '22, K 0.05
Con. Arizona.....	N. Y. Curb	*3	*3	*3	Dec. '18, Q	0.05	Porcupine Crown.....	Toronto	*23	*20	*22	July '17, 0.03
Con. Copper Mines.....	N. Y. Curb	*50	*50	*50			Porcupine V. N. T.....	Toronto	*18	*16	*16	
Copper Range.....	Boston	44	43	43	Mar. '22, Q	1.00	Portland.....	Colo. Springs	*40	*20	*40	Oct. '20, Q 0.01
Crystal Copper.....	Boston Curb	*90	*82	*86			Sehumacher.....	Toronto	*75	*73	*74	
Davis-Daly.....	Boston	7	7	7	Mar. '20, Q	0.25	Silver Pick.....	N. Y. Curb	*12	*12	*12	
East Butte.....	Boston	11	10	10	Dec. '19, A	0.50	Teck Hughes.....	Toronto	*54	*53	*54	
First National.....	Boston Curb	*90	*60	*62	Feb. '19, SA	0.15	Tom Reed.....	Los Angeles	*52	*52	*52	Dec. '19, 0.02
Franklin.....	Boston	2	2	2			United Eastern.....	N. Y. Curb	1	1	1	Apr. '22, Q 0.15
Gadaden Copper.....	Boston Curb	90	80	88			Vindicator Consol.....	Colo. Springs	*4	*4	*4	Jan. '20, Q 0.01
Granby Consol.....	New York	30	29	29	May '19, Q	1.25	White Caps Mining.....	N. Y. Curb	*7	*6	*7	
Greene-Cananea.....	New York	31	30	30	Nov. '20, Q	0.50	Wright-Hargreaves.....	Toronto	2.80	2.55	2.55	July '22, 0.02
Hancock.....	Boston	2	2	2			Yukon Gold.....	N. Y. Curb	*95	*95	*95	June '18, 0.02
Howe Sound.....	N. Y. Curb	3	2	2	Jan. '21, Q	0.05	<b>SILVER</b>					
Inspiration Consol.....	New York	41	40	40	Oct. '20, Q	1.00	Batopilas Mining.....	New York	1	1	1	Dec. '07, I 0.12
Iron Cap.....	Boston Curb	7	7	7	Sept. '20, K	0.25	Beaver Consol.....	Toronto	*29	*27	*28	May '20, K 0.03
Isle Royale.....	Boston	23	23	23	Sept. '19, SA	0.50	Coniagos.....	Toronto	1.30	1.25	1.30	May '21, Q 0.12
Kennecott.....	New York	36	34	36	Dec. '20, Q	0.50	Crown Reserve.....	Toronto	*19	*15	*16	Jan. '17, 0.05
Keweenaw.....	Boston	2	2	2			Kerr Lake.....	N. Y. Curb	3	3	3	July '22, Q 0.12
Lake Copper.....	Boston	4	4	4			La Rose.....	Toronto	*31	*30	*30	Apr. '22, 0.10
La Salle.....	Boston	4	4	4			McKinley-Dar-Sav.....	Toronto	*28	*24	*28	Oct. '20, Q 0.03
Magma Copper.....	N. Y. Curb	28	28	28	Jan. '19, Q	0.50	Mining Corp. Can.....	Toronto	1.00	*75	1.00	Sept. '20, Q 0.12
Majestic.....	Boston Curb	†1	†5	*10			Nipissing.....	N. Y. Curb	5	5	5	Apr. '22, Q, X 0.30
Mason Valley.....	Boston	2	2	2			Ontario Silver.....	New York	7	7	7	Jan. '19, Q 0.50
Mass. Consolidated.....	Boston	3	3	3	Nov. '17, Q	1.00	Ophir Silver.....	N. Y. Curb			*12	Jan. '12, 0.10
Miami Copper.....	New York	30	29	29	May '22, Q	0.50	Temiskaming.....	Toronto	*27	*25	*25	Jan. '20, K 0.04
Michigan.....	Boston	1	1	1			Trethewey.....	Toronto	*4	*3	*4	Jan. '19, 0.05
Mohawk.....	Boston	65	62	63	July '22, Q	1.00	<b>GOLD AND SILVER</b>					
Mother Lode Coa.....	N. Y. Curb	9	9	9	June '22, I	0.50	Boston & Montana.....	N. Y. Curb	*16	*13	*16	
Nevada Consol.....	New York	16	16	16	Sept. '20, Q	0.25	Cash Boy.....	N. Y. Curb	*6	*6	*6	
New Cornelia.....	Boston	19	18	19	May '22, K	0.25	Dolores Esperanza.....	N. Y. Curb	1	1	1	July '22, 2.50
North Butte.....	Boston	13	12	12	Oct. '18, Q	0.25	El Salvador.....	N. Y. Curb	*5	*5	*5	
North Lake.....	Boston						Jim Butler.....	N. Y. Curb	*4	*4	*4	Aug. '18, SA 0.07
Ohio Copper.....	N. Y. Curb	*10	*9	*9			Jumbo Belmont.....	N. Y. Curb	*4	*4	*4	June '16, 0.05
Old Dominion.....	Boston	25	23	25	Dec. '18, Q	1.00	MacNamara M.&M.....	N. Y. Curb			*6	May '10, 0.02
