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August 26, 1922



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## Radioactivity and Time

**H**ELIUM is a gaseous element which is formed as a stable product from the decay of uranium and radium. Besides helium, the disintegration of the element uranium also produces lead. This disintegration, which is constantly taking place in radioactive minerals, has been measured by experiment and with considerable accuracy by physicists. The gaseous product, helium, is, of course, evolved, but the non-volatile product, lead, remains with the uranium metal. Therefore, by ascertaining, through chemical analyses, the ratio of uranium to lead in any uranium mineral, a calculation is possible as to the age of that mineral, or the lapse of time since it was formed.

Uranium minerals (like other minerals) have been formed at many stages of the earth's history, and the geologic period at which each deposit was formed is generally ascertainable by the relation of the deposits, directly or indirectly, to some fossiliferous stratum whose organic remains register a certain stage in the geologic column—a certain division of the evolution of life—which is the basis of our division of the past into geologic periods. Uranium minerals all over the world, belonging to these various stages—formed at one or the other of these periods—have been analyzed, and the ratio of lead has been found to be fairly constant in those minerals taken from the same geologic horizon in different parts of the world. Thus the ages in years of the different strata have been computed, dating them back to various remote periods, as described in a previous editorial, with a maximum of one and a half billion years for a certain stage of the Archaean, oldest and vastest of geologic divisions—the prehistoric era of geology. The time scale thus obtained seems to fit in admirably with the rougher estimates of time required by other geologic processes, such as erosion and sedimentation and even such operations as faulting and ore deposition.

The change from uranium to lead and helium is a change from one element into two other elements. It is transmutation, formerly thought impossible: it shows that an element is not absolutely elementary.

Is this, then, the origin of lead and helium in general? Lead occurs in relatively enormous quantities, and helium occurs in sufficient volume so that it is being collected and used for war balloons by the United States Government, and also in Canada; but both uranium and to a far greater degree radium are very rare. Lead deposits occur as one of a normal series of deposits, closely associated with zinc and also with copper and silver: lead is thus mainly the result of the selective concentration ("differentiation") of igneous magmas, with no known connection with radioactivity. Helium occurs mixed in various degrees with "natural gas," acting thus as an adulterant to the combustible gas which is considered by geologists to be of organic origin. That the helium is also of organic origin is improbable: it is

probably of deep-earth (telluric) origin—hence magmatic. That much we may believe: and that its combination with organic "natural gas" is a mechanical mingling. If lead and helium, then—both magmatic—are due to radioactivity, we shall have to go back of the igneous magmas as we know them—immensely back as to time, and down into the unknown earth's depths as a point of origin.

## Mining and Metallurgical Progress and How It Is Promoted

**T**HE PRACTICE of mining and metallurgy is, generally speaking, probably further advanced on this continent, and in other countries where the work has been managed by North American engineers, than anywhere else. The principal reason for this is not that Americans and Canadians are more clever in this work than are the technical men of other nationalities; it is that they are not so secretive; they are willing to talk things over with competitors; to share ideas; to give and take, that all may prosper.

Travelers abroad, reputable engineers too, tell us that it is almost necessary to have a special meeting of the board of directors to be admitted to most metallurgical plants, even where the process is not a so-called secret one. The procedure employed is closely guarded, and nothing is willingly allowed to leak out that would be of any possible benefit to a competitor.

One of the editorial staff has recently returned from a trip of several weeks in which he visited many operations, including the gold, silver, and nickel plants in Ontario, the copper plants in Michigan, the zinc smelters in Illinois, and the lead refineries near Chicago. Everywhere he was welcome; at only four out of about thirty properties visited was there even any objection to the taking of photographs. In most instances he was allowed to wander about the mill or smelter at will, if he chose, though an intelligent first inspection naturally requires a guide. In many plants, not even a pass was needed.

It was interesting to observe that the secretive spirit is dying, though dying hard, in the zinc-smelting industry, in which there has been less progress probably than in the metallurgy of any of the other common metals. In one zinc smelter, for instance, though the editor in question was allowed to go through the plant, he had a feeling that he was an intruder; his guide was an individual who did not know so much as he did about the machinery and process, and he was introduced to none of the operatives. He was cautioned against publishing any of the information that he got, which was precious little. The manager told him that he had not been in the neighboring plant of another company in thirty years: and yet this was not because of any personal animosity or because any secret processes were being used; it was simply because he has not yet seen fit to adopt the policy of co-operation.

Of course, our representative learned many things which will be held absolutely confidential until the time comes for their release. An engineer who is developing a new method naturally does not care to have his ideas seized upon by others before he has had a chance to work them out himself and obtain public credit for them. Then, too, there is the case of the plant which is doing something in an entirely different way from any one else. The manager may then feel that the release of information would be of benefit to others from whom he, himself, could gain little or nothing. The important idea in all this is that of reciprocity.

For you who have given us your time and admitted us to your plants, we hope to publish a better paper; and should you come to New York we can assure you that the atmosphere in this office is not icy; we shall be glad to see you, to hold your mail if you wish, to tell you what shows are worth seeing, or even buy the tickets in advance, and to do anything else that you have a right to expect from friends.

### Denver's Victory

**I**F YOU WILL SCRUTINIZE one of Messrs. Rand McNally's pictures of the western half of the United States you will note two main arteries of traffic connecting the Mississippi valley with San Francisco, via Salt Lake City, Utah. One, of which the Union Pacific is the principal link, passes through Cheyenne, in Wyoming; the other, which includes the Denver & Rio Grande, passes through Pueblo, in Colorado. About midway between Pueblo and Cheyenne is Denver, the largest city between the Missouri River and San Francisco. The student of the map will note also several rail lines converging at Denver from the east, and a short railroad extending westward from Denver, in the general direction of Salt Lake City, but coming to an abrupt halt at a small town called Craig, in Routt County, Col. Denver, the capital of what was once the greatest mining region in the country—for the Centennial State long held that distinction and Denver was the center of activity—has suffered grievously from the fact that it was not on a great transcontinental railway. Recognizing this handicap twenty years ago, the late David H. Moffat, one of Denver's pioneers, whose fortune of ten million had its start in the mines of Colorado, conceived the idea of building a new railroad on a direct route from Denver to Salt Lake. With the true spirit of the empire builder that he was, Moffat dedicated his wealth and his energy to the task of building this road. In addition to providing the link that would put Denver on the shortest main line across the continent, the road would open a vast territory in western Colorado and eastern Utah, rich in mineral and other natural resources that could not be developed without transportation. In two counties of Colorado reliable estimates place the workable coal lands as totaling 79,000 acres that should produce more than two billion tons of coal.

Moffat started in 1902. He knew that the job was difficult because the Continental Divide stretched its great back almost across the state and imposed unusual obstacles in the way of the construction of a road that would have reasonable grades. That is the reason that the older lines had gone to the north and to the south. Long and costly tunnels would be necessary, and construction cost would be immense, but from an engineering standpoint the line was entirely practicable. Ther

an obstacle of a different kind interposed. The other transcontinental companies naturally looked with disfavor on the project, for the reason that the completion of the road meant competition. So powerful was their influence in the financial world that they were able to prevent the floating of the bonds that would have raised the necessary money. Before he died, in 1911, however, Moffat had built 200 miles of road almost entirely with his own resources. Since then Denver, almost single handed, has been striving to pass legislation that would permit the realization of Moffat's plan.

Besides the competing railroads, various interests in the state thought they saw disadvantages to themselves in the completion of the line. They had been able to block Denver's efforts until a short time ago, when, at a special session, the Legislature created the Colorado Tunnel Commission, and provided for the issue of \$6,720,000 in bonds for the construction of a six-mile tunnel through the backbone of the Rockies. Ultimately—it will be a number of years at best—the line will have a maximum grade of 2 per cent, and it will shorten the rail distance between Chicago and San Francisco by seventy miles. Incidentally, signs that are unmissable point to a revival of mining in territory tributary to Denver. The depletion of the exceedingly rich orebodies, together with the increase in smelting and transportation costs, has caused the industry to languish; but metallurgical progress, more economical mining, and a policy of intelligent co-operation on the part of railroads and smelting companies should make possible the successful exploitation of lower-grade ores. And as the lean is being mined it is always possible that streaks of fat will be revealed.

Denver's best friend admits that in recent years it has dropped a few steps behind in the march of Western progress. Though we realize, as George Eliot said, that of all forms of human error "prophecy is the most gratuitous," we will take a chance and venture the prediction that Denver in a few years will regain its stride!

### Wet and Dry Mining Camps

**D**EEP DOWN in a good-sized Western mine—which is as definite as we shall be—a cardboard sign is suspended from an overhead pipe at a pump station. On this card, in letters large enough to be read at fifty feet, is the following inscription: "Bring along your demijohn; there's plenty of stuff for all; we're too deep for the Government hounds." No mention is made of the stuff available, whether mine-made, home-made, or imported, but one reads a certain amount of defiance in the notice, as if the author felt perfectly secure in his location far below the surface. And well he might. One could picture Government agents snooping behind drifts, old stopes, and the numerous other hiding places familiar to the miner, searching for the stuff. Evidently the mine management countenanced this activity on the part of several of the crew and believed in allowing them to have their little fun. Perhaps they felt that their miners should be classed with those of the early days who somehow are always associated with strong drink in the minds of many of us. (The country has been dry so long it almost takes a Bret Harte story nowadays to refresh one's memory.) However, this reasoning would hardly hold, for the adventurous prospectors, miners, and others who had so much to do with the settlement and development of the

West have been largely supplanted—when it comes to actual mining—by foreign laborers, many of whom have difficulty in understanding the English language. Sam Treloar and Jack Adams have given way to Josef Spasek, Eleutherios Adrianopolis, Juan Hermosa and many others, but practically all these foreign-born miners are used to drink in some form of other, and many were greatly dissatisfied when even mild stimulants were denied them by Congressional legislation. In this Western mine they were obviously getting around—or through—the law.

What effect has prohibition had in the smaller and larger mining centers? Has it made labor more difficult to procure and keep satisfied? It is the opinion of some mine executives, particularly those in the drier camps, that miners are being lost to those mining districts which are distinctly damp. If true, then this condition can obviously be corrected by a more equitable enforcement of the law, but, as it happens, the mining companies are generally so dominant in everything that concerns life in their communities, that should they permit the flouting of a dry law, openly or not, the task of making their particular locality dry would be a thankless job.

The varying degrees of aridity found in mining camps is quite noticeable. Some are doubtless as dry as they will ever get; others decidedly moist, while still others appear as if they were entirely unaware of the existence of a new amendment to the Constitution. Where the foreign-born element preponderates one will usually find an effort—generally highly successful—to ease the drought by the manufacture of the national foreign beverage, whatever it may be. We know of one community of Italians in a Western mining camp which imports many carloads of California grapes each fall and uses them to manufacture a highly palatable grade of wine, popular not only among themselves but among other miners and mining men.

Has prohibition been partly responsible for the heavy exodus of foreign labor in the last two years? Is it going to make the work of collecting a satisfactory labor force increasingly difficult, and is it ultimately going to affect the cost of producing copper, lead, zinc, and other metals? These are questions well worth thinking about. It surely has made labor more efficient.

### The Lees of the Lees

**M**INING does not lack fascinating literature. The daily press which prints the truth, and nothing but the truth, furnishes alluring items. The more professional and elaborate literature of altruists who are trying to enrich us by letting us in on the ground floor of mining investments is not only grateful to us for its romantic interest but for the milk of human kindness which saturates it all. Here is Jim Haynes, of Fort Worth, who writes as Dear Friend. Dear old Jim—strange that we can't remember him. Still he must be the right stuff—we won't let him know that our memory is so short. He is working with none other than General Robert A. Lee, right in the oil game, where they make millionaires, and while we were not born south of the Mason and Dixon line, we know who General Robert E. Lee was, and that he was all right. Robert A. Lee knows that, too. He says "History is not a feather in my cap, but the fact that I came from the good old stock that produced such men as Robert E. Lee, Henry Lee, Fitzhugh Lee gives me

the great ambition to live up to the high ideals and standards of my forbears."

The General seems to be fond of dreaming; he indulges, one might say, in Generalities. He says: "My derrick is up. The machinery will be moved out in a few days. I have an empire of 6,000 acres and more, which I am starting to develop. By the time this letter reaches you, I expect to see the giant drill grinding rapidly toward the golden oil sands I am sure will be found there. The vision of Roanoke of tomorrow is before my eyes. I see the Roanoke of today, a sleepy little country village sitting squarely in the heart of the Roanoke Uplift, a geological discovery of my own. I can see the morrow bright with the prospect of tremendous fortunes created from a new oil discovery. I can see hundreds of wells plunging downward, racing for the vast wealth that oil alone can create. I can see homes, schools, churches, and happy homes—all as a result of my pioneering efforts."

If the General can see all this for \$1 (the price of the stock he will let us buy) what would he see for \$5? We begin to believe that prohibition is a failure.

In the circular which accompanies his confidential letter he takes another shot, and immediately begins to relate:

"I can see before my eyes the vision of tomorrow at Roanoke, the site of the giant structure which I have uncovered and on which I am centering my initial operations. I see in it fortunes made for hundreds and thousands; I see new raw wealth created by tapping the wonderful reservoirs of oil far down in the earth."

But golden visions in this case, says the illustrious Lee, have a scientific foundation. General Robert A. Lee is a geologist. He admits it. He says,

"First, I have gone as deeply into the scientific phases of oil geology as it is possible for me to go." (The italics are ours.)

"Second, I have never pronounced judgment on a location or field until I have given it the most thorough, searching examination that my geologic education and long practical experience make possible."

The italicised clauses have given us temporary pause in our haste to line up under the Lee banners. Can there be any guile in this? And then, again, "Act on this offer NOW. Delay may be fatal. It often is in the oil fields. Don't wait. Your fifty dollars in my Interests may be worth ten thousand dollars within a few weeks. No man knows what the value of General Lee Interests will be tomorrow—a month from today."

We pause again. Is there a treacherous smile concealed behind the sentence which we have italicised? Being Yankees, we expect an ambush.

But no. Listen:

"A Lee never broke faith. I am a Lee of the Virginia Lees. I would rather lead you and a thousand others to financial independence than to have won Fredericksburg or Chancellorsville."

The American flag and the Confederate flag in colors are entwined on the General's letterhead. It is like government protection—only better.

And in great letters over the whole page we read—

### THE SACRED PROMISE OF A GREAT GEOLOGIST

so that when we see at the bottom the caution "Use the application blank immediately," what is there that can stop us from coming in under the protection of the great leader—soldier, scientist, philanthropist?

## THE JOURNAL-PRESS STAFF

ARTHUR WATTS ALLEN

**A**TINY ISLAND in the Western Pacific afforded Arthur Watts Allen his first opportunity for purely scientific research. Born in England in 1879, when seventeen Allen had won a scholarship tenable at Cambridge University. He was graduated in 1902 with the B. A. degree. Allen had elected to take a general science course, and after graduation joined a relative, H. A. (now Sir Henry) Wickham, in New Guinea. Wickham held a grant of an atoll of islands from the British government on condition that development and research be conducted on the artificial propagation of sponge and pearl shell. This biological re-



ARTHUR WATTS ALLEN

search was done by Allen, who reported to the government and also contributed a paper on another phase of marine zoology to the *Transactions* of the Linnean Society, of London.

After interesting experiences in New Guinea and the islands, Allen went to Western Australia, where he joined his eldest brother, Robert, in a journey to the Australian Northwest. He assisted in the construction of a tailing re-treatment plant, taking charge as soon as this was in operation. At the conclusion of this work Allen went to the Westralia Mount Morgans mine as assayer, becoming metallurgist after a few months. In 1907, he left Australia, went to Mexico, and took charge of the sixty-stamp mill and cyanide plant of the Palmarejo & Mexican Goldfields, in Chihuahua. Here he devised a new method of operating a stationary-leaf vacuum filter; this he patented, a description being published in *Engineering and Mining Journal* of May 15, 1909. Followed professional work with the Rio Plata company at Guazapares, after which Allen was asked by an English company to report on mill and power-plant requirements for the cyanidation of a silver ore at San Julian, near Guadalupe y Calvo. This led to an engage-

ment as constructional metallurgical engineer. He was metallurgist to the Uruguay Consolidated Mines Co. and consulting metallurgist to the Uruguay Goldfields Co., Uruguay, South America, in 1910-1911. He went to Africa in 1912 for Lewis & Marks and became reduction-works manager at the Lonely Reef mine, in Rhodesia. In 1914 he compiled "Mill and Cyanide Handbook," and began preparing a third edition of Julian & Smart's "Cyaniding Gold and Silver Ores," recently published. At the outbreak of the Great War he volunteered for active service, but the offer was declined by the British War Office. Allen then went to Argentina as general manager of some silver mines. He left Argentina in 1916 and made an inspection of methods of recovering nitrate in Chile, with special reference to the handling of the slime in the caliche. He came to the United States in 1917, and in that year and 1918 carried out consulting work in New York, in the latter year joining the staff of *Engineering and Mining Journal* as Metallurgical Editor and filing "first papers" for American citizenship. In 1919 an opportunity arose to interest a New York syndicate in a new process for treating Chilean caliche which had been evolved by Allen since his visit to Chile in 1916, and in 1920 he accepted an appointment as engineer to the Penyon Syndicate, which had obtained an option on an immense deposit of nitrate grounds in Chile and had erected a pilot mill to demonstrate the feasibility of an exceedingly complicated process. After exhaustive trials this process was abandoned. At the conclusion of experimentation Allen was able to make a few tests to demonstrate his own process, and with promising results. Early in 1920 he was asked by the Du Pont Nitrate company to submit a report on the subject of the treatment of caliche, with particular reference to his process, and as a result was engaged to go to Chile to demonstrate his method on a commercial scale. The Du Pont oficina at Taltal is now converted to operate entirely by the new process. Allen wrote an account of the Shanks as well as his own process, which was published as "Recovery of Nitrate from Chilean Caliche," by Charles Griffin & Co., of London. He joined *Mining and Scientific Press* early in 1921 as Associate Editor. He has published, in addition to "Handbook of Ore Dressing," many contributions to the technical press and to society *Transactions*.

Allen's recent writing discloses a ripening of his earlier conclusions as to the great service to industry and to humanity of purely scientific research. In a widely copied paper he holds that: "Science needs and deserves encouragement, sympathy, and facilities. It must be allowed to work in freedom and without restraint. The provision of funds is not all that is necessary; for discovery is not an open book, to be read by the passer-by. It must be approached by men of keen analytical and dissective minds, men with experience, knowledge, perception, logic, and a capacity for unlimited perseverance. Three essentials are needed: the best men that can be found, ample resources, and patience as to results." The quotation, in its statement of the requisite characteristics of the research engineer, bodies forth the man himself.

Mr. Allen is now Associate Editor of the *Pacific Mining News* and Assistant Editor, *Engineering and Mining Journal-Press*. He is a member of the Institution of Mining and Metallurgy, the Mining and Metallurgical Society of America, and the Society of Chemical Industry. He lives, with his family, in Berkeley, Cal.

## Shortage of Miners in the West

BY T. A. RICKARD

**S**HORTAGE OF LABOR at the mines of the West is reported to be serious. It is felt more particularly by the big copper companies that resumed operations on a large scale recently. For example, Mr. D. C. Jackling states that at the four mines with which he is connected as managing director there is need of 600 men. The shortage is chiefly among miners, notably machine-drillers. Although these are paid 50 cents per shift more than are shovelers and trammers, there seems an unwillingness on the part of the men to act as drillers; they appear to prefer the less skilful task despite a differential of 50 cents in wages. They shy at labor that requires head-work. At Grass Valley the machine-drillers now are paid 75 cents per shift more than trammers and shovelers for the purpose of encouraging the men to become miners. Moreover, the oilfields are attracting workmen, because at the oil-wells the unskilled laborer usually receives \$4 per shift as against the \$3.50, or even \$3, paid at the metal mines. Undoubtedly some readjustment is needed. The difficulty, of course, is that in many districts the decrease in wages has proceeded rather more rapidly than the decrease in the cost of living. According to the statistics of the U. S. Department of Labor, the index price of commodities at wholesale is now 148, as against 155 in 1921, 243 in 1920, and 100 in 1913. The retail-food index is 139 now, as against 153 in 1921, 203 in 1920, and 100 in 1913. A decrease began in July 1920 and continued to July 1921, but the curve has flattened depressingly during the last twelve months. Thus the index figures recording changes in the cost of living show an increase of about 44% since 1913, whereas wages at the metal mines, on the average, are 50 to 75 cents per shift above the pre-War rate, that is, they are only 15 to 20% higher. For the purpose of assisting their employees during this trying period, many companies have established stores at the mines, where they sell food and other domestic staples at invoice cost plus 10%, which is a price considerably below that charged by the trades-people. This has helped, especially as trading at the company store is not made compulsory, as in former days, when this practice was the cause of friction between management and men. It is pleasant to note that matters of this kind are approached now by directors and managers with a humaneness rare ten or twenty years ago. It may become necessary to raise the wages of drillers in order to assure an adequate supply. Unfortunately the Unions insist upon every miner being paid full wages, even though he be a novice that is being taught how to use the drill. Superintendents naturally dislike paying full wages to men not yet competent. The unprogressive spirit of the leaders of organized labor injures to the disadvantage of their own people. One reason for the shortage in this department of mine-work is the restriction on immigration. Before the War the rate of immigration was a million persons per annum, in 1913 it was 1,197,892 and in 1914 it was 1,218,480. During the War the average inflow of population was 300,000, but the outflow was 150,000, so that the net gain was only half the immigration. In 1913 and 1914 the outflow was 308,190 and 303,338 respectively. Last year we received 355,000 immigrants only, because the Johnson law restricts the

proportion from any one country to 3% of the population of any foreign nationality in this country. Moreover, there has been a marked change in the tide of migration. Fifty years ago American mining was benefited by receiving the aid of the Cornish, hereditary miners, who settled in several mining districts in such numbers as to give them a distinct character, for example, Grass Valley in California, Gilpin county in Colorado, and Houghton in Michigan. Many Irish also joined the miner's ranks at about this time and in the decade following. Then, twenty years later, came an influx of Scandinavians, not so skilful as miners but sturdy workers and quick learners of the art of breaking rock underground; the Finns, notably, became prominent in the Lake Superior mines and in the Rocky Mountain region. In later years Southern Europe has given us the chief supplies of immigrant labor, notably Italy, from which we have drawn large numbers of the Piedmontese, a people experienced in mining and excellent hammer-men. Last year 3,000 more Italians left this country than came to it, one reason for their departure, it is said, being the prohibition against the making of wine. Just before the War and since, the sources of immigration have been the eastern lands of the Mediterranean, from which large numbers of Serbians and Montenegrins have come to the mines of the United States. It is a fact that the native-born American does not take to mining underground; he prefers to work in the mill or machine-shop. The English-speaking workmen form a decreasing proportion of miners, their places being taken by Mexicans, Spaniards, and Czech-Slovaks. These are clannish, as the English-speaking miners used to be in the days of their dominance, and when they are in a majority they drive away those who are 'foreigners' to them.

The shortage of drill-men, particularly of the better type of English-speaking miners, is a serious matter. One reason, as stated already, is the difficulty, under Union regulations, of teaching young men the technique of drilling and blasting rock underground. Some means must be devised for doing so. An attempt was made by Mr. Albert Burch, two or three years ago, to induce the gold-mining companies in California to establish night-schools for the training of the young employees, and thereby to attract the sons of farmers and ranchers to the mines, but the effort proved abortive. The mining industry is suffering today, in loss of efficiency in operations, because a lower type of alien is displacing the better type of alien and the native-born that used to wield the pick and hammer. It may be found advantageous to increase the differential in wages between miners and shovelers, but, it seems to me, that the establishment of some method, such as that advocated by Mr. Burch, for giving an elementary technical training in night-schools to the better type of young men, would be the more fruitful in the long run. It will be a great pity if, in the effort to obtain cheap labor, the operators of mines should do anything or allow anything permanently to degrade the miner's calling, for as surely as a calling or a profession loses character or becomes unattractive to men of intelligence and initiative, so surely will it lose caste and diminish in its usefulness to the community.

## DISCUSSION

### An Engineer's Patents

Alleged That Defects in Stanley Bill Will Result in  
Putting Poor and Independent Inventors  
Out of Business

**THE EDITOR:**

Sir—Your able and thoughtful editorial on "An Engineer's Patents" in your issue of July 29, shows a clear conception of the subject.

An inventor, on applying for a patent, has to take oath that he is the original and first inventor, and the literature of the world is ransacked to make sure that he is not getting anything he has not earned. After the patent is granted, it simply gives him the privilege to litigate, and, as you have indicated, the victory is usually on the side of those who can command the most capital and the ablest attorneys. Under these conditions the poor and independent inventor is quickly brought to a full realization that law and justice may not have even a speaking acquaintance when they come face to face in the courts. It should be said, however, that in recent years most of the larger companies have adopted a more liberal policy toward inventors than was the custom some years ago.

With all the troubles that the inventors already have, it is now proposed to put a working condition on patents, which, if enacted into law, will surely have the effect of putting all poor and independent inventors out of business. When this is done, the United States will cease to be an inventive nation, for nothing can be clearer than that major inventions are not as a rule worked out in expensive research laboratories and by men of independent means. Research may state the conditions of a problem, but only meditation—the intense concentration of thought upon an idea or theme with the object of thoroughly comprehending it—can ever solve the problem.

Great advancement in most lines of endeavor rarely comes from dominant orders, parties, or interests. No great reform in politics ever came through a dominant political party. The interests which control the telegraph did not invent the telephone, and the interests which control the telephone did not invent the wireless. Carrie Everson quite clearly stated the essentials of flotation in 1886 and tried very hard indeed to give it practical application, but it was fully fifteen years before further serious attention was paid to it, and then not in expensive research laboratories connected with the large mining companies, but by more or less independent investigators who proved the conditions of its practicability, and after that it was fully ten years before it received even scant recognition.

The farmers have a Department of Agriculture to look after their interests. The miners have a Geological Survey and a Bureau of Mines to work out metallurgical problems at the expense of the independent chemist and metallurgist. The inventors are given no help and little consideration, and now, through a working condi-

tion in the patent law, it is purposed to make it improbable for the average inventor to hold his rights, or to deliver a patent with a clear title.

Let there be no mistake or misunderstanding about this. There are now something like 600,000 unexpired and effective patents in the United States. Under the proposed working condition fully 400,000 of these would revert to the Government after the first two years under the proposed amendment, and it is likely to be more than less. If the invention is not worked in the United States after two years, it is difficult to see how an inventor can deliver a clear title to his patents.

According to the latest amendment of the Stanley bill, it provides that "two years after the issuance of any United States patent . . . if it is shown that the invention concerned by such patent is being worked in a substantial manner in a foreign country, and the owner thereof has failed to work it in the United States . . . then on the petition of any reputable citizen, corporation, or partnership, the court shall order a non-exclusive license be granted to the petitioner."

Clearly, no valid title to any patent can exist if the invention is not worked in the United States within two years. How is the inventor or any one else to know whether the invention is being worked in any part of the world outside of the United States?

Two questions have to be determined: what constitutes "substantial working" and the terms of license granted by the Government if the patent is forfeited.

Would "substantial working" be based on profit, or would it be based on the magnitude of operation? It would have to be one or the other, or both. A gram of radium produced per year by a patented process would be something of an undertaking: the amount produced would be small. It might be produced at a loss, and quite likely the first gram would be so produced. Would that be substantial working? Would the production of a gram of copper per year by patented process be "substantial working"? If not, when does the amount become substantial? It is quite certain that neither one gram, one pound, one ton, ten tons, or even 100 tons, per year, could be produced at a profit under ordinary conditions, by a newly patented process, and it is quite remote that it could be produced in those amounts at a profit by any process, new or old, patented or unpatented. When could an inventor be free from the danger of being forced into the courts and at great expense to defend himself against the confiscation of his patents?

In a daily paper, under date of July 24, is the following (also referred to in *Chemical and Metallurgical Engineering*, July 5, 1922, p. 27):

"According to a bill offered by Senator Ladd the holder of a patent, instead of receiving exclusive rights to manufacture a patented product, would have the right only when he manufactures. If he didn't, the patent would revert to the Government, which would turn it over to some one that really would manufacture and deliver to the public. Bring the patent laws up to date."



Quite so. But why single out the inventor, who already gets less for what he does than any class of intelligent workers? Why not apply the same prescription to mines that are not being worked; to buildings that are not occupied; to arable land that is not being cultivated; to machinery that is not operated; to city lots that are not improved? Why such rank class legislation? The world is looking for men with a broad vision in these times, and the remedy for existing evils can be found, but it cannot be found in ill-advised class legislation.

The litigation brought about by the proposed amendments would be interminable. It would be like the famous litigation in Colorado over a cow. A Denver prospector who wanted to spend the summer in the hills, turned his cow over to a dairyman with the understanding that the dairyman could have the milk for keeping the cow during his absence. During the prospector's absence the dairyman's herd was sold for debt, and with the herd went the prospector's cow. When the prospector returned, he sued to recover; that is to determine the ownership and the value of the cow. The litigation cost the litigants something like \$10,000, the case was in the courts twenty-two years, and all the original litigants were dead when the Supreme Court rendered its decision, and the cow had been dead ten years.

This Colorado cow case can find an easy parallel in the Minerals Separation litigation.

This is probably the kind of a mess working conditions and compulsory licenses would get the patent situation into, and it will be seen why it would practically mean the annihilation of the patent office. Rich men would not invent, and poor men could not. The one man who is interested in developing an invention is the patentee, and if the patentee and inventor is deprived of the fruits of his labor, no one will be sufficiently interested to develop an immature idea, and that is what almost all inventions are when patents are first applied for.

WILLIAM E. GREENAWALT.

Denver, Col.

### A Problem in Mine Ventilation

THE EDITOR:

Sir—In the July 8, 1922, issue of the *Journal-Press*, Mr. C. N. Schuette, in his article entitled "A Problem in Mine Ventilation," mentions the effect on the eyes of mine gases in which hydrogen sulphide and carbon dioxide are both present. He seems uncertain as to whether this effect is due solely to the presence of the hydrogen sulphide, or whether the carbon dioxide absorbed by the blood and the rarity of the air at an elevation of 10,000 ft. are contributory factors.

In 1916 and 1917, I was in charge of the development of a zinc and lead property near Picher, Okla. When our first shaft reached the ore horizon, considerable water was encountered, much of which gave off hydrogen sulphide. This was not uncommon in that district while the first shafts were being sunk. The characteristic odor of hydrogen sulphide could often be detected at some distance from the mines where much water was being pumped.

