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Prospecting for gold in California

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

December 30, 1922

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Hydrogen From the Air

WE HAVE HAD occasion before to speak of the pseudoscience served us by the newspapers. Comes now no less a popular hero than Mr. Arthur Brisbane with the following in the *New York American:*

"German scientists, according to the great Einstein, have solved the problem of producing cheap hydrogen. If that could be done the fuel problem would be settled for the next thousand years, simply by burning up the atmosphere, instead of slowly digging coal. Get hydrogen and nitrogen from the air cheap and the world's wealth is multiplied by ten."

We had fondly imagined, credulous as we are, that it was fairly generally known that the air was made of oxygen and nitrogen, and that hydrogen and oxygen go to make up water. Apparently Mr. Brisbane's knowledge of science is no more extended than is his comprehension of economics.

And after the atmosphere is exhausted—what next?

Independent Journalism and Service to the Industry

A CONTEMPORARY publishes an eight-page article on the Argonaut disaster. A careful reading of this article leaves the impression that Fate had taken the lives of these forty-seven miners despite every precaution that human ingenuity and foresight could devise.

It has remained for the *Journal-Press* to tell the whole story, the real story. Where there have been differences of opinion (and some there have been), the *Journal-Press* has impartially presented both sides. No less than a dozen letters have been printed from contributors to our discussion pages. Editorially we have said what we thought. We feel that we have been instrumental in indelibly impressing upon the minds of everyone in the mining industry the necessity for taking every reasonable measure to prevent mine fires, and to make adequate provision for fighting them. We have perhaps hurt the pride of some, but we have been honest and we have published the facts.

The Near East and Mexico

THAT THE CUSTOMS of the Near East have influenced the American continent would be doubted by the average man. Yet the traveler in Mexico who observes the fine old churches of that country will, if he is also familiar with the Near East, not fail to note the Byzantine type of the Mexican architecture. As a matter of fact, the Mexican church architecture is Spanish; and the Spanish learned their architecture from the Mohammedan Moors, who were the cultured race of their time on the Iberian peninsula; and the Moors borrowed their architecture in part from the wonderful examples of the old Byzantine Empire, which was conquered by the Turks, and its architecture adopted as their own. Thus, the Byzantine Greeks imparted somewhat of their architectural genius to the Turks, the Turks to the Moors, the Moors to the Spaniards, and so to Mexico and on down to the present day.

Again, our readers who observed in our issue of Sept. 9 the illustration of the ancient Phœnician mine ladder in Spain will have recognized it as the famous "chicken ladder" of Mexico, identical as to shape and disposition. When we looked at this picture we were brought back forcibly to the climbs we have made so many times in Mexico, up and down abandoned shafts, over rotten "chicken ladders" placed just as perilously as the picture shows—just so. And the Mexicans like to "pack" the ore on their backs up these ladders just as the Phœnicians taught the Iberians to do. The story of the wanderings of this "primitive" ladder is as long as that of church architecture. Brought by the Phœnicians to Spain, it persisted to Mexico, and has outlasted the centuries of Mexican mining.

Even the national rice dish of Mexico is prepared and eaten in the same way as the rice of Turkey—the "pillaf"; and the line of origin may be traced to the same source as the church architecture.

Treasure Island

THE romance of piracy finds its hectic afterglow in the treasure-hunting expeditions to which the public is invited by promoters that disregard the prosaic regulations of the State Securities Act in California. The organizers of one venture offer shares in an expedition that is to recover twelve million dollars' worth of gold, silver, and precious stones said to have been buried by pirates on Cocos Island, off the Peruvian coast. The shares in this expedition are offered at $1,000 apiece to a hundred persons, who are invited to be passengers on the vessel that is to be chartered and to participate themselves in the search for "pieces of eight" and other piratic loot, after the style of "Treasure Island." The key to the secret place where the gold and jewelry are hidden is held by August Gissler, a German, formerly a resident on Cocos Island and at one time Governor there, so it is said. Who appointed him Governor we are not told. Certainly he will be a suitable candidate for reappointment if he finds $12,000,000 more or less and shares it with 100 worthy San Franciscans.

Another expedition of an equally romantic character is sponsored by a Mr. H. J. Stocker, of the Bethlehem Engineering Corporation. Mr. Stocker proposes to unearth a buccaneer's hoard at a place described vaguely as "midway between New York and San Francisco, near Panama, in the Pacific Ocean," which leaves plenty of latitude to the imagination, including palm-sheltered islands in purple spheres of sea inhabited by dusky simpletons unaware of the wealth over which they have been playing for a hundred years or more. These in-

vitations to an excursion in the South Seas sound harmless enough, but the Commissioner of Corporations has objected to the advertisements of Messrs. Gissler and Stocker because they contravene a law intended to prevent the fool from parting with his money. If, therefore, the expeditions are to set forth to the treasure islands, they must choose a port not on the Californian coast.

A Metallurgical Comparison

TWO interesting metallurgical developments are to be chronicled to the credit of the Coeur d'Alene region. The first is the adoption of the all-sliming all-flotation method in the mill at the Morning mine, owned by the Federal Mining & Smelting Co. The original mill was built about thirty years ago and has undergone successive changes with the amplification of the old German method of gradual reduction and step-concentration by means of rolls, jigs, and tables. The plant now is being reconstructed for the purpose of reducing all the pulp to slime previous to concentration by flotation *à la* Minerals Separation.

It is a noteworthy fact that the Morning mine has been productive for thirty-seven years, or more than the life of one generation of man.

The other bit of news relates to the Tainton process, which has been developed at the Bunker Hill mill, at Kellogg, by Mr. Urlyn C. Tainton, an Afrikander, who has invented a process for treating complex sulphide ore. This involves fine grinding, concentration, roasting, leaching, and precipitation. The copper and zinc in the roasted concentrate are dissolved in sulphuric acid, the copper then being precipitated by zinc dust, while the zinc is precipitated electrolytically on aluminum cathodes. The residue—containing the lead, silver, and gold—is leached by brine, all three metals then being precipitated on, and by, a rotary cathode made of "duriron" or even sheet iron. The lead and the precious metals can be recovered separately in the same machine. Free chlorine is liberated and serves later to regenerate the leaching solution. We may add that Messrs. F. L. Bosqui and Thomas H. Leggett, both of New York, and well known to our readers, have been at Kellogg supervising a working test on a carload of complex ore, containing the five metals, from the Pecos mine, in New Mexico. The test is said to have given satisfactory results. The present experimental plant has a capacity of a ton, more or less, depending on the metallic output. It is being enlarged to a capacity of thirty to fifty tons per day. Millmen and metallurgists will be interested in watching the inevitable comparison offered by the operation of these two processes in the same district. Will all-sliming and all-flotation prove more effective than the roasting, leaching, and precipitation?

The Greatest American

THE STUDENTS at Bowdoin College recently balloted as to who, in their opinion, was the greatest American. The choice fell upon Edison, with Wilson and Lodge coming some distance afterward, and sundry others as runners-up. So thinks Young America; and surely Edison is a great man, a wielder of thunder bolts, a colossal example of the domination of man over natural forces!