Oseola.....	Boston	32	32	32	June '20, Q	0.50	Ontario Belmont.....	N. Y. Curb	1	1	1	July '22, Q 0.05
Phelps Dodge.....	Open Mar.	†180	†170		July '22, Q	1.00	Tonopah Divide.....	N. Y. Curb	*80	*77	*78	
Quincy.....	Boston	44	44	44	Mar. '20, Q	1.00	Tonopah Extension.....	N. Y. Curb	1	1	1	July '22, Q 0.05
Ray Consolidated.....	New York	16	16	16	Dec. '20, Q	0.25	Tonopah Mining.....	N. Y. Curb	1	1	1	Apr. '22, SA, X 0.07
Ray Hercules.....	N. Y. Curb	1	1	1			West End Consol.....	N. Y. Curb	1	1	1	June '22, SA 0.05
St. Mary's Min. Ld.....	Boston			48	Apr. '22, K	2.00	<b>SILVER-LEAD</b>					
Seneca Copper.....	Boston	13	13	13			Caledonia.....	N. Y. Curb	*8	*7	*8	Jan. '21, M 0.01
Shannon.....	Boston	*90	*82	*90	Nov. '17, Q	0.25	Cardiff M. & M.....	Salt Lake	†90	†81	*90	Dec. '20, 0.15
Shattuck Arizona.....	New York	10	9	9	Jan. '20, Q	0.25	Chief Consol.....	Boston Curb	5	4	5	May '22, Q 0.05
South Lake.....	Boston	†1	†85	*98			Consol. M. & S.....	Montreal	25	24	24	Oct. '20, Q 0.62
Superior & Boston.....	Boston	10	10	10			Daly Mining.....	Salt Lake	†2.00	*1.35		July '20, Q 0.10
Tenn. C. & C. cfs.....	New York	10	10	10	May '18, I	1.00	Daly-West.....	Boston			1	Dec. '20, Q 0.25
Tuolumne.....	Boston	*69	*69	*69	May '13, 0.10		Eagle & Blue Bell.....	Boston Curb	†3	†2	†2	Apr. '21, K 0.05
United Verde Ex.....	Boston Curb	28	27	28	May '22, Q	0.25	Electric Point.....	Spokane	*7	*5	*5	May '20, SA 0.03
Utah Consol.....	Boston	3	3	3	Sept. '18, 0.25		Federal M. & S.....	New York	†17	†12	11	Jan. '09, 1.50
Utah Copper.....	New York	65	63	65	June '22, Q	0.50	Federal M. & S. pfd.....	New York	50	50	50	June '22, Q 1.25
Utah Metal & T.....	Boston	1	1	1	Dec. '17, 0.30		Florence Silver.....	Spokane	*24	*22	*24	Apr. '19, 0.01
Victoria.....	Boston	1	1	1			Grand Central.....	Salt Lake	*61	*61	*61	Jan. '21, K 0.01
Winona.....	Boston	1	1	1			Hecla Mining.....	N. Y. Curb	6	6	6	June '22, Q 0.15
Wolverine.....	Boston	12	12	12			Iron Blossom Con.....	N. Y. Curb			*28	Apr. '22, Q 0.02
<b>NICKEL-COPPER</b>						<b>VANADIUM</b>						
Internat. Nickel.....	New York	17	16	17	Mar. '19, 0.50		Vanadium Corp.....	New York	47	44	46	Jan. '21, Q 1.00
Internat. Nickel, pfd	New York	83	81	83	May. '22, Q 1.50		<b>ASBESTOS</b>					
<b>LEAD</b>						<b>SULPHUR</b>						
National Lead.....	New York	103	98	100	June '22, Q 1.50		Asbestos Corp.....	Montreal	67	65	65	July '22, Q 1.50
National Lead, pfd...	New York	112	111	112	June '22, Q 1.75		Asbestos Corp. pfd...	Montreal	82	81	81	July '22, Q 1.75
St. Joseph Lead.....	New York	15	15	15	June '22, Q 0.25		<b>MINING, SMELTING AND REFINING</b>					
<b>QUICK-SILVER</b>						Amer. Sm. & Ref.....						
New Idria.....	Boston	*10	*10	*10			Amer. Sm. & Ref. pf...	New York	62	60	61	Mar. '21, Q 1.00
<b>ZINC</b>						Am. Sm. Sec. pf. A.....						
Am. Z. L. & S.....	New York	18	17	17	May '20, 1.00		U. S. Sm. R. & M.....	New York	99	97	99	June '22, Q 1.75
Am. Z. L. & S. pfd...	New York	46	43	43	Nov. '20, Q 1.50		U. S. Sm. R. & M. pfd...	New York	47	47	47	July '22, Q .87
Butte C. & Z.....	New York	7	6	7	June '18, 0.50							
Butte & Superior.....	New York	29	28	29	Sept. '20, 1.25							
Callahan Zn-Ld.....	New York	8	8	8	Dec. '20, Q 0.50							
New Jersey Zn.....	N. Y. Curb			141	May '22, Q 2.00							
Yellow Pine.....	Los Angeles	*40	*40	*40	Sept. '20, Q 0.03							