This gas had much the same effect on the eyes of the shaft-sinking crews as that described by Mr. Schuette. The eyelids became swollen and inflamed, and the eyes watered freely and smarted severely. In extreme cases, where the gas was unusually strong, a few hours' exposure in a shaft was sufficient to cause

temporary blindness on returning to daylight, and light was so painful to the eyes that it was difficult to induce a patient to open the lids for examination or treatment. The affliction was known locally around Picher as "pink-eye," and a treatment by Dr. Connell, the Eagle-Pitcher Lead Co.'s physician there, relieved much of the pain almost immediately.

Since carbon dioxide was not met in sinking the shafts around Picher, and since this district has an elevation of only a few hundred feet, it seems fairly certain that the eye trouble described by Mr. Schuette was due entirely to the hydrogen sulphide, for, of his three possible causes, this alone was found at Picher.

White Hills, Ariz.

W. C. HOGOBOOM.

### Troubles of Cementation in Screening Analysis

THE EDITOR:

Sir—A. W. Allen in his article, "Checking Assay Samples by Screening Analysis," in the *Journal-Press* of May 13, points out the difficulties in screening analysis caused by the cementation of fine particles after wet treatment. Thus he suggests to establish by wetting the heads, retained for comparison with the residue sample, the same cementation condition. For checking assay samples this may be accurate enough, but when it comes to the task of controlling crushing, screening, concentration and extraction devices it is absolutely necessary to know the true relations of the different pulp sizes. During our metallurgical researches we arrived at a very satisfactory method in this respect.

The accurately weighed sample is placed on a 150-mesh screen, partially immersed in a vessel of convenient diameter, containing clean water. The immersion is adjusted, the water just covering the pulp, by a gentle shaking of the screen for a definite amount of time, the —150 mesh separating from the coarser. Finally we wash the remainder on the screen with the wash-bottle until the water flows clean from the screen. The screen-content is then washed into a drying pan, dried, passed through the screens coarser than 150 mesh, the fractions weighed and analyzed. The pulp finer than 150 mesh, which is collected in the water vessel, is poured on a 220-mesh screen equally immersed in water, and the +200-mesh component separated from the —200-mesh component in the manner as described above. The two fractions are then dried, weighed and analyzed. By proceeding in this manner all fines are removed from the coarser product.

Taiyudong, Korea.

CHARLES FLURY.

### A Home-Made Electroscope

THE EDITOR:

Sir—In your issue for June 10 there is a description of a home-made electroscope for the use of prospectors. You left out a very important detail. The electroscope should be covered by a cage made of wire gauze and the whole covered with the glass tumbler. Another way is to cover the instrument with a small tin can with openings cut in the side. Pieces of celluloid may be used as windows.

The point is that the instrument you describe will have a very rapid natural leak and will not hold a charge long enough for satisfactory work. With the metallic screen it will hold a charge several hours except in the presence of a radioactive substance.

Stanley, Idaho.

JOHN B. PLATTS.

## Leaching Ore With Sulphur Dioxide

Experiments at the Nevada-Douglas Consolidated Copper Co.'s Mines Indicate Practicability of Extracting Copper by Means of Sulphur-Dioxide Gas — Description of Equipment Used—Detailed Data Showing Results of Tests

BY JOSEPH IRVING, JR.

**T**HE POSSIBILITY of the direct treatment of ore with sulphur dioxide has long attracted the attention of metallurgists, and a great deal of experimental work has been done. In some of the better-known processes, as applied to copper ore, a solution of sulphurous acid, formed by bringing sulphur dioxide gas in direct contact with water or solution, is used to dissolve the metal. The solution is then boiled to precipitate the copper and to release the excess sulphur dioxide for further use as a solvent. This article is intended to cover, however, only those processes in which the gas is brought into direct contact with the ore itself and in which the metal passes into solution as a sulphate.

Although a large amount of experimental work has been done with the process, I believe that it was first thoroughly investigated and that its commercial possibilities were first demonstrated at the property of the Nevada-Douglas Consolidated Copper Co., which had for a number of years been investigating possible processes for the treatment of its low-grade oxidized and sulphide copper ores. Exhaustive experiments had proved that the low-grade oxidized ores were not amenable to treatment by direct leaching with sulphuric acid, largely because of the quantity of acid-soluble substances present. Experimentation had also proved that the low-grade sulphide ores were too low grade for economical treatment by concentration. A leaching plant using Rankin nitric-acid leaching, was first erected, but the anticipated yield, unfortunately, did not materialize. Sulphur-dioxide leaching was then brought to the attention of the company by George C. Westby, one of the patentees of the original process for sulphur-dioxide leaching. Small-scale experiments gave encouraging results. Large-scale experiments, although confirming these, proved that the major difficulties lay in mechanical application and in the development of the necessary apparatus. It was at this time that I became connected with the company, first as mechanical engineer and later as construction engineer and mill superintendent, Mr. Westby continuing as metallurgist. It was due to co-operation on the part of the management that we were able to accomplish as much as we did in the limited time and with limited resources.

All work on the process up to that time had been done on ore, crushed dry to minus 48 mesh and mixed with water to form a pulp of approximately 80 per cent moisture. The sulphur dioxide was brought in contact with the pulp, the resulting copper solution being separated by decantation. As it was impracticable to crush dry all the ore to minus 48 mesh, we decided to investigate the possibility of applying the process to the treatment of ore crushed to minus 1 in., previously screened to remove fine material. An experimental thirty-ton vat was designed and erected. The charge was supported on a perforated bottom set about 3 ft. above the bottom of the vat. The sulphur dioxide was forced by a small fan into the bottom and allowed to

pass up through the ore. The leaching solution was sprayed on the surface and allowed to percolate downward through the ore, being drained to a sump. It was circulated continuously through the ore, by means of a pump, until the desired concentration in copper was reached, when it was discharged to the precipitating plant. Another fresh charge of water was then added to the sump and circulated. The first test gave satisfactory results. Other tests, in which the coarseness of the ore was varied, practically confirmed these.

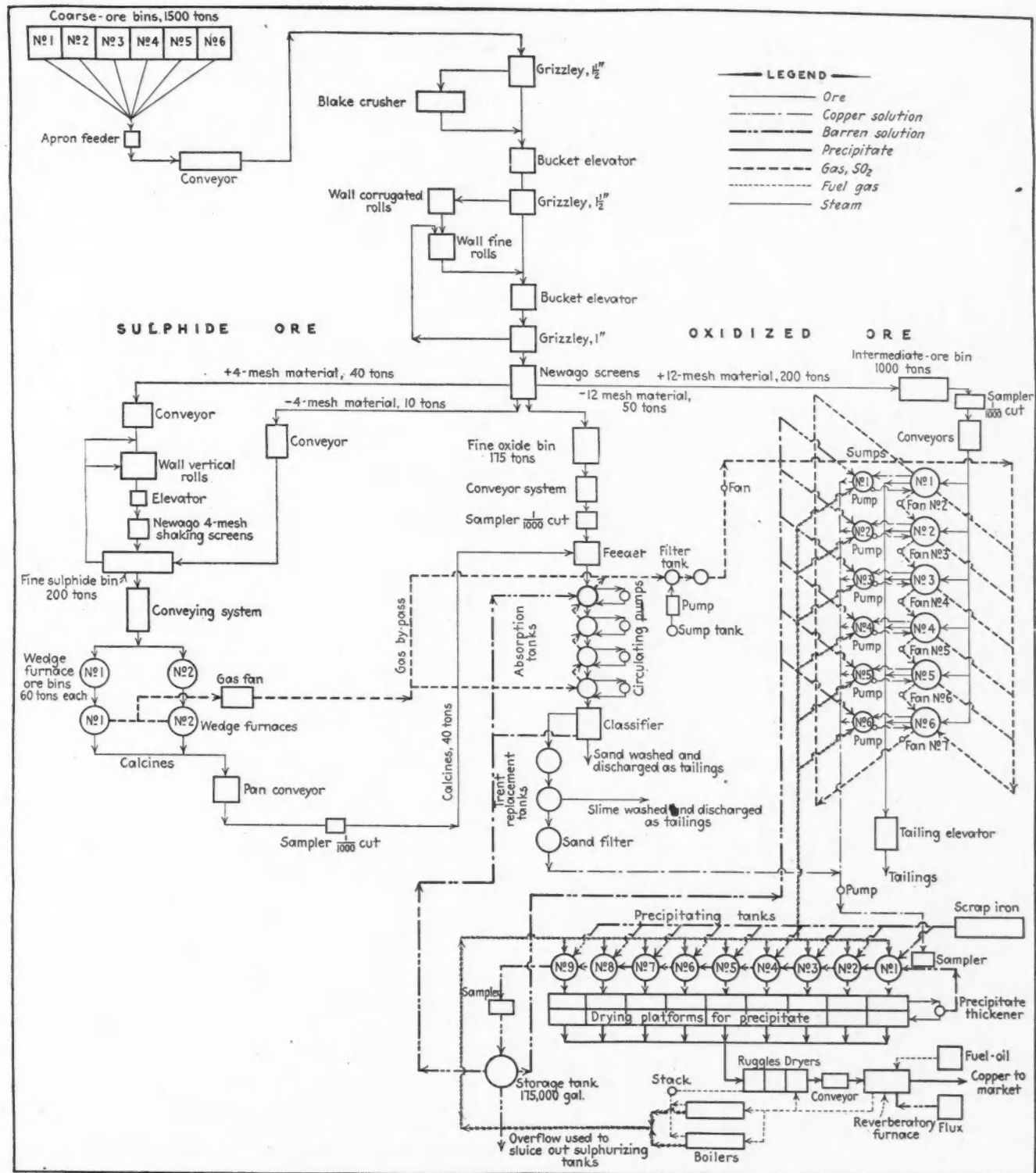
Concurrently, tests were being made to develop apparatus for the treatment of the fine material. Satisfactory results were obtained from a gas-tight vat in which the fine ore was treated in the form of a pulp. We had decided to roast the low-grade sulphide ore from the mine to obtain sulphur dioxide. As this ore contained a small amount of copper it was desirable to make it acid-soluble by roasting. We decided to leach the calcine from the roaster after mixing it with the minus 12-mesh oxidized ore.

### LEACHING PLANT DESIGNED

We now had sufficient data to design and construct the leaching plant, which was divided into five different departments—for crushing, fine-ore treatment, coarse-ore treatment, roasting, and precipitating. The crushing plant contained the usual equipment necessary to reduce mine-run ore to minus 1 in. and to separate the minus 12-mesh material from the coarse. The fine-ore leaching plant, or absorption-vat system, as we called it, consisted of four vats, 16 ft. diameter, by 22 ft. high, set upright in a row with a drop of 2 ft. between each. The vats, which had to be made gas-tight, were all of the same design. A distributor was placed inside the gas-tight top. Closely spaced slats about 12 ft. deep were placed below this. Below these a conical bottom served to collect the pulp as it fell through the slats to the outlet at the center of the bottom. The suction of a 1,000-gal. circulating pump was connected to the outlet; this discharged to the distributing top, which spread the pulp evenly over the slats. Arrangements were made so that any portion of pulp could be discharged from one vat into the vat following.

The dry ore was mixed with the required quantity of water and added to the first vat, passing through the four in series. The pulp was discharged from the last vat to a separator, where the sand was separated from the slime and washed. The slime passed to two Trent replacement vats, where it was separated from the solution and washed. The solution was pumped to the precipitating plant, the sand and slime being discharged as tailing.

The sulphur dioxide from the roasters was forced, "counter-current" to the pulp, through the four vats in series by means of a No. 10 Buffalo fan. The gas then passed to the coarse-ore treatment plant. This consisted of six leaching vats, 40 ft. in diameter by 20 ft. high, also built gas-tight. Each was equipped with a false tray bottom, set about 4 ft. above the bottom



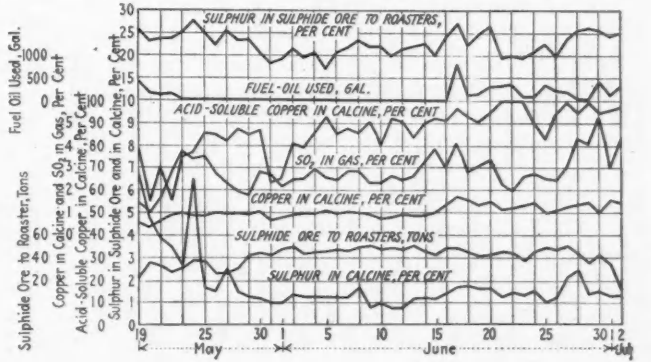
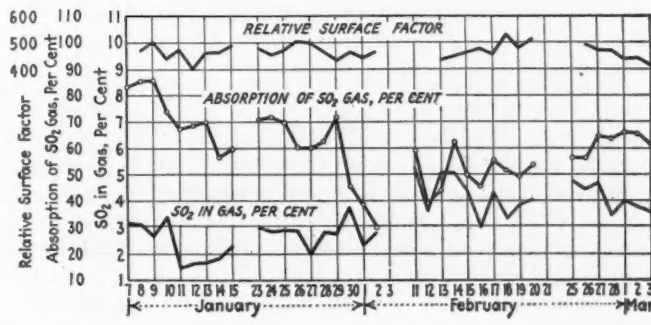
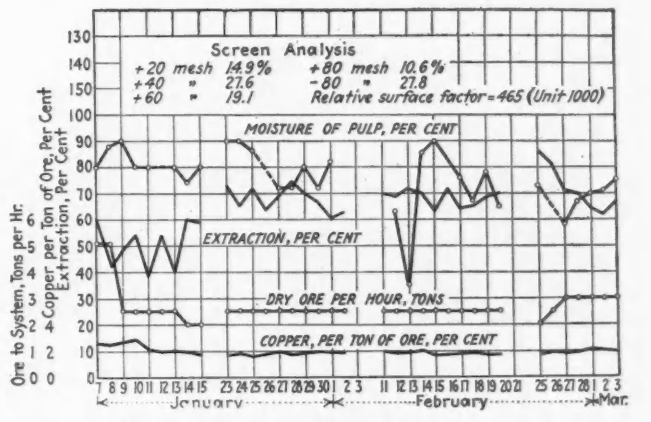
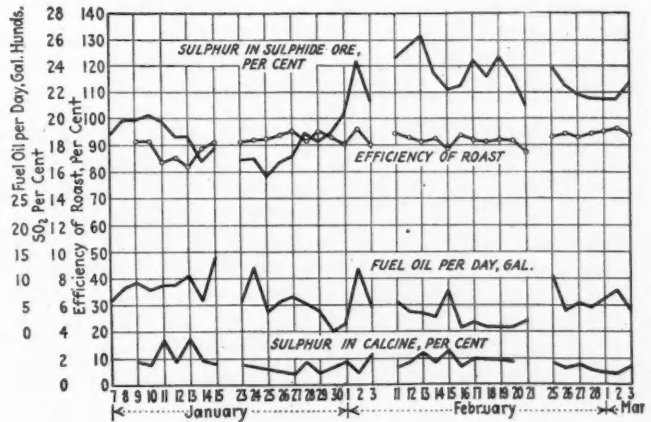
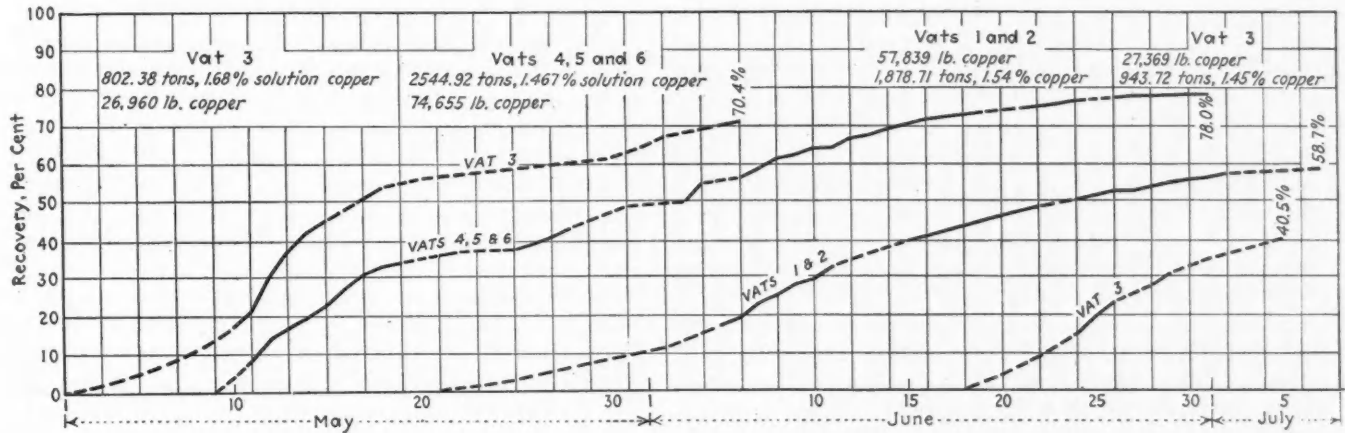
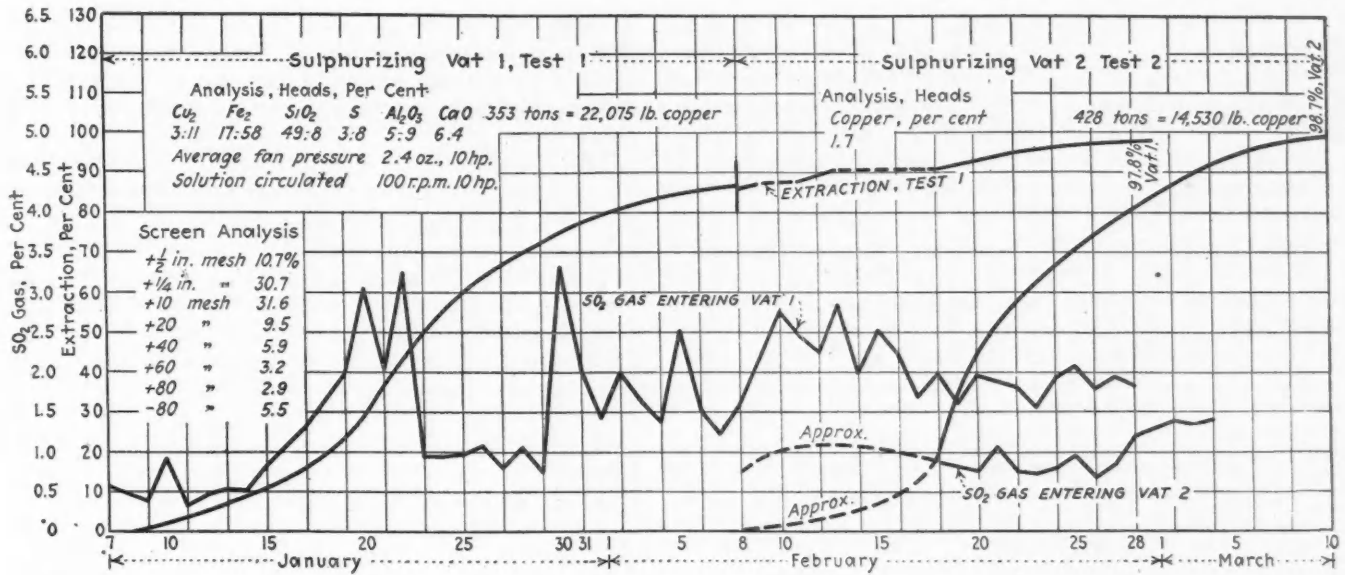
Flow sheet of Nevada-Douglas experimental plant

proper, on which the ore to be leached was placed. This false bottom was designed to allow the gas to pass upward freely into the ore and the leaching solution to percolate downward. Below each vat a sump, 20 ft. in diameter by 10 ft. high, was set. Connected to the bottom of this was a 300-gal. circulating pump, the solution being forced through six sprays set evenly around the top of the leaching vat, and thus delivered evenly over the ore. It percolated downward and was drained into the sump. Once a day the sump was discharged to the precipitating plant and refilled with water.

The ore was brought by conveyor from the coarse-ore bin and charged into the leaching vats through a number of small openings in the top. A small amount of hand labor was required to level off the charge. Each vat held 1,000 tons, the leached ore being removed by sluicing. The sulphur dioxide was forced through the vats in series. A No. 7 Sturtevant fan was connected to each, the gas being taken from the top of one vat and discharged into the bottom of the next. The gas from the last was discharged into the atmosphere.

The roasting plant consisted of two eight-hearth, muffle-type, Wedge roasters, each 18 ft. diameter. The





Graphs showing results of sulphur-dioxide leaching on ore from the Ludwig mine of the Nevada-Douglas company

of the copper was slow, taking from ten to thirty days, depending on the fineness of the ore. To counterbalance this, however, there were many advantageous operating conditions. It was a simple task to weigh and sample the charge. The only materials handled during treatment of the charge were the sulphur dioxide and the leaching solution, the handling of both being simple and inexpensive. The solution that drained from the sumps was clean and amenable to electrolysis or precipitation by scrap iron. The absorption of the gas was satisfactory, on some days reaching 100 per cent. The diffusion of the gas through the ore was apparently even, and the vats were discharged easily by sluicing. Costs for labor and repairs per ton of ore treated were low.

While the large plant was under construction and being operated, several interesting and instructive investigations were conducted, by members of the company's metallurgical department, on methods of applying the process to various ores and on the development of sundry types of apparatus.

The revolving drum, for the treatment of fine material in a pulp, although giving a fair extraction, was found to be over-sensitive in operation; it also gave trouble mechanically. The multiple-deck revolving-arm sulphatizing tower and the self-dumping shelf-type of sulphatizing tower were also designed for the treatment of fine material. These were unique in many ways and gave satisfactory results, but mechanical difficulties arose, which, although by no means insurmountable, were of such a nature that considerable time and effort were expended before the apparatus could be simplified sufficiently to be of economic value. Efforts were then confined to the treatment of different ores by the process; these included copper, silver, lead, silver-lead-zinc, and manganese ores. Although the results varied, they demonstrated that the process had possibilities in addition to the treatment of copper ores. Experiments conducted later by myself on the low-grade copper-gold-silver ores of the Tintic mining district of Utah gave varying though interesting results.

TABLE II—RESULTS OF TESTS ON ORE FROM TINTIC, UTAH

Heads			Tails			Extraction, Per Cent		Cu.	Au.	Ag.	Time, hr.	Average Temperature, Fahrenheit, Degrees	SO <sub>2</sub> , Per Cent
Cu, Per Cent	Au, Oz.	Ag, Oz.	Cu, Per Cent	Au, Oz.	Ag, Oz.								
1.56	0.06	4.9	0.98	0.06	3.9	37	20	48	0.42				
1.56	0.06	4.9	0.59	0.06	3.9	62	20	40	0.32				
1.56	0.06	4.9	1.1	0.05	4.1	30	17	16	3.6				
1.56	0.06	4.9	0.39	0.05	4.2	75	17	14	4.1				
1.3	0.07	4.6	0.58	0.06	4.6	55	14	2	3.3				
1.3	0.07	4.6	0.91	0.07	4.6	30	50	45	4.2				
1.3	0.07	4.6	0.65	0.032	2.5	50	50	45	4.2				

There is reason to believe that the process will eventually find a large field of application. It is not difficult to apply; the operating costs are low, and it does not require high metallurgical skill. It offers possibilities beyond the scope of the processes in use at the present time.

Sulphur dioxide is an active solvent; a low-grade gas is apparently as effective as a high-grade one, provided equal quantities of sulphur are used. The solvent can generally be procured easily and cheaply; and in some operations it can be obtained from the ore itself by preliminary roasting. A high absorption of the gas is obtained. The copper is brought into solution as a sulphate, thereby avoiding losses from premature precipitation. The solution is, at all times, under complete

control, and can be built up to any strength in copper that may be desired. Being saturated with sulphur dioxide, conditions are ideal for the recovery of contained copper by electrolysis or by precipitation with scrap iron.

The process is especially adaptable for the treatment of oxidized ores with a high acid-soluble content, and also for those that require preliminary roasting. It offers a cheap method and involves for the treatment of concentrate the construction of an inexpensive plant, consisting of roasting, leaching, and precipitating departments. The condition of the solution is such that high-grade copper could be obtained by electrolytic precipitation. Roasting would produce sufficient heat to generate a large proportion of the power required to precipitate the copper. The roasting also produces the solvent required. The total operating costs of such a plant would be low, and a finished product—electrolytic copper—would be produced.

### 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 fireclay. The sales of fireclay 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, a decrease of 55 per cent as compared with 1920.

### Most Permissible Explosives Sold of Ammonium Nitrate Class

Reports covering the year 1921, made to the U. S. Bureau of Mines by all manufacturers of permissible explosives, show that 93.5 per cent of such explosives sold during that year belong to the ammonium nitrate class. The total quantity of commercial ammonium nitrate used in permissible explosives in 1921 aggregated 25,381,500 lb. The total quantity of nitroglycerin and "modified" nitroglycerin used in permissible explosives aggregated 3,974,000 lb., for the manufacture of which approximately 1,766,000 lb. of glycerin was used. By "modified" nitroglycerin is meant the products obtained by the nitration of a mixture of glycerin and certain compounds.

## The Use of Telephones in Mines\*

Safety Regulations in Several States Provide for Their Compulsory Installation—Severe Conditions Imposed Require Special Construction of Devices—Reliable Transmission and Signaling, Prevention of Burn-outs, and Safety to Users Essential

BY D. E. A. CHARLTON

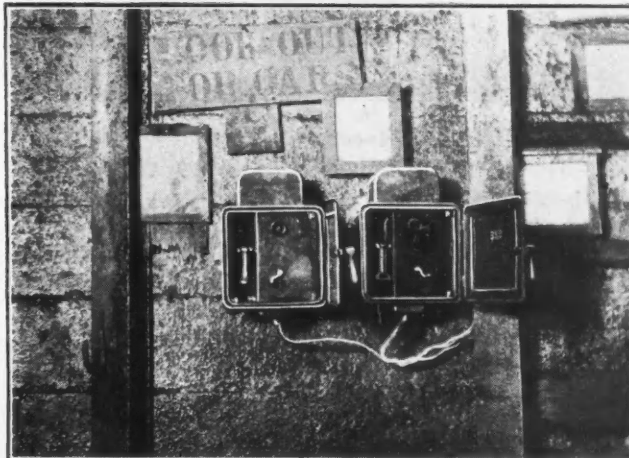
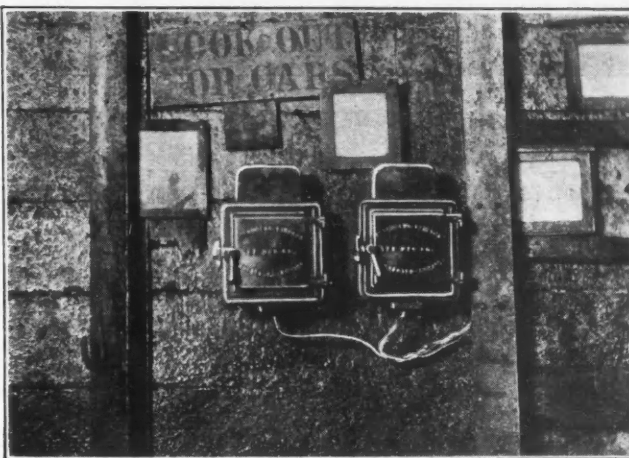
**T**O ENUMERATE the several uses of the telephone in mines would be to repeat what has already appeared in technical publications, safety-rule books, bulletins, and other literature. Not a shift passes but the usefulness of this invention is made manifest, and it hardly seems necessary in these days of so-called civilization and enlightenment that it is needful to enact laws that make the use of the telephone in mines compulsory. To paraphrase the slogan of the peddler who deals in household appurtenances, "No well-regulated mine should be without one."

In June, 1921, the U. S. Bureau of Mines issued<sup>1</sup> a compilation, prepared by L. C. Ilsley and R. A. Kearns, of state safety regulations pertaining to the use of telephones at mines. This shows that sixteen states have rules or enactments relating to telephones, and I understand<sup>2</sup> that there have been no new state regulations since then, although changes may take place at any time. It is of interest that the Federal Leasing Act of Feb. 25, 1920, has the following reference to mine telephones:

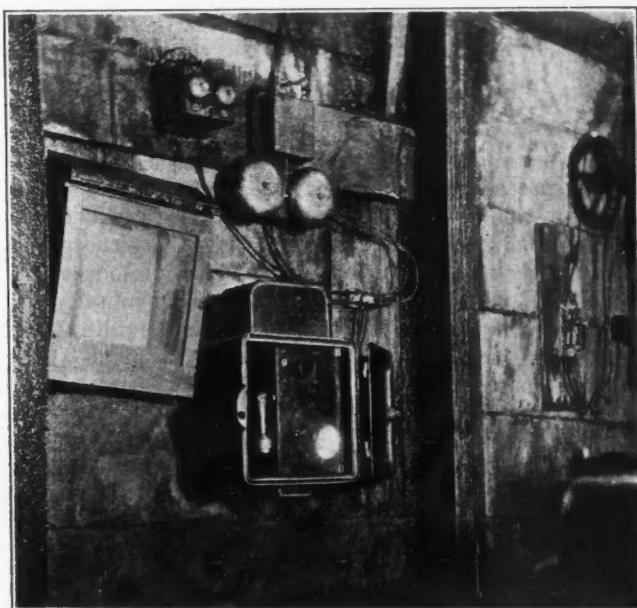
The lessee shall provide and maintain, in each mine where more than 100 men are employed underground on any shift, a telephone system between the hoisting-engine room, the ground landing of the shaft or slope, the principal mine exit of drift mines, the fan building when same is located 1,000 ft. or more from the power house or main exit of the mine, and such other points on the surface as may be advisable for safety of the employees. The telephone system shall also extend into the mine and telephones be placed on each shaft or slope landing in use and at the inside siding of each of the main haulage roads. The underground telephones shall be so placed that no twenty men shall be more

than 1,000 ft. from the nearest telephone station. Telephones shall also be placed in each refuge and first-aid chamber.