But as to the greatest American of our time, we have a shrewd guess as to who he is. The influence of America phenomenally remains, in spite of our stupid blunders, paramount in the world. The world does not respect our armed power; it does not respect any armed power—it hates it, and is always ready to match blow for blow. But everywhere there persists the belief, in the rank and file of foreign lands, that "America is humanitarian"; and they listen to what America will say as to one who is a well-wisher to all. When the freedom of the Dardanelles was being debated, the other day, at the Lausanne conference, a final deadlock had been reached between the Allies on the one hand and the Turks and Russians on the other. Then the American representative spoke, saying that America would like to have her citizens go everywhere, her merchant ships to go wherever they would float, and her cruisers likewise. And immediately Turkey agreed, and Russia agreed. The newspapers stated in headlines "America Awes Turks." Awes?—nonsense. The Turks trust America's impartiality—they distrust every European nation. The American colleges in Turkey, the American relief work, stand in contrast as a record to the diplomatic sharp practice, the military encroachments, of Europe. And Russia—in Russia the peasants pronounce the word "American" with reverence, and a hard-headed naval officer and engineer recently told us that their attitude toward one American can only be called, even conservatively speaking, worship. A pretty strong word for a naval officer. There is one American of whom King Albert of the Belgians recently said that the Belgian people regarded him as "a savior." Strong words from the soldier king—but he meant them. That same American has wrought upon the stiff-necked German nation so that they look to America for all just and generous actions and free her of their general bitterness and suspicion. So that we, in our sober judgment, would vote with the millions of Europe that the greatest American of his day is this man, and that history will so clearly recognize him. The feeder of millions, friend and foe; the savior of myriads of children who bless his name; the greatest moral—and hence, as we have seen, material—influence which America has produced since the time of Lincoln. And he happens to be a mining engineer.

Anaconda Absorbs Chile Copper Co.

APPARENTLY Anaconda's appetite was only whetted by the absorption of the American Brass Co., and it has taken the acquisition of Chile Copper Co. to satisfy the pangs of amalgamation or consolidation with other units of the industry. The Anaconda Copper Mining Co. itself is the outcome of combining many mining enterprises in the Butte copper area, and it is only carrying this method of growth several degrees further. The expansion which occurred when Anaconda bought American Brass Co. gave more than an adequate outlet to the Montana production. The purchase of Chile Copper gives Anaconda the largest low-cost copper mine in the world and a fitting companion of the largest manufacturer of copper products. As in all such arrangements, it is interesting to reflect on the motive which may have been responsible for the transaction.

The opinion has been publicly expressed that Anaconda wishes to assume a position in the copper industry comparable with that of the United States Steel Corporation in the iron and steel trade or the Standard Oil Co. in the oil industry. This reasoning is probably

not far from correct. At the present time, although there are some gigantic American copper companies operating in North and South America, such as Utah, Phelps Dodge, Anaconda, Chile, Braden, and others, none of them occupies a dominant position—dominant in the sense that they are powerful enough to adopt a production and selling policy that will inure to the stabilization of prices. Some of them have adopted such a policy, but without avail.

The business of producing and selling copper today is highly competitive. Although a half dozen distinct groups of producers control production, each group has a different and independent outlook on production, the market and anything else in which it happens to be interested. The strongest group is that represented by the selling agency of Guggenheim Brothers. This firm handles the output of Utah, Ray, Chino, Nevada Consolidated, Chile, Kennecott, and Braden Copper companies. In the aggregate a heavy tonnage is sold by this one agency, but relative to the entire commerce the ratio is only about 35 per cent of the total North and South American production. Despite the fact that this percentage is larger than that for any other group, it is insufficient to give leadership in the industry.

Though the transfer of Chile Copper to Anaconda will not give Anaconda a relatively greater predominance than that formerly held by Guggenheim Brothers, it is a big step forward to leadership. It may presage further acquisitions necessary to give Anaconda the premier position. There is a feeling among producers that a "Steel Corporation," with its financial strength, is badly wanted in the industry, on the ground that such a company would be able to minimize price fluctuations or make them less violent than they have been in the past. The kaleidoscopic change from activity to stagnation which has frequently been the lot of copper producers has made them anxious to seize on anything that will improve their position.

In explaining the willingness of the Guggenheim interests to relinquish control of Chile Copper, one need not go widely afield to seek a plausible motive. The recent sudden death of Mr. Isaac Guggenheim undoubtedly came as a shock to the family, and more than likely served as a vivid reminder that the strenuous high-pressure pace of modern business imposes its exactions upon those who try to keep up with it. The Guggenheims can well afford to rest on the laurels they have won in the copper business.

Calumet & Hecla Follows Anaconda's Lead

THE EPIDEMIC of stock-dividend declarations which was begun by the Standard Oil companies and has swept the whole industrial field has as its basis, according to common explanation, the escape of taxation of surplus. Not having large surpluses to divide, the mining industries have not participated in this widespread practice. They have resorted to different means in strengthening their industrial and financial positions. Copper companies in particular have had no melons to cut, but the recent announcement of an impending Calumet & Hecla Mining Co. consolidation indicates that the leadership of the Anaconda Copper Mining Co. in effecting a revolutionary reorganization of its position in the world's copper mining industry is causing other companies to consider taking similar steps.

The various mines of the Calumet & Hecla group, Ahmeek, Isle Royale, Tamarack, Superior, Osceola, and others, not to forget the Calumet & Hecla unit itself, have all been operated under one central direction for many years, but the individual properties have maintained separate corporate existences. The valuation of the units which has been performed by several eminent engineers with a view to a merger of the vast holdings of Calumet & Hecla in northern Michigan repeats the effort that was made some twelve years ago to bring about a similar consolidation. At that time, however, the obduracy of certain minor stockholders prevented the consummation of the plans of the directors. However, it is not the closer knitting of the Calumet & Hecla fabric which is most significant, but, rather, the announcement that "plans are also under consideration for the acquisition of manufacturing facilities which will assure the consumption of a large part of the output of the mines." In other words, C. & H., like Anaconda, will have its outlet for production independent of the general copper market.

No mention has been made of the manufacturing plant for which negotiations are being made. Several excellent selections are available, despite the fact that the American Brass Co. overshadows, in volume of production, that of its competitors. The American Brass Co. by no means has had the manufacturing field all to itself and has been subject to competitive influences. Calumet & Hecla will be the second copper company, after the manufacturing outlet is acquired, to assume the so-called "vertical trust" form of corporate expansion, which has as its object the control of a commodity from the time it is produced as a raw material until it is finally sold to consumers as a manufactured product.

In view of the tendency in this country to form large amalgamations, tremendous business enterprises and the like, one cannot help wondering whether mere size alone is so much of an advantage as it is ordinarily held to be. In the railroad systems of the country it most certainly is not. The smaller lines, such as the Central R.R. of New Jersey, the Delaware & Hudson, the Lackawanna, the Reading, the Norfolk & Western and others, are the high dividend payers, whereas the large systems, such as the Pennsylvania, the New York Central, the Santa Fé and others, are not conspicuous for the size of their payments to stockholders. In the mining industries, some of the smaller properties have been singularly successful mines. Miami Copper maintained production and dividends during the depression, United Verde Extension since 1916 has been placed on the dividend paying list, while many larger copper companies have not been so fortunate. It is unsafe to carry a generalization too far and there are many exceptions to the rule, but is it not likely that the smaller mines can build up and maintain a high morale more easily than their larger brethren? For one thing, the directors and executives can keep in closer touch with the rank and file of their organization, which counts for a great deal in these days of serious labor trouble. But we are digressing.

The plans given out by Calumet & Hecla are further developments in a year in the copper industry which has been crowded with epoch-making projects that have been announced and consummated with bewildering rapidity. Anaconda buys American Brass, Anaconda absorbs Chile Copper, Calumet & Hecla is trying to obtain a manufacturing outlet for its production. What next?