\*Cents per share. †Bid or asked. Q, Quarterly. SA, Semi-annually. M Monthly. K, Irregular. I, Initial. X, Includes extra.  
Toronto quotations courtesy Hamilton B. Wills; Spokane, Pohlman Investment Co; Salt Lake, Stock and Mining Exchange; Los Angeles, Chamber of Commerce and Oil; Colorado Springs, The Financial Press, N. Y.

## NEW MACHINERY AND INVENTIONS

### A New $\frac{3}{4}$ -Cu.Yd. Universal Shovel

The announcement of a new 20-ton,  $\frac{3}{4}$ -cu.yd. revolving shovel will be received with general interest in the mining field. From boom point to ash pan, this shovel is a distinctly new design and contains a number of exclusive features not found on other  $\frac{3}{4}$ -cu.yd. shovels.

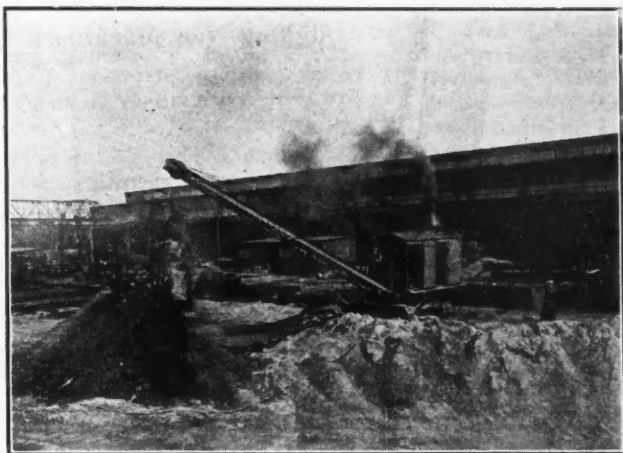
The shovel is manufactured by the Bucyrus Co., South Milwaukee, Wis., is known as the 20-B and the design is similar to that of the Bucyrus 30-B universal shovel, its bigger 1-cu.yd. brother. It is a universal machine, be-