The following is a résumé of the various state regu-



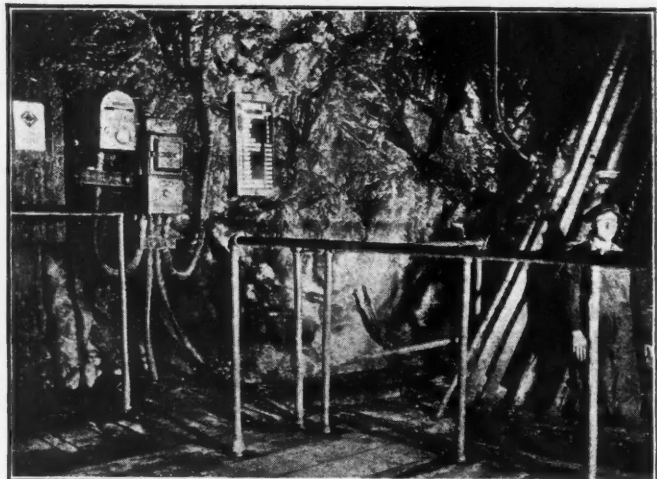
At a level station. Upper, telephone closed; lower, telephone open



Telephone in a pump room. Note the extra signal bell

\*A paper to be presented before the Mining Section of the National Safety Council, Detroit, Michigan, Aug. 28 to Sept. 1, 1922.  
<sup>1</sup>"Reports of Investigations," June, 1921, Serial No. 2,258.  
<sup>2</sup>Personal communication.

lations with regard to the use of telephones at mines: California rules provide that telephones be maintained in all mines over 500 ft. in depth. Colorado specifies the maintenance of an adequate telephone system in all mines, from the surface extending to the bottom of the shaft. Illinois, that there shall be a system of party-line telephones that shall include one telephone at the bottom of the hoisting shaft or in slope or drift mines at the first cross entry, and one at each inside parting. Iowa, in all mines where the workings exceed 3,000 ft. from the foot of the slope, shaft, or the mouth of the drift there shall be installed a telephone system, and this shall be extended as the works of the mine progress 3,000 ft. therefrom. Kentucky specifies that in any coal mine where more than fifty men are employed underground, one or more telephones shall be



*The hoisting engineer takes special orders  
Mine telephone installation in a coal entry*

*The mine clerk checks up with the shift boss  
Telephone installed at a shaft station*

installed communicating with the surface. In Kansas it is unlawful to operate or permit to be operated any coal mine not equipped with a party-line telephone system. The New Mexico law apparently exempts metal mines, for it is stated that it shall be the duty of the operator to install and maintain a telephone system in every coal mine. North Dakota also relates to coal, and specifies that in any coal mine where more than fifty men are employed underground, one or more telephones shall be installed. The Oklahoma laws provide that a telephone system shall be furnished in every coal mine where as many as fifteen men are working.

In the anthracite mines of Pennsylvania it is necessary to provide means of communication, by telegraph or telephone, between mines and collieries, and in the bituminous region of that state the law relates more specifically to communication between the surface and the bottom of the shaft or slope. Tennessee specifies the maintenance of a metal tube from top to bottom of shaft, or a telephone system. Texas also requires that a metal tube or telephone be maintained. The Utah laws provide that in all mines in which ten or more men are working more than 2,000 ft. from the entrance, or in which there are ten or more working places more than 2,000 ft. from the entrance, there shall be installed an underground telephone system. Washington specifies the maintenance of a telephone or metal tube from the top to the bottom of every shaft or slope, and at each alternate working level. Wyoming

specifies a system of party-line telephones in each coal mine in operation. In addition, several of the regulations of the various states contain clauses relating to the installation and maintenance of mine telephones.

#### SPECIAL CONSIDERATIONS GOVERN MINE TELEPHONE CONSTRUCTION

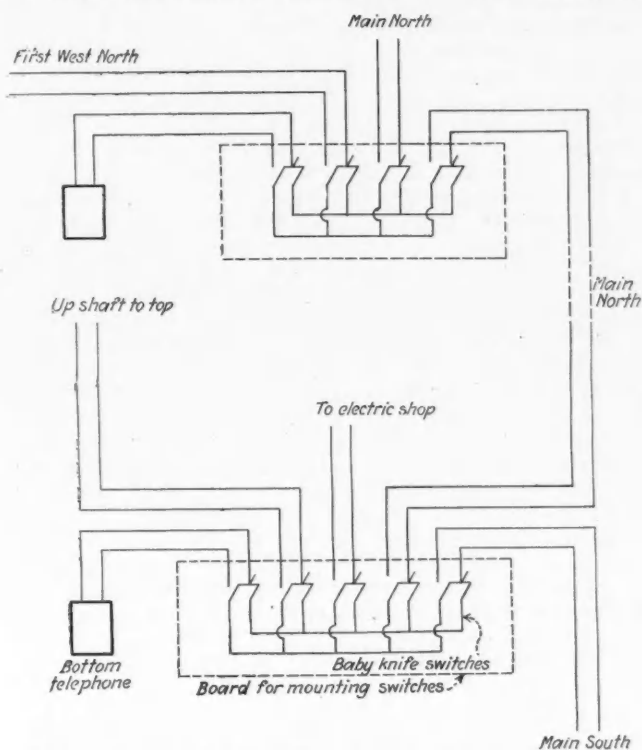
The severe conditions imposed on mine telephones make it necessary to supply a more rugged construction than that required for the ordinary installation. Underground, the device frequently must be exposed to moisture, gases, acid water, and mechanical sources of injury. Of these, the last, which include falls of ground, concussions of blasting, and rough handling, are the most frequent; moisture is probably the next. Gas and acid-water conditions are somewhat restricted to coal and copper mines.

The generally accepted types of mine telephones are housed in a moisture- and rust-proof iron or steel case, of sufficient thickness to provide ample protection from injury. The edges of the case are well rounded, so that water and falling objects will easily slide off, and strong mounting supports are provided to insure rigidity when the telephone is installed. An outer door on the case, provided with a rubber gasket, serves, when closed, completely to protect the mechanism from any disturbing elements. When this is opened, only the transmitter, receiver, receiver cord, and generator handle are exposed, as an inner door effectually conceals



and protects all of the delicate mechanism of the telephone. When considered necessary, locks or padlocks may be placed on the outer door and keys provided to the shift bosses or foremen. Binding posts for the line and ground wires are placed in a terminal box, which is either mounted on the underside of the case proper or included as a part of it. The bells, bell mounting, and clapper rod assembly are housed in a dome-shaped casting on the top of the case.

The talking apparatus of the mine telephone consists of a standard long-distance transmitter and receiver, slightly modified for underground service. In the design of these the manufacturers have considered carefully the hard usage to which the mechanism will be subject, and waterproof windings and special insulation are used throughout. The ordinary form of gravity-



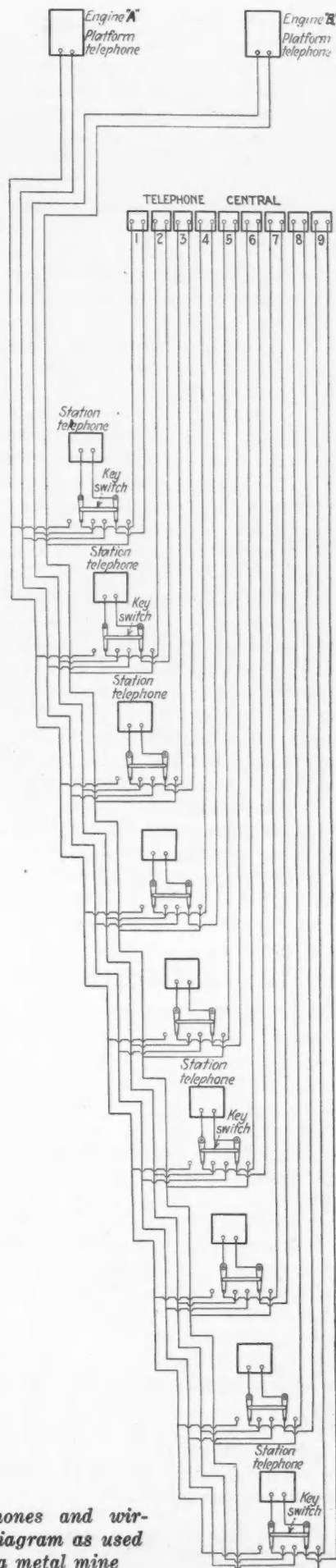
Arrangement of telephone switches in a coal mine

controlled hook switch is not sufficiently rugged for mine service, and one manufacturer, at least, has devised a positive spring-controlled hook switch in which the force of gravity is not employed. The receiver, instead of being suspended from a lever terminating in a fork-shaped yoke, normally rests between the jaws of a special receiver holder. When the receiver is taken out of the jaws a trigger depresses a small plunger which passes through the door and actuates the contact spring of the hook switch.

**ECONOMICAL IN CURRENT CONSUMPTION**

Mine telephones are usually supplied with ringers of 1,600 or 2,500 ohms resistance and five-bar hand generators. Under average service two standard dry cells will furnish talking current for a year or more, as the transmitter has a fairly high resistance and therefore a low current consumption.

Frequently it is desirable to supply extension bells which are loud-ringing, so that the telephone signals may be heard at some distance or above the noise in a particular place, such as the shaft station or pump room. In this event gongs of 6- to 8-in. diameter are



Telephones and wiring diagram as used at a metal mine

supplied, the ringer coils usually having the same resistance as those used in the telephones.

It is customary to protect mine telephones against lightning discharge and accidental crossing with high-tension lighting or power circuits, and for this purpose a protector, consisting of mountings equipped with fuses and carbon-block type open-space cut-outs, is used.

Several kinds of conductors may be used for telephone lines in mines, and a number of different types of brackets and insulators, which are in general use, are available. No one type of installation can be recommended under all conditions. The following kinds of conductors are in general use for wiring mine telephone systems:

*Surface:* Triple braid weatherproof copper or iron wire (No. 12 gage); bare copper or iron wire; bridle or drop wire for short runs.

*Underground:* Considerable diversity of practice exists as to sizes and types of wire used underground. One manufacturer recommends armored cable, Ferrin cable, or twisted pair drop wire (40 per cent para insulation). From a questionnaire which I sent out the replies varied a good deal, but in general Nos. 12, 14, and 16 copper wire, rubber covered and armored, also No. 12 iron wire, tinned, were specified. In some instances, the wires down the shaft are included with the signaling wires, the entire consisting of a single cable with individual strands for the two functions.

Where conduits were made use of,  $\frac{1}{2}$ -in. metallic carriers were specified.

Concerning the maintenance of the wiring for the mine telephones, not infrequently a great deal of trouble is experienced because of the breaking of the line by falls of roof and similar happenings. In the installation of wires, particularly in haulage drifts where trolley locomotives are used, it is essential that care be taken in the placing of wires so that there shall be no connection between the two circuits. Unless the telephone wire be well insulated, it is recommended that where it crosses over trolley wires a wooden or insulated conduit be provided.

#### VARIOUS METHODS OF ARRANGING CIRCUIT

The situation of mine telephones depends of course upon the extent of the operations. Not infrequently a group of mines will be connected from a central switchboard which will serve all important points above and below ground. In most installations, however, it is customary to maintain a single circuit at each mine, connecting the surface with the underground workings and signaling to the different stations by means of code rings. The following buildings will usually be included in such a circuit. For metal mines (surface): Office, engine room, boiler room, shops, change house, first-aid room, and top of shaft; (underground): shaft stations, pump stations, powder magazines, loading pockets, and transmitting levels. For coal mines (surface): Office, engine room, shops, tippie, top of shaft or slope, and first-aid room; (underground): shaft or slope bottom, pump stations, main partings and first-aid rooms.

The following general requirements have been specified in a tentative draft<sup>1</sup> prepared by the U. S. Bureau of Mines for establishing a list of permissible telephones for use in gaseous mines:

<sup>1</sup>Tentative Draft, Schedule 9A, Bureau of Mines, "Procedure for Establishing a List of Permissible Telephones for Use in Gaseous Mines; Character of Tests, etc."

The apparatus shall be so designed and constructed that under no circumstances can its normal operation cause ignition of surrounding explosive mine atmospheres. All parts of the apparatus shall be adequate for the service for which they are intended.

The construction of permissible apparatus shall be especially durable. This requirement shall be applied consistently to all the details of the apparatus under test in order that with proper care and maintenance the permissible qualities of the apparatus will remain unimpaired under the severe conditions imposed by mining service.

All terminals and contacts, and all wiring, shall be adequately protected, and all leads shall pass through the casings of the apparatus by means of adequately insulated devices of approved design.

All parts of the apparatus, such as the magneto, the hook switch, etc., which are capable during normal operation of igniting explosive gas and air mixtures, shall be placed in permissible compartments.

All openings in the casings of permissible compartments shall be tightly closed, and it is desirable that such openings shall be as few as possible. All joints in the casings of a permissible compartment shall be metal-to-metal, so designed as to form a path not less than 1 in. long from the inside of the casing to the atmosphere. All bolt holes in the casing shall be bottomed or so arranged that the accidental omission of a bolt will not give an opening through the casing. The compartment shall be provided with an adequate lock or seal to prevent tampering with the apparatus inside the casing.

Battery cells shall be placed in a permissible, or in a locked or sealed adequate compartment, and their terminals and the connections thereto shall be arranged so as to preclude the possibility of anyone meddling or tampering, or making electrical connection with them. The short-circuit current of the battery measured as close as possible to the terminals shall not exceed the following limits: For batteries giving 2.5 v. or less, 100 amp.; for batteries giving 2.5 v. but not more than 4 v., 85 amp.; for batteries giving more than 5 v. but not more than 6 v., 45 amp.

The manufacturer shall permanently attach to the case of the apparatus adequate instructions for the installation and connection of the telephone, so that the safety and efficiency of the apparatus and the system to which it is connected shall not be diminished by its installation. He shall also attach to the instrument an adequate wiring diagram of the apparatus.

Good transmission, which means correct wiring and proper installation and maintenance, combined with sensible usage, is essential to the success of any mine telephone system. In any consideration of the necessities in mine operation the telephone should occupy a high place, for without it today safety and efficiency would hardly be worthy of the name.

In the preparation of this paper I am indebted to L. C. Ilsley, electrical engineer of the U. S. Bureau of Mines; the Stromberg-Carlson Telephone Manufacturing Co., the Western Electric Co., and to the several safety engineers and superintendents who have given me specific information concerning telephone installations and various other details of practical operation at their mines.

#### Demand Further Tests With Liquid Oxygen Explosive

Such promising results have been obtained in the course of the experiments conducted by the Bureau of Mines in the use of liquid oxygen as an explosive that there is a widespread demand for further experimentation. The demand is coming largely from the building and city improvement industries where there is need for an explosive possessing the minimum handling hazard.

## The Marketing of Manganese

Industrial Conditions in the Steel Trade Govern Market for the Metal—Chemical and Physical Characteristics Important—Large Proportion of Supply Is Imported From Cheaply Mined Foreign Deposits

BY W. R. CRANE

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**M**ANGANESE is one of the more common of the metallic minerals, and has a wide distribution both geographically and geologically. It is claimed that fully 125 minerals have manganese as an essential constituent, and other minerals contain it in smaller and varying amounts. Manganese has the property of forming alloys with a large number of metals, and consequently has a wide application in the steel industry. The alloys formed are strong and tough.

Aside from being an important constituent of certain alloys, manganese is used in the manufacture of oxygen, chlorine, bromine, and disinfectants, as a decolorizer of glass, in calico printing and dyeing, coloring glass, pottery and brick, as a drier of paints and paint pigments, as a depolarizer in dry batteries, as a gas purifier, and in the manufacture of drugs and chemicals.

Practically all of the oxides and to a less extent the carbonate and silicate are used in the manufacture of alloys: ferromanganese, spiegeleisen, silico-manganese, and special alloys, as manganese bronze. The dioxide is used in the manufacture of dry batteries, paints and chemicals. Pyrolusite, manganese dioxide, contains more available oxygen than other oxide of manganese found in nature.

### METAL OCCURS IN COMBINED FORM

The principal minerals of manganese are oxides, carbonates, and silicates, the oxides being of the most importance. The oxides are: pyrolusite, psilomelane, braunite, hausmannite, and manganite. Rhodochrosite and rhodonite are the carbonate and silicate, respectively, of commercial importance.

Manganese is not found in the native form, as it oxidizes very readily. In practically all deposits there are evidences of its dissolution and redeposition; in fact, the waters of springs and wells in many localities carry manganese in sufficient amounts to cause deposits to form on the inside of the conducting pipes.

The common elements associated with manganese are: oxygen, arsenic, boron, sulphur, fluorine, phosphorus, tungsten, cobalt, iron and silicon. Manganese minerals are found in superficial clay deposits, as impregnations in beds and irregular masses, and in metalliferous veins at considerable depth from the surface.

Although manganese is known to occur in practically all parts of the world, the principal producing countries are Russia, India, Brazil, Cuba, South Africa, the United States, Mexico, Japan, and China. Many other countries give promise of being large producers, but the resources are mainly unproved.

The principal mines in Russia are situated at Tchiaturi, about 125 miles from the Black Sea ports of Batum and Poti. The ore from the principal Indian mines is shipped from Bombay and Calcutta. Manganese from the states of Minas Geraes, Matto Grosso, and other points are accessible to the ports of Bahia and Rio de

Janeiro, Brazil. Ore from the various districts in Cuba reaches the coast at Cardenas and Santiago de Cuba. Mexican manganese enters the United States through El Paso, Tex. Ore from Chile, South America, is shipped from Coquimbo and Carrizal.

Ports of entry for ores imported into the United States are: New York, Philadelphia, Baltimore, San Francisco, and Seattle. Inland points of consumption are: Bessemer, Ala.; South Chicago, Ill.; Sparrow Point, Md.; and Kittanning, Lebanon, Dunbar, Newport, Sheridan, and Pittsburgh, Pa.

Manganese ores may be classed as merchantable and marketable. An ore may be merchantable, but unless it can be sold it is not marketable. Improvement in methods of preparation may effect the classification. A further classification of ores may be given as follows:

Ore averaging 45 per cent or over is manganese ore.

Ore containing 35 to 45 per cent manganese is ferruginous ore.

Ore containing 5 to 35 per cent manganese is manganeseiferous iron ore.

Ore with less than 5 per cent manganese is not considered.

The character of the ore determines the purpose for which it is used. For instance, an ore suitable for chemical purposes may be of little value to the metallurgist. Chemical ore should be high in oxygen and may contain considerable phosphorus and silica, and be low in lime; ore high in lime and low in oxygen, phosphorus, and silica is classed as "metallurgical" or "furnace," and, to be able to produce 80 per cent ferromanganese, the iron content must not be too high.

### PHYSICAL AS WELL AS CHEMICAL CHARACTERISTICS ARE IMPORTANT

The grade of ore usually specified in contracts is 50 per cent metallic manganese dried at 212 deg. F. For metallurgical purposes the physical characteristics of the ore are of much importance. Fine and soft ores are particularly objectionable in blast-furnace practice, hard ore in medium-size lumps being desired, that the weight of the charge may be sustained without breakage. Soft and fine ores both impede the blast and cause loss as flue dust.

Indian, Brazilian, and Caucasian ores differ in shipping qualities; the two former can be handled without much breakage, while the Caucasian ore is rather friable.

Specifications for foreign ores are usually given "as of usual grade," meaning that the grade should not be below 45 or 50 per cent metallic manganese, as the custom and practice indicate. In England and Germany the common basis for the sale of ore is 50 per cent manganese at so much per unit, with a small bonus or penalty for each unit above or below standard, a maximum of 8 or 9 per cent silica and 0.20 or 0.15 per cent phosphorus being agreed upon.

Specifications for domestic ores are much more strict, owing to the variable character of ores shipped. During periods of unusual demand, as during the World War, all domestic ores were bought on a schedule or sliding scale of prices, which was based on the unit of metallic manganese contained per ton, with penalties for silica and phosphorus above a fixed limit. Prices are usually based on 8 per cent silica and 0.2 per cent phosphorus. Premiums were also paid for ores containing less silica and phosphorus than the limit for penalties.

#### PRICES CALCULATED ON METALLIC MANGANESE BASIS

During periods of normal demand the specifications usually call for a fixed price per long-ton unit, for a certain range in percentage of metallic manganese, with penalties stated; points of delivery, South Chicago, and Pittsburgh, Pa., or other. Under similar conditions foreign ores are quoted, for example, as: Brazilian, 60 to 65c.; Indian, 65 to 70c. a unit; c.i.f. Atlantic ports; 45 to 50 per cent.

It was at one time customary to credit high-grade manganese ore with the iron units contained, but that custom terminated with the war.

Schedules and penalties on ores are for the purpose of protecting the consumers against loss resulting from variations in grade of ore, as well as supply and demand.

For chemical purposes the most important consideration is the amount of available oxygen contained in the mineral, which for the more common forms is as follows<sup>2</sup>:

Mineral	MnO <sub>2</sub> Per cent	Available O, Per cent
Pyrolusite.....	100.00	18.39
Psilomelane.....	42.46-77.33	7.81-13.06
Manganite.....	49.44	9.09
Braunite.....	43.99	6.99
Rhodochrosite.....	None	None

Specifications for dioxide or "chemical" ore were formerly 80 to 90 per cent manganese dioxide, but much ore has been used running as low as 70 per cent. Iron should be under 2 per cent; copper not to exceed 0.02 per cent, and cobalt, nickel, and arsenic should not be present in appreciable quantities.

The four standard forms of manganese alloys, with essential constituents in per cents, follow<sup>3</sup>:

	Mn	Fe	Si	C
Ferromanganese.....	50-80	40-8	0.5-1.5	5-7.00
Spiegeleisen.....	10-35	85-60	About 1.0	4-5.00
Silico-manganese.....	55-70	20-5	About 25.0	0-0.35
Silico-spiegel.....	20-50	67-43	4-10.0	1.5-3.50

In 1918 the grades of standard ferromanganese and spiegeleisen were lowered to 70 and 16 per cent respectively, which was done to render available a larger tonnage of domestic ores suitable for making 70 but not 80 per cent alloy. The rejection limits for silica and phosphorus were also extended.

The objects in the use of ferromanganese instead of ore in the manufacture of steel are:

1. Ferromanganese permits the metal to be introduced into the molten metal in a condensed form with a minimum amount of impurities, and, being less in weight, is readily handled, thus rendering pre-heating unnecessary.

<sup>1</sup>"Review of the Manganese Situation," by C. M. Weld, "War Minerals Investigations," U. S. Bureau of Mines, No. 7, p. 4.

<sup>2</sup>"Review of the Manganese Situation," by C. M. Weld, "War Minerals Investigations Series," U. S. Bureau of Mines, No. 7, p. 2. Also, "Manganiferous Iron Ores of the Cuyuna District, Minnesota," by Edmund Newton, University of Minnesota, Bulletin 6, 1918.

2. It is brittle and consequently easily prepared.

3. It is possible to keep down the carbon content when low-carbon steel is made, the ratio of manganese to carbon being about 12 to 1. Further carbon may be added, if desired, by the use of pig iron, coke, or coal.

The principal objections to the use of spiegeleisen and grades intermediate between it and ferromanganese in the making of steel are that in texture it is similar to pig iron and does not break up readily; further, it is likely to have considerable sand adhering to it, the resulting product being a steel-iron rather than straight steel.

#### ORE SHIPPED IN BULK

Domestic manganese ore for metallurgical purposes is shipped by the carload lot, minimum thirty tons, but imported ores, except certain ores from Mexico, are contracted for by the cargo of several thousand tons. The domestic ores are delivered f.o.b. furnace; the foreign ore is sampled at port of delivery and shipped by rail to the furnace. Payment on foreign ore is c.i.f., Atlantic or Pacific seaboard.

Manganese ore is loaded in bulk into the holds of ships and occupies a space of about 20 cu.ft. per ton. It has, therefore, an advantage over other freight that must of necessity be shipped in containers, in that there is no waste space, the ore forming a most excellent ballast.

Chemical or battery ore is sold by the gross ton; the granulated or powdered form is sold by the pound. Owing to the softness of this ore it is customary to pack in containers, as sacks or barrels, the price being increased by the amount of the packing and extra handling required.

Sampling of shipments by car or cargo lots is done by the buyer at the point of delivery, usually by taking samples from the surface of the lot or from the face of the exposed bank of ore as it is removed by shoveling or otherwise. Various more or less elaborate systems of sampling are followed in a general way, but the tendency is to revert to simple methods, which, if carefully followed, give satisfactory results. It is noteworthy that higher assay returns are obtained in the United States than abroad, due probably to the method of sampling generally employed—i.e., to taking a smaller proportion of small-size ore.

#### ORES ANALYZED AND STOCKED

Considerable care must, however, be taken in sampling, particularly in surface work, because, owing to difficulties peculiar to loading, some cars are surfaced with high-grade lump, and others with nothing but fines.

The practice at certain furnaces is to analyze all ores received, then stock them irrespective of locality where produced, which procedure gives a rough classification as follows:

1. A. 45-53 per cent Mn.; low in silica and iron.
2. B. 40-45 per cent Mn.; high in silica.
3. C. 35-45 per cent Mn.; high in iron.

Grade of ore is determined by wet assay or chemical analysis, based on material dried to 212 deg. F. The value of the ore having been calculated from analysis based on the contract schedule of prices, penalties and premiums are adjusted and settlement is made accordingly.

Terms of payment vary considerably, but it is cus-

tomary for the purchaser to advance 70 to 80 per cent of estimated value of shipment based on actual railroad scale weights, and a certificate of analysis by an approved chemist, which is attached to railroad bill of lading. The balance due is payable on receipt of ore by purchaser.

The unit price is based on 100 per cent or 100 parts. In a long or gross ton there are 2,240 lb., and there would then be 22.40 lb. to the unit. If the schedule calls for a price of \$1 per unit, and the analysis shows 35 per cent manganese, the value of the ore would be \$35 per ton. Premiums would be added to this or penalties deducted from it. If, however, the ore was sold by the pound and the price was the same per unit, the price per pound would be 4.42c., or 100 divided by 22.40.

#### STEEL PRODUCTION INFLUENCES MARKET

The market and price of manganese ores in the countries of greatest consumption are governed to a large extent by the use of steel products, and vary accordingly. India, Brazil, and Russia will for some time be the principal sources of supply of manganese ore for the steel-producing countries, the United States, Great Britain, Germany, France, and others. It naturally follows, therefore, that the price paid per unit for the metallic manganese in the ore is approximately the same for each country. The volume of the shipments and the direction taken are the controlling factors in the final cost to the consumer, whether at American or European ports.

The cost of placing manganese ores on the United States market is undoubtedly somewhat higher than for the European markets, but the higher assay return secured in this country tends to compensate for the higher costs.

Prior to the war the manganese production of the United States was less than 1 per cent of its requirements. During the war, and largely through lack of adequate shipping facilities, the domestic ores were drawn upon and to a large extent supplied the needs of the country. This fact is used as an argument for the continued use of domestic ores, but high cost of production, lower grade of ore in comparison with foreign ore, and the uncertainty of a sufficient supply have practically reduced the domestic manganese industry to its former condition.

#### FOREIGN DEPOSITS CHEAPLY MINED

Those countries possessing the largest deposits of high-grade manganese ore also have an abundant supply of cheap labor, which, coupled with ease of mining, gives them an almost insurmountable advantage over the domestic producer in the United States. In short, the life of the domestic industry depends upon the ability of the miner to produce the grade of ore desired cheaply and the ability of the steel works to use the ores produced. It may be assumed that the consumer does not know what constitutes the best ore for his particular use, but the fact remains that he will not buy what he does not want. The producer, then, whether he be domestic or the agent of a foreign company, must meet severe competition in volume, grade, and cheapness of ore produced by the favored manganese-producing countries, but, as ocean freight rates are lower than the railroad rates of the United States, the foreign producer has an added advantage in that particular also.

Further, competition between the three great producing countries automatically holds the price per unit at approximately the same level, with no country having the decided advantage.

With no tariff on manganese ore, foreign ores can compete with domestic ores; however, the freight rates restrict the use of foreign ores to the Atlantic and Pacific seaboards, but as the points of consumption of manganese depend upon the cost of collecting the ores and marketing the product, it is evident that manganese ore will continue to be sent to the big steel-manufacturing centers tributary to the seaboards.

In the marketing of domestic ores the producer is usually his own agent, whereas foreign ores are purchased through agents or corporations who guarantee amount, grade, and physical condition of shipments received. So well are the requirements of the consumer known, and so great is the risk of loss through failure to meet specifications, that practically no shipments are rejected, which conditions are at such variance with troubles experienced with small shipments of domestic ores that the preference for foreign ores may be readily understood.

#### MANUFACTURE OF FERROMANGANESE REQUIRES CHEAP POWER

Prior to 1914 there was only one producer of ferromanganese in the United States, and the production was less than one-half of the requirements; during 1914 only 54 per cent of the total requirements of 183,728 tons was made. In 1917, the total amount available, including production and imports, increased to 331,381 tons, 86 per cent, or 286,000 tons, being manufactured in the United States. In 1918, the home production increased to approximately 90 per cent<sup>3</sup>.

Ferromanganese is made principally in England, Germany, Sweden, Japan, India, and Canada. A tendency has been noted during recent years for the production of ferromanganese to shift to those localities where hydro-electric power is available for the operation of electric furnaces. With the more extended application of cheap electric power there would be a greater demand for domestic ores, particularly the high-silica manganese ores of the West, which could be used for the manufacture of silico-manganese, provided a satisfactory market could be created for such product.

The ferro-alloy plants in the United States are not advantageously situated with respect to assembling raw materials and selling products, nor can the water-power sites be developed as cheaply as in certain other countries, as Canada, Norway and Sweden, and France. It is claimed that the cost abroad ranges from \$7 to \$15 per horsepower, compared with \$15 to \$30 in the United States<sup>4</sup>.

As a rule the price of ferromanganese depends upon its origin, English metal often selling at \$5 to \$10 lower than the American product, while the German metal is usually held at a slightly lower price than the English.

The price of domestic, Russian, Indian, and Brazilian ores is based on the content of metallic manganese, phosphorus and silica, while the price of Japanese, Spanish, and German ores is commonly calculated on

<sup>3</sup>"Development of the Ferromanganese Industry in the United States," by Theodore Swann. *Chemical and Metallurgical Engineering*, Nov. 1, 1918.

<sup>4</sup>*Trans. A. I. M. E.*, Bulletin 104, p. 1712.

the contents of manganese dioxide. The price of both ferromanganese and spiegeleisen is also based on the content of metallic manganese.

The price of manganese ore, ferromanganese and spiegeleisen, in dollars per long ton for a period of years, from 1911 to 1921, is given in the following table:

Year	Ore, 35 Per Cent	Ferromanganese (a), 80 Per Cent	Spiegeleisen (d) 20 Per Cent
1911.....	10.00	37.25	.....
1912.....	10.20	50.40	.....
1913.....	10.40	57.70	28.28
1914.....	10.39	53.58	24.75
1915.....	11.67	99.66	27.12
1916.....	27.00	161.37	48.33
1917 (a).....	28.00	297.29	73.54
1918.....	29.10	250.00	70.58
1919 (b).....	27.00 (c)	118.00	38.00
1920.....	30.00 (c)	.....	.....
1921.....	15.00 (c)	77.00	.....