The Colorado River Project

By T. A. Rickard

THREE years ago Mr. Herbert Hoover discussed the problems of the day before the principal clubs of San Francisco; despite a poor delivery his utterances commanded keen attention, because he was better informed on world affairs than any other man in the country and he had proved himself to be one of the supremely useful men of his generation. Last month he re-visited San Francisco and again made a series of addresses. On December 1 he was the guest of the Commonwealth Club. The unusually large attendance indicated that he retains his hold on the goodwill of thoughtful men. He was received with enthusiasm; he was heard with rapt attention. His delivery has improved; he does not talk to his soup-plate as much as formerly; he continues to wear the stereotyped dark-blue serge suit, and he stands with his hands in his pockets, disdaining oratorial gestures. He talks to his audience; and he talks the organized common-sense that Huxley said was science. The manner may be faulty, but the matter is fine. On the occasion to which I refer he described the project for developing the usefulness of the Colorado river, a subject that he had at his finger tips because he had been acting as chairman of the commission that has been unraveling the legal tangle arising out of the conflicting water-rights of seven States—Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming. "The Colorado river is the greatest single undeveloped resource of the American people", he declared. The storage of its waters in the great canyon would yield four or five million horse-power, or considerably more than the total electric energy as yet developed in the whole Sierra Nevada region. The use of the water for irrigation would increase the area of cultivable land in the watershed of the Colorado from 2½ million acres to 6 million acres, and it would add 3,000,000 of population, besides protecting the Imperial Valley and its investment of $75,000,000 from destruction by floods. Existing irrigation has absorbed the whole of the minimum flow. An enormous annual variation in the volume of water hinders development; therefore storage is needed. Many sites for the purpose are available, particularly two, both of which would retain the entire flow of the river in 14 months. The building of reservoirs has been prevented by the legal difficulties arising from inter-state distribution of the water. Conflicting decisions of the courts, State and Federal, have stood in the way. Hence the plan now to be adopted of falling back on the constitutional right of the States to make treaties among themselves. The Commission appointed to settle these difficulties and to outline a policy of development was in session at Santa Fe "last week," said Mr. Hoover, and a plan was prepared to cover all the principal contingencies. Agriculture is to be given priority over power. The conflict that threatened to delay development for a quarter of a century has been settled by unanimous agreement, and the joint proposals will be submitted shortly for ratification to the legislatures of the several States and to the Congress. The next step is to promote the actual productive development of the resources of the river. To do that Federal assistance is needed, more particularly for the purpose of controlling the lower river and thereby protecting the Imperial Valley, which otherwise may revert to its former status as Salton Sea. During the last flood the Valley escaped destruction by less than nine inches in the height of the dikes. An expenditure of $20,000,000 will protect Imperial Valley in perpetuity, and the income-tax accruing from increased agriculture will suffice to pay back this appropriation.

Mr. Hoover then turned to the National budget and the cost of government. The plan to re-organize the departments at Washington is in hand. He made mention of the scheme for co-ordinating the engineering work of the Government. Apparently the idea of a Federal Department of Public Works has been shelved, for he said that the various engineering activities would be placed in charge of an Under-Secretary in the Department of the Interior, instead of being scattered among 7 departments and 22 bureaus. He told the story of the bears to illustrate the absurdities of the existing system: the polar bear is in the care of the Department of Commerce, the grizzly belongs to the Department of the Interior, and the brown bear to the Department of Agriculture! However, the main economy to be effected through the proposed plan of reorganization will be indirect; the saving in time and money to the people doing business with the Government, he explained, will be greater than "the direct savings to the national budget in eliminating the present overlapping and duplications of work". The development of the reproductive assets of the nation could do more to lessen the burden of taxes than a reduction of pennies in bureaucratic administration. The budget had done much already in "curtailing log-rolling in national expenditure". The expenses of the Government this year would be $3,200,000,000, a decrease of $1,600,000,000 as compared with two years ago. No less than 197,000 men have been dropped from Government service and returned to productive activity, chiefly by the reductions in the Army and Navy. Of the total Federal expenses two billion dollars, or 61%, went to meet the cost of past wars and 18% was being spent on account of future wars, although our Army has been so reduced that it numbers "less than the policemen on our streets". At present the legislative, administrative, and regulatory functions of the Government absorb 12% of the budget, leaving only 7% for reproductive work. "Only 7 units out of 100!" To this he added the remark: "The services done in aid of railroads, harbors, and agriculture bring 1000% of return to the American people". We must aim to reduce the tax burden by increasing our expenditure on reproductive development, for little more can be done by economies elsewhere. "We must not do anything that destroys the initiative and the productive impulse of our people. The test of our system is whether it carries within itself the impulse to progress. The fundamental purpose of government is to improve the standard of living and thereby prepare the soil from which shall grow the finer flowers of civilization".

This utterance of our mining engineer Secretary of Commerce was well worthy of his reputation. It was intensely interesting to watch him in his attack upon constructive problems in government and to listen to the expression of ideals so essentially American. What would Abraham Lincoln think of this humanitarian engineer? The sure answer conveys the greatest compliment that one can pay to Herbert Hoover.

DISCUSSION

The Effect of Prohibition

THE EDITOR:

Sir—Referring to Mr. Loring's letter on "Prohibition and the Mining Industry," in your issue of Dec. 2, I agree with the statement that the "ten day man" is not as good a miner as he used to be. He still roams around, but while he is on the job he is certainly not as efficient as in former times. I doubt, however, if the old-time miner, even the one who remained at his work during the war, is as interested as in days gone by. There seems to be a lowering of morale, a lack of the spirit of accomplishment, that was more or less evident among the majority of underground men. How much of this is due to prohibition is, of course, a moot question, but I feel that prohibition is responsible for much of the trouble and unrest of the present day.

We have found in this district, that with the advent of prohibition came no reformation of habitual drunkards. The occasional drinkers still drink occasionally, and in some instances men who did not drink before now drink the poisonous moonshine or adulterated bootleg whiskey. If prohibition *can* prohibit, all well and good; if it can not, let us recognize the fact and amend the enabling act so that it will be more practical as well as more acceptable. ROBERT M. BETTS.

Cornucopia, Ore.

Getting the Man and the Job Together

THE EDITOR:

Sir—I have found that one of the greatest problems of the man who has followed mining and milling work in the West is to obtain employment when for any reason he may be out of a job. There are many employment offices throughout the country that charge exorbitant commissions for their services, and that even then do not assure you a permanent position. They frequently misrepresent conditions at the place where the job is. In many places on the Pacific Coast a man can walk into an employment agency, pay a $2 fee and get a good job. They will tell you the truth about it and will tell you how long the work will last.

Farther east, however, you have to pay some chair warmer your first month's pay in advance, and then you do not know what you are getting. A great many men have families, and cannot afford to work for the benefit of an employment agent for the first month, especially when the job may be finished at the end of that time. The result is a great hardship on men who have spent most of their lives following mining and milling, either on construction or operation.

Would it not be possible for mining companies to make known their wants for unskilled labor through the Searchlight Section of the *Engineering and Mining Journal-Press*? A great many men have come to me asking for help in finding a job, and I am sure you would be doing the mine workers a great service if you could help solve this problem. R. W. STEWART.

Candelaria, Nev.

Difficulties of Fighting Mine Fires

THE EDITOR:

Sir—The following letter describes conditions that actually existed after the fire started at the Argonaut mine last August and in a measure shows that little can be done against the spread of fire after it gains any appreciable headway.