The dipper latch is double-hinged which prevents bending of the latch or breakage if the dipper should strike the side of a car or truck. A device is provided for keeping the dump rope always taut for ease when engaged in dumping.

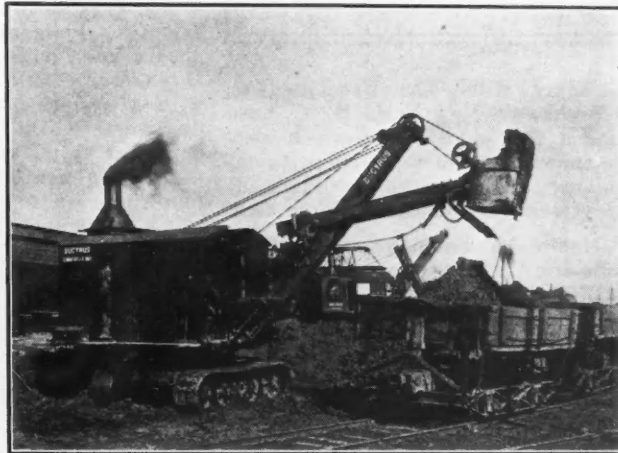
This shovel is equipped with an improved and simplified three-lever control. One lever controls the independent operation of the throttle and the ram. Furthermore, a release throttle is provided whereby the dipper may be lowered without the need of applying the brake. Two speeds are provided. A change from one to the other may be made with one lever, similar to an automobile gear shift. Propelling may be accomplished without the need of closing a gate valve to the hoisting engine.

The boiler is said to have a larger heating surface and grate area than

The shovel is interchangeable from caterpillars to trucks or traction wheels. There are only two rollers in each caterpillar. These are of large diameter with bearings high out of the mud and water. The driving is through direct gearing to the tumblers, no chains being used. The elimination of the side frames increases the accessibility and ease of repair and adjustment. The rollers may be removed without even disconnecting the caterpillar chain. The links are of one piece, made of a specially selected and specially treated steel. The pin connections are on the outside, not at the center. This assures a straight travel and prevents damage should a link strike an obstruction on its edge. There are only twenty-three links in each caterpillar. They form a perfectly smooth platform with no gaps between each link to pick up rocks and



Twenty-ton,  $\frac{3}{4}$ -cu.yd. shovel in use as a dragline



Loading dump cars with universal shovel

ing adaptable to dragline, high lift, clam shell, crane and other combinations.

A two-part instead of a three-part hoist enables the dragline excavator to be as good as a dragline as the shovel is a shovel. Furthermore, wear on rope is reduced, a shorter rope is required, and faster digging speed is made possible without sacrifice of power.

This shovel also has the outside type of dipper sticks and box girder type of boom, similar to the 30-B. It is stated that this has been proved, through many years of experience on the big 8-yd. stripping shovels, to be the strongest possible construction for withstanding successfully the twisting and wrenching strains that are so severe in shovel work.

The A-frame is directly connected to a steel center casting. The back leg instead of being attached to a structural rear end is also connected to this casting. This affords a more perfect and solid support than has heretofore been found on 20-ton shovels.

The dipper has all four corners rounded, another exclusive feature which greatly increases the ability to free itself from sticky material.

that on other  $\frac{3}{4}$ -cu.yd. shovels and is further equipped with a patented scale chamber. The advantages of this scale chamber are many, making it possible to work with poorer water, with greater steaming efficiency and less delay. The boiler is further supplied with shaking grates, a safety guard around the water glass and a gage for the water tank. The house at the rear of the boiler is of steel, which lessens the possibility of fire.