(a) Schedules of prices were followed from 1913 to 1917 and varied with locality and demand. About the end of 1917 the demand became greater and schedules were not followed so closely. In May, 1918, a fixed schedule was adopted, with a lower limit in grade of ore set at 35 per cent. In November, 1918, the market collapsed, and few purchases were made for a number of months.  
 (b) The variation in price of ore and alloys from 1919 up to the present time has been marked and averages are not altogether satisfactory.  
 (c) As per cent grade.  
 (d) Figures taken from "Prices of Ferroalloys, Non-ferrous and Rare Metals," War Industries Board Bulletin No. 34, pp. 88 to 89, except for years 1911, 1912, 1919, 1920 and 1921.

The price of dioxide or chemical ore depends upon its value in available peroxide, schedule of prices being based on so much per gross ton of MnO<sub>2</sub>. Although grades ranging from 85 to 90 per cent are preferred, considerable tonnages of 70 to 75 per cent and 65 to 70 per cent are used.

Prices prior to the war ranged from \$20 to \$35 per ton; during the war \$80 to \$125 was paid per ton. Since 1918 dioxide ore has ranged in price from \$50 to \$85 per gross ton.

PHYSICAL PROPERTIES IMPORTANT IN CHEMICAL GRADES

The variations in price of the dioxide or chemical ore depend more upon the ease with which it can be decomposed, freeing the oxygen, than upon the manganese content. The physical properties of the ore, and the absence of iron, lime, or other substances, are therefore prime requirements of ore used in the manufacture of chemicals, dry batteries, and glass.

Prior to the war the manganese ore from the various producing countries sold for the following prices in England<sup>2</sup>:

	Pre-War Prices, Pence
Indian ore.....	11 to 11½
Georgian (Caucasian).....	9 to 9½
Brazilian.....	6½ to 7

Imports of manganese ore in the United States in gross tons from 1913 to 1921 were as follows<sup>3</sup>:

Year	Total	Average per Month	Year	Total	Average per Month
1921.....	401,354	33,446	1917.....	629,972	52,498
1920.....	606,937	50,578	1916.....	576,324	48,027
1919.....	332,344	27,779	1915.....	320,784	26,732
1918.....	491,303	40,942	1913.....	345,084	28,858

It is evident from the above that the factors controlling the price of manganese are chemical composition, physical properties and geographical position; however, the best standard with which to judge an ore is the applicability to the purpose for which it is to be used—for a metallurgical ore it is the manufacture of 80 per cent ferromanganese; for a chemical ore the amount of available oxygen present and the readiness with which it is freed. High prices may result from variations in production, imports, consumption, and shortage in supply.

<sup>2</sup>South Australian Mining Review, No. 31, 1919, p. 88.  
<sup>3</sup>The Iron Age, June 15, 1922, p. 1658

Ferromanganese and spiegeleisen output of the United States, in gross tons, 1913-1921, was as follows<sup>4</sup>:

Year	Ferromanganese	Spiegeleisen	Total	Average per Month
1921.....	98,439	56,139	154,578	12,881
1920.....	282,681	103,448	386,129	32,177
1919.....	179,029	65,391	244,470	20,732
1918.....	345,306	249,002	594,308	49,525
1913.....	119,495	126,081	245,576	20,464

Production, exports and imports, also available supplies in gross tons, 1910-1921, were as follows:

Year	Output	Imports	Average per Month Exports	Available Supplies
1921.....	8,203	755	57	8,901
1920.....	23,557	4,941	288	28,210
1919.....	14,923	2,752	225	17,420
1918.....	28,775	2,264	298	30,741
1917.....	21,486	3,703	(a) 776	25,413
1916.....	17,365	7,577	.....	.....
1915.....	12,021	4,605	.....	.....
1913.....	9,958	10,672	.....	.....
1911.....	6,207	6,688	.....	12,895
1910-14	.....	.....	.....	.....
Five-year average per month..	8,280	8,399	.....	.....
(a) First half only.	.....	.....	.....	.....

It is estimated that the available supplies of ferromanganese for 1922 will be 187,350 tons; normal consumption is close to 250,000 tons. However, the demand may reach 266,800 tons of ferromanganese, based on a 3,000,000-ton steel output per month. It is evident, therefore, that an increase of imports may be necessary.

It has been variously intimated that the consumption of manganese ore for all uses other than metallurgical is between 30,000 to 50,000 tons per year; the present world demand for ore for dry batteries alone is placed at 20,000 tons per annum.<sup>5</sup> As there is no reliable information available upon which to base an estimate, it is impossible to state which estimate is the more nearly correct.

The United States is largely dependent upon foreign sources of supply both of ore and ferromanganese, although the larger high-grade deposits of the South and West are producing an ever increasing amount of ores suitable for metallurgical and chemical purposes. For such deposits the prospect is fair for a steadily increasing demand.

Pyritic Furnaces Made Too Much Slag

It is not often that a metallurgist or other scientist is confronted with a difficulty caused by his processes or inventions proving too successful, but an experience of this kind is said to have occurred with the late Robert Sticht. When asked whether he had any initial trouble in smelting the Mount Lyell copper sulphide ores pyritically, the noted scientist smiled and replied "No; why should I? The only trouble that occurred was through overlooking a small detail. Otherwise everything went with the utmost smoothness." The small detail was that the pyritic action was so strong in the furnace—so much iron was oxidized—that more slag was made than there was provision for handling.

Maps of Northern Manitoba Being Prepared

The Canadian Geological Survey is preparing a complete geological map of northern Manitoba, which will be issued as soon as the geologists now securing data in the district have supplied the material. In addition to one large general map, maps on a small scale will be provided and also a series of prospector's maps covering the Keewatin areas.

<sup>4</sup>The Iron Age, June 15, 1922, p. 1658.  
<sup>5</sup>The Iron Age, June 15, 1922, p. 1658.  
<sup>6</sup>South Australian Mining Review, No. 31, 1919, p. 87.

## Recovering Silver From Movie Laboratory Waste

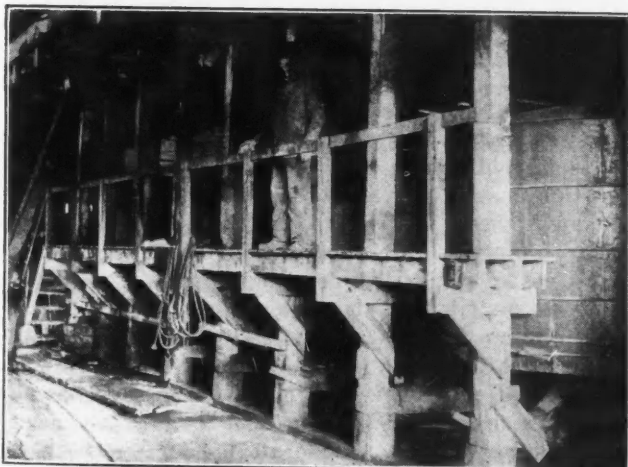
Much of the Precious Metal That Goes Into the Film Industry Is Not Lost, Over 10,000 Oz. a Month Being Recovered Around Los Angeles Alone—Treatment of Spent "Hypo" Baths Is Simple

BY CHARLES ALMA BYERS

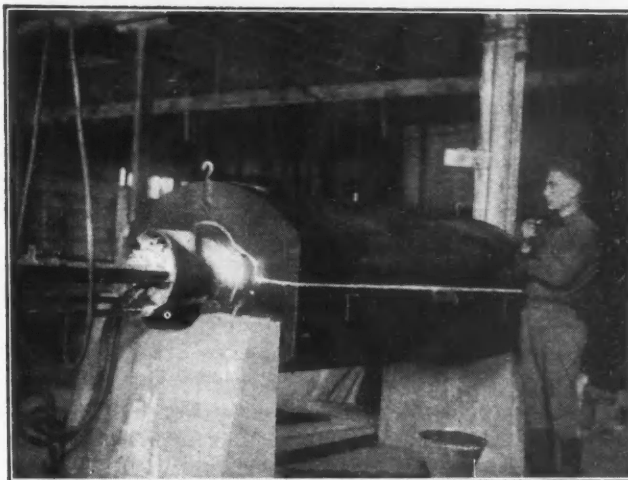
**T**HE MOTION-PICTURE BUSINESS, in common with nearly every other large industry, has many ramifications; it supports, directly or indirectly, a great many lesser industries. One of these, strange as it may seem, is that of silver refining. This has nothing to do, strictly speaking, either with taking silver from the mine or with minted silver. Instead, the silver comes from so-called laboratory waste, and the quantity of this metal recovered from such waste is surprisingly large, making its reclamation an important and profitable business. From the motion-picture studios in and about Los Angeles alone, for instance, it regularly totals to 9,000 or 10,000 oz. of silver per month, or enough to coin between eleven and twelve thousand silver dollars.

Motion-picture film, like other photographic film, owes its sensitiveness to light to certain compounds of silver known as haloids. The emulsion containing these silver salts is necessarily prepared in the dark. When exposed to light in the camera, those particles of the emulsion so exposed are rendered more amenable to reduction to metallic silver by the reducing agents of which developers are composed than are the particles which have not been exposed to light. After development, much of the silver compound is therefore left in the film in its original state and must be removed to make the film transparent. For this purpose, a chemical must be used which will dissolve the silver haloid but not the reduced silver. Sodium thiosulphate, popularly called "hypo," is cheap and efficient for this purpose.

It is this dissolved silver salt, which accumulates in the hypo bath, that is responsible for the motion picture industry's side-line business of silver refining. The solution finally becomes so rich in silver, together with other foreign matter from the film coating, that it must be discarded for new. It then becomes so-called laboratory waste, is taken over by the various "refineries" which have sprung into being about the picture studios, and is treated for the recovery of its valuable ingredient.



Large tanks in which the waste hypo is stored and treated for the recovery of its silver



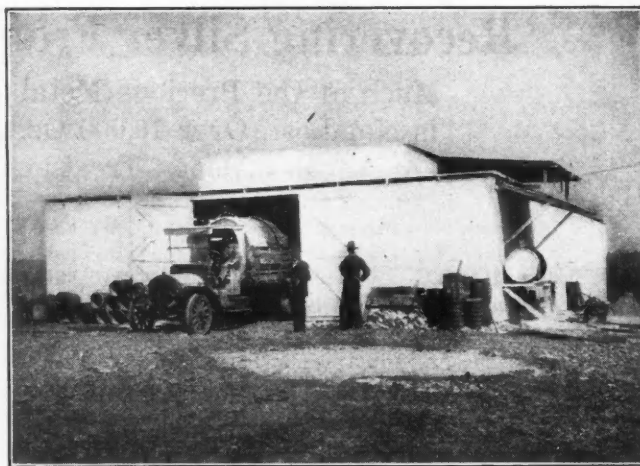
In some of the silver-refining plants, the recovered metal is melted in electric furnaces like this. The one shown, used at the Chemical Economy Co.'s plant, has a capacity of 300 lb.

The amount of silver to the gallon of waste varies considerably, for the solution is permitted to become much richer in some laboratories than in others. Generally it will not exceed a third of an ounce to the gallon, but in laboratories where regular analyses of the bath are made it is allowed, with safety, to run from one-half to one ounce or more to the gallon. The quantity recovered on the basis of film footage also varies, but not to so great an extent. The average is probably slightly in excess of 800 oz. to the million feet, or about one-half of the silver represented in the film's original coating. In other words, approximately a half of the coating, in taking the picture of average lights and shadows, is not affected by the light rays, and hence will be dissolved and removed in the hypo. This is virtually true of both the negative, or "taking" film, and the positive, or "projecting" film.

In and about Los Angeles are four or five firms engaged exclusively in the work of salvaging this by-product, various methods being used. One extremely simple and thorough method is a catalytic process. It is the one favored and generally employed by the Chemical Economy Co., one of the leaders in this work in the Los Angeles studio district. Catalytic, according to Webster, means "contact action," and that is just what the method is. Into the great storage tanks of waste hypo at this treatment plant are immersed or suspended large sheets of iron—the use of iron in this way constituting a patented process. Of their own accord, these metal plates slowly attract, magnet-like, the silver ingredient of the waste, and eventually will become completely coated with it. In about ten days, in fact, they will have attracted and attached practically all the silver in the solution. They are then removed and permitted to dry, after which a torch is played over their surfaces, causing the silver to fall off in scales. These



Baking the "silver mud" to dry it before furnace treatment



Plant of A. S. O'Neil and W. E. Stradley in Los Angeles, at which silver is recovered from waste hypo

scales are carefully preserved and later melted in a furnace. Sometimes, when quicker action is desired, electricity is utilized in conjunction with this contact-action treatment, in much the same way as it is used in silver plating. The extraction then is accomplished in the reduced time of forty-eight hours.

Certain so-called chemical methods are employed by other companies. Precipitating agents are used, the silver, together with other foreign matter in the solution, settling to the bottom of the treatment tanks in the form of black mud, called "silver mud." Sodium sulphide is the chemical perhaps most popularly used for this purpose. It produces precipitation of the silver in a little less than ten days, and is used in the proportion of approximately one pound to each twenty gallons of solution. With the silver and other foreign matter precipitated to mud, the water is then drained off and the "silver mud" scooped out and placed in large vats or trays to dry. Its drying is hastened by placing these trays over a fire, with the result that the mud is literally baked. Afterward it is broken up and sacked, and subsequently put through a furnace to separate the silver from the other matter.

Whether accumulated by the catalytic method into scales, or precipitated and dried, the product, at either of these stages, is subjected to furnace heat, at about 1,800 deg. F., which results in melting the silver, the waste matter being eliminated by skimming it off while hot, or breaking it off when cold. Finally, the silver is remelted and moulded into ingots of about forty pounds each, when it is sold to some United States Mint or otherwise disposed of at the prevailing market price for "foreign" silver. And the amount of such silver recovered from laboratory waste around Los Angeles is, as indicated above, nearly half a ton per month, or approximately six tons in a year.

Aside from the silver recovered from the waste hypo, still another form of waste accumulates at these motion-picture studios that yields a considerable quantity of the metal. The film, as perhaps everybody or nearly everybody knows, must be provided with sprocket holes along each edge to prepare it for manipulation—negative film for the camera and positive film for the projector. The film, therefore, is put through punching machines, and the tiny particles removed in the operation accumulate in surprising bulk. This waste, because it contains silver, is also saved and sold to the photo-metal refineries. It is frequently received by them in

lots of one ton or more. Then, too, much film that is spoiled and not developed by the picture producers is treated for the recovery of its silver. A common method of handling waste in this form is to burn the film or film particles, and then put the ashes through the melting process.

With specific reference to the waste hypo, there is still another phase of this subject that is highly interesting and deserving of mention. At the plant of the Chemical Economy Co. even the old hypo is not a waste, in the true sense, for it is carefully treated after the silver has been extracted, and eventually restored to the condition where it may be used again. By being purified it is thus used over and over.

In conclusion, it perhaps should be added that recovering silver from waste hypo is not new. It has been done by photographers for many years. Never before, however, has it been done on anything like so large a scale as the great growth of the motion-picture business now makes possible.

### Oil Shale Investigations Made at Boulder, Col.

In the course of the co-operative oil shale investigations at the Boulder, Col., field office of the U. S. Bureau of Mines, experimental work with the horizontal retort on Colorado standard shale has been completed. Later developments confirm the earlier work on fractional distillation. Though the oil produced at different temperatures during the same run varies somewhat in quality, the amount of variation is apparently not enough to be taken advantage of commercially.

Kerogen has been separated from Utah and Scottish shale in addition to standard Colorado shale, and combustion analyses have been made by the Bureau at the Boulder office. The results have been tabulated and will soon be ready for publication. All problems have apparently been overcome except that due to the difficulty of distributing the nitrogen.

The same office has practically completed the program of testing Utah shales in assay retorts. This work follows the procedure used on the Colorado shale, and indicates clearly the differences in the oils produced.

Work has also been done at Boulder on the experimental refining of shale-oil naphtha. The work has been somewhat limited on account of inadequate equipment, but should now progress rapidly.



## USEFUL OPERATING IDEAS

### Cutting Mine Samples With Machines

Practice Sometimes Advantageous—Output  
Much Greater Than With Hand-Moil  
—Methods at Oatman

BY DONALD C. GILBERT

**I**N OPERATING mines where compressed air is available it is sometimes advantageous to cut samples with the stoper or other form of drilling machine. This is true in many gold mines where the vein is hard and values are so unevenly distributed that a close sampling interval is required.

Most mining men will accept without argument the statement that, where the occurrence of gold values is erratic and mining is in large part controlled by the assays of mine samples, it is desirable to increase the foot-weight and reduce the interval of samples. A man cutting a sample across the back of a drift or stope in hard vein quartz by means of hammer andmoil is doing genuine hard labor and makes but little progress in a shift. Two or three hours of hard, aggravating labor expended in cutting a sample channel 5 ft. in length is at times justified, but in many instances is misdirected energy. If it is possible to make compressed air do the work, the decision rests upon the following factors:

1. If machine work is adopted, will each sample be as nearly representative of the grade of ore in question as a corresponding hand-cut sample would be?
2. In case the machine-cut sample is less accurate, will the greater number of samples possible by the method offset this factor?

It is true that the average machine-cut sample would be less accurate than the average hand-cut sample if it were attempted to cut the channel to the same width and depth in either case. The reason for this is chiefly in the fact that the heavy blow of the machine on the rock jars down the fines and small particles in the vicinity of the cut, which frequently serves to contaminate the sample. But one distinct advantage of machine sampling is in the fact that the size of cut may be greatly increased with little additional labor, and this increase in size will usually serve to diminish the salting effect to a negligible amount. The exception is found in instances where the valuable mineral is in very friable form, such as auriferous pyrite occurring in seams, and is easily dislodged.

Under average conditions it should be possible for the sampler to triple his daily output with the machine with much less labor than he would usually expend on the handmoil. This increase may be used either by diminishing the interval between channels to increase the accuracy of the record, or to allow a greater rate of advance by the sampler, with a proportionate decrease in sampling charges on the cost sheet.

The methods employed by the United Eastern Mining Co. at Oatman, Ariz., are representative of good practice in machine sampling. Two types of machine

are employed; a light-weight, dry stoper, and a small chipping hammer with a D-handle and thumb trigger. Three-quarter-inch machine moils and a light rubber hose are used with the chipping hammer; and regulation hose and cross-bit steel, available in any portion of the mine, are used with the stoper. Drifts and raises are breast-sampled with the chipping hammer after each round. The channel is cut about 2 in. wide and 1 in. deep under ordinary conditions, but where greater accuracy is required the size is increased.

The cuttings are caught on an 8 x 10-ft. piece of heavy canvas, and the entire cut is sacked. The method of coning and quartering is not attempted in the mine, as it not only increases the labor of the sampler but is naturally less accurate than crushing and riffing in the assay office. After approximately 50 ft. of advance in a drift, the vein is sampled in the back at 5-ft. intervals with the stoper. This is the record for the first stope cut.

At the present writing, all stopes are worked by the flat-back cut-and-fill method, and it is an easy matter to keep pace with the laying of floor on fresh fill in sampling stope backs. Alternate backs are sampled, and as the average depth of slice is 5 ft., the sample interval on the dip of the vein is 10 ft. The interval along the strike of the vein is also 10 ft., but in wide parts of the vein it is necessary to take from two to five samples in cutting a channel from wall to wall, as it is not conducive to good results to include more than 5-ft. width of vein in each individual sample that may be taken.

#### SAMPLING HARD AND SOFT MATERIAL

The vein filling consists of quartz, calcite, and altered andesite, and varies greatly in hardness, dependent on the relative proportions of these constituents. Sulphides are very rare, and the gold is finely divided and is associated with both quartz and calcite. The last-named condition necessitates care in cutting proportional amounts of hard and soft material for the sample, as the locus of values is seldom known by the sampler. The usual difficulty with hand sampling under this condition is the universal tendency to cut a nice groove through the softer portion of the vein and get the hard material where it comes easy—that is, to break out a chunk of the quartz streak, crush it with a hammer and throw it into the sample to represent the entire streak. This source of "error" is in large part eliminated in the machine-cut sample, as the physical labor of cutting quartz is little greater than that required in cutting softer material.

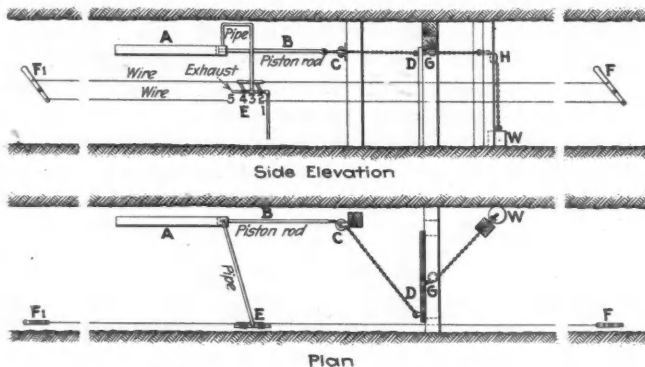
It would be absurd to maintain that machine sampling is generally superior to hand work, and it is not my purpose in writing this to do so. Neither is it necessary to enumerate the many possibilities which will govern the choice of method. Where existing conditions justify a trial, it may be made at small cost, and the decision will then be based upon the dominant factor—results.

## A Mechanically Operated Air Door

BY TOM A. MILLER

The door shown in the accompanying sketch is in use during the winter months on the Marquette Range to limit the flow of air along drifts directly connected to a downcast shaft. A downcast air current of high velocity will carry freezing temperatures at surface to a great depth, and the ice so formed becomes a serious problem. By using these doors in pairs and locking the trains through, the doors being far enough apart so that one door is shut before the other is opened, the velocity of the downcast is greatly reduced.

A study of the sketch explains the operation. *A* is an air cylinder controlling piston rod *B*, which is connected by a chain around pulley *C* to door *D*. A pipe leads from the cylinder *A* to the valve arrangement *E*, as shown. The door *D* is also connected by a chain around pulleys *G* and *H* to a weight *W*. In the sketch, the door is shown closed and is held so by *W*. The levers *F* and *F*<sub>1</sub> are connected to the valves *E*<sub>2</sub> and *E*<sub>1</sub>, and in operation close one valve while opening the other. As shown, valve 2 is closed, shutting off the compressed-air source 1 and leaving the cylinder connected through tee 3 and open valve 4 to exhaust 5. By throwing levers *F* or *F*<sub>1</sub>, valve 2 may be opened and valve 4 shut, allowing compressed air to travel by route 1—2—3 to cylinder *A*, where a pull on piston rod *B* is immediately set up, which, acting through chain, opens door *D* and lifts weight *W*. Throwing *FF*<sub>1</sub> back to position shown in the sketch shuts off the pressure on piston, and opens the exhaust *E*, allowing the weight *W* to pull door closed.



Mine door operated by compressed air

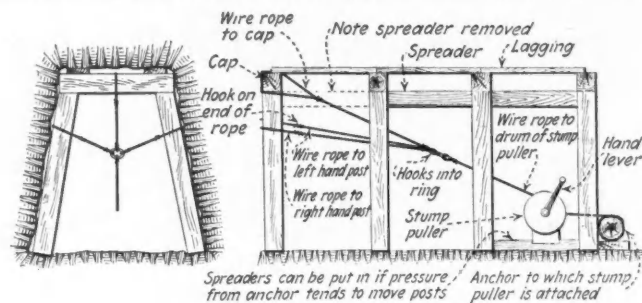
*F* and *F*<sub>1</sub> are situated at a distance of about 125 ft., or the length of an average train, plus a factor of safety from the door *D*, which can be opened for the train and closed after it without stopping the motor.

## Recovering Mine Timber at Cananea

An ingenious device to recover mine timber has been installed at Cananea by M. W. Mitchell, superintendent of mines. The apparatus consists of a hand-power stump puller and some extra wire ropes. When a timbered drift has served its purpose and is no longer needed, the drift timbers can be recovered by means of this equipment in the following way:

The stump puller is set up in the drift several sets back from the set to be recovered. An anchor to which the stump puller is attached is put across the drift back of the bottom of two posts. The cable of the stump puller ends in a ring. To this ring are attached three short cables by means of hooks. The other ends of

these cables are also provided with hooks. One cable is then wrapped around the center of the cap, and one around the upper portion of each post and hooked. The cable around the cap is made a little shorter than the post cables, for the reason that when the stump puller exerts its pull there is a tendency to loosen the cap first. Before the pressure is put upon the cables, the spreaders between sets are removed and, if necessary, any ground



Stump puller in position for removing drift set

just back of the posts is picked away. If the lagging have taken great weight in such a way that they tend to prevent the cap being pulled back, they can be partly cut away or the pressure partly relieved by removing a little ground above them. When all is ready, tension is put on the cable by the stump puller. First the high gear can be used and then the low gear. With the latter gear a tremendous tension can be exerted, and slowly the cap will be drawn out of place and the posts will follow.

The great advantage of this device is that no matter how heavy or dangerous the ground, the men always work below the timbered portion of the drift. When the timbers are finally free they are dragged back under cover. The process is then repeated on the next set.

It is surprising how much timber can be recovered even in the heaviest drifts by the method described. Timbers that have great weight upon them, by being "relieved" a little, will often be easily recovered. The question as to how much work can be done in recovery is entirely an economic one. The drift set is worth \$5 to \$6 and sometimes more, depending on the number of board feet in it and the condition of the timber. The number of sets that can be recovered in one shift depends entirely upon the character of the ground.

## Wanted— Useful Operating Ideas

**W**HAT ingenious devices or methods are you using in your plant? Something out of the ordinary is to be seen in many mines and mills. Standard practice does not always give the solution to difficulties that arise in operation. Then again, necessity may be the mother of invention. Often these products of ingenuity are little known outside a limited area. These pages are intended to serve as an exchange of such ideas. Articles and sketches describing them will be welcomed.

—EDITOR.

## THE PETROLEUM INDUSTRY

### Petroleum Concessions in Persia\*

An Account of Events Leading Up to Rescinding of Anglo-Persian Company's Khostaria Concessions by the Persian Government—Opposition to Standard Oil's Agreement Hinders Development of Northern Field

BY I. M. VON TOLL

**D**URING THE PAST MONTHS there has been much discussion in the press regarding the concessions given by the Persian Government for exploiting petroleum and allied substances in Persia. To many the action of that government in rescinding the Khostaria concessions held by the Anglo-Persian Oil Co. has seemed arbitrary and illegal. A history of the oil concessions and the basic mining legislation of Persia is here presented to assist in clearing up some misunderstandings that appear to exist in the views held by the general public.

There was no written Persian mining law before 1906. Previous to that time the securing of a concession was to foreigners and natives alike a matter of diplomatic negotiation or of personal influence with the Shah, who determined the grants and the taxes to be paid upon them. In 1906, however, as a result of growing democratic influence in Persia, the Shah permitted a constitution to be drawn up, by one clause of which the granting of all mining rights became subject to ratification by the newly constituted Mejliss, or parliament. This was the only written mining law until on Oct. 2, 1917, a temporary mining law was approved by the Council of Ministers, responsible to the Mejliss. According to this law, still in effect, the Ministry of Public Works is responsible for the execution of its regulations.

#### PETROLEUM LONG A SOURCE OF IMPERIAL REVENUE

For centuries the oil springs in Persia have been operated by Persians under imperial grants, the taxes thus derived providing a small revenue for the reigning Shah. The first real attempt by non-Persians to develop petroleum extensively was that made by the Persian Bank Mining Rights Corporation. This British corporation in 1890 secured the mining rights of the Persian State Bank, whose concession of the previous year had granted the exclusive privilege of exploiting all mineral deposits on state-owned lands, with the right to purchase privately owned deposits. The corporation's capital of £1,000,000 was expended in unprofitable exploration, and in 1894 the company became bankrupt, the concession reverting to the state.

In 1895, a ninety-nine years' concession for exploiting petroleum in the districts of Tunekabun, Rujur, and Kalalestag, in the Province of Mazanderan, was given to Mohamad Vali Khan Sepahsalar. On May 28, 1901, William Knox D'Arcy was granted a monopolistic concession "to prospect, obtain, exploit, develop, prepare

for commerce and to export and sell natural gas, petroleum, asphalt and mineral wax throughout the Persian Empire for sixty years. . . . these privileges not to extend to the provinces of Azerbaijan, Ghilan, Mazanderan, Astrabad, and Khorassan, on condition that the Imperial Persian Government should not grant to other persons the right to construct pipe lines to the rivers of the south or to the southern coasts of Persia." Under the terms of this instrument uncultivated state lands would be granted gratuitously; cultivated state lands and private lands (with the owners' consent) could be bought at current prices; and lands, materials, machinery, and exported products would be tax-free. Compensation to the state in money and to the native exploiters of oil pits and springs in kind was provided for, so that neither would be deprived of the benefits enjoyed by the earlier exploitation.

The concessionaire was authorized to form companies for the exploitation of the concession, with the provision that one month after its organization the first company should pay to the Persian Government a sum of £20,000 sterling in cash and £20,000 sterling in stock, and thereafter a sum equal to 16 per cent of the net annual profit of the company and of other companies formed in accordance with the concession. An Imperial Commissioner was to be appointed by the government, at the expense of the concessionaire, to safeguard the interests of the government and the operating company or companies. With the exception of the technical personnel, the company employees were required to be Persian subjects.

The government undertook to insure the execution of the concession and the safety of materials and machinery and to protect company representatives and employees. The concession states, "The Imperial Government having thus executed its engagements, the concessionaire and the companies formed by him cannot under any pretext claim damages to their interests from the Persian Government." Any differences that might arise were to be settled by three arbitrators, one each appointed by the concessionaire and the government, the third elected by these two.

#### ANGLO-PERSIAN OIL CO. ORGANIZED

In order to develop the oil regions of the Karun, D'Arcy in 1903 formed the First Exploitation Co. in partnership with the Burmah Oil Co. and Lord Strathcona, the Persian Government and the Bakhtiari Khans being minor stockholders. Two years later the entire concession was taken over by the Concessions Syndicate, Ltd., formed by the Burmah Oil Co. and Lord

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Strathcona. Instead of comprising, as formerly, the whole Karun region, the properties of the First Exploitation Co. were limited by the syndicate to the one square mile of the Maidan-i-Naftun field. On April 8, 1909, the Bakhtiari Oil Co. was organized as a subsidiary of Concessions Syndicate to exploit the oil-bearing territory in the Bakhtiari country not controlled by the First Exploitation Co. In the week following, the Anglo-Persian Oil Co. was registered to acquire the D'Arcy concessions from Concessions Syndicate, which went into voluntary liquidation in 1915. The initial capital of the Anglo-Persian Oil Co. was £2,000,000. This was increased in 1914 to £4,000,000, in 1917 to £5,000,000, and in 1919 to £20,000,000.