At 12:40 a.m., Aug. 28, 1922, I was notified at Plymouth that the Argonaut shaft at Jackson was on fire. I loaded three Gibbs' apparatus in an automobile and drove to the scene of the disaster, arriving at approximately 2:30 a.m.

At the shaft collar, men were preparing to get water down the shaft. The water skips were being swung on to the rails and hoses connected with the water line to fill the water skips. The first chance for action was given to me at 7 a.m., when, with two other men, under apparatus, we went to the 2,400 level, thence south to the Muldoon winze. Here we found a volume of thick white smoke that would not permit a candle or carbide light to burn for a fraction of a second. This was reported to Superintendent Garbarini, who was then on the 2,600 level.

On arriving on the surface, men were endeavoring to change the air column into a water line. At about 10 a.m. the first unit of Bureau of Mines men arrived, and we started telephoning to the Carson Hill, Eagle Shawmut, and North Star mines for apparatus men. The first real exploration began when we had ten apparatus men available. We used the skip to the 2,600 level, then climbed down the manway through intense white smoke to the 2,750 level. Here the heat was so intense that the timbers above us were almost too hot to touch, the atmosphere was thick with steam, smoke, and gases. We could see nothing—only feel and hear. We heard a steady hissing as of water being played on fire and which no doubt was the water on the foot wall being evaporated by the intense heat. Everything was hot to the touch and sooty. This exploration confirmed one thing. The fire had traveled up to within a few feet of the 2,750 level, or approximately 250 ft. up the shaft in a day and a half. How far down I don't know.

We advised shooting out the shaft timbers between 2,600 and 2,750 levels, but this suggestion was not carried out. Finally, three sets were blasted below the 2,400; these the apparatus men cleaned out and retimbered. Then we got to the 2,500 level and finally located the fire 55 ft. below the station. The fire was not raging but glowing, with a tongue of flame licking out at intervals. Hoses were connected to the air line, which was now a water line, and water was played on the fire by two men, supported by other apparatus men up the shaft. We were but two sets above the fire. The shaft was then bulkheaded with 2 x 12-in. plank, tar-paper, and clay.

A large amount of caving was taking place below us before we got to the fire, and afterward caves large enough to shoot smoke and gas up the shaft for 150 ft.

against the decided downcast air currents occurred. The Bureau of Mines men and those of special qualifications patrolled the bulkhead, watched for, and sealed off smoke that seeped through north of the shaft above the 2,500 level. The work of the rescue teams in the Argonaut shaft was to try and locate the fire, put it out, and endeavor to go through the burned area, if possible. An inspection of the shaft below the bulkhead showed the utter futility of our hope. The shaft is a wreck as far as can be seen by aid of a storage battery and spotlight. The great number of large concussions below the bulkhead indicate tremendous caves and a stripped shaft. ROBERT J. DUNCAN.

Plymouth, Calif.

Extinguishing Mine Fires

THE EDITOR:

Sir—The recent articles and discussions in the *Journal-Press* on the subject of mine fires seem to dwell considerably on ventilating currents and the reversing of the same. In either case, in so far as the actual fire is concerned, and aside from the question of asphyxiating smoke and fumes and their disastrous effect on men underground, the air currents would apparently lend fuel to the flames with the additional supply of oxygen.

In all fires, whether above ground or in mines, the methods of extinguishing are the same—either by cooling the materials afire below the burning temperature, or by the smothering action of shutting off the oxygen of the air. In the former case, water in large quantities is very effective, and in the latter case foam types of hand extinguishers and chemical foam engines are the most satisfactory. The cost of either installation can be determined by each individual mine management. Oxygen-breathing apparatus and goggles should also be placed underground at all locations, together with the extinguishers.

As the foam method is not yet widely known in the mining industry, it may be opportune to give a brief description of its action and effect:

The several small and large types of portable foam apparatus contain two separate solutions which may be mixed by inverting the apparatus. Carbon dioxide is immediately generated at a high pressure and the moist foam thus produced is discharged through a short hose and nozzle for distances of 35 to 50 ft. The foam consists of minute film-covered bubbles of carbon dioxide. It adheres to all surfaces and materials, including all sides and the tops and bottoms of mine timbers, promptly extinguishing all fire. Also, it acts as a fireproofing coating, lasting for several hours, so that re-ignition is difficult. Incidentally, it puts out all oil fires, including boiling gasoline.

No dangerous fumes are emitted and the foam is harmless to person, material, and machinery, but it is deadly to fire. It is not an experiment, but is of proved efficacy, with several years' use in all industries.

The materials used in producing the foam are two chemical solutions, one of aluminum sulphate and the other of sodium bicarbonate and a foam-producing extract which does not deteriorate. When these two solutions mix the chemical reaction is

$$6NaHCO_3 + Al_2(SO_4)_3 = 6CO_2 + 2Al(OH)_3 + 3Na_2SO_4$$

Reports on the practical application of the foam in the Pittsburgh experimental mine are published by the Bureau of Mines, Washington, D. C.

Mexico City, Mexico. GRANT D. MILLER.

A Self-Dumping Bucket

THE EDITOR:

Sir—In your issue of Dec. 2 there is a description by A. W. Allen of a self-dumping bucket arrangement in use at Pittsburg-Mount Shasta Gold Mining & Milling Co.'s property at Randsburg. Though this arrangement is new at Randsburg, it has been in use in northwestern mining camps for years. Credit for the original design is due, I believe, to Rush White, engineer at the Mace mine for the Federal Mining & Smelting Co., in the Couer d'Alene district, Idaho, and the device was installed and successfully used there by R. H. Pascoe, mine superintendent, for the Federal company prior to 1916. A description of this arrangement, by Mr. Pascoe, and accompanied by drawings, was published by the *Engineering and Mining Journal* about 1917 and is now shown in the volume on "Mining Details" which forms part of the "Mining Library" published by the *Engineering and Mining Journal* several years ago.

In the fall of 1916, while superintendent of the Last Chance mine, at Republic, Wash., I installed this dumping arrangement at the Last Chance shaft, the design being identical with the White-Pascoe plan except that only two bucket deflectors were used, whereas the White-Pascoe drawing showed four.

The dumping arrangement mentioned by Mr. Allen and recently installed here by the Pittsburg-Mount Shasta company is an exact duplicate of one built by Mr. McCormick at this company's Shasta County copper property. The plans for the Shasta County installation were made by myself in 1919, in my Redding office, and were taken from the White-Pascoe drawings and from those of my Last Chance design and differed from the latter design only in the substitution of iron pipe for wood in material for bucket deflectors.

As stated by Mr. Allen, this arrangement is "foolproof" and it is also faster than any I have seen. Its use in connection with a waste bin eliminates the necessity of a top man in constant attendance, while hoisting. The plant at the Pittsburg-Mount Shasta company's shaft forms a remarkable contrast with the old trapdoor method which has been in general use at Randsburg.

Randsburg, Calif. G. CLEVELAND TAYLOR.

Compressibility of Water and the Wave Transmission System

THE EDITOR:

Sir—In your issue of Dec. 2, page 970, under the heading "Wave Transmission of Power," you say, "Contrary to common belief, water is elastic." No material is elastic unless it be compressible, and water is the most incompressible of known substances. Indeed, the coefficient indicating its compressibility is 0.0006 or less; and it may be yet shown that this is an error in the determination of the actual compressibility of water. The statement that water is elastic is misleading on this account. W. M. CHAUVENET.