Accessibility and simplicity of upkeep is prominent in the design throughout. One instance of this is the ability of lifting out the vertical propelling shaft from the top instead of extracting it from the bottom, and another, the fact that the swing rollers are arranged so that they may be removed without the necessity of jacking up the frame.

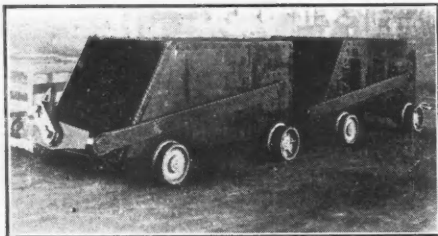
Centering the revolving frame on the base is accomplished by the revolving frame casting and the base center casting fitting into each other in such a manner that they take all the side thrusts. This relieves the vertical propelling shaft, which is depended upon ordinarily, to center the machine of all strains.

act as small jaw crushers. They wont rip up a pavement.

For operation in the pit, where a pit man is always available, a simple and effective hand steer is provided. The clutches are on the outside, where they are accessible and high out of danger of getting clogged with mud. There are no links and rods to get out of order. For moving from job to job a patented power steering wheel is provided. This device consists of a rubber-tired wheel which is easily and quickly attached to the front of the dipper. Steering is accomplished merely by pointing the boom in the direction of travel. The caterpillars track after this wheel. This device eliminates the delay incidental to stopping on the road to throw in and out clutches.

### New Skips for Ford's Iron Mine

The accompanying photograph shows two 72-cu.ft. capacity, incline skips recently shipped to the Ford mining properties at Michigamme, Mich. These skips are designed for 48-in. track gage and are built to the following specifications: 14-in. chilled iron



Skips of 72-cu.ft. capacity for Henry Ford's Michigan iron mines

wheels; wheel base of 5 ft. 6 in.; length of box, 9 ft. 9½ in.; width of box, 3 ft. 6 in.; height of box, 3 ft. 3 in., and over-all height 4 ft. 1 in. These skips were made by the Lake Shore Engine Works Co. of Marquette, Mich.

## TRADE CATALOGS

**Grinding Mills**—The Hardinge Co., 120 Broadway, New York, N. Y., have issued a four-page leaflet which asks and answers a number of pertinent questions relative to the operation, advantages and uses of the Hardinge mill.

**Portable Air Compressors**—Sullivan Machinery Co., Chicago, Ill., have issued Bulletin No. 77-0, "Sullivan Portable Air Compressors." This bulletin describes three types: gasoline-engine-driven, driven by belt from an electric motor, and driven by belt from a tractor. These outfits should find a ready application in open-pit work and other operations where small quantities of air power are required at scattered points for a short time.

**Fire Brick**—The Walsh Fire Clay Products Co., St. Louis, Mo., have issued a 6-p. brief on the subject of Walsh fire brick. These brick have been widely and successfully used in boiler furnaces of all kinds, powdered coal, oil and gas-fired furnaces, lead, zinc, and copper smelters, blast furnaces, melting furnaces and annealing ovens, oil refinery practice and many other operations. Several of the shapes and designs are illustrated.

**High-Temperature Castings**—The Electro Alloys Co., Elyria, Ohio, have issued a 7-p. bulletin describing their "Therm Alloy," a high chromium alloy which is said to remain unchanged under drastic thermal conditions. It not only is resistant to oxidation at high temperatures, but will not tarnish in ordinary use and is free from atmospheric or salt corrosion. It is also resistant to the action of nitric, carbonic, sulphuric and hydrochloric acids and to all alkalis.

**Spaders**—Sullivan Machinery Co., Chicago, Ill., have issued Bulletin 70-X, "The Sullivan Spader," which illustrates and describes a compressed-air spader or pneumatic clay-digging tool. It consists of a light Sullivan air ham-

mer equipped with a steel spade, and is said to have been successful in excavating clay in trenches, open cuts, caissons and tunnels in which the ground is not sufficiently hard to be drilled and blasted and yet too hard to be removed by pick-and-shovel methods.