#### BRITISH GOVERNMENT SECURES CONTROL

In May, 1914, the British Government purchased 2,000,000 ordinary shares and 1,000 preferred shares of the total 4,000,000 issued shares of the company's stock. This action was designed to insure a supply of fuel oil for the royal navy and was taken after a careful investigation of the prospects of the Anglo-Persian Oil Co. and of other companies.

In the agreement entered upon by the British Government and the Anglo-Persian Oil Co. it was stipulated that the company should not enter into nor be party to any trust or combine, but should always remain an independent British company. Although the government by this transaction acquired and purposed to maintain a majority ownership of the company, its control thereof was somewhat limited. Two ex-officio directors, one responsible to the Admiralty, the other to the Treasury, represent the government on the board of directors. These ex-officio directors have the right of vetoing resolutions proposed at meetings of the board or committees of directors, with the provision that the other members have the right of final appeal to the government (the Treasury and Admiralty).

The government has given the company assurance that the veto would be exercised "with due regard to the financial and commercial interests of the company and only in respect of general policy, such as supervision of activities affecting questions of foreign and military policy, any sale of the undertaking or change of status of the company, any new exploitations, and other matters directly bearing on the fulfillment of current contracts for the Admiralty." With respect to any contract or arrangements affecting the British Government its ex-officio representatives are entitled to vote as directors. Furthermore, should the government interests make it advisable, the written consent of two of the Lords Commissioners of the Treasury will transfer the government shares in the company to any person or persons to hold, the holders having all the rights and privileges of members of the company except as regards minor provisions to the contrary and except that dividends are payable only to the Treasury.

The British Government expected to secure a little less than half of the oil required for the navy from the Anglo-Persian Oil Co. As all navy fuel oil contracts are secret, the terms of the Anglo-Persian Oil Co. contract are not known.

Although the Anglo-Persian Oil Co. has acquired concessions in other parts of the world, its entire production comes from the oil fields of southern Persia. These fields have proved so productive that Persia now ranks seventh of the petroleum-producing countries of the world, with a production officially stated to be

1,354,501 metric tons in 1919 and 1,633,843 metric tons in 1920, and an estimated production of 1,992,000 metric tons in 1921. In order to handle this production the Anglo-Persian Oil Co. has organized as subsidiaries and now owns or controls not only the First Exploitation and the Bakhtiari, but also the D'Arcy Exploration Co., Ltd., British Petroleum Co., Ltd., British Tanker Co., Ltd., Homelight Oil Co., Ltd., Petroleum Steamship Co., Ltd., National Oil Refineries, Ltd., Scottish Oils, Ltd., Scottish-American Oil & Transport, Ltd., and Tankers, Ltd.

During the discussions in Parliament that preceded the Treasury purchase of Anglo-Persian stock, an apparently groundless fear was expressed by a member that such an act would greatly strain the friendly relations between Russia and Great Britain; that Russia might consider it a violation of the 1907 convention partitioning the spheres of influence of Russia and Great Britain in Persia and Afghanistan after a long period of struggle for supremacy. By this convention it had been agreed that north of a line from Kasri-Shirin, Isfahan, Yezd, and Kakh to the junction of the Russian, Persian, and Afghanistan frontiers, Great Britain was to seek no political or commercial concession and was to refrain from opposing the acquiring of such concessions by Russians. Russia was to observe a like abstinence in regard to the region south of a line from the Afghanistan frontier to Gazic, Birjend, Kerman, and Bender Abbas. The territory between was to be neutral, where nationals of either country might obtain concessions. All previously existing concessions were to be respected.

The influence of Russia in northern Persia was very strong, both politically and economically, with the result that *entrepreneurs* of the other nations found it impossible or inadvisable to negotiate for concessions. One of the most important of her Persian commercial concessions before the late World War was the seventy-year grant secured by the Russian Discount and Loan Bank in 1902 for the construction of a road or railway from Julfa, on the Araxes, to Tabriz and thence to Kazvin, with branch roads. The right to mine coal and petroleum in an area extending 39.7 miles each side of the road was included. The Persian Government was to receive royalties of 20 per cent. A later concession was secured by the bank for a road from Enzeli to Teheran, with branch roads. In this case the coal and oil rights were for a distance of twenty-five miles each side of the road. In 1906 the road was completed as far as Tabriz, and by 1916 a railway to Tabriz, with a branch road to Lake Urumia, was in operation.

#### CONCESSIONS GRANTED TO KHOSTARIA

No further petroleum concessions were granted by Persia until on March 9, 1916, A. M. Khostaria, a Russian subject resident in Georgia, received an instrument, signed by the Prime Minister of Persia and the Ministers of Justice, Finance, Public Instruction, War, Post, and Telegraph, and Public Works and Commerce, whereby he was granted the right to prospect for and exploit petroleum and natural gas in the provinces of Ghilan, Mazanderan, and Astrabad, except in the districts of Tunekabun, Rujur, and Kalalestak, covered by the Sepahsalar grant of 1895. Under the terms of this instrument the properties were to revert to the state upon the expiration of the concession in 1986 unless it had been previously nullified because work had not been begun within five years of the date

of the concession. Free use was given of state lands within the area of the concession, and permission was given to rent or purchase private lands, except those belonging to shrines, at normal rates. The necessary lands, materials, and the finished product would be duty-free and tax-free. Should the concessionaire decide to exploit the properties he would be required to pay to the government the sum of 100,000 rubles in gold, 100,000 rubles in capital stock, and 16 per cent of the annual net income. The salary of a government representative and inspector would also have to be paid by the concessionaire. Any company formed by the concessionaire was to be registered with the government, and any difficulties that might arise were to be settled by arbitrators.

Later in the year Khostaria purchased the Sepahsalar concession, thus securing the monopoly over petroleum and natural gas in three provinces.

On Jan. 22, 1917, Khostaria obtained a second concession, for working all mines in Ghilan, Mazanderan, Astrabad, and Ardebil except those of lime, chalk, marble, salt, silver, gold, and jewels, and those already being worked. This concession was for seventy years, but it was required that work should be started within ten years of the date of the concession. Property regulations were the same as in the previous concession, but with the express stipulation that the government should be permitted to use telephones and railways constructed to aid in carrying out the terms of the concession. The terms under which the concessionaire might form companies were quite clearly stipulated:

"This concession is granted to Mr. Khostaria, but he is allowed to find partners or form a company for executing the contents of this concession. If the organizations are approved by the government, the fulfillment of all conditions shall be required of such organizations, which shall not be formed for four years after the date of this concession. The concessionaire shall present to the government the regulations of the company within one month after its formation. Furthermore, he must pay to the government 500,000 fr. in gold and 500,000 fr. of the shares of capital stock. For properly executing the terms of this concession the company formed is allowed to give or sell its rights to other companies or partners, with the condition that they shall guarantee the fulfillment of the conditions stipulated in this concession."

Maps of areas to be developed were to be required on the scale of one to ten thousand, and for each jarib (10,000 sq.m.) so mapped a tax of 1 toman was to be paid (about \$4 per acre). Taxes amounting to 14 per cent of the net income on private lands and 18 per cent of the income from state lands were to be paid annually, and, in addition, company representatives were to be required to pay 500 tomans for official recognition. One-fourth of the shares of companies formed were to be offered for sale to Persians by Persian brokers, and it was required that all non-technical employees be Persian subjects. The Persian Government gave assurance of its assistance in every possible way and agreed to furnish special detachments of troops at the concessionaire's expense. The government retained the right of inspection of works and books and set fines for non-conformance with the terms of the concession. Any difficulties between the companies and the government were to be arbitrated.

In order to exploit his concessions Khostaria organized the Russo-Persian Oil Producing & Trading Co., Rupento. The company appears to have failed, however, for in 1920 the concessions were held by the Russo-Persian Naphtha Co., controlled by Khostaria and

C. I. Djakelly. Khostaria went to London to try to interest various capitalists in his project, with the result that on May 8, 1920, the Anglo-Persian formed, as a subsidiary, the North Persian Oils, Ltd., to acquire the three North Persian concessions from the Russo-Persian Naphtha Co. The consideration was £100,000 in cash and £1,500,000 in stock out of a capitalization of £3,000,000. Both Khostaria and Djakelly are also on the board of directors of the North Persian Oils, Ltd.

The Persian Government refused to recognize the legality of the transfer or the validity of the concessions. On Dec. 15, 1920, the Persian Legation in London announced that the concessions held by the North Persian Oils, Ltd., were improperly constituted and illegal. The Persian Government in Teheran declared later that they were obtained by coercive methods and without the consent of the Mejliss, and that they had been formally cancelled by the Russian Soviet Government in January, 1918, on which occasion the Russian Government stated that any partnership or transfer relating to the concession must be valueless.

These statements followed the action of the Mejliss on Nov. 22, 1921, in approving a grant to the Standard Oil Co. of New Jersey of a fifty-years' concession to exploit the oil fields of the provinces of Azerbaijan, Ghilan, Astrabad, Mazanderan and Khorassan. One of the principal clauses of the proposed concession to the Standard was that the company should be precluded from transferring to or associating with any other company without the consent of the Mejliss. The Standard Oil Co., however, was not willing to accept a concession for developing a petroleum industry in a region so difficultly situated geographically as is northern Persia unless there were available some way of transporting materials and products from and to the world's markets. The terms of the D'Arcy concession made it impossible to construct pipe lines to the southern rivers or the gulf coast. The only other conceivable routes for exporting petroleum from the country would be to pipe it to the Caspian coast, whence tankers could remove it to Baku, or to construct pipe lines to Batum or to the Syrian coast. All three are practically impossible. Some agreement with the Anglo-Persian Oil Co. was necessary, as Persian territory must be crossed in order to export the possible rivers of oil. The Standard Oil therefore commenced negotiations with the Anglo-Persian Oil Co., with the result that an agreement has been reached whereby the two consent to organize a joint company for oil development in the five northern provinces of Persia.

The Standard Oil has not yet actually secured the documents, however, as the Mejliss objects to the proposed association with the Anglo-Persian. It is understood that the Sinclair Consolidated Oil Corporation is interested and has become a contestant for a petroleum concession in the northern provinces. Should the Persian Government maintain its position in regard to association with the Anglo-Persian Oil Co., there is none but a local market for North Persian petroleum.

The present consumption of petroleum in northern Persia is not large. The market is supplied by oil imported from Russia, amounting to from 85,000 to 90,000 metric tons annually from 1909 to 1917; 115,095 metric tons in the year ended March 20, 1918; 43,927 metric tons in the year following; and 90,900 metric tons in the year ended March 20, 1920. The market has possibilities of a greater development, as Persian industries have always been handicapped by lack of fuel.

## Technical Papers

**Oil Possibilities of Idaho**—Virgil R. D. Kirkham has prepared as Bulletin No. 4, University of Idaho, a monograph on the possibilities of finding petroleum in Idaho. While he frankly says that his purpose is to point out the area *least unlikely* for the production of oil, he concludes that there is sufficient promise in various localities to warrant wildcat drilling. Numerous geological sections are shown and the reasons for arriving at his conclusions are given. A copy of the bulletin can be had by writing to the University of Idaho at Moscow.

**Montana Petroleum**—Bulletin 736-B of the U. S. Geological Survey, Washington, D. C., seventeen pages, obtainable on request, is entitled "Oil and Gas Prospects in and Near the Crow Indian Reservation, Montana." The structure that has been drilled does not warrant enthusiasm, but the reservation affords a better chance for the wildcatter than some other areas in the State.

**Blaine County, Idaho**—"Geology and Ore Deposits of Alturas Quadrangle" is the title of Bulletin No. 5, thirty-six pages, issued by the Bureau of Mines and Geology, Moscow, Idaho, and obtainable on request. The district contains several promising deposits of silver ores, the predominating minerals being proustite, pyrrargyrite, and stibnite.

**Mine Valuation**—*Mining and Metallurgy* for July (29 West 39th St., New York; price, \$1) contains a six-page article by E. S. Berry on "Present Value in Its Relation to Ore Reserves." It is a clear exposition of some of the principles to be observed.

**Geology of Silver Ores**—Bulletin 735-E, twenty-four pages, of the U. S. Geological Survey, Washington, D. C., free, discusses the primary native-silver ores near Wickenburg, Ariz., and their bearing on the genesis of the silver ores of Cobalt, Ont.

**Statistics on Iron and Steel**—The statistics relating to the production and consumption of iron and the various products made therefrom, as well as iron ore and coke, are customarily published separately from similar data for the non-ferrous metals. Data for 1921 are included in a ninety-six-page book issued by the American Iron and Steel Institute, 40 Rector St., New York. All of the customary figures for some years back are included.

**Prospecting by Airplane**—A seven-page paper in the August *Bulletin* of the Canadian Institute of Mining and Metallurgy (603 Drummond Building, Montreal; price, 50c.) describes the possibilities of the airplane as an aid to prospecting and mapping of mining areas. Success all depends on the pilot, and the best equipment is none too good, according to the author.

**Jamaica as a Mining Country**—*The Mining Magazine* for April (Salisbury House, London Wall, London, E. C. 2, England; price, 1s. 6d.) contains a six-page article on "Jamaica: Its Geology and Mining Possibilities." No mining work has been carried on in Jamaica for many years, but several mineral deposits (copper, lead, and manganese) are known, and it is suggested that with the present state of technical knowledge some of them might be profitable.

**Drill Steel**—"A Proposed Section for Hollow Drill Steel" occupies eight pages in the June *Bulletin* of the Canadian Institute of Mining and Metallurgy (603 Drummond Building, Montreal; price, 50c.). The author recommends 1½-in. fluted steel instead of the hexagon commonly used, and claims the following advantages: Long life to chuck bushings; steel well guided; no tendency to stick in chuck bushing or drilled hole; satisfactory weight and stiffness; and chuck bushings and sharpener dies easy to manufacture.

**Spontaneous Coal Combustion**—Technical Paper 311 of the U. S. Bureau of Mines, Washington, D. C., nine pages, free, will prove of interest to those who stockpile bituminous coal. It is entitled "Factors in the Spontaneous Combustion of Coal."

**Iron Ore Statistics**—The U. S. Bureau of the Census, Washington, D. C., has issued a twenty-five-page paper of statistics showing the geographic distribution of the iron-ore industry by states and mining districts; the progress compared with preceding censuses; character of organization and size of operating enterprises; persons engaged in the industry; the acreage of mineral and other lands controlled; and power equipment and fuel used. The bulletin may be obtained free of charge.

**Petroleum and Natural-Gas Statistics**—The results of the 1919 census pertaining to the oil and natural-gas industry are given in a thirty-one-page bulletin issued by the U. S. Bureau of the Census, Washington, D. C., obtainable on request.

**Oklahoma Petroleum**—Bulletin 686-Z, obtainable from the U. S. Geological Survey, Washington, D. C., contains twenty-five pages, with numerous maps and charts, devoted to the structure and oil and gas resources of the Osage Reservation, in Oklahoma.

**Geology of B. C. Gold Ores**—"The Gold-Quartz Veins of Bridge River District, B. C., and Their Relationship to Similar Ore Deposits in the Western Cordilleras" is the title of a twenty-page paper by W. S. McCann in *Economic Geology* for August (Lancaster, Pa.; price, 65c.). The veins are similar to those of Grass Valley, Cal., and southeastern Alaska.

**Analysis of Explosives**—Technical Paper 282 of the U. S. Bureau of Mines, Washington, D. C., thirty-three pages, obtainable on request, describes methods of analyzing detonating and priming mixtures. The bulletin is timely, as many new forms of these compounds are now being used.

## Recent Patents

**Gold and Silver**—Canadian patent No. 218,817. A. A. Lockwood, Mostyn Road, Merton Park, Surrey, England. A method of cyaniding gold and silver ores and precipitating the precious metals by electrolytic methods, the pulp being kept in suspension by a jet of air.

**Reducing Ores**—No. 1,403,576. Alfred Stansfield, Montreal, Que. A process and equipment for the treatment of ores with reducing gases.

**Ball Mill and Classifier**—No. 1,418,523. J. R. Broadley, London, England. A rotating cylinder, in which grinding with balls or pebbles is done in one end, the product passing through a diaphragm in the central portion of the mill and being subjected to hydraulic classification in the other end, the slime passing out through the discharge trunnion.

**Titanium Extraction**—Canadian patent No. 221,537. George Carteret, Boulogne, France, and Maurice Devaux, Paris. After heating titanium ores containing iron in a reducing atmosphere, currents of halogen gas are passed through the ore at temperatures from 350 to 600 deg. C., which volatilize the iron and titanous chloride. These are separately collected and treated.

**Roasting and Leaching Process**—Canadian patent No. 221,675. La Sociedad Metalurgica Chilena Cuprun, assignee of C. M. Malsch, Santiago, and C. H. Gilson, Valparaiso, Chile. Sulphide ores are roasted to form SO<sub>2</sub>, and moisture and nitrates introduced into the roasting zone to form sulphuric acid which reacts with the roasted ore to form sulphates. These are leached and the valuable metals precipitated by freshly prepared iron sulphide.

**Tungsten Extraction**—Canadian patent No. 221,781. J. C. Blanch, Paris, France. The patent covers a tilting conical hopper with steam injection nozzle, for separating the soluble from the insoluble portions of tungsten ores.

**Self-Dumping Mine Cage**—No. 1,410,124. W. B. Reynolds, Roundup, Mont. A hoisting cage for mines comprising a hinged platform, a roller support for the platform, and means for tripping the support at a predetermined point.

**Cone Classifier**—No. 1,410,152. Charles Allen, El Paso, Tex. A cone classifier with means for introducing a stream of water into the tank at two or more levels, conical spreaders being used to prevent agitation.

**Drum-Filter Agitator**—No. 1,410,221. E. S. Pettis, Mill Valley, Cal. Means for agitating the pulp to keep the solid matter in suspension beneath a drum filter.

**Gyratory Crusher**—No. 1,410,244. F. H. Edwards, Meriden, Conn., assignor to American Manganese Steel Co., Augusta, Me. A new design for a gyratory crusher head.

## New Books

### The 1922 Weed

**The Mines Handbook.** Vol. 15. By Walter Harvey Weed. Published by the Mines Handbook Co., Tuckahoe, N. Y. \$15.

For those who need to know anything about a mining company, its situation, officials, financial organization, property, development, equipment, or production, no book is so complete as this. Next to the dictionary it is the most important volume in this office. The 1922 edition covers 10,000 companies in all parts of the world: in foreign countries only the most important companies receive attention, but on this continent even prospects are included. Where Mr. Weed has personal knowledge of a property, his opinion of the company's prospects is appended.

### Of Interest to Physical Chemists

**Fluidity and Plasticity.** By Eugene C. Bingham. 440 pp., illustrated. New York: McGraw-Hill Book Co. \$4.

The continued study and elaboration of what have been considered as minor and unimportant phases of physical chemistry; the formulation of theories and the collection of scientific data; the comparison of results and the publication of information—these all show that the spirit of disinterested research is by no means dead, nor is it even sleeping. Dr. Bingham's work in the physics of matter is known to all who have had occasion to study the problems of fluidity and viscosity, problems that have demanded solution in many industries. It is fitting, therefore, that he should have undertaken the task of filling the gap in the available literature on the subject. There can be no question as to the need for such a book as the one under review. Its very lack of finality will act as a spur to initiative in a field of research that must exert an immense influence on many phases of industrial endeavor.

As the author states in the preface, the study of the flow of electrical energy long since developed into a science, but our knowledge of the problems involved in the flow of matter remains inchoate and unclassified. In 1842, Poiseuille distinguished between viscous flow and hydraulic flow, but only recently has it been possible to differentiate scientifically between viscosity and plasticity. The author of the book under review was responsible for the distinction that with a viscous flow any shearing force, however small, will produce permanent deformation; whereas in the case of a plastic flow it is necessary to use a shearing force of finite magnitude to produce permanent deformation. This is but an indication of the constructive theorizing that the subject has received

from Dr. Bingham; all of his suggestions and conclusions will serve as a groundwork for further research and for that comment and criticism which is usually needed before a complete and acceptable gospel of fundamentals can be formulated.

In Part I, the author discusses methods of measurement, the law of Poiseuille and its amplification, viscosity as a definite physical quantity and the viscometer. Readers will welcome a clarification of nomenclature. An acknowledgment of help from Brander Matthews adds authority to Dr. Bingham's conclusions.

In Part II, the general subjects of viscosity and fluidity are discussed, with special reference to temperature, volume and pressure; collisional and diffusional viscosity; fluidity and vapor pressure; fluidity of solutions; fluidity and diffusion; colloidal solutions; the plasticity of solids; the viscosity of gases; superficial fluidity and lubrication. An unusually complete bibliography is appended. The book is a pioneer effort that possesses the hallmark of careful research and scholarly preparation. It will be a welcome addition to the libraries of all who are interested in the application to industry of the science of the physics of matter, as well as a valuable book of reference for those who are concerned with the many problems connected with the flow of liquids. A. W. A.

### A Volume of Natural History

**The Outline of Science.** Vol. II. By Prof. J. Arthur Thomson. G. P. Putnam's Sons. New York. \$4.50.

This volume maintains the high standard set by the first book of the series of four to be published. By far the largest part of it is devoted to a description of the animal life of the earth, natural history. Many excellent illustrations picture odd inhabitants of the globe and admirably lighten the text—which isn't heavy by any means. Birds, mammals, and the insect world receive a chapter each and cover an immense field in relatively few pages, but do it exceptionally well. Other chapters in the work treat of the wonders of microscopy, the body machine and its work. The fifteenth discusses the science of the mind, and even goes into the complexities of psycho-analysis.

Twenty-two pages summarize the position of Darwinism and emphasize the universal acceptance of the evolution idea, which makes us pause to wonder how the publishers must feel knowing that, for one thing, their "Outline" can never grace William Jennings Bryan's library.

The first two volumes have given scant notice to "earth science" geology—except fossils as fossil records have been pointed out as valuable indices to past life on the globe. We trust that in the volumes yet to appear more adequate treatment will be given to this important subject.

## Societies, Addresses and Reports

### Many Papers for Lake Superior Institute Meeting

The papers to be presented at the twenty-second annual meeting of the Lake Superior Mining Institute, which is to be held at Houghton, in the Michigan copper district, Aug. 28, 29 and 30, are as follows:

"Co-operative Effort in the Study of Mining Methods," with an outline of the papers on mining methods, compiled by the mining methods committee of the American Institute of Mining and Metallurgical Engineers. It will be presented by Charles F. Jackson, secretary, Cleveland, Ohio.

"Why We Need a Classification of Methods of Mining." By F. W. Sperr, of the Michigan College of Mines, Houghton, Mich.

"Calumet & Hecla's Reclamation Plant." By C. Harry Benedict, Calumet, Mich.

"Handling Underground Waste Rock Through Underground Skip Dump, Quincy Mining Co." By T. C. DeSollar, Hancock, Mich.

"Recent Practice in the Use of Scrapers on Sub-Levels." By Lucien Eaton, superintendent of the Cleveland-Cliffs Iron Co., Ishpeming, Mich.

"Compound Steam Hoist Installation of the Quincy Mining Co." By Ray W. Armstrong, Hancock, Mich.

"Mining Methods of the Copper Range Co." By W. H. Schacht, general manager, Painesdale, Mich.

"Reorganization of the Arcadian Consolidated Mining Co." By Robert H. Shields, Houghton, Mich.

"Faulting on the Gogebic Range." By W. O. Hotchkiss, State Geologist of Wisconsin.

"Geology of the Eastern Menominee Range." By Major L. P. Barrett, mining geologist, of Michigan.

"Pumping in East Vulcan Mine." By Frank H. Armstrong, Vulcan, Mich.

"Development and Extraction Methods for Lake Superior Copper Deposits." By F. W. Denton, Painesdale, Mich.

Additional papers are being prepared and will be included in the annual proceedings of the Lake Superior Mining Institute, to be published later.

### Mining Law Senator King's Theme at Club Luncheon

Senator King, of Utah, was on the program to speak on mining law at the weekly luncheon of the mining committee of the Salt Lake City Commercial Club, of Salt Lake City, Utah, on Aug. 19. It is planned, whenever possible, to have as guests at the weekly luncheons members of the state Congressional delegation, and in this way to establish a cordial relationship and thorough understanding between Utah Congressmen and the committee.

## MEN YOU SHOULD KNOW ABOUT

W. W. Mein has recently been in Utah.

Ernest N. Patty left Seattle, Wash., on Aug. 9, for Fairbanks, Alaska.

Edwin Higgins, F. G. Farish, and F. H. Dakin are at the Fremont mine, near Sutter Creek, Cal.

E. A. Julian, general manager for the Goldfield Consolidated Mining Co., is in Reno from San Francisco.

Charles L. Denison, president of the Teck Hughes, has visited the property in Kirkland Lake, Ontario.

Rol. King is in Los Angeles. His address for the present is 304 Wilcox Building.

D. F. Hewett is acting as chief of the section of metalliferous deposits of the U. S. Geological Survey.

A. G. Hall, until recently the manager of the properties of Burma Mines, Ltd., in India, is in San Francisco.

Pentecost Mitchell, of Duluth, Minn., vice-president of the Oliver Iron Mining Co., has returned from a trip abroad.

Roy Young, of Spokane, was in Stewart, B. C., in July and has left for Eagle, on the Yukon River, in Alaska.

L. F. S. Holland has been making an examination in Lincoln County, N. M., and returned to Hollywood, Cal., on Aug. 24.

S. A. Spellmeyer, chief engineer for the San Luis Mining Co., in Durango, Mexico, expects to pass the next few months in California.

Edward Sampson and J. L. Gilson, of the U. S. Geological Survey, are making geological observations at the south end of Lake Pend Oreille, Idaho.

Edmund Juessen, mining engineer, with headquarters in San Francisco, has been doing professional work on the Comstock Lode, Nevada.

H. L. Harland, mill superintendent for the Robinson Gold Mining Co., Ltd., South Africa, for many years, is visiting relatives at Juneau, Alaska.

M. P. McDonald, mining engineer of Toronto, inspected the Spokane Mining & Development Co.'s copper property, near Beasley, B. C., early in August.

Dorsey A. Lyon, chief metallurgist of the U. S. Bureau of Mines, after several months spent at Western stations of the Bureau, has returned to Washington.

T. P. O'Hara, who has served for many years as an assistant to the Director of the U. S. Geological Survey, has resigned to undertake the practice of law.

James F. McCarthy, of Wallace, Idaho, president and manager of the Hecla Mining Co., is in Milwaukee where he attended a meeting of Hecla directors held on Aug. 19.

Sydney W. Ford, of the Rimer Gold Dredging Co., New Zealand, has been investigating gold-dredging operations in California and left San Francisco for New Zealand on Aug. 15.

J. Nelson Nevius, of Pasadena, Cal., has accepted appointment as valuation mining engineer with the Income Tax Unit, Bureau of Internal Revenue, and is now in Washington.

Louis D. Huntoon has gone to Schumacher, Ontario, to examine the recent developments in the McIntyre mine. He examined this property last January and again in March.

George S. Rice, chief mining engineer of the U. S. Bureau of Mines, is making a tour of the Western mining states, and will also visit British Columbia before his return to Washington.

Fred Morris, of San Francisco, was recently in Juneau, Alaska, en route to San Francisco from the Atlin district in northern British Columbia. Mr. Morris examined a silver-lead deposit.

Harry E. Meyer, chief clerk of the U. S. Bureau of Mines, is visiting the experiment stations with the idea of improving office management and standardizing office clerical procedure.

Maurice D. Leehey, mining man and attorney of Seattle, returned to his home on Aug. 16, after a hurried trip to Fairbanks, Iowa, where he had been called by the sudden death of his mother.

E. F. Campbell, late superintendent of United Verde Extension Mining Co. at Jerome, Ariz., is organizing an exploration company on the Pacific Coast, and is changing his home address to San Diego.

T. H. Aldrich, mining engineer and mineralogist of Birmingham, Ala., has just returned from a three weeks' investigation, for the owners, of the Emma mine of the Buffalo Sulphur Refining Co. at Telluride, Col.

Robert K. Painter, James D. Stewart and Arthur V. Schenck have formed a partnership under the firm name of Painter, Stewart & Schenck, for the practice of mining, civil and hydroelectric engineering at Auburn, Cal.

Walter B. Lang has been appointed geologic aid to take the place of H. W. Hoots in the work on Texas potash. Mr. Lang will be in the chemical laboratory of the Survey for a short time prior to taking up the work in Texas.

C. E. Augustine, a fuel engineer of the Bureau of Mines staff, at the request of the Veteran's Bureau will visit all hospitals, making recommendations as to the improvements that may be made in fuel-burning equipment and in the selection of fuel.

G. R. Hanks, superintendent of the High Bridge plant of the Taylor-Wharton Iron & Steel Co., is visiting the gold-dredging fields in California for the purpose of determining the conditions under which alloy steel is used in the dredging industry.

Philip Wiseman, of Los Angeles, spent part of the month of August at Spokane and in the Coeur d'Alenes. While in the latter district he spent much of his time on the property under development by the Coeur d'Alene Syndicate, in which he is interested.

William C. Noxon, Agent-General for Ontario in England, recently addressed the mining club of London on the mining industries of Ontario in connection with an exhibit of samples of the gold and silver ores of that province. These were examined by a large number of engineers and metallurgists.

An exploring party including Prof. W. G. Worcester, provincial engineer of Saskatchewan; Prof. C. J. Mackenzie, of Saskatchewan University; and W. G. Hastings, of the provincial Bureau of Labor, have gone to Red Deer Lake to investigate the original source of coal deposits on the banks of the Red River.

J. Niles, of Sheffield, England, and O. Wehrheim, of The Hague, Holland, European representatives of Freyn-Bassett Steel Co., Chicago, were recent visitors on the iron ranges in Minnesota. They have been inspecting mines and concentrators prior to their departure for The Hague, where they will superintend the erection of a furnace.

Mining and metallurgical engineers visiting New York City last week included: Alfred C. Langdon, of Globe, Ariz.; W. Spencer Hutchinson, of Boston, Mass.; S. D. Bridge, of Monterey, Mexico; David Tamor, of Cuba; Guy Courtney, of Melbourne, Australia; and H. J. Morgan, of Cleveland, Ohio.