St. Louis, Mo.

[The fact that a coefficient of compressibility is recognized is sufficient proof of the elasticity of water. In a comparatively long column of liquid, such as is used in the Constantinesco system to connect the generator to the rock drill, the compression would be appreciable.—EDITOR.]

Titles in Mine Examination

Great Care Should Be Exercised in the Investigation of Rights to Mineral Properties—Knowledge of Legal Procedure Helpful

By James Underhill
Mining Engineer, Idaho Springs, Colo.

IN MAKING MINE EXAMINATIONS, engineers are often careless in examining titles, and on account of lack of experience take chances that they would not think for a moment of taking in, for example, the handling of samples. An attorney and an engineer working together on mine titles make an ideal team. It frequently happens, however, that the engineer is working miles away from an attorney and has to do the best that he can under the circumstances, or cases come up that must be handled in a hurry where the assistance of an attorney cannot be obtained. In the examination of titles an engineer working by himself has a better chance of success than the average attorney working alone, for the reason that there are more mining engineers in active practice who are familiar with mining law than there are attorneys who have an understanding of the problems of mining engineering.

The first point to be considered in examining a title is whether the ground in question is held by location or patent or partly by both. If held by location, the abstract of title may show clear ownership that would satisfy an attorney, but at the same time the claim under consideration may be located on the top of and possibly with the identical boundaries of a prior legal location or even patent, and in this way the second locator may have no rights whatever. Again, although the locator may hold his discovery shaft legally, a large portion of his claim may cover a prior valid location or patent and this fact not be brought out in the abstract.

Research in the Surveyor General's Records

In examining possessory titles, about the only thing to do is to look up all existing patents and plat them out to see if there are any conflicts. The notes and official plats can be obtained from the office of the nearest U. S. Surveyor General. Then run over all the ground outside of the patented claims to see if there are any workings or stakes that can possibly belong to prior valid surveys. If no workings or stakes are found, it is possible that there may be rights of statutory tunnels to be considered. Even with the greatest possible care, conflicting rights may be overlooked and never be made apparent till the time arrives to adverse an application for patent.

The only way to be sure of getting a title to a location survey is to have the owner get a patent with the understanding that no cash is to be paid for the property till patent issues. This takes time—usually several years—but is the only safe method of procedure.

More can be told from the abstract of title in case of patents than in case of possessory titles of locations, but in some mining counties not 10 per cent of the patents are recorded. In case of unrecorded patents, original patents or certified copies obtained from the Land Office may be used. The abstract of title must be carefully checked with the patent documents themselves or the copy on record, and also with the deeds and other papers on file in the office of the recorder of deeds. As a matter of fact, the abstract is only a guide, and each paper should be examined either in the original, by certified copy, or on the county records. Here it may be found that numerous private arrangements have complicated matters. The ground actually patented may have been added to by small parcels of land from other patents, or pieces may have been cut out of the ground described in the patent and deeded to others. These parcels of ground may be of great importance as regards apex or extralateral rights or they may amount to nothing at all. Nevertheless, they all should be platted and their significance clearly established.

A Title Map Facilitates Matters

If the situation is at all complicated it is generally best to make a title map. This should be as a rule on a scale of 100 or 200 ft. to the inch. The latter, being the Land Office scale, is generally the easiest to use. In making a title map, the oldest patent is platted first or taken up first if a completed map is used. Here it should be noted that the oldest number usually belongs to the oldest patent, but not necessarily. All the ground belonging to this claim is colored on the map. The ground excluded, if any, may or may not be colored with some other color. It generally is not. The other claims are then platted in the order of patenting and the ground actually belonging to each one is colored. All ground acquired by deed or deeded away is shown, and shown if possible in relation to apex and extralateral rights.

As a rule only one color is used for the territory being examined. It may in certain lawsuits be necessary to show, with another color, ground owned by opponents or possibly show other areas in other colors.

The completion of a title map will often bring out flaws and defects in a title that were previously unsuspected or carefully concealed. In one case, for example, the discovery shaft of a location was found to be on ground which the records of the Surveyor General showed had been excluded from a certain patent, but which the patent itself showed had been included. This fact invalidated the whole location, but not till thousands of dollars had been spent in defending its title.

Sometimes the examining engineer is shown a mine or prospect and told that the vendor has title, although as a matter of fact the title is to an entirely different piece of ground. A few years ago I made a trip to examine a mining property and was told by the intending buyers that they had an option on this particular prospect. As I had some knowledge of the district from a previous visit, I was at once suspicious. A few hours' work on the surface showed conclusively by patent corners that the ground actually under option had no mine workings of any consequence and was eight hundred feet south of the workings shown the prospective purchasers.

It is necessary in every case to make sure that the option, bond, or lease really covers the territory shown

or desired, and this can be determined only by a careful investigation of the monuments on the ground. In patented claims, this is usually simple enough, but in location surveys it may be difficult or impossible. With a large property it is usually not necessary, especially in the case of patents, to run out every claim. A traverse around the exterior boundaries is usually sufficient.

Frequently, the engineer is assured by the intending purchaser that the title is perfect. In this event the engineer should for his future protection state in his report that, in view of his client's assurances, no investigation of title has been made. Later on it is possible a flaw may be disclosed that may seem to have been overlooked by him.

The engineer should be prepared to correct any slight self-evident flaws by preparing the necessary deeds, leaving the more difficult corrections to be made by an attorney. In fact, he should carry forms or blanks, so that, in case of emergency, he may be able to make out deeds, leases, bonds, and escrow agreements. It is often possible, by having the right paper all ready to sign, to avoid the difficulty of having one of the negotiators change his mind over night, and quickly to correct some difficulty that later may cause serious trouble.

After all questions of title are settled, or even before, it is necessary to look into the apex and extralateral rights. Does the ground in question cover the apex or apexes and in such a way that extralateral rights are assured? If the mine workings do not give this information, it may sometimes be possible to interview disinterested people in the neighborhood and get all possible information.

Finally, the question should be asked, Has everything possible been done to avoid future litigation?

Alumina from Clay*

In recent years much interest has been centered on the possibility of producing alumina from clay, and proposed methods for the recovery of alumina are appearing constantly in patent literature. As a good grade of clay contains from 30 to 40 per cent of alumina, the prospect of recovering it is alluring, although obviously difficult.

A patent typical of many projected thermal processes is that of Paul Miguet (U. S. Patent No. 1,376,563) entitled "Process for the preparation of pure alkaline aluminates." He proposes to prepare alkaline aluminate by fusing clay, lime, and scrap iron with a reducing agent in the electric furnace, thereby reducing the silica and forming calcium aluminate and ferrosilicon. The calcium aluminate, being lighter, would float on top substantially free from foreign oxides. It could then be tapped off, cooled, and later crushed and leached with sodium carbonate solution to form, by double decomposition, sodium aluminate and calcium carbonate. The former is soluble and yields readily aluminum hydroxide. The ferrosilicon would be recovered as such and sold at a profit. The reactions are supposedly as follows:

(1) $Al_2O_3 \cdot 2\,SiO_2 \cdot 2\,H_2O + Fe + 4\,C + CaO = FeSi_2 + 4\,CO + CaO \cdot Al_2O_3 + 2\,H_2O.$

(2) $CaO.\ Al_2O_3 + Na_2CO_3 = CaCO_3 + Na_2O \cdot Al_2O_3.$

Many reactions similar to the above have been proposed, and it is popularly believed that alumina can be obtained from clay by fusion. Accordingly, the Northwest experiment station of the Bureau of Mines at Seattle, Wash., undertook to investigate the Miguet process.