**Generators**—Allis-Chalmers Mfg. Co., Milwaukee, Wis., have issued Bulletin No. 1099B, "Belted Alternating Current Generators." The small alternating-current generators described and illustrated in this pamphlet can be used in many installations where the space occupied is not a deciding factor in the selection of the generating unit. Their lower first cost, as compared with direct-connected units, and the ease with which these generators may be connected to an existing source of power, has led to an extensive use of the type.

**Ash Treatment**—American Engineering Co., Philadelphia, Pa., have issued a 20-p. bulletin "The Rotary Ash Discharge," which deals exclusively with a system of ash treatment and discharge, which was originated and perfected by the company. The use of the rotary ash discharge effects the following results: It provides a space in which combustible may be consumed to the ultimate degree; it provides a space in which the ash may be cooled, and it provides a means whereby the ash and clinker may be continuously crushed and discharged.

**Electric Pumps**—"Instructions for Installing and Operating Electric Pumps" is the title of a very interesting and valuable publication recently issued by the Prescott Co. of Menominee, Mich. The first part of the booklet deals with the various details of correct pump installation, the tools used, foundation, suction, discharge, method of erection, and other information. The operation of the pump is then given consideration with details as to proper oiling, air charging, priming, and packing. The booklet also contains a series of tables of interest and value to those engaged in the operation of pumping plants together with general information pertaining to the subject of pump operation.

**Electric Screens**—The W. S. Tyler Co., Cleveland, Ohio, have recently issued Catalog 45, "Hum-mer Electric Screens." This 80-page catalog will prove to be of great interest to the mill operator who is not familiar with the apparent success that has followed the installation of the Hum-mer electric screens. Several claims are made for the machine, and these seem well substantiated. Among these it is stated that the Hum-mer electric screen is the first machine in the history of screening to apply electric vibration to a wire-cloth screening surface commercially; it combines with electric vibration the fundamental screening principle of maintaining a wire-cloth

screening surface at "drumhead" tension; the vibration of the screening surface can be intensified or reduced to suit any condition of material as to fineness or moisture content, and to suit the weight of the material to be vibrated; it does not clog, as the wire cloth vibrates regardless of the load of material on the screen, and it is the first machine in which the vibrating mechanism requires no lubrication. The machine has been successful in screening wet and dry material from 2½-in. opening to 200 mesh and is already widely used in the non-metallic mining industry.

## CONSTRUCTION NEWS

### Mining Companies in Arizona Are Erecting New Plants and Installing New Machinery

Among the construction projects underway in Arizona may be mentioned the following:

The Magma Copper Co. at Superior is building a reverberatory furnace plant, enlarging its concentrator, and broad-gaging its 30-mile railroad.

The United Verde Copper Co. at Clarkdale is erecting a new crushing plant and a Cottrell plant for removing dust from smelter fume.

The New Cornelia Copper Co. is planning a 5,000-ton flotation plant to treat sulphide ores at Ajo.

The Ray Hercules Mines, Inc., is to remodel its crushing and concentrating plants.

The Old Dominion Company is remodeling its 700-ton plant at Globe to treat 1,000 tons per day. Output is not being suspended in the meantime.

The Pinal Gold Mines Co. is installing a hoist and compressor at its mine at Casa Grande.

The Stargo Mining Co. is erecting a 50-ton mill at its silver mine at Morenci.

### Oliver Mining Co. Starts \$500,000 Shaft in Michigan—Steel and Concrete Lining

The Oliver Iron Mining Co. has started preliminary work on a half-million dollar shaft to be sunk at the Royal mine between the Davis-Geneva and Puritan mines on the Gogebic Range in Michigan. The shaft is to be sunk in the granite south of the footwall, and will be vertical. It will have two skip compartments, two for cages, and two for pipes and ladders. The shaft will be a deep one, probably 3,000 ft., and it will be necessary to have more than the one cage to handle men and timber. The shaft will be lined with steel and concrete, and will have a steel headframe with independent ore pockets. The hoists will be electric driven.