## SOCIETY MEETINGS ANNOUNCED

The Nevada Section of the A.I.M.E., will meet at Gold Hill on Sept. 20, the day set for the starting of the 2,500-ton plant of the United Comstock Mines Co.

American Electrochemical Society will hold its forty-second general meeting at Montreal, Quebec, Sept. 21 to 23, at the Hotel Windsor.

## OBITUARY

Gardner F. Williams died in San Francisco on Aug. 22. An appreciation of the man and his work will appear in an early issue.

Hans S. Meyer died of appendicitis at Johannesburg, South Africa, on Aug. 4. Mr. Meyer was forty-five years old. He came to the Rand in 1897, and had been with the Rand Mines up to his death. Mr. Meyer was a past president of the Chemical and Metallurgical Society of South Africa.



## 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

**TARIFF RATES** provided in the metals schedule of the Fordney-McCumber Bill, as passed by the Senate, are in general lower than those approved by the House.

The Denver Mint, it has been announced, will resume the purchase of silver on Sept. 1, as a designated point of delivery under the Pittman Act.

Effects of the coal and rail strikes are becoming apparent in various mining districts. Increasing inconvenience is reported from many points.

The Genessee mine, at Cobalt, Ont., is the scene of an interesting discovery of high-grade silver ore.

Queensland's experience with its "Mining on Private Land Act" is cited in this issue by our Brisbane correspondent, with reference to the legislation proposed in the United States.

The Northern Pacific's "smelting in transit" rate, recently established, has caused the Bunker Hill & Sullivan Mining & Concentration Co. to protest strongly.

A fifty-mile railroad to the coal fields in Emery County, Utah, has been proposed by the Utah Central Railroad Co. The road will run via Cleveland and Huntington to Wellington.

#### New Northern Pacific Rate Causes Protest

Refund Made for Freight on Metal Contents of Ore Between Coeur d'Alenes and East Helena

Effective from Aug. 1 the Northern Pacific R.R. Co. has established what is known as the "smelting-in-transit" rate on ores from the Coeur d'Alene district, Idaho, to East Helena, Mont. The rate on usual shipments on ore to the East Helena smelter is \$3.50 per ton. The rate on bullion from East Helena to the Atlantic coast is \$16.50, and that is also the rate on bullion from Bradley, the smelter station of the Bunker Hill & Sullivan Mining & Concentrating Co., in the Coeur d'Alene district, although it is about 250 miles west of East Helena. Under the "smelting-in-transit" rate, ore shipped to the A. S. & R. plant at East Helena is billed at the regular \$3.50 rate, but upon arriving at the smelter and having the actual lead content determined, a deduction is made covering the metal tonnage, and freight is charged only against the gangue or waste associated with the ore or concentrates. The average lead content in concentrates is about 45 per cent, so the effect is to reduce the old rate about one-half. The Bunker Hill company has protested against the "smelting-in-transit" rate to the Interstate Commerce Commission and asked that it be suspended for three months to give time for a hearing. The protest was denied, but it is understood that the Bunker Hill will renew its efforts to get a hearing in protest against the rate, claiming that it is deprived of its natural and rightful advantages as a local institution in contracting for Coeur d'Alene ores.

#### Will Take Testimony in Wolf Mineral Process Suits

Willis B. Rice, of the firm of Duell, Warfield & Duell, of New York, sailed on Aug. 19 on the "Homer" to take the testimony of Messrs. Sulman & Picard in London in connection with the suits brought by Wolf's Mineral Process Corporation to recover the Sulman, Picard & Ballot patent.

#### British America Nickel's Plant at Deschenes, Que., Started

On Aug. 14 operations were resumed on a small scale at the plant of the British America Nickel Corporation at Deschenes, Que. At present only a small part of the plant is in use, but it is expected that work will soon be carried on more actively.

#### Denver a Silver Delivery Point Beginning Sept. 1

Advices have just been received in Denver that beginning Sept. 1, the United States Mint there will resume the purchase of silver as a designated point of delivery under the Pittman Act, and that in all probability purchases will continue until the end of the present year at least. Practically all of the silver produced in Colorado is refined at the Atlantic seaboard, and at present is sold to the Philadelphia Mint. With delivery required at Denver, the seller will be obliged to pay express charges from seaboard refining points to Denver, and in consequence the American Smelting & Refining Company will, after Sept. 1, pay Colorado operators, for the silver content of their ores, 99¼c. an oz. instead of 99½c.

#### The "Farthest North" College Alaskans to Have School of Mines at Fairbanks—Opening Set for This Fall

*Special Correspondence*

The Alaska Agricultural College and School of Mines, which begins its work at Fairbanks, Alaska, next September, brings higher educational advantages directly home to the Alaskans. Every year many students from Alaska are forced to crowd into the universities and colleges of the western states. There existed a definite demand for a college within the territory, and the newly organized institution is the answer to that demand.

The campus comprises four sections of land, a part of which is occupied by the Government Experiment Farm, four miles from Fairbanks. This tract was set aside by special act of Congress in 1915. In 1917, the Territorial Legislature appropriated \$60,000 for the construction of buildings and purchase of equipment. This was inadequate to complete the work, and the 1921 Legislature appropriated an additional \$41,000. When the college is a going institution the Federal Government will furnish \$50,000 annually toward operating expenses.

Charles E. Bunnell, who has been appointed president, is one of the pioneer educational workers of Alaska. He holds the degree of A.M. from Bucknell College, and has been in Alaska since 1900. During the last seven years he has been Federal Judge of the Fourth Judicial District. Mr. Bunnell has been in the United States for the last six months selecting the faculty and purchasing operating equipment for the new institution.

For the first years five general courses of study will be offered, namely, agriculture, home economics, civil engineering, mining engineering and general science.

Earl R. Pilgrim has been chosen as head of the department of mining and metallurgy. He is a graduate of the University of Washington, College of Mines, and at present is metallurgist for the Kirk-Simon Smelting Co., at Harbor City, Cal.

Ernest N. Patty is head of the department of geology. He also is a graduate of the University of Washington, College of Mines, and at present is engineer-in-charge of the Washington Black Rock Mining Co., at Northport, Washington.

The new college is starting in a modest way. It expects the difficulties through which all pioneer institutions must pass, but its field is an alluring one, and there is no reason why it will not fill the need for which it was created.

The department of mining and geology will no doubt co-operate with the Fairbanks' station of the U. S. Bureau of Mines, and will further enjoy the advantage of close contact with the various phases of mining operations to be found in Alaska.

### Sudbury District's Coal Reported of Little Importance

Much newspaper publicity has recently been given to the report of the discovery of anthracite coal in the Sudbury district. Similiar occurrences have been known in that part of the country for many years, but a more recent discovery of greater size has once more stirred up interest. The government geologists state that the material is anthraxolite. Although it has the same composition and appearance of anthracite coal, the name anthraxolite is given to it because the deposit apparently cuts across the slate beds instead of being interbedded, and as this is not the way in which anthracite should be found, the geologists have come to the conclusion that some other name must be applied to it. C. W. Knight, assistant provincial geologist, has recently paid a visit to the discovery, and reports that the deposit appears to be small in extent and badly mixed with quartz. He does not consider it to be of any economic importance.

### Important Silver Discovery Made at Cobalt

A discovery of high-grade silver ore has been made on the 350 level of the Genesee mine at Cobalt, Ont., which shows, in places, 2 in. of 2,000-ounce ore. The discovery is important because it represents the first high-grade ore found in the section of the Cobalt camp north of the 64 fault, which passes through the Hudson Bay, Nipissing, Chambers-Ferland, and La Rose, and which was thought to have dammed back the solutions.

## News from Washington

By PAUL WOOTON  
Special Correspondent

### Tariff Rates in Metals Schedule Lowered

Senate Provisions Less Than Those Fixed by House—Duty on Aluminum Strongly Supported—Rates on Ferro-alloys Reduced

AS PASSED by the Senate, the Fordney-McCumber Tariff Bill provides rates in the metals schedule generally lower than those fixed in the measure as it was adopted by the House. This difference was true as the bill was reported by the Senate Finance Committee, and during the weeks of consideration the changes in metals from the committee's original figures have been downward, with few exceptions.

In the last week of the Senate's consideration of the bill, the Finance Committee reduced the rate on high-speed steel 7 per cent by cutting the duty on steel valued at more than 16c. per lb. to 20 per cent ad valorem, from the original figure of 25 per cent, and decreasing from 10 to 8 per cent the additional duty to be paid on steel containing more than six-tenths of 1 per cent of metallic alloy.

Rates on metallic magnesium were reduced in the final days of the Senate debate on the bill, on motion of Senator Phipps, of Colorado, which was not resisted by the Finance Committee. As rewritten, the rate on magnesium in the crude, ingots, alloys or scrap stands in the bill at 10c. per lb., instead of 50 and 40c., as provided in the different classifications as originally drawn; the rate on the metal in coils, plates, sheets and other unfinished forms is 20c. per lb., instead of 40c., while the rate on ribbons, tubing, powder and other finished articles remains at 40c. per lb. upon the metallic magnesium content and 20 per cent ad valorem.

#### EFFORTS TO CUT RATE ON ALUMINUM FAIL

Repeated efforts were made at various stages of the bill in the Senate to reduce the duty on aluminum from the figures of 5c. per lb. on the crude and 9c. per lb. on the prepared, which were fixed by the House and unchanged by the Finance Committee, but all of these were unsuccessful. Vigorous attacks upon the Aluminum Co. of America were made by the Democratic side, and Senator Reed, of Missouri, insinuated that the influence of Secretary of the Treasury Mellon, listed as a director of this corporation, had been felt in fixing these rates. The latter charge brought a heated rejoinder from Senator McCumber, chairman of the Finance Committee, who denied that any person connected with the Treasury Department had had any connection with determining these rates and who pointed out that in the first nine months of 1921 imports of unmanufactured

aluminum were more than 24,000,000 lb. while exports were barely more than 1,000,000 lb.

The Senate committee reduced from 5 to 3c. per lb. the rate on nickel. No change was made in the House rate of 1½c. per lb. on lead-bearing ore. The House rates on zinc ore, which provide a sliding scale according to the zinc content, also were unchanged, but rates on manufactures of zinc were increased slightly. The basic copper rate of 2½c. per lb. in rolls, rods, or sheets was not changed.

#### RATES ON ALL FERRO-ALLOYS REDUCED —DUTY ON MANGANESE ORE RETAINED

The duty on pig iron, iron kettles and spiegeleisen was reduced from \$1.25 per ton to 75c. per ton during the last week of Senate consideration of the bill and scrap iron and scrap steel were reduced from \$1 to 75c. per ton.

The rates on all ferro-alloys were reduced below the figures fixed by the House Ways and Means Committee, and in its final summing up of the bill, the Senate made no changes from the figures which were fixed upon alloys in May and June.

The Finance Committee's recommendation to place manganese ore on the free list was rejected by the Senate, 19 to 35, and the duty of 1 cent per lb. upon the metallic content, as provided by the House, remains in the bill. This was done at the insistence of Senators from the West, where production began in quantity during the war. The domestic ore runs from 35 to 45 per cent manganese, while the imported ore, principally from British India and from Brazil, averages 45 to 55 per cent manganese, and, being easier to mine, is cheaper.

The Finance Committee reduced the House rate of 75c. per lb. on the metallic content to 35c. on molybdenum ore. The 45c. House rate on tungsten ore was retained. The Senate reduced to 1½c. per lb. the duty on ferromanganese; cut the rate on manganese metal to 1½c. per lb. and 15 per cent ad valorem; reduced the rate on ferromolybdenum, powder, calcium and alloys to 50c. per lb. and 15 per cent ad valorem; fixed a rate of 60c. per lb. and 25 per cent ad valorem on ferrotungsten, powder, acid and compounds and the same rate on chromium-tungsten; adopted rates of 2 to 8c. per lb. on ferrosilicon according to silicon content; retained the House rates of 3½c. per lb. to 30 per cent ad valorem on ferrochrome, according to carbon

content; reduced to 25 per cent the duty on ferrophosphorus, ferrotitanium, and other alloys used in the manufacture of steel not specially provided for, and adopted a rate of \$2 per lb. on cerium metal and \$2 per lb. and 25 per cent ad valorem on all cerium alloys.

Most of the reductions made in the metals schedule came in the manufactured articles. In the last week of consideration, the Finance Committee increased by 5 per cent the duties on woven-wire cloth of any metal, but though the figures are 5 points above those fixed in the House bill, the rates actually are lower as the measure stands now, because of the difference in the valuation basis used by the two houses of Congress.

The rate on table, household, kitchen and hospital utensils of iron or steel, enameled or glazed, was reduced from 50 to 30 per cent in the last week of Senate consideration on an individual amendment of Senator Jones, of New Mexico.

What is true of general reductions having been made in the metals schedule by the Senate applies with perhaps a little less force to the schedule on earths, earthenware, and glassware. In general this schedule, also, shows rates below those provided in the House bill.

#### LOWER DUTIES ON MAGNESITE RESTORED

Having made an increase in the duties on magnesite, the Senate reversed itself in the final days of consideration of the bill and restored a rate of five-sixteenths of 1c. per lb. on the crude, five-eighths of 1c. per lb. on caustic calcined magnesite and four-tenths of 1c. per lb. on dead-burned and grain magnesite, the change having been made on motion of Senator Calder, of New York.

A vigorous fight to have amorphous graphite placed on the free list was defeated, and the duty of 10 per cent remains in the bill.

Crude plaster rock was placed on the free list in the last week of Senate debate.

The duty on talc, steatite, or soapstone, and French chalk, if ground, washed, powdered or pulverized, was lowered on motion of Senator Calder, of New York, from one-half of 1c. per lb. to 25 per cent ad valorem.

While, in the bill as a whole, the average of the specific rates are admittedly high, Chairman McCumber, of the Finance Committee, contends that the average ad valorem rates are lower than in any Republican tariff bill enacted heretofore. The Senate materially reduced the rates prescribed in the House bill, with the exception of those on coal-tar products and those in the agricultural schedule. These rates were increased materially.

One of the very important phases of the bill is its provisions for flexible tariff rates. This is the first time any elasticity in tariff rates won the approval of either house. Though the amendment proposing to enlarge the Tariff Commission did not prevail, the

commission is authorized to hold hearings and to conduct continuous investigations with the idea of remedying any inequities that may be found in tariff rates. The Tariff Commission will submit its finding of facts to the President, who is empowered until July 1, 1924, to change rates, provided that no change, either up or down, is to exceed 50 per cent. The date of July 1, 1924, was selected by the majority party so that in the event of a change of administration, the power would not be conveyed to a Democratic President.

#### TEN PER CENT DUTY ON GRAPHITE RETAINED IN BILL

The contest over the duty on graphite, which held the attention of the Senate for many hours late in May and was brought up from time to time subsequently, sprang to life again in the last week of consideration of the Tariff Bill through an amendment offered by Senator Newberry, of Michigan, to place amorphous graphite on the free list. Senator Newberry was supported in his fight by Senator Walsh, of Massachusetts, and was opposed by Senators Nicholson, of Colorado; Gooding, of Idaho, and Heflin, of Alabama. The amendment was defeated 14 to 44, and the duty of 10 per cent ad valorem remains in the bill.

In attacking the duty, Senator Newberry declared that the American graphite is inferior to the foreign product, although great sums have been spent in trying to find deposits of the proper quality in this country, and that the Mexican graphite is preferred, although the freight rate alone is more than the price at which the domestic product is offered.

Senators Nicholson and Heflin disputed the charge of inferiority of the American product and waxed warm in its defense. The Colorado Senator attempted to introduce an amendment to increase the duty, but was ruled out of order. During the debate, a letter from the Alabama Graphite Producers' Association was introduced, claiming that the duties fixed in the bill are wholly inadequate.

Contributing to the controversy, Senator McCumber, chairman of the Finance Committee, declared that the 10 per cent ad valorem duty was equivalent to three-tenths of 1c. per lb., and, asserting that the principal opposition comes from pencil manufacturers, said that this was in poor grace, inasmuch as a heavy protective duty had been placed on pencils. In fact, he said, a protective duty has been placed upon all products in the manufacture of which graphite is used.

#### Service Between Alaskan Points Improved

The Alaska Railroad now is maintaining a twenty-three-hour schedule between Seward and Nenana. This is in contrast with the former three-day schedule, which included over-night stops at Anchorage, Curry, and McKinley Park.

#### Further War Minerals Awards Made, Subject to Approval

##### Rich Claim Allowed After Being Reconsidered—Four Petitions Found To Be Not Within Act

Subject to the approval of the Secretary of the Interior, the War Minerals Relief Commission has recommended awards as follows: Estate of Herman and William Rich, Canton, Ga., \$10,605.52; I. J. Matheny, Batesville, Ark., \$421.60; Samuel Altshuler, San Francisco, \$1,604.56; E. C. Hosner, Lone Pine, Cal., \$744; Triangle Mining Co., Salt Lake City, \$1,590.63; E. H. Bartholf, Colfax, Cal., \$1,222.87.

As to the Rich claim, the former commission disagreed. A majority recommendation, signed by Commissioners Moore and Pomeroy, recommended disallowance, but Senator Shafroth's minority report recommended an award of \$3,461.27. John Briar, the assistant commissioner who wrote the opinion on which the \$10,605.52 recommendation is based, states that the claimants "had to deal with excessive water and caving which retarded their progress toward production. The end of the war came without any contribution of ore to war needs, but in mining unfavorable conditions often are met which prevent the operator from accomplishing what he confidently set out to do."

In recommending the award to Mr. Hosner, Mr. Briar states: "This miner made an honest effort to aid the Government. His responses to the interrogations of Commissioner Moore make a most favorable impression and, in my opinion, place him in that class which the act seeks to reach."

The disallowances during the week ended Aug. 19 were as follows: Miller, Nichols & Nichols, Medford, Ore., not within the act; Matt Cronon, Gold Hill, Utah, not within the act; A. J. Schmidt, Oakland, Cal., not within the act; also F. A. Lawson, San Francisco.

#### Coal Operators Expected to Sign Cleveland Agreement

##### Situation Described as a Truce—Government Officials Able to Crystallize Public Opinion

A truce, with both of the contestants retaining their arms and preparing for a resumption of hostilities on a larger scale, describes the situation in the coal industry. It is an opinion in Washington—almost unanimously held—that all the operators eventually will accept the Cleveland agreement. So far as Government officials are concerned, they will have little patience with any other course. Their position is that the public's need of coal is more important at this time than any issue involved in the strike. The viewpoint of Government officials and members of the Congressional bodies is important, not so much from any law the Government can invoke, but from the fact that they are assured complete publicity for their opinions on this subject and in that way can crystallize public opinion.

## News by Mining Districts

### London Letter

**East Rand Proprietary Announces  
Discovery of Good Ore—Other  
Finds Made Elsewhere**

BY W. A. DOMAN

London, Aug. 11.—Truly the Witwatersrand is a remarkable gold field. For some years now waves of pessimism have swept over it; it was played out; there was nothing to go for or to expect in the case of the older mines, and the future depended upon the Far Eastern wing. Now a few rays of light are said to be piercing the gloom, and here and there hopes have risen to a remarkable degree. It would almost appear as though Hugh F. Harriott, the late consulting engineer to the Central Mining & Investment Corporation, and an expert who knows Rand working conditions throughout the length and breadth of the field, would prove to have had a good deal of right and foresight on his side. For his presidential address to the members of the Institution of Mining and Metallurgy some years ago, he took the subject of deep mining on the Rand. Optimistic he was called, and he has not "got home," but good developments at depth on various properties have recently been reported. I have already mentioned the Robinson Deep. A few days ago a cable dispatch was received from the East Rand Proprietary Mines announcing that ore of exceptional grade had been found in the lower levels of the Driefontein & Comet sections of the property. At the time of writing extent and values are not known. It is not the practice of the management, however, to cable the details concerning insignificant matters and so hopes thus raised have led to purchases of the shares, which are higher than they have been for very many months past. As a matter of interest it may be mentioned that ore of high gold content is urgently needed to keep the company on its financial legs. It is somewhat of a disappointment to learn that the cost of treating 119,000 tons of ore in July absorbed £130,000 out of a total of £137,900 realized for 30,559 oz. of fine gold sold at £4 10s. 3d. net, leaving a working profit of only £7,937. As is the case with other companies the mine could not be worked at any profit at the existing level of expenditure if there were no "premium" on the disposal of the gold.

The Witwatersrand Deep is also in the eastern part of the Rand, and very good values have lately been opened up in this mine. It is not easy to find out who runs the company, but a suggestion has been made that Sir Abe Bailey is not unconnected with its recent finance. Stanley Edwards, who took the Gaika from the Gold Fields of South Africa stable, thinks rather well of Witwatersrand Deep.

In the outside districts of the Transvaal as well as on the Rand itself discoveries are being made. The Trans-

vaal Gold Mining Estates at Lydenburg announces that at its Standsdrift mine high-grade ore has been exposed on the fourth level at the intersection of the reef with the extension of the "blow." As with the East Rand Proprietary Mines, insufficient work has yet been done to prove extent and value. At Rustenberg again good finds are reported, but generally speaking there is nothing but a whetting of the appetite at present.

### Johannesburg Letter

**Electrolytic Zinc Plant in View at  
Rhodesia Broken Hill**

BY JOHN WATSON

Johannesburg, July 11.—The Transvaal gold output for June was declared yesterday by the Chamber of Mines as 675,697 fine oz., being an increase of 45,911 oz. over the May return. The value for June was £3,125,099 (at £4-12-6 per fine ounce), showing an increase of £226,083. The June price was 6d. per fine ounce higher than the May figure. The most notable increases are from Modder B, 5,116 oz.; New Modder, 4,560 oz. increase; Randfontein Central, 4,142; Crown Mines, 3,389, and E. R. P. M. 2,616 oz. increase. The returns of native labor on the gold mines show 170,464 employed in June, against 155,425 in May.

From the Broken Hill mine, in north-western Rhodesia, an extension of the orebody in the eastern section is reported. Engineers there are investigating a hydro-electric scheme for generating power from the Nulunguski and Wusenfwa Rivers for a large electrolytic zinc plant. Experiment on a leaching process with a small plant has produced 50 lb. of zinc per day. A company in that district is making large quantities of high-grade lead and has proved occurrences of vanadium.

A river-digger in the Douglas district, near Kimberley, recently found an amber-colored diamond of 93 carats.

The prospectus of a new mineral venture, the African Exploitation Co., Ltd., has just been issued. The directors are Timothy Sleith, a well-known merchant in S. W. Africa; T. J. Carlisle, late inspector of farms to the Land Bank, and Colonel M. J. de Jager, of Windhoek, chairman of the Land Board. The vendors are the S. W. African Mining and Exploration Syndicate of Windhoek. The company states in its prospectus that it is interested in a large number of gold-bearing claims. One property, which it is intended to exploit immediately gave assays from 19 dwt. to 91 dwt. gold per ton. The company also holds options over diamondiferous claims, and others carrying uranium, pitchblende, coal, oil, silver, tin, copper, mica, and precious stones.

### KOREA

Unsankinko—The Oriental Consolidated Mining Co. obtained \$75,000 from its July cleanup, compared with \$78,000 in June.

### QUEENSLAND

**New Guinea Copper Sells Railway and  
Jetty to Government—The State's  
"Mining on Private Land" Act**

From Our Special Correspondent

Brisbane, July 17.—The New Guinea Copper Mining Co., formerly known as the Laloki, has arranged to sell to the Commonwealth Government its jetty and railway for £45,000. For the use of these works the company has to pay a rent equivalent to 6 per cent of the purchase money for twelve years, and undertake to spend £100,000 on the development of its mine. The company has entered into an arrangement with the British Metal Corporation, of London, by which the latter is to handle its products. The latter company was formed in 1918 with a capital of £5,000,000 in £10 shares to support and sustain the general trade of the United Kingdom in non-ferrous metals; to obtain for British manufacturers the raw materials needed for their trade; to afford the credits required by users of metals and ores; to assist producers, and to develop and extend the mineral and metal production of the empire.

The New Guinea company, in order to provide for its scheme of development, proposes to increase its authorized capital to £500,000, and an arrangement has been entered into with Messrs. E. L. and C. Baillieu to underwrite an issue of £125,000 of 10 per cent cumulative preference shares. The money is to be used to carry out the erection of a smelter and other plant of the company's mines at Laloki. The whole project has been reported upon by Eric Huntly, general manager, who calculates that £78,000 will be needed to get the company into good condition. He estimates that in the Laloki mine there is 240,000 tons of ore containing 4½ per cent copper and 2½ dwt. gold, and in the Dubuna mine 45,000 tons of ore containing 5 per cent copper and 2½ dwt. gold. He suggests the erection of a smelting and converting plant at Bootless Inlet to treat 6,000 tons of ore a month. Costs he puts down at £40 to £45 per ton gross, and the profit is estimated at the difference between this cost and the price for electrolytic copper. He estimates that by treating 200 tons of 4½ per cent copper and 2½ dwt. gold per ton, he will extract 8½ tons copper and 25 oz. gold a day. The outlay on the works and on equipment necessary to get the plant in going order is £78,000. Mr. Huntly considers that, owing to the ease with which the ore can be won and its smelting qualities, he can "produce copper at a price comparable with the cheapest average costs in the world."

In the *Engineering and Mining Journal* for March 25, p. 502, it is stated that discussion was being held in Washington as to the advisability of legislation which will allow prospecting under certain conditions in the Eastern states. While, of course, the mining conditions in the east of the United States are

very different to what they are in the sparsely populated regions of Queensland, it may be of interest to residents of that part of the United States to know that this state has had a Mining on Private Land Act in operation for the last thirteen years, and that almost nothing has resulted from it. One reason for passing such a measure was that it would force certain owners of freehold land where minerals were known to exist, but where no effort was being made to exploit them, either to work these properties themselves or allow others to come in and do so, but not one instance can be pointed to where this effect has been secured. A case in view at the time was that of the Australian copper mine, near Cloncurry, owned by the Mount Elliott company, but the reason why that was not being worked was because the company could at that time obtain all the ore it wanted from mines nearer to its smelters, and as soon as the occasion arose started to open up the Australian.

When silver-lead ore was discovered on a building allotment at Indooroopilly, a suburb of Brisbane, scores of licenses to mine on private property not only adjacent to the original find but miles away were taken out. In some cases shafts were sunk, but in the majority of instances the rights over the properties were simply held for speculative purposes, while in others they were acquired as a lever to levy blackmail. In one case an elderly man, who had inherited from his father not only a large property but the ideas of a Britisher that a man's freehold was his own to do what he liked with, was so perturbed over the invasion of his land by strangers that he worried himself into a serious illness. Under the Queensland law, silver occurring on private land is the property of the Crown, while lead belongs to the owner, which means that the holder of a license from the Crown is entitled to take any silver he may find on other people's land, but must not touch the lead. In the Indooroopilly areas, as in most other places in Queensland, the silver and the lead were found in the same ore. When the original discovery was made the owner, finding the vein of ore followed was going toward his neighbor's land, got a license to mine under the latter, but the neighbor threatened that if he touched his lead there would be trouble. Unfortunately for the lawyers, an amalgamation settled the difficulty.

Activity prevails on the Mount Coolon gold field, situated about 150 miles northerly from Clermont, between the latter region and the old Ravenswood gold field, in the north of Queensland. The Native Bear, the chief mine on the field, operated profitably last year, and lately has been engaged in greatly improving its mining and treatment facilities. It is now working at a depth of 100 ft. Among other mines operating on this field, the Sydney, worked by tributaries, recently cleaned up 136 oz. of gold and a few tons of sand worth from £7 to £8 per ton from 100 tons of ore.

## ONTARIO

### Dome Establishing Position as High-Grade Mine—Argonaut to Defer Building Mill

**Cobalt**—During July the Nipissing mined ore of an estimated net value of \$191,138, and shipped bullion and residues of an estimated net value of \$141,927. The high-grade plant treated 1,705 tons and the refinery shipped 152,231 fine ounces of bullion. Underground development during the month was favorable. On the third level of the 63 shaft drifting has proved a 2-in. vein, assaying 2,575 oz., for a length of 295 ft.

During the week ended Aug. 11, the Nipissing shipped nine cars, containing 714,000 lb. and the Mining Corporation six cars containing 408,000 lb. All the shipments consisted of residues, and are the heaviest that have been made for a long while.

The Colonial, recently taken over by American interests, is being turned over to a new company called the Mageno Mines, Ltd.

**Kirkland Lake**—Within a few days the Kirkland Gold will cut the main vein at a depth of 1,000 ft., which will be the deepest level in the camp. On the 900 ft. level a new oreshoot has been drifted on for 50 ft., and shows satisfactory values.

The Moffat-Hall, which recently increased its capital from \$3,000,000 to \$5,000,000, expects to resume operations soon. The company now controls 600 acres.

The Nipissing is diamond drilling the Stellar claim, which is close to the Tough-Oakes.

It is understood that the Argonaut will not proceed with the proposed mill construction. The treatment of the ore is more difficult than at first anticipated, and a new flow sheet may be necessary.

An encouraging discovery has been made on the Lightning River property. The vein is 14 ft. wide and shows extensive mineralization.

The shaft of the Bidgood will reach 600 ft. in a short time, where a level will be opened to develop the vein found at 400 ft.

The old directors were re-elected at a recent shareholders meeting of the Lake Shore.

A mining plant has been installed on the Queen-Label, and underground work is to be resumed.

**Porcupine**—A meeting of the La Palme shareholders has been called to ratify the proposal to sell the company's assets to the Ontario National Development Corporation Ltd., a \$5,000,000 company, of which La Palme shareholders will receive 1,000,000 shares.

The Hollinger statement for the six months ended June 30 shows that there was milled 665,115 tons, from which was recovered a total of \$5,669,555, and a net profit was realized of \$3,034,966. The average tonnage per day was 3,959; the average value of the ore was \$8.82, and the average

cost \$4.42. Profits were somewhat less than for the preceding six months, on account of the drop in the grade of the ore without a corresponding decrease in costs. It is understood, however, that costs are now below \$4, and the tonnage is running nearly 4,500 tons a day. Since the commencement of operations the Hollinger's gross income totals \$56,000,000; net profits \$29,000,000 and dividends \$18,000,000. The president of the company has announced that arrangements are being made which will permit the company to develop its own hydro-electric power. He also states definitely that the dividend will be increased in the near future.