The tests were carried out in a carbon-lined pit furnace of the Girod type, having a tap hole to remove the fused material. Clay containing 38 per cent alumina, pure air-slaked lime, steel turnings, and gas-retort carbon were used. These materials were finely ground, intimately mixed, wetted, and dried in lumps to avoid dust.

In the first tests the charges were made up with clay, lime, iron, and carbon in theoretical proportions according to the Miguet patent. The charge melted down readily, and when melted was tapped. The analysis showed only a slight reduction of silica, and it was thought that possibly insufficient time had been allowed for reduction. The test was therefore repeated, the charge being held molten for a considerable time before tapping. No increase was noted in the amount of silica reduced. When the product was crushed and leached with a hot concentrated solution of sodium carbonate, only a trace of alumina and fully as much ferrous iron was found in solution.

Restrictions as to Practicability Abandoned

When the proportion of lime was increased, it merely increased the melting point and gave no better product. In these first tests an effort was made to keep within the limits of commercial practicability, but having failed to obtain any favorable results, these restrictions were cast aside and tests were made to determine what was technically possible. The proportion of lime, carbon, and iron to clay was increased to speed up their action on the clay, and the charge after fusion was heated to 1,800 deg. C. and held for thirty minutes. Still results were unsatisfactory. A charge was then made up with carbon three times and iron twice the theoretical quantity. The purpose was to subject the charge to the most intense reducing conditions possible, and silica is known to reduce more readily in the presence of iron. The charge was melted with the furnace over-powered to such an extent that dense fumes arose. The product obtained was black and stony—hard enough to scratch glass easily. On examination, it was found to contain carbides of calcium, aluminum, and silicon, sillimanite, and quantities of a glassy substance. The analysis showed that about 40 per cent of the silicon had been reduced and alloyed with the iron. The product of this final fusion, when leached with sodium carbonate, gave a recovery of about 30 per cent of the alumina. This alumina upon analysis was shown to contain 0.6 per cent SiO_2.

The fact that alumina was actually produced gives some small basis for the claims of the patent, but the prospects of its successful applications are extremely poor. In the first place, to produce alumina by the method of the most favorable test, the cost of the material alone would be more than $300 per ton, as the minimum figure. Moreover, there is no proof that calcium aluminate was formed, because, with so much carbide present, it is just as likely that the sodium aluminate obtained was formed by the decomposition of aluminum carbide and its subsequent solution in the sodium carbonate. It is certain, too, that silica is not alone in being acted on by the carbon, but that all the other oxides will also be reduced in varying degrees.

*Reports of Investigations, by C. E. Williams and Clarence E. Simms, U. S. Bureau of Mines.

The Fiechtl Vertical Retort Furnace for Zinc Ores

Greater Simplicity of Design and Lower Cost of Erection and Operation Than With the Ordinary Retort Process Are Claimed—Device Has Been Tested by Construction of Four Retorts at a Kansas Plant

BY WILLIAM KAPELLMANN

THE FIECHTL vertical retort furnace is the invention of Ferdinand Fiechtl, of Cherryvale, Kan., who, being aware of the need for improvement in the old retort furnace for the distillation of zinc ores, conceived the idea of building a vertical retort furnace, which would reduce, if not eliminate, most of the bad features of the old furnace, chief among them the labor, repair, and fuel costs.

Fig. 1 illustrates at a glance the design and operation of the furnace. It consists of a double row of vertical retorts arranged within the furnace and parallel to its length. This facilitates the charging by means of the charging car above, and also the removal of the ashes by the ash car below, shown in the concrete cellar. The lower end of each retort rests and is anchored in an annular cooling chamber through which cold water circulates. Provision is thus made to cool gradually the residue or spent charge which accumulates in the lower part of the retort.

The lower end of each retort is closed by means of a cone-shaped valve bottom which is raised or lowered by a hand wheel operated from the upper furnace floor. The ashes are received in the hopper below and may be removed at any suitable time after the retorts have been recharged.

METHOD OF CHARGING

Each retort is provided with a cover, which is removed when it is desired to charge the retort. The charging car above is divided in four compartments, two to each side. Two compartments contain the regular charge for the retort, and the other two, which are proportionately smaller, contain ashes to fill that part of the cooling chamber below the furnace bottom. From this point upward the retort is given the regular charge.

After the retorts in one section of the furnace have been charged, it is fired to the proper temperature, and gradually the zinc vapors rise and pass into the vapor condenser, condensing there to the metallic form. The liquid metallic zinc is drawn from here in the usual manner by means of the draw car and is then molded into plates of desired dimensions.

No reference is here made to the preliminary work required to prepare the charge, such as mixing and roasting, as the equipment necessary for this work is of standard construction, and this new type of furnace may be installed without affecting this equipment in any way. This is, in itself, a great advantage.

MAIN FEATURES OF THE FIECHTL FURNACE

In simplicity of design and operation the Fiechtl furnace is much superior to others. It was designed primarily to eliminate high labor cost and to reduce material upkeep, the purpose being to build a furnace that would yield more metal per retort, by increasing its length. The retorts in the Fiechtl furnace are 70 in. long and will produce 45 lb. of metal, which is equal to 18,000 lb. of metal for 400 retorts. The retorts in the old furnace are 45 in. long and produce 30 lb. of metal, which is equal to 18,000 lb. of metal for 600 retorts. A saving of one-third the number of retorts per furnace is the result.

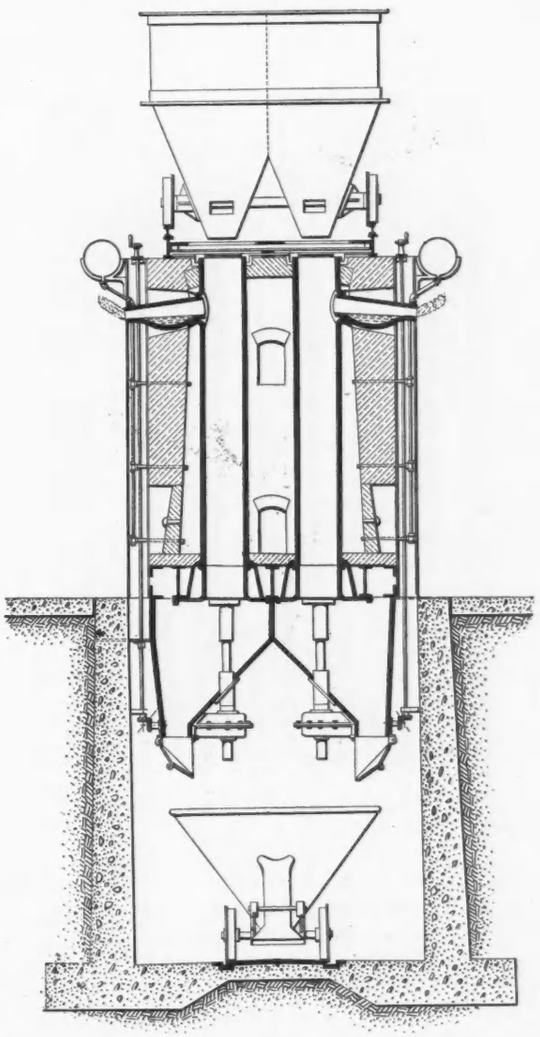


Fig. 1—Diagrammatic sketch of Fiechtl furnace.

However, the Fiechtl furnace does not merely reduce the upkeep expense, as will be seen in the accompanying comparative cost data. The Fiechtl furnace data cover actual performance both in fuel and labor. The remarkable reduction of over 70 per cent in the labor cost is due principally to the simplicity of the furnace itself, and the reduced fuel expense is to be credited to the increased combustion efficiency, gained only by careful and diligent effort.

COMPARATIVE DATA ON VARIOUS ZINC PROCESSES

	Belgian Process	Fiechtl Process		Electrothermic (a)		Electrolytic (a)	
			Per Cent of Cost of Belgian Process		Per Cent of Cost of Belgian Process		Per Cent of Cost of Belgian Process
Cost of 2,400-ton capacity per month plant, on roasted ore	$300,000	$180,000	60	$329,000	110	$500,000	167
Cost of materials per ton of ore	1.56	1.56	100	3.44	220	1.56	100
Cost of fuel or power per ton	4.59	3.33	73	7.00	153	9.00	198
Cost of labor per ton of ore	5.00	1.53	30	2.48	50	1.66	33
Total cost of materials and labor per ton of roasted ore, not including cost of ore itself	11.15	6.42	57	12.92	115	12.22	110

(a) I am not personally informed on the costs of the electrolytic and electrothermic processes and have based the figures given for the former on the statements made by F. Laist, before the American Zinc Institute, in May, 1921; and for the latter on the figures given in the description of the process by Charles H. Fulton, in the *Engineering and Mining Journal-Press* in July, 1922.

By comparison with the old retort process, it will be noted that the cost of installation is reduced 40 per cent, the fuel cost 27 per cent, and the labor cost 70 per cent. The cost of coal for mixing is the same, as no change is made in the charge, except that the charge in the Fiechtl furnace differs from the old furnace charge in that it is a dry mix. By this method no time is wasted in the distillation process, and the furnace cycle is reduced to a considerable degree.

Fig. 2—Front view of Fiechtl furnace erected at Cherryvale, Kan.

The adaptability of the furnace to different fuels, such as natural and producer gas and pulverized coal, is one of its noteworthy features also. It does not require the attention of skilled labor nor the investment of expensive handling equipment, or expensive power-generating equipment, nor is it subject to extraneous conditions which may affect the continuous operation of the plant. The systematic handling of the ores and ashes is also a decided advantage. The efficiency of the furnace has increased the recovery 2 per cent, which makes a total of 90 per cent recovery. The furnace is free from dust, and this sanitary feature insures a small turnover of labor.

The Fiechtl furnace has been tested by the erection of four retorts, of commercial size, at the works of the Edgar Zinc Co., at Cherryvale, Kan. The furnace and mechanism were of proportions identical to those of a large furnace except as to length, which depends only on the number of retorts that can be operated efficiently in a block. The yields were taken from actual operations, and the fuel and labor were determined from operating conditions as found by the operation of this small block, without making the claims too extravagant.

In conclusion, it should be noted that the location of an industrial plant is determined by the relationship of two main factors and sometimes more than these—namely, the relative advantage of shipping raw materials, and fuel, and of transporting the finished product. The zinc smelters in Kansas fortunately are close to the gas belts, coal fields, and ore deposits, and only the finished product is shipped to distant points if necessary. With its adaptability to various fuels, the Fiechtl furnace enjoys a lucrative position. In other processes using electric power for the distillation of the ores, the problem of situation becomes more complex and difficult to solve. Where power must be generated, the large investment necessary is a factor which should not be overlooked in the selection of a new process.

Tin Mines of the Netherland East Indies

Tin deposits are worked commercially on the islands of Banka, Billiton, and Singkep, situated off the southeast coast of Sumatra. The total production of tin in the Dutch East Indies during 1920 amounted to 21,991 metric tons, a small increase over the output in 1913 (21,200 tons). This was all produced by the government mines at Banka (13,427 tons), the Billiton Tin Mining Maatschappij (7,956 tons), and the Singkep Tin Maatschappij (608 tons), according to *The Far Eastern Review*.

The production of the Banka mines, which are owned and operated by the government, under the direction of the Department of Government Enterprises, is by far the most important factor in the industry, as it amounts to nearly 60 per cent of the total production of the colony. The latest statistics available regarding the Banka workings, compared with immediately preceding years and with the pre-war year of 1913, are:

	1913	1918	1919	1920
	Number	Number	Number	Number
Mines or pits	362	325	301	300
Average labor force	21,436	18,658	18,627	21,722
	Tons	Tons	Tons	Tons
Production	15,752	12,055	12,191	13,427
Tin auctioned in Holland	15,390	36	893	12
Tin sold in Dutch East Indies	.....	10,934	15,047	9,326
	Florins	Florins	Florins	Florins
Cost of production per picul, including freight and selling charges	45	50	56	59
Average selling price per picul in Holland	152	228	189	204
In Dutch East Indies	.....	204	176	195
Net receipts	36,566,674	36,277,380	46,227,847	29,025,717
Net profits	25,219,074	25,803,489	(a)	(a)

(a) Not yet made public

No statistics are yet available for 1921 except for the number of mines or pits, 293, and the average labor force, 21,273 persons. Net profits for 1919 and 1920 have not yet been declared.

Marketing of Metalliferous Ores and Concentrates—II

General Provisions of Smelting Contracts—Simplified Analyses of Actual Settlements—A Cost-Plus Contract—Advantages of Sorting at the Mine —Advice to the "Small" Miner

By Arthur B. Parsons
Assistant Editor

BEFORE giving examples of schedules and settlement sheets, I shall describe briefly the various other provisions in a typical contract and explain, when necessary, the reason for making such provisions. In doing this, legal phraseology will be avoided as much as possible. The agreement starts by naming the parties and specifying that the miner shall be known as the seller and the smelter as the buyer.

Sales Clause—This provides that during the term of the contract the seller will sell and deliver to the buyer all ore, slimes, or concentrates produced from mines of the seller in a particular locality; and that the products, as far as reasonably possible, will conform approximately to specified analyses.

In some instances limits of analyses may be prescribed within which the seller must prepare his ore or concentrate to make it acceptable under the terms of the contract. However, it is usually possible to have the credits and penalties fixed (1) so that ore of any analysis will be acceptable and will bear a smelting charge approximately proportional to its deserts, and (2) so that the best interests of both buyer and seller will be identical so far as the preparing of the product for shipment is concerned. Some contracts specify that metallurgical products shall not be mixed with each other, or with crude ore, without the consent of the buyer.

Buyer Reserves Option to Buy All Product

Certain classes of product may be excluded from the contract, but the buyer reserves the option to take these products also, under the terms of the agreement. If he does not care to exercise the option, the miner is at liberty to dispose of them as he pleases. The object is to prevent the seller from making a more favorable contract with some other smelter. At the same time, the seller is assured of a market for his output up to a certain maximum which may or may not be specified. If it be specified, the buyer has an option to purchase any excess that the seller may have ready for market.

Duration of Contract—The life of contracts varies; it may be a year or it may be fifteen years. Sometimes it is provided that a minimum aggregate tonnage be delivered, and that if such amount has not been delivered at the expiration of the agreed term, the contract is automatically extended until the tonnage has been delivered. The desirability of making long-time contracts and the contingency that the character of the ore may change are two reasons why it is well to have the smelting charges variable with the analysis of the ore, instead of being arbitrarily fixed at the time the contract is made.