The outstanding feature of the Porcupine camp is the position which the Dome is establishing. The company has discovered what is practically a new line below the seventh level, with a much higher grade of ore, and it looks as if this property, which was considered low grade, will be the highest-grade mine in the Porcupine camp. During July the production amounted to \$335,254 from 1,030 tons, or an average recovery of \$10.50 a ton. During the first nine days of August recovery was \$22,000 ahead of the corresponding period in July, and some of the ore has been so high in grade that the company found it necessary to sort it underground.

## BRITISH COLUMBIA

### R. H. Stewart Acquires Ruth-Hope Mine—Silversmith Board Re-elected

**Sandon**—The Ruth-Hope mine has recently been acquired by R. H. Stewart, former general manager of the Consolidated Mining & Smelting Co. Associated with Mr. Stewart is R. S. Lennie, an attorney of Vancouver, B. C., and others. The mine was owned by English interests represented by George H. Alexander and associates, of London. The Ruth mines has produced \$500,000 to the third level, and \$100,000 has been mined from the surface workings of the Hope. The consideration has not been made public.

The Silversmith has re-elected the old board of directors. Election of officers was held in Spokane, Aug. 14. During the month the mine shipped 100 tons of crude ore, 400 tons of lead concentrate and 300 tons of zinc concentrate. Stopping from the 500 to the 1,100 levels is being carried on.

**Paulson**—The Molly Gibson mine, near Paulson, has recently opened a ledge 8 ft. wide on its property. An assay across the face, as reported by F. H. Jacobson, a director, gave returns of \$59 per ton in gold. The strike was made in the upper tunnel, and this ledge had not been encountered before in any of the workings.

**Victoria**—George A. Young, government road superintendent, says that good progress is being made in opening up the mining district of Portland Canal. A branch of the Premier mine road is being built to the Big Missouri, a distance of six miles, and will be in condition for ore haulage this

year. The Bear-Naas River trail is being put in good condition. This runs into Meziaden Lake, a distance of forty miles from Stewart, and will facilitate access to many mining prospects.

**Vancouver**—A. G. Henderson, W. T. Campbell, and William Hunt, of Vancouver, B. C., are planning the exploitation of large deposits of kaolin in the Cariboo. The establishment of a fine pottery and tile industry is proposed. The clay is pure white, and government analyses show it to be of excellent quality. A test made at the government laboratory, Ottawa, produced a hard, white, non-absorbent tile which takes a good glaze and is pronounced equal or superior to any imported to this country from England.

Manifests of vessels leaving Vancouver for the Orient and Europe indicate that there has been a marked growth in the movement of spelter through the Port of Vancouver in recent months. At the close of the war it was estimated that there was 20,000 tons of lead and zinc on hand in British Columbia for which there was no foreign market. Japan first and later Europe absorbed this supply, and the demand has continued. Nearly every boat leaving for Japan carries a quantity of these metals, exports to that country amounting to about 1,200 tons a month. Europe takes approximately one-third of that amount a month. The production of the Trail smelter runs to about 90 tons of zinc and 150 tons of lead daily.

**Trail**—Ore shipments received at the consolidated smelter, Aug. 8 to 14, inclusive, totaled 6,936 tons, of which 6,324 came from company mines. The other shippers were: Black Rock, Northport, Wash., 101; California, Nelson, B. C., 13; Northport S. & R. Co., Northport, Wash., 53; Ottawa, Slocan City, B. C., 12; Paradise, Lake Windermere, B. C., 45; Quilp, Republic, Wash., 159; Rosebery Surprise, New Denver, B. C., 84; Rambler Lease, Rambler, B. C., 43; Silversmith, Sandon, B. C., 32; and Whitewater, Retalack, B. C., 70.

**Nelson**—With the long continued dry weather, danger of fire to mining properties throughout the Kootenays increased greatly until the middle of August. Rain throughout the district became general at that time, and in many cases averted further damage. It is likely that no additional danger will be encountered by mine surface equipment this season from extension of forest fires.

## QUEBEC

### Buckingham Feldspar Property Sold

**Buckingham** — Interest in feldspar mining in the Lievre River district has been aroused by the purchase of the Buckingham feldspar mine, which is situated about thirteen miles from the town of Buckingham, by M. A. Mahoney and George Rice, of Ottawa, at a price of about \$100,000. Active work is now under way. Numerous showings have been found on other lots in the neighborhood.

## CALIFORNIA

### Gwin Mine To Be Reopened—Randsburg—Grass Valley—Marble Quarrying

*Special Correspondence.*

**San Francisco**—The Gwin mine, near Jackson, is to be reopened by the California Gwin Mining Co., which has filled articles of incorporation with the county clerk. The property shut down about twelve years ago, following a dispute with the water company; it has a record of having mined 1,000,000 tons of ore for a production of \$5,500,000.

The Randsburg district continues to attract attention in consequence of the output from the California Rand, the premier silver producer of California. The Ben Hur, Belcher Extension, and other companies are active, and numerous corporations are developing ore.

The Julia Ross mine and ranch property, in the Newton district of Nevada County, has been bonded in Los Angeles interests. Development work is planned, and it is expected that a mill will be erected. The mine is the result of a discovery in a field on the Ross ranch two years ago. Several shipments of ore have been made to the Selby smelter. The Signal mine, in the Deer Creek section of Nevada County, closed for about two years, has been reopened by the owner, E. M. Taylor. The Grass Valley district is showing activity.

After four years of preparation, the Morington Mining Co. is treating the gravel at Hartman's Bar, in Butte County. A dam has just been completed. The machinery is operated by electricity.

After lying idle for twenty-five years, the Pine Grove marble quarry near Jackson is being reopened. This quarry has furnished some of the finest marble seen in California, used extensively in building operations in Stockton and elsewhere in the state. The rock was hauled to Ione in the old days by mule teams, but the expense became prohibitive, and the quarry was shut down. Cheaper means of transportation, however, will enable the owners to work the quarry profitably.

## OREGON

### New Crosscut Started in Bay Horse Mine; 100-Ton Mill To Be Built

**Huntington**—The U. S. Metals Co., which is operating the Bay Horse Mine, 10 miles from Huntington, on the Snake River, is starting a new crosscut to develop the vein 130 ft. below the No. 2 level. The company is shipping four cars weekly which average \$1,200 to the car. Plans are being laid to install a 100-ton concentrator. C. A. Magney, consulting engineer, and D. C. Livingston, professor of geology at the State University of Oregon, are now on the property studying the geology of the vicinity, of which very little is known. Surface indications, however, show ore across the general strike of the veins for 300 ft. in width.

## NEVADA

### Coal and Rail Strikes Hampering Work in South—White Caps Mill to Resume

*By Our Special Correspondent.*

**Mina**—Leasers on the old Webster mine, at Grantsville, fifty-four miles east of Mina, have shipped a carload of concentrate which carries 35 to 40 per cent lead and about 235 ounces of silver per ton. Mill capacity is 50 tons of ore per day. The mill consists of a rock crusher, two five-stamp batteries, rod mill, and two K & K flotation machines. Power is supplied by gasoline engines.

The West End Consolidated Mining Co. has shipped the second car of high-grade ore from the Mabel mine to the West End mill at Tonopah. The shaft at the Mabel mine has been sunk 200 ft. below the tunnel level and work is being done on three levels.

**Divide**—The south crosscut on the 1,400 level of the Tonopah Divide mine is out 380 ft. from the shaft. On account of the irregularity in dip of the vein, which has changed from a steep dip to the northeast on the upper levels to a steep dip to the southwest on the lower levels, it is impossible to foretell just where it will be cut on the 1,400 level, but it is expected to show at any time.

**Manhattan**—It is reported that the White Caps mill, which has been closed for several years because of the inability of the operators to solve the metallurgical problem of handling the refractory ore then existing in the mine, will resume operations in August. Underground work in the White Caps mine has been practically continuous, and orebodies developed which can be treated successfully.

**Tonopah**—Bullion shipments from this district during July totaled \$675,000, which is slightly above normal. Regular production is being maintained by the four larger companies of the district, the Belmont, West End, Tonopah Extension, and Tonopah Mining; and in addition a substantial tonnage of ore is being shipped regularly from the Halifax, Rescue, Montana, Midway, and North Star mines.

There is no noticeable effect on operations in this territory from the coal and railroad strikes, but in the southern part of the state conditions are becoming serious and are likely to have a marked effect on future work and production.

**Goodsprings**—Morris P. Kirk is sinking a shaft on the Milford property, at Goodsprings. A number of smaller properties are being worked in the district.

**Ely**—Work is being rushed on cleaning up the debris from the fire that recently destroyed the mill of Nevada Consolidated Copper Co. Construction has not yet started on the first unit, which is to be ready for operation early next spring. The steam shovels have ceased work in the pits, but an increased force is working underground at Ruth.

## ARIZONA

**Fuel Situation in State Assuming Serious Aspect—Increasing Force at Morenci**

Phoenix—Though recent adjustments are expected to start the Gallup mines again, the fuel situation in Arizona had begun to assume a serious aspect. The Santa Fe strike was of grave importance to the United Verde smelter at Clarkdale and the Extension smelter at Clemenceau, as both use powdered Gallup coal as reverberatory fuel, while coke is needed for the water jackets. Both companies have large supplies of fuel on hand, gathered during the slack period, but began to be pinched for ordinary supplies after the first week of the strike. Governor Campbell has been forming an Arizona Fuel and Distribution Committee, on which George Jay was named as the southeastern representative. The Warren district of Cochise County is a large consumer of coal and coke, and it is said that many commercial orders were refused by Colorado and New Mexico producers.

Morenci—Capt. J. P. Hodgson, manager of the Phelps-Dodge Morenci branch, states that 150 more miners and muckers are to be put at work here as soon as possible, to serve as the nucleus of a larger organization, to do a large amount of development work and to get out about 700 tons of ore a day for the No. 6 mill. The men now working in the Coronado mine will be transferred to Morenci soon. Though the plans for enlargement of the No. 6 mill will be ready next month, no decision has been reached concerning the work to be done. It is stated that the copper outlook is not considered bright enough to warrant much expenditure of money in the near future, though it is proposed eventually to spend about \$8,000,000 in a rehabilitation of the large property, to the end that copper shall be produced at the least possible cost and by the most effective modern methods.

Douglas—The Copper Queen smelter each month has been handling concentrates from Nacozari, representing 2,500,000 lb. of copper, about 2,000,000 lb. in concentrates from Clifton, and about 5,000,000 lb. has been produced from Bisbee ores.

## NEW MEXICO

**Anita Copper Co.'s Mill Tested**

*Special Correspondence*

Lordsburg — Leasers in the No. 1 shaft of the Bonney mine are shipping about fifty tons of ore weekly. Smelter returns on the last car shipped by Shauber & Kurtz ran .11 oz. gold, 5.30 oz. silver, 8.20 per cent copper. Sholley & Reynolds have contracted their mining on a basis of \$4 per ton of ore, smelter weight, furnishing fuse, powder, and hoisting. They are hoisting about eight tons of ore daily.

The new concentration-flotation mill at the Last Chance mine is turning out an \$1,800 concentrate. This will probably be cut down to about \$800 with an increase in extraction.

The test run of the Anita Copper Co.'s mill gave a 65 per cent recovery. This will be increased to about 82 per cent by making changes and treating the tailing by flotation. A new three and one-half ton truck has been added to the equipment, and ore is being hauled to the Southern Pacific for shipment to the El Paso smelter. George Foreman is manager.

## UTAH

**Utah Zinc Co.'s Plant to Run at Full Capacity—Utah Central to Build Fifty-Mile Branch**

Park City—Shipments for the week ended Aug. 12 were: Ontario, 1,383 tons; Silver King Coalition, 1,005; Park-Utah, 968; Judge, Daly, and Daly West, 483.

Murray—The new plant of the Utah Zinc Co., operation of which was started June 15, will be brought up to its capacity of 300 tons of zinc oxide monthly within a few days. This company, which was organized about two years ago, is backed by Utah men. Operation was deemed inadvisable for some time after completion of the company's plant, owing to market conditions. However, profitable operation is now expected. Most of the ore for the plant is coming from the Tecoma mine, near the Utah-Nevada line on the Western and Southern Pacific railroads, and from Ely, Nev.

Salt Lake City—The Utah Central Railroad Co., which proposes to construct a fifty-mile line to the new coal fields in Emery County, has filed with the Public Utilities Commission of Utah a copy of its application with the Interstate Commerce Commission for a certificate of convenience and necessity to construct such a line, asking the commission to indicate its desire within ten days as to representation or hearings. The application is signed by James H. Mays, Harry L. Gandy, and Thomas C. Bradley, who represent the Utah Central railroad company, in process of organization under the laws of South Dakota.

The application sets forth, among other things, that the proposed new line will have as its termini the coal mines situated in Huntington and tributary canyons, and will follow a general northeasterly direction through or near the towns of Huntington, Desert Lake, and Cleveland to the town of Wellington on the Rio Grande Western R.R. and by branch line from a point on said proposed line between the towns of Cleveland and Wellington, will connect with the Utah railroad at or near Utah Railroad Junction, Utah, which will be the end of the line.

Eureka—Tintic shipments for the week ended Aug. 12 amount to 147 cars. Shippers were: Chief Consolidated, 40 cars; Tintic Standard, 33; Colorado, 16; Iron Blosson, 14; Victoria, 10; Grand Central, 9; Mammoth, 4; Centennial-Eureka, 4; Dragon, 2; Bullion Beck, 2; and Tintic Drain Tunnel, 1.

## COLORADO

**Tonopah-Colorado Leasing Co. Takes Over Lombard Group—Uncle Sam, at Silverton, Sold—Suit Filed Against Eurades Co.**

Idaho Springs—The Tonopah-Colorado Leasing Co. has taken over the Lombard group, ten miles northwest of this place, and under the management of James Hopkins has begun to clean out the old workings and to get the property in condition for examination and test preliminary to purchase. The Tonopah company is a subsidiary of the Tonopah Mining Co. of Nevada, which for several years has been operating placer properties in this state near Breckenridge, in Summit County. The Lombard group comprises a large acreage developed by a 4,000-ft. tunnel, and is credited with a production of a million dollars and more, consisting principally in lead-silver ores.

Silverton—The Uncle Sam group, locally known as the Yukon mine, has been sold to the Ariadne Corporation. The combination of the Ariadne and the Uncle Sam group comprises one of the most important mining transfers of the year, and is said to be the beginning of the most extensive operations in this section. The properties are on Boulder mountain about two miles from Silverton. Operations are in charge of Colonel A. A. Lamont.

Suit has been filed in the Denver District Court by the receiver of the Michigan Avenue Trust Co., of Chicago, to recover \$153,000 from the Eurades Mining Co., which until July, 1921, was operating in Ouray County, Col. The suit originated from the alleged embezzlement of W. C. Spurgin, who was president of the trust company, as well as the mining company, and who, it is alleged, absconded with \$153,000 of the bank's funds. The trust company asks that the mining property be made over to it for the purpose of reimbursing it for the embezzlement.

Alma—The Lincoln Consolidated has opened up a 3-ft. vein of 150-oz. silver ore. This is supposed to be the continuation of the famous Russia vein worked in early days. This company has let a contract for a number of diamond-drill holes to prospect a large acreage of unproved territory. The machinery is now on the ground and drilling will start in a few days.

The Platte River Dredging Co. is operating its dredge near Fairplay, Col., to capacity, with satisfactory results. Hydraulic placers have been forced to suspend operations, owing to the exceedingly dry season.

Oliva—During July some of the larger companies have increased their forces and a number of smaller properties have resumed operations. The London Gold Mines heads the list of shippers, with eight cars of high-grade gold ore, shipped to the Arkansas Valley plant of the A. S. & R. Co. at Leadville, Col.

## MICHIGAN

## The Copper Country

C. & H. Shafts in Good Condition;  
No. 12 Holed Through—New Baltic  
Shaft Near Objective

BY M. W. YOUNGS

**Houghton**—The Calumet & Hecla conglomerate shafts have been restored to their former good condition and are now in readiness to get out as large a tonnage as before the shut-down in April a year ago. Rock is averaging close to 40 lb. to the ton, much of it coming from the upper levels, where pillars, backs of stopes, and arches are being removed. Red Jacket shaft repairs have been completed, but the shaft is not yet in use and No. 6 will continue for a time to handle rock that ordinarily would be raised through the Red Jacket. The No. 12 shaft, southern terminal of the haulage tunnel at the eighty-first level of the conglomerate department, has been holed through after many months of work, a distance of 2,400 ft., from the eighty-first to the fifty-eighth level. It was a considerable engineering feat, the point of contact being practically at the calculated junction. About 600 ft. of the haulageway remains to be driven, the total length being 8,000 ft. Equipment is being installed.

Rapid progress is being made in the sinking of the New Baltic shaft of Arcadian Consolidated. The shaft has reached a depth of 1,225 ft. and will be sunk an additional 50 ft. It is expected that the objective, or the 1,275 level, will be reached by Sept. 1.

Development work is proceeding on a small scale at the Victoria mine, in Ontonagon County. A drift west from No. 2 shaft, at the twenty-second level, in ground not previously explored, has opened vein matter heavily charged with copper. Two drills are at work here, and the territory will be thoroughly investigated. The drift at the nineteenth level, now in about 900 ft. also looks promising. The opening on the twenty-fifth level, east, is in good ground, while the rock in the twenty-seventh level, east, is fair and both drifts on the twenty-eighth level have encouraging values. It is unlikely that Victoria will resume production until copper has reached a higher price and labor conditions improve. In the meantime, however, development work will be prosecuted on a small but vigorous scale.

Ahmeek is shipping 1,600 to 1,700 tons of rock daily to the mill. This is averaging close to 30 lb. to the ton, and with a mass copper yield of approximately 150,000 lb. a month, Ahmeek's monthly output is 1,400,000 lb., refined.

Since the introduction of the bonus or contract system, Ahmeek's labor turnover has been small. There is a possibility of a further extension of the bonus principle in the Ahmeek and other mines of the Calumet & Hecla group.

## Marquette Range

Cleveland-Cliffs Buys Land in Cascade  
District

**Ishpeming** — The Cleveland-Cliffs Iron Co. has purchased from the Heidelberg Estate, of New York, nine forties of land in the Cascade district, close to Palmer. It is known that there are deposits of low-grade iron ore on the lands and possibilities of finding bodies of higher grade. The transaction was made through John H. Quinn, of Ishpeming. The consideration is not announced.

## Menominee Range

Ore Movements Hindered by Railroad  
Strike

**Iron River** — Ore shipments were held up for several days this week when train crews refused to take out locomotives which they believed were not in condition for duty. After inspection had been made, the men returned to work. The rail strike has interfered with the ore movement on the Menominee and Gogebic ranges, and a few mines have had to curtail.

## MINNESOTA

## Mesabi Range

Pickands, Mather Company Buys  
Equipment for Danube and  
Bennett Mines

**Hibbing**—A fire which started recently in the Utica mine, operated by the Pickands, Mather Co., did little damage. It was finally located in an abandoned portion of the property and was confined to a small area. It was caused by spontaneous combustion.

The Mesabi Cliffs Iron Mining Co. is shipping from its Boeing open pit.

**Eveleth**—The Oliver Iron Mining Co. is shipping some of the ocherous variety of limonite ore from its Adams open pit to a paint manufacturing company in St. Louis.

**Aurora**—Ore shipments from the stockpile at the Mohawk mine, a property of the Pickands, Mather Co., are being made daily to the docks.

The loading of the stockpile at the Meadow-Fowler mine has been completed by the Cleveland-Cliffs Iron Co., and practically all of the company's equipment has been removed. The lease on this property was relinquished about a year ago.

**Marble**—The Pickands, Mather Co. has ordered equipment for open-pit operations at its Danube and Bennett properties. The order calls for five locomotives with 21 by 26-in. cylinders, weighing 102 tons each, including the tender. Thirty-five Kilbourne & Jacobs steel automatic dump cars, of 20 cu. yd. capacity, have been ordered for stripping operations, and in addition two No. 76 Marion steam shovels with 3½-cu. yd. dippers have been ordered for the Danube open pit. The work in this pit was formerly done by contract, but under the present plans the operating company will conduct all further work.

## ALABAMA

Pig-Iron and Coal Production at High  
Point—Graphite Operators Be-  
coming More Active

BY GEORGE HUNTINGTON CLARK

**Birmingham** — Pig-iron production during the first week in August was on a basis of 215,000 tons for the month, from twenty-five active furnaces, and may possibly go as high as 225,000 tons provided there is no serious interference with the necessary coal, coke, ore, and limestone supplies. At least two stacks now out of blast are in a position to resume operations, and may do so soon, in the event that strike conditions (with resultant car shortage), and fuel priority distribution, justify blowing in. As regards the lack of influence of these unfavorable conditions on production in the district thus far, as limiting factors, it is somewhat remarkable that the production now indicated for August is so large when compared with the total July production in the state, which was 194,300 tons, and a total output for June of 189,008 tons. Yard stocks are necessarily on the increase because of lack of transportation. The present coal production is still around 375,000 tons per week, notwithstanding the fact that the railroad strike is already responsible for a heavy drop in loaded car movements because of disabled rolling stock and limited motive power.

As regards Alabama's assistance in relieving the existing national coal shortage, it may be briefly stated that whereas in January, 1922, Alabama furnished only 2.2 per cent of the total output of the country, the output of the state for the week ended July 29, or 375,000 tons, was 8.8 per cent of the total. Wholly irrespective of conditions which may obtain in other coal fields in the immediate future, there is now and will remain for some time to come an indicated demand for the maximum production of which Alabama is capable, approximately 100,000 tons per day, which is double the normal production of the state.

In the Alabama graphite field, some relatively unimportant but encouraging activity has been noted, which is due to improved market conditions.

The plant of the Pocahontus Graphite Co., a subsidiary of the Dixie Graphite Co., has been in regular operation for more than a month, with a mill record estimated at 150 tons per day, turning out a product standardized on ten recent shipments at 90.030 per cent graphitic carbon made by Minerals Separation flotation. This plant is near Ashland, in Clay County.

The Ceylon plant, near Goodwater, in Coosa County, has been undergoing necessary repairs following recent inactivity and is either already in operation or will be soon. This is also true of the Taber graphite mill, in Chilton County, where by reason of low iron content in the ore, the electrostatic method of reduction has long been in successful use.



# THE MARKET REPORT

## Daily Prices of Metals

Aug.	Copper, N. Y., net refinery*		Tin		Lead		Zinc
	Electrolytic		99 Per Cent	Straits	N. Y.	St. L.	St. L.
17	13.75		32.375	32.75	5.75@5.85	5.55	6.15@6.20
18	13.75		32.25	32.75	5.75@5.90	5.55	6.15@6.20
19	13.75		32.25	32.75	5.75@5.90	5.55	6.20
21	13.725		32.25	32.625	5.90	5.55@5.60	6.20@6.25
22	13.725		32.25	32.50	5.90@5.95	5.55@5.625	6.20@6.25
23	13.725		32.25	32.50	5.90@5.95	5.55@5.625	6.25

\*These prices correspond to the following quotations for copper delivered: Aug. 17, 18, 19, 14c.; Aug. 21, 22, 23, 13.975c.

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.

delivery throughout the remainder of the year could probably be obtained today for 13.875c. delivered if the intending buyer should thoroughly comb the market, though most producers are still on the 14c. basis. Most of the inquiries are for October-November delivery, with September and December in lesser, though about equal, demand. Buying is well distributed among the usual consuming trade. Practically no re-sale copper is being offered.

Export demand has been more quiet than usual, the general price level being slightly less than 14c. f.a.s.

### Lead

On Monday, Aug. 21, the American Smelting & Refining Co. increased its official contract price for lead from 5.75 to 5.90c., New York.

Last Thursday, Friday and Saturday practically no lead was to be obtained on the New York market at the price quoted by the leading interest, most of the outside sales being made at 5.875@5.90c. This condition led the Smelting company to raise the price over the week-end, but even at the current level, the offerings are decidedly light, with all the anxiety on the part of the consumers. Quotations are being made as high as 6.05c. today, but we have heard of no sales by producers at that level. However, two or three hundred tons have been sold at 6c. in the last two or three days, and for October delivery this price represents about the lowest level at which the metal could be booked. Sales in general were light before the price advance, but have been in somewhat larger volume since then.

The St. Louis market has been satisfactory, though the price did not advance proportionately to that in New York. All week, including today, chemical lead has been offered at 5.55c., though some sellers are quoting up to 5.65c. and sales have actually been made as high as 5.70c. The higher prices, however, generally cover desilverized lead.

## London

Aug.	Copper			Tin		Lead		Zinc	
	Standard	Electrolytic		Spot	3M	Spot	3M	Spot	3M
	Spot	3M							
17	64	64½	70	161½	161½	24½	23½	31½	30½
18	63½	64	70	161½	161½	24½	24	31½	30½
21	63½	63½	69½	161½	161½	24½	23½	31½	30½
22	63½	63½	69½	160½	160½	24½	23½	31½	30½
23	63½	63½	69½	160½	160½	24½	23½	31½	30½

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

Aug.	Sterling Exchange "Checks"	Silver			Aug.	Sterling Exchange "Checks"	Silver		
		New York Domestic Origin	New York Foreign Origin	London			New York Domestic Origin	New York Foreign Origin	London
17	4.47½	99½	69½	34½	21	4.48	99½	69½	35
18	4.48	99½	69½	34½	22	4.47½	99½	69½	34½
19	4.47½	99½	69½	34½	23	4.47	99½	69½	34½

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

## Metal Markets

### New York, Aug. 23, 1922

Settlement of the railway shopmen's strike and the coal strike seems much farther away than it did last week, and these unsettled conditions have of course had a bad effect on all business, including trade in the metals. Sales have been of fair volume nevertheless, and little metal of any kind is being forced on the market at any price that it will bring. Fundamental conditions continue to improve, as indicated by the new high levels reached by the stock market in the last week.

### Copper

The 14c. price for delivered copper is not quite so firm as it was last week, though most of the business has been done at that figure. Some producers report very satisfactory sales at a uniform price of 14c. delivered. Others have cut the price to 13.95 and 13.90c. where the freight to the consumer was less than 25 points. Then too, several million pounds have been sold at 13.875c. delivered, and large tonnages for delivery many months in the future have been offered at a marked concession even from this low price without attracting a purchaser. Copper for

### Zinc

The market has been stronger and prices have recovered from the slight reaction which occurred last week, though sales have been light. Last Thursday zinc could have been bought for 6.15c. from at least one producer, although 6.175c. was paid. Since then the price has risen gradually, and today the general holding level is 6.25c. The statistical position of zinc is so satisfactory from the producers' standpoint, and production is so handicapped by labor and fuel troubles, that producers are generally not at all anxious to

press their metal for sale and are frankly anticipating a better market. High-grade zinc business is excellent, and that grade of metal was sold for 7@7.25c. during the week with a freight allowance of 30c. per 100 lb. The price of Prime Western in New York continues at 35 points above the St. Louis market.

### Tin

The tin market has been quiet all week until yesterday, when a slight decline, emanating from London, aroused some of the dealers to buy. The 99 per cent grade continues very scarce, with a marked price differential between various brands. Forward metal could be obtained for from ¼c. to ½c. less than the prices which we quote. Forward deliveries have commanded premiums of ¼c. over the prices asked for spot Straits.

Arrivals of tin, in long tons; Aug. 18th, Straits, 55; China, 5; 19th, China, 50.

### Gold

Gold in London: Aug. 17th, 92s. 1d.; 18th, 92s.; 21st, 92s.; 22d, 92s.; 23d, 92s. 1d.

### Foreign Exchange

Foreign exchanges have weakened slightly since last week. On Tuesday, Aug. 22, francs were 7.93c.; lire, 4.52c.; marks 0.08¼c.; and Canadian dollars ¾ per cent discount.

### Silver

Silver has again developed weakness, although prices have been better maintained in New York and San Francisco than abroad. The market closes dull, with tendency uncertain.

Mexican Dollars—Aug. 17, 53½; 18th, 53¼; 19th, 53¼; 21st, 53¼; 22d, 52¾; 23d, 52¼c.

### 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, very active at 5.375c. W.C.C., 6@6.25c. Cookson's "C" grade, 7@7.50c.

Bismuth—\$2@2.10 per lb.

Cadmium—\$1.20@1.25 per lb.

Iridium—Metal very scarce. Quotations nominal. Demand strong but no supplies. One consumer has scoured the market without locating purchasable metal.

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

Palladium—\$55 per oz.

Platinum—\$98 per oz. Strong. Stringency in platinum supplies is noticeable. Consumption is reported good, particularly in jewelry and automobile manufacture. Colombia is present chief producing country. Russian supplies are unavailable.

Quicksilver — \$57 per 75-lb. flask. Market active. San Francisco wires \$58.70. Strong.

Selenium—\$1.80@1.90 per lb.

Tellurium—\$2 per lb.

The prices of Cobalt, Magnesium, Molybdenum, Monel Metal, Osmium, Rhodium, Thallium and Tungsten are unchanged from prices given Aug. 5.

### Metallic Ores

Manganese Ore—29c. per long ton unit, seaport.

Iron Ore, Chrome, Magnetite, Molybdenum, Tantalum, Titanium, Tungsten, Uranium, Vanadium, and Zircon ore are unchanged from the quotations published Aug. 5.

### Zinc and Lead Ore Markets

Joplin, Mo., Aug. 19—Zinc blende, per ton, high, \$38.25; basis 60 per cent zinc, premium, \$38; Prime Western, \$36; fines and slimes \$34@32; average settling price, all grades of blende, \$36.69; calamine, basis 40 per cent zinc, \$20@22.50.

Lead, high, \$82.75; basis 80 per cent lead, \$80; average settling price, all grades of lead, \$80.43 per ton.

Shipments for the week: Blende, 8,713; calamine, 53; lead, 1,518 tons. Value, all ores the week, \$440,620.

Premium blende was advanced \$1 per ton, with other grades selling as previous week. Lead held the advance of last week.

Purchases are larger than shipments. Car assignment is made on basis purchases, and buyers purchase more than they can ship to secure a large apportionment of cars. Eastern smelters were given preference this week.

Platteville, Wis., Aug. 19—Blende, basis 60 per cent zinc, \$38 per ton. Lead, basis 80 per cent lead, \$80 per ton. Shipments for the week: Blende, 468; lead, none. Shipments for the year: Blende, 10,594; lead, 1,129 tons. Shipments during week to separating plants, 870 tons blende.

### Non-Metallic Minerals

Barytes—Washed crude, 92 per cent BaSO<sub>4</sub>, guaranteed, \$8@9 per long ton, f.o.b. Georgia points; off-color ground No. 1 grade, \$20; No. 2 grade, \$15.

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, Feldspar, Fluorspar, Fuller's Earth, Graphite, Gypsum, Limestone, Magnesite, Mica, Monazite, Phosphate, Pumice, Pyrites, Silica, and Sulphur are unchanged from the prices published Aug. 5.

### Mineral Products

Arsenious Oxide (white arsenic)—8c. per lb.

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

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

Potassium Sulphate and Sodium Sulphate are unchanged from quotations of Aug. 5.

### Ferro-Alloys

Ferrocium, Ferrochrome, Ferromanganese, Ferromolybdenum, Ferrosilicon, Ferrotitanium, Ferrotungsten, Ferro-uranium, and Ferrovandium are unchanged from the prices published Aug. 5.

### Metal Products

Copper Sheets—New York base, 21c. per lb.; wire, 15.50@15.75c. net.

Nickel Silver—28c. per lb., for 18 per cent nickel Grade "A" sheets.

Yellow Metal—Dimension sheets, 18.75c.; rods, 15.75c. per lb.

Lead Sheets are unchanged from the quotations published in the Aug. 5 issue.

Zinc Sheets — 7.75c. per lb., f.o.b. smelter.

### 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 Aug. 5.

### The Iron Trade

#### Pittsburgh, Aug. 22, 1922

The iron and steel industry is receiving little if any more coal than formerly, and as additional stockpiles are depleted from time to time production of pig iron and steel decreases. Production of steel ingots now is probably nearer 25,000,000 than 30,000,000 tons a year, being off fully 25 per cent from the recent high rate, reached late in June.

The American Sheet & Tin Plate Co. has advanced its sheet prices \$2 a ton on blue annealed to 2.50c., and \$4 a ton on other grades, to 3.35c. for common black, 4.35c. for galvanized, and 4.70c. for automobile sheets. Independents are now lining up at \$3 a ton above these prices. Independent pipe mills have advanced prices \$6 a ton on black and \$4 a ton on galvanized, while most independent wire mills have advanced plain wire \$2 a ton to 2.35c. and wire nails 20c. a keg to \$2.60.

On an average, mills are sold up almost to the end of the year, yet in most lines buyers are willing to place some additional tonnages.

Pig Iron—Sales of bessemer aggregating over 1,000 tons have been made at \$30, Valley, or \$3 advance. Basic is nominal at \$26, Valley, the price on the last sales reported. All Valley foundry iron seems to be cleaned up, the cheapest iron for Pittsburgh delivery being from Buffalo, at \$30, furnace, equivalent for Pittsburgh delivery to \$31.50, Valley. No forward market will be developed until coke is less scarce and furnaces see an opportunity to run.

Connellsville Coke — Furnace, \$12@13; foundry, \$15@15.50.

## German Metal Industries Unsettled

*Special Foreign Correspondence*

Charlottenburg, Aug. 7.—The appallingly rapid depreciation of the German mark raised the price of copper wire bars on the Berlin Metal Exchange from 11,167 marks by the end of June, 1922, to 28,202 marks in the first days of August, 1922, for a quintal (100 kilos). The difference for lead is indicated by the prices 3,970 and 10,150 marks, respectively. These two metals are the most needed in Germany, for the use of its busy cable industry. But even that rich industry is at present marking time on account of the heavy money stringency prevailing all over the country. It would be a fallacy to believe that there is an exact proportion between the rise in the dollar and that of the metallic rawstuffs in this country. On the contrary, on the third of August the appreciation in the dollar was 198 times its pre-war value in terms of marks, whereas on the same day the Berlin quotation for electrolytic copper had soared 207 fold, and that of lead has even been multiplied by 294. As for other metals, there still exists some supply of zinc of Upper Silesian origin, which, however, is depleted gradually, owing to the filled order books of the galvanizing industry. It would appear that the German smelters are prepared to accept the help of British-Australian ore producers. People in Germany argue that the world price of spelter at the London Metal Exchange has gone so high not only by reason of diminishing supplies in the United States, but of the greatly increased need for this metal all over the world, the United Kingdom included. The last-named country therefore would hail in the long run the opportunity to pass on to German smelters its embarrassment of riches in the form of available ores.

As for aluminum, the expensiveness of copper has rendered it a most sought-for substitute. The excess supply of this light metal, which for a long time had been a feature in this country, so far as to force an outlet to American competition with the product of the Aluminum Company of America, exists no more. Germany is even compelled to import relatively large quantities of aluminum, amounting to 3,259 quintals in June last and to 10,312 quintals for the first half of 1922.

It may be of interest to note the German import figures for the same half year with regard to the principal metals. The aggregate for lead is 59,270 quintals in June and 498,543 quintals in the half year; zinc, 4,728 and 28,742, respectively; tin, 3,926 and 40,495; nickel, 518 and 12,438; copper, 185,620 and 1,344,350 quintals.

I learn from a most reliable source that Germany's consumption of copper in the current year will be, at the present rate, 135,000 metric tons or thereabouts. But owing to the acute shortage of money, much concern is felt of a possible progressive raising of prices by the Copper Producers' Association across the Atlantic, which would indeed be hard conditions for German consumers to meet, the more so as the supply of scrap metal here is at present negligible, and the shortage of fuel is greatly handicapping the work of the heretofore flourishing refineries located in this country.

Until recently, the car and locomotive industries of Germany had full order books from abroad. But it would seem the corner has been turned by reason of foreign competition. The working out of Bolivian tin ores by tin smelters had necessarily to be restricted, though the consumption of tin by makers of bronze and babbitt is still very large. But the price of tin has attained inaccessible heights for German purses, and research work has succeeded in creating new forms of bearing metals wherein tin and antimony are nearly eliminated. Platinum is quoted already at 2,250,000 marks for one kilo and is taken off the markets by smugglers, who send it to America. The same applies in a minor degree to gold and silver, and indeed other precious metals.

## Troubles of the Sicilian Sulphur Industry

Continued attempts are being made in Italy to meet the crisis which has arisen since the war in the Sicilian sulphur industry, due to the accumulation of large stocks which could not be disposed of on account of the high cost of production, making competition with the American product difficult. It is estimated that from Aug. 1, 1921, to June 30, 1922, only 70,000 tons of Sicilian sulphur were sold abroad, as against 139,575 tons during the corresponding period of 1920-21, and 205,790 tons during the same period of 1919-20, according to *Commerce Reports*.

An obligatory consortium, controlling the production and sale of Sicilian sulphur, was formed to reduce costs and to better the position of the product in the international market. Measures have been passed by the government to aid the industry.

The bill of May 13 provides that a quantity of raw sulphur on hand in the warehouses of the consortium on April 30, 1922 (not to exceed 270,000 tons), will become the property of the consortium, which will buy it at the rate of 370 lire per ton delivered at the warehouse. This stock of 270,000 tons of sulphur will be considered as distinct from any other quantity of sulphur acquired by the consortium. One-eighth of this stock, or 33,750 tons, will be sold yearly, and the proceeds of this sale will be paid to the Banca di Sicilia for bond-redeeming operations.

The price of 370 lire per ton fixed in the proposal is approximately the rate at which Sicilian sulphur is now sold in France, Spain, and Portugal in competition with United States sulphur. The financial burden imposed on the state through the proposed measure will, therefore, depend on the decrease from this quotation which will apply to sulphur sales in the future.

The price of American sulphur is said to be \$16 per ton, f.o.b., while ocean freight to Mediterranean points is about \$5 per ton. This would bring the c.i.f. price to \$21, or, at the exchange rate of 20 lire to the dollar, to 420 lire per ton.

The f.o.b. price of Sicilian sulphur has been fixed at 350 lire per ton in order to meet American competition, but the Italians believe that the cost of production can be reduced to such an extent that it will be possible to sell for less than 300 lire per ton. Furthermore, it is believed in Italy that the American companies are not more than breaking even at present prices and that in the United States production costs and transportation rates are more likely to increase than to decrease. Consequently, the prospect for the future of Sicilian sulphur is considered favorable, and the government is counted upon to tide over the hard times through which the industry is passing.

Another factor which it is said that the United States must consider is the discovery that the crude sulphur as it comes out of the mine can be ground and used with very satisfactory results for treating grape vines. About 10,000 tons of sulphur are already being employed annually in Italy for this purpose, and it is believed that it can be introduced in large quantities in France, Spain, and other near-by countries where grapes are grown. This ground sulphur can be sold at one-fourth the price of the refined product, as there is no waste whatever, and consequently American sulphur would have no chance to compete successfully with it.

Italy believes that the continuation of a policy of competition will only result in loss to both American and Italian producers, whereas it would be mutually advantageous if an agreement could be entered into with the American producers for the maintenance of fair prices and a division of markets. The Sicilian producers are already united in an obligatory consortium, and the government is prepared to compel the producers on the mainland of Italy to enter the consortium if an agreement with the United States can be reached.

## COMPANY REPORTS

### United Eastern Mining Co.

A report of operations of United Eastern Mining Co. for 1921 shows a profit of \$127,726.37 as follows:

Values recovered			
Gold.....	\$1,843,296.99		
Silver.....	66,756.79		
		\$1,910,053.78	
Miscellaneous income.....		33,901.38	
			\$1,943,955.16
Deduct:			
Cost of mining, milling, general and administrative expenses, etc.			
Mining.....		\$427,454.13	
Development.....		127,752.89	
Milling.....		190,819.58	
Labor and incidental expenses.....		45,511.03	
Marketing.....		11,861.43	
Taxes			
State and county.....	\$114,915.76		
Capital stock.....	2,630.02		
1920 income and profits.....	43,967.71	\$161,513.49	
Casualty reserve.....		1,403.83	
Superintendence.....		9,778.44	
Administrative and general.....		54,752.19	
Litigation.....		4,888.05	
Miscellaneous.....		523.66	
			1,036,258.72
Income before providing for depletion, depreciation and 1921 Federal income and profits taxes.....			
			\$907,696.44
Deduct			
Depletion.....	\$727,995.64		
Depreciation of plant, etc.....	51,974.43		
			779,970.07
Net income before providing for 1921 Federal income and profit taxes.....			
			\$127,726.37

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

ASSETS			
Capital assets			
Property at value agreed upon with Treasury Department for depletion purposes.....			
	\$4,738,933.30		
Less depletion.....			
	3,642,988.83		
		\$1,095,944.47	
Plant and betterments (depreciated values).....			
	178,622.91		
		\$1,274,567.38	
Investments at cost			
Liberty Bonds (par):			
On hand.....	\$50,200.00		
Loaned to bank.....	450,000.00	\$500,200.00	
El Tigre properties.....		45,660.00	
Apache Powder Co. stock (par).....		15,000.00	560,860.00
Working and current assets			
Warehouse stock.....	\$84,008.79		
Bullion values in solution, etc.....	15,676.48	\$99,685.27	
Accrued interest.....			
		4,481.07	
Account receivable			
Bullion shipments.....	\$72,926.03		
Miscellaneous.....	2,931.30	75,857.33	
Cash in banks and on hand.....		342,109.45	522,133.12
Deferred charges			
Unamortized development.....	\$61,683.25		
Advance to Oatman store.....	5,500.00		
Prepaid taxes, insurance, etc.....	2,903.67		70,086.92
			\$2,427,647.42

LIABILITIES			
Capital stock			
Authorized and issued 1,500,000 shares of \$1 each.....		\$1,500,000.00	
Less in treasury 137,000 shares of \$1 each.....		137,000.00	
Outstanding 1,363,000 shares of \$1 each.....		\$1,363,000.00	
Capital surplus			
Balance Dec. 31, 1920 (adjusted), after deducting depletion.....	\$1,636,602.73		
Distribution to stockholders in excess of net income for the year.....	690,073.63		946,529.10
Distribution to stockholders.....	\$817,800.00		
Net income from operations after providing for depletion and depreciation.....	127,726.37		
	\$690,073.63		
Current liabilities			
Accounts and wages payable.....	\$35,153.31		
Accrued state and county taxes.....	57,457.91		
Reserve for accidents.....	25,507.10	118,118.32	
			\$2,427,647.42

Production amounted to 97,413 tons, with an average value of \$20.26 per ton, of which 96.93 per cent was recovered. Gold mines are at Oatman, Ariz.

### Cerro Gordo Mines Co. Silver-Lead; California

A report of the operations of the Cerro Gordo Mines Co. for 1921 shows a deficit of \$335,192.10, according to the following profit and loss account:

Earnings			
Concentrate sales.....	\$7,329.95		
Silver-lead ore sales.....	101.96		
Lime rock sales.....	687.50		
Miscellaneous revenue.....	2,262.08		
			\$10,381.49
Deduct			
Operating expenses.....	\$29,246.17		
Administration expenses.....	15,951.44		
Loss on sale of Liberty Bonds.....	6,240.63		
Loss on fire and sundry accounts.....	1,331.54		
			\$52,769.78
Depletion and depreciation.....			
			\$42,388.29
			29,097.16
Deficit.....			
			\$71,485.45
Surplus account (deficit) Dec. 31, 1920.....			
			263,706.65
Deficit.....			
			\$335,192.10

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

ASSETS			
Mines and mining claims, tramway and equipment, Dec. 31, 1920.....			
	\$1,085,071.30		
Cash expenditure for improvements and additions from Jan. 1, 1921, to Dec. 31, 1921.....			
	23,873.54		
		\$1,108,944.84	
Less sale of mine equipment.....			
	\$250.00		
Loss of assay office, etc.....			
	811.30		
		\$1,061.30	\$1,107,883.54
Less reserve for depletion, depreciation and contingencies.....			
			437,824.38
Cash in bank and on hand.....			
			\$670,059.16
Inventories.....			
			321.60
Accounts receivable.....			
			15,472.55
			1,527.84
Deficit			
Operating loss for 1921.....	\$42,338.29		
Depletion and depreciation.....	29,097.16		
			\$71,485.45
Add deficit Dec. 31, 1920.....			
			263,706.65
			\$335,192.10

LIABILITIES			
Capital stock			
1,000,000 shares of par value of \$1.00 each.....		\$1,000,000.00	
Bills payable.....		12,870.00	
Accounts payable.....		9,703.25	
			\$1,022,573.25

Production amounted to 164,540 tons during October, November and December, 1921, containing 55.3 oz. of gold, 4,815 oz. of silver, and 163,337 lb. of lead.

### Barnes-King Development Co. Gold; Montana

The records of the Barnes-King Development Co. show the following operating results for the quarter ending June 30, 1922:

Earnings:			
Shannon property.....	\$27,855.40		
North Moccasin property.....	3.52		
Interest received.....	1,074.83		
			\$28,933.75
Deduct			
Piegan-Gloster property expense.....	\$1,490.07		
Kendall property expense.....	114.70		
Strawn development expense.....	9,312.76		
Miscellaneous expense.....	563.20		
			11,480.73
Difference being profit on operations for quarter ending June 30, 1922.....			
			\$17,453.02

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 Aug. 19, 1922

Stock	Exch.	High	Low	Last	Last Div.	Stock	Exch.	High	Low	Last	Last Div.	
<b>COPPER</b>						<b>GOLD</b>						
Ahmeek.....	Boston	63	62	63	Aug. '22, Q	\$1.00	Alaska Gold.....	New York				
Alaska-Br. Col. new.	N. Y. Curb	2	2	2			Alaska Juneau.....	New York				
Allouez.....	Boston	25	25	25	Mar. '19	1.00	Atlas.....	Toronto	*29	*26	*28	
Anaconda.....	New York	54	52	54	Nov. '20, Q	1.00	Carson Hill.....	New York	11	10	10	
Areadian Consol.....	Boston	3	3	3			Crosson Consol. G.....	N. Y. Curb	21	21	21	
Aris. Com'l.....	Boston	9	8	8	Oct. '18, Q	0.50	Dome Mines.....	New York	35	32	35	
Big Ledge.....	N. Y. Curb	*13	*8	*11			Florence Goldfield.....	N. Y. Curb	*14	*12	*14	
Bingham Mines.....	Boston	115	114	114	Sept. '19, Q	0.25	Golden Cycle.....	Colo. Springs	1.00	*92	*92	
Calumet & Arizona.....	Boston	61	59	61	June '22, Q	0.50	Goldfield Consol.....	N. Y. Curb	*9	*8	*9	
Calumet & Hecla.....	Boston	295	290	295	Aug. '22, Q	5.00	Gordon Murray.....	Toronto				
Canada Copper.....	N. Y. Curb	*9	*6	*9			Hollinger Consol.....	Toronto	12.00	11.80	12.00	
Centennial.....	Boston	10	9	9	Dec. '18, SA	1.00	Homestake Mining.....	New York	70	70	70	
Cerro de Pasco.....	New York	40	38	40	Mar. '21, Q	0.50	Keora.....	Toronto	*13	*11	*13	
Chile Copper.....	New York	22	21	22			Kirkland Lake.....	Toronto	*47	*39	*47	
Chino.....	New York	30	28	30	Sept. '20, Q	0.37	Lake Shore.....	Toronto				
Columbus Rexall.....	Salt Lake	*27	*26	*26	Aug. '22, Q	0.03	McIntyre-Porcupine.....	Toronto	20.00	18.80	20.00	
Con. Arizona.....	N. Y. Curb				Dec. '18, Q	0.05	Porcupine Crown.....	Toronto	*25	*24	*25	
Con. Copper Mines.....	N. Y. Curb	*53	*40	*40			Porcupine V. N. T.....	Toronto	*18	*16	*17	
Copper Range.....	Boston	43	42	43	Mar. '22, Q	1.00	Portland.....	Colo. Springs	*40	*35	*39	
Crystal Copper.....	Boston Curb	1	1	1			Schumacher.....	Toronto	*75	*74	*75	
Davis-Daly.....	Boston	7	7	7	Mar. '20, Q	0.25	Silver Pick.....	N. Y. Curb	*10	*9	*10	
East Butte.....	Boston	10	10	10	Dec. '19, A	0.50	Teek Hughes.....	Toronto	*73	*69	*73	
First National.....	Boston Curb	*64	*60	*64	Feb. '19, SA	0.15	Tom Reed.....	Los Angeles	*70	*65	*70	
Franklin.....	Boston	2	2	2			United Eastern.....	N. Y. Curb	1	1	1	
Gadsden Copper.....	Boston Curb	88	80	88	May '19, Q	1.25	Vindicator Consol.....	Colo. Springs	*5	*4	*5	
Granby Consol.....	New York	32	30	32	Nov. '20, Q	0.50	White Caps Mining.....	N. Y. Curb	*14	*5	*14	
Greene-Cananea.....	New York	32	31	32	Nov. '20, Q	0.50	Wright-Hargreaves.....	Toronto	3.40	3.25	3.35	
Hancock.....	Boston	2	1	1			Yukon Gold.....	N. Y. Curb	*95	*90	*95	
Howe Sound.....	N. Y. Curb	3	3	3	Jan. '21, Q	0.05	<b>SILVER</b>					
Inspiration Consol.....	New York	41	40	41	Oct. '20, Q	1.00	Batopilas Mining.....	New York	*36	*31	*36	
Iron Cap.....	Boston Curb	18	17	18	Sept. '20, K	0.25	Beaver Consol.....	Toronto	1.35	1.35	1.35	
Isle Royale.....	Boston	24	23	23	Sept. '19, SA	0.50	Coniagas.....	Toronto	*25	*20	*24	
Kennecott.....	New York	37	35	36	Dec. '20, Q	0.50	Crown Reserve.....	Toronto	*29	*31	*29	
Keweenaw.....	Boston	2	2	2			Kerr Lake.....	N. Y. Curb	*29	*26	*28	
Lake Copper.....	Boston	4	4	4			La Rose.....	Toronto	*29	*26	*28	
La Salle.....	Boston	12	11	12			McKinley-Dar-Sav.....	Toronto	*95	*95	*95	
Magma Copper.....	N. Y. Curb	27	27	27	Jan. '19, Q	0.50	Mining Corp. Can.....	Toronto	6	5	6	
Majestic.....	Boston Curb	*10	*5	*5			Nipissing.....	N. Y. Curb	7	6	7	
Mason Valley.....	Boston	1	1	1			Ontario Silver.....	New York	6	6	6	
Mass. Consolidated.....	Boston	3	2	2	Nov. '17, Q	1.00	Ophir Silver.....	N. Y. Curb	*36	*32	*36	
Miami Copper.....	New York	29	29	29	Aug. '22, Q	0.50	Temiskaming.....	Toronto	*4	*3	*3	
Michigan.....	Boston	3	2	3			<b>GOLD AND SILVER</b>					
Mohawk.....	Boston	62	61	62	July '22, Q	1.00	Boston & Montana.....	N. Y. Curb	*17	*16	*16	
Mother Lode Coa.....	N. Y. Curb	11	9	11	June '22, I	0.50	Cash Bay.....	N. Y. Curb	*7	*7	*7	
Nevada Consol.....	New York	17	16	17	Sept. '20, Q	0.25	Dolores Esperanza.....	N. Y. Curb	2	2	2	
New Cornelia.....	Boston	19	18	19	May '22, K	0.25	El Salvador.....	N. Y. Curb	*9	*5	*6	
North Butte.....	Boston	13	12	12	Oct. '18, Q	0.25	Jim Butler.....	N. Y. Curb	*6	*6	*6	
North Lake.....	Boston	*9	*8	*8			Junco Extension.....	N. Y. Curb	*6	*6	*6	
Ohio Copper.....	N. Y. Curb	25	25	25	Dec. '18, Q	1.00	MacNamara M.&M.....	N. Y. Curb	*9	*7	*8	
Old Dominion.....	Boston	37	35	37	Aug. '22, Q	1.00	Tonopah Belmont.....	N. Y. Curb	1	1	1	
Oseola.....	Boston	1175	1160	1175	July '22, Q	1.00	Tonopah Divide.....	N. Y. Curb	*69	*66	*68	
Phelps Dodge.....	Open Mar.	44	42	43	Mar. '20, Q	1.00	Tonopah Extension.....	N. Y. Curb	1	1	1	
Quincy.....	Boston	16	16	16	Dec. '20, Q	0.25	Tonopah Mining.....	N. Y. Curb	1	1	1	
Ray Consolidated.....	New York	48	47	48	Apr. '22, K	2.00	West End Consol.....	N. Y. Curb	1	1	1	
Ray Hercules.....	N. Y. Curb	12	11	12			<b>SILVER-LEAD</b>					
St. Mary's Min. Ld.....	Boston	*90	*82	*85	Nov. '17, Q	0.25	Caledonia.....	N. Y. Curb			*8	
Seneca Copper.....	Boston	9	8	9	Jan. '20, Q	0.25	Cardiff M. & M.....	Salt Lake	175	165	170	
Shannon.....	Boston	*95	*95	*95			Chief Consol.....	Boston Curb	5	5	5	
Shattuck Arizona.....	New York	10	10	10	May '18, I	1.00	Consol. M. & S.....	Montreal	25	25	25	
South Lake.....	Boston	1	1	1			Daly Mining.....	Salt Lake	13.00	11.90		
Superior & Boston.....	Boston	70	60	70	May '13,	0.10	Daly-West.....	Boston			1	
Tenn. C. & C. cis.....	New York	30	28	30	Aug. '22, Q	0.25	Eagle & Blue Bell.....	Boston Curb	13	12	13	
Tollumne.....	Boston	2	2	2	Sept. '18,	0.25	Electric Point.....	Spokane	4	4	4	
United Verde Ex.....	Boston Curb	67	64	66	June '22, Q	0.50	Federal M. & S.....	New York	14	14	14	
Utah Consol.....	New York	1	1	1	Dec. '17,	0.30	Federal M. & S. pfd.....	New York	54	53	53	
Utah Copper.....	Boston	1	1	1			Florence Silver.....	Spokane	*35	*34	*35	
Utah Metal & T.....	Boston	1	1	1			Grand Central.....	Salt Lake	*65	*60	*61	
Victoria.....	Boston	1	1	1			Hecla Mining.....	N. Y. Curb	8	7	7	
Winona.....	Boston	12	10	10			Iron Blossom Con.....	N. Y. Curb			*31	
Wolverine.....	Boston						Judge M. & S.....	Salt Lake	14.00	13.00	14.00	
<b>NICKEL-COPPER</b>						<b>LEAD</b>						
Internat. Nickel.....	New York	18	17	18	Mar. '19,	0.50	National Lead.....	New York	104	99	103	
Internat. Nickel, pfd	New York	81	81	81	Aug. '22, Q	1.50	National Lead, pfd...	New York	114	113	114	
<b>LEAD</b>						<b>QUICKSILVER</b>						
<b>ZINC</b>						<b>ASBESTOS</b>						
<b>SULPHUR</b>						<b>MINING, SMELTING AND REFINING</b>						
Am. Z. L. & S.....	New York	17	17	17	May '20,	1.00	Amer. Sm. & Ref.....	New York	63	60	62	
Am. Z. L. & S. pfd...	New York	47	46	46	Nov. '20, Q	1.50	Amer. Sm. & Ref. pf.	New York	99	98	99	
Butte C. & Z.....	New York	7	7	7	June '18,	0.50	Am. Sm. Sec. pf. A.....	New York	97	96	97	
Butte & Superior.....	New York	30	28	30	Sept. '20,	1.25	U. S. Sm. R. & M.....	New York	42	40	42	
Callahan Zn-Ld.....	New York	8	8	8	Dec. '20, Q	0.50	U.S. Sm.R. & M. pf..	New York	49	48	48	
New Jersey Zn.....	N. Y. Curb	146	144	146	Aug. '22, Q	2.00	<b>ASBESTOS</b>					
Yellow Pine.....	Los Angeles				Sept. '20, Q	0.03	Asbestos Corp.....	Montreal	65	64	64	
<b>QUICKSILVER</b>						<b>ASBESTOS</b>						
<b>ZINC</b>						<b>SULPHUR</b>						
<b>MINING, SMELTING AND REFINING</b>						<b>ASBESTOS</b>						
<b>SULPHUR</b>						<b>MINING, SMELTING AND REFINING</b>						
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<b>MINING, SMELTING AND REFINING</b>						<b>ASBESTOS</b>						
<b>SULPHUR</b> </												

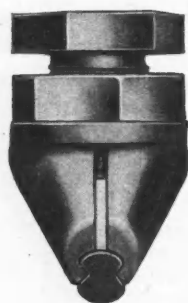
## NEW MACHINERY AND INVENTIONS

### A Trolley Wire Clamp Which Requires Minimum Head Room

A new type of mine trolley wire clamp or trolley ear which has many improvements over preceding types has been placed on the market. The design is exceedingly simple, and has but four parts—namely, a machined steel center, two malleable iron jaws, and a locking nut. All are permanently assembled and sherardized.

There has been a continuous demand for a clamp requiring a minimum of head room, and in this new type the total height of the assembly is but 2 in. This feature will undoubtedly prove of much interest to operators, but of no less interest is the means provided for securing a positive grip on the wire and the fact that the clamp offers the least possible obstruction to the trolley wheel and is both simple and rugged.

The upper hexagon nut is screwed up tightly against the suspension, after which the jaws are aligned with the trolley wire and locked in position by means of the lower hexagon nut, which is fitted with a left-hand thread,



Improved mine trolley wire clamp

and thus the entire assembly is tightened. The device is manufactured by the Electric Service Supplies Co., 17th and Cambria Sts., Philadelphia, Pa.

A decision was recently rendered by the Circuit Court of Appeals for the Third Circuit in the case of John S. Surbaugh and the Pittsburgh Shovel Co. vs. Hubbard & Co., No. 2838, March Term, 1922. The opinion, written by Judge Buffington, found the Surbaugh patent in suit, No. 1,212,582, to be valid and infringed as to all claims in suit. The litigation is conclusive as to the validity of the patent covering the two-prong or double-frog type of coal shovel or scoop known as the "Coal Bluff" and the three-prong or triple-frog type of same known as the "Pacemaker." Manufacture and sale of these types of shovel is controlled by the Pittsburgh Shovel Co.

device and at its lower position holds the point of the hook in place by means of the sheath screw. The hook operates on a hinge, and a small lug is used to insure rigidity. There should be ample for this hook in shaft, testing, and general hoisting work.

The Ashburn Works of E. I. du Pont de Nemours & Co., near Hannibal, Mo., will resume the manufacture of high explosives early in September. This plant was closed down about a year ago when the slump in business conditions caused a falling off in the consumption of dynamite. During the time of the shut-down, the trade logical to the plant was supplied from other operating works. The improvement in business conditions, resulting in increased demands for high explosives, makes it necessary to resume operations. The Ashburn plant has a capacity of about 15,000,000 lb. of explosives per year.

## INDUSTRIAL NOTES

The Associated Engineers have moved to larger quarters at 373 Broadway, Milwaukee, Wis.

Scheid Engineering Corporation, 90 West St., New York City, has been appointed metropolitan and export representative for the Franklin Moore Co., Winsted, Conn., manufacturer of material-handling machinery for industrial plants.

Effective Aug. 7, 1922, George E. Walker became manager of the Galigher Machinery Co., Salt Lake City, Utah. Mr. Walker succeeds J. E. Galigher, who retires from the active management of the company, but retains his interest and his position as vice-president.

The American Car & Foundry Co., of Buffalo, N. Y., has purchased a 7-ft. diameter by 36-in. cylinder Hardinge ball mill for the grinding of bituminous coal. McIntyre-Porcupine Mines Co., Ltd., Schumacher, Ont., Canada, has purchased an 8-ft. diameter by 36-in. cylinder grinding in its new plant. Mineral Refining & Chemical Co., St. Louis, Mo., has purchased two 7-ft. diameter by 36-in. cylinder Hardinge pebble mills which are to be used for grinding barytes to be used as paint filler.

Arthur Whitcraft, manager of manganese steel sales, Hadfield-Penfield Steel Co., in addition to his previous duties has also been placed in charge of all foundry operations at the South Works at Bucyrus, Ohio. The rapidly expanding volume of orders for manganese steel and special heat-treated steel has made it necessary to materially increase production, and Mr. Whitcraft has already effected an appreciable relief from the congestion which has been interfering with the meeting of delivery in accordance with sales agreements.

J. Thompson Brown has been appointed general manager of the Explosives Department of E. I. du Pont de Nemours & Co., to succeed the late Charles A. Patterson. Mr. Brown was first employed by the du Pont company in 1903 and has been engaged in plant engineering and special and general operating work at the high-explosives plants. He has held the positions of secretary to assistant director, manager of dynamite works, general superintendent of the high explosives division, and finally assistant general manager of the department. He is a graduate of Virginia Polytechnic Institute and subsequently took a course in engineering at Cornell University.