Delivery—The delivery is to be made at the buyer's plant, generally in carload lots. Ordinarily the buyer pays the freight bill on receipt of the ore and deducts the amount from the proceeds accruing to the shipper on the settlement sheet. I have alluded to an exception to this rule: Ore purchasers in the Joplin district of Missouri, and the Platteville district of Wisconsin, buy concentrate in the bin at the seller's plant.

Weighing and Sampling—Sampling and weighing is done by the "most approved methods" at the expense of the buyer at his plant, or at a public sampling works at the expense of the shipper. Generally the first procedure is followed, the seller, if he desires, being represented by an engineer of his own selection, who is privileged to inspect scales and sampling equipment and to observe and check any apparatus or operation that may have a bearing on the correctness of the sampling done. Protest on the part of the seller's representative as to the accuracy of sampling and weighing must be made within twenty-four hours.

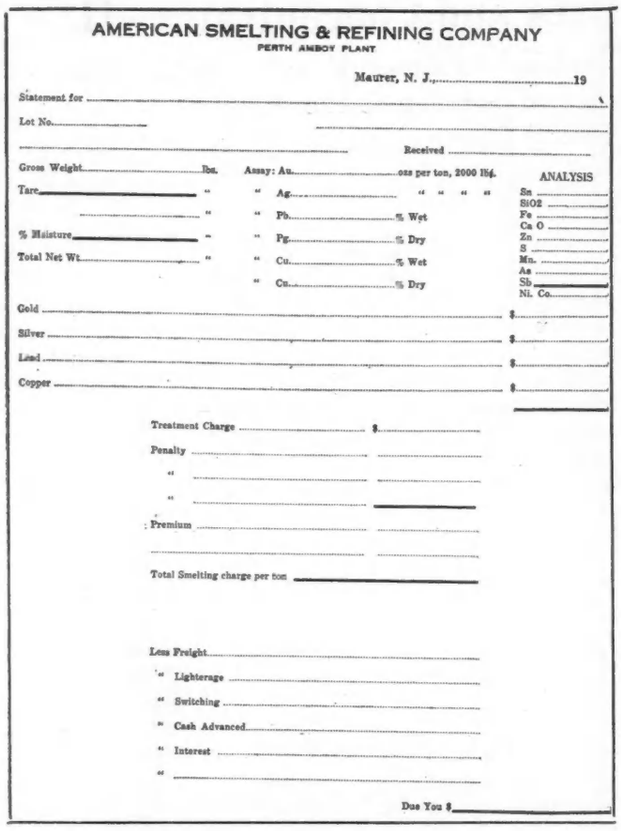
"Splitting" to Determine Settlement Assay

Assaying—It is agreed that in the process of sampling at least three finished pulps be taken for each lot of ore. Both buyer and seller shall have the necessary analyses made, the buyer's to control unless protest is made by the seller. Usually "splitting" limits are specified for each of the constituents determined. If on comparison the two analyses agree within this limit, the arithmetical average is accepted as the basis for settlement. In the event that the divergence is wider than the allowable limit, a re-assay by both parties may be agreed upon in an effort to reconcile results and avoid the necessity for an umpire assay. The umpire is the last resort. A number of established firms of assayers are named in the contract by mutual agreement, one of whom is to be called upon to make necessary umpire assays. If his determination shall fall between those of the seller and buyer or shall be identical with either one, that will be final. But if the umpire be above the higher assay, or below the lower, the result nearer the umpire shall govern settlement. The cost of the umpire assay shall be paid by the party whose result is farther from that obtained by the umpire. Although splitting limits vary widely, the following are frequently used:

Silica, iron, lime, and sulphur	0.5 per cent
Gold	0.02 oz.
Silver	0.5 oz.
Copper	0.2 per cent
Lead	0.5 per cent

Sometimes it is specified that the splitting limit may be "any other amount mutually agreed upon." This permits the adjustment of any settlement by compromise.

With respect to actual assaying, it is usually provided that gold and silver shall be determined by the "most approved methods of fire assay"; that copper shall be by electrolytic assay or by the standard iodide (wet) method, and lead and zinc by standard commercial wet methods of analysis. As pointed out before, however, the analysis used in settling for lead is not the wet assay but a figure determined from the wet assay by making an arbitrary deduction that is presumed to represent the equivalent of the lead that is lost in smelting. This is usually 1.25 or 1.5 per cent, though it may be either higher or lower. Formerly the straight fire assay was



AMERICAN SMELTING & REFINING COMPANY
PERTH AMBOY PLANT

Maurer, N. J. 19

Statement for .....

Lot No. .....

Received .....

Gross Weight ..... lbs. Assay: Au ..... ozs per ton, 2000 lbs. ANALYSIS

Tare ..... " " Ag ..... " " " " Sn .....

..... " " Pb ..... % Wet SiO2 .....

% Moisture ..... " " Pg ..... % Dry Fe .....

Total Net Wt. ..... " " Cu ..... % Wet Ca O .....

" " Cu ..... % Dry Zn .....

S .....

Mn. .....

As .....

Sb .....

Ni. Co. .....

Gold ..... $ .....

Silver ..... $ .....

Lead ..... $ .....

Copper ..... $ .....

Treatment Charge ..... $ .....

Penalty .....

" .....

" .....

Premium .....

.....

Total Smelting charge per ton .....

Less Freight .....

" Lighterage .....

" Switching .....

" Cash Advanced .....

" Interest .....

" .....

Due You $ .....

used, but that may be either high or low, depending upon the way it is conducted and upon the other metals in the ore. One alternative method is to make a wet determination on the button obtained from a fire assay. When this procedure is specified, the schedule may not provide for a deduction on the lead content. The determinations for copper and zinc probably are as nearly accurate as is possible; the gold is a trifle low and the silver is still lower.

Much Depends Upon Moisture Determination

Moisture—Moisture samples are to be taken at the time of weighing to determine the dry weight and in some contracts to base a penalty on products, such as flotation concentrate, that contain water in excess of an allowable maximum. The seller's representative is to have the same privilege in respect to this sample as to the assay samples. The taking of the moisture sample when the ore, or part of it, is wet, requires care and skill. It is very important to determine the moisture correctly, because the ore is weighed when wet, and all the analyses are made on the basis of dry ore. The sample should be dried in a steam bath at a temperature not exceeding 250 deg. F.

Definitions—The word "ton" is defined as meaning the short ton of 2,000 lb. avoirdupois. The word "ounce," where used relating to gold and silver, is understood to be the troy ounce; and the word "unit" is defined as meaning 1 per cent of a ton, or 20 lb. avoirdupois.

Quotations—The metal quotations upon which the settlement is calculated are usually specified in the schedule. The generally accepted quotations are:

Gold—Standard at $20.67 per oz., though the settlement figure is never over $20.50 and is generally less.

Silver—Handy & Harman quotation as quoted in the *Engineering and Mining Journal-Press* on either (1) the date of buyer's first assay or (2) on the date of final settlement. The Pittman Act for the time being fixes the quotation on domestic silver at $1 per ounce, or, with the necessary adjustments for fineness (999) and the cost of delivery to the mint, at about 99⅝c. per ounce, the exact figure depending upon the mint or assay office which has been designated by the director to receive consignments under the act.

Lead—Average price delivered to the consumer at New York for common domestic lead as quoted by the *Engineering and Mining Journal-Press* for the week ending Wednesday next preceding either (1) the date of receipt of the ore at the smelter or (2) the date of final settlement. The St. Louis price may be specified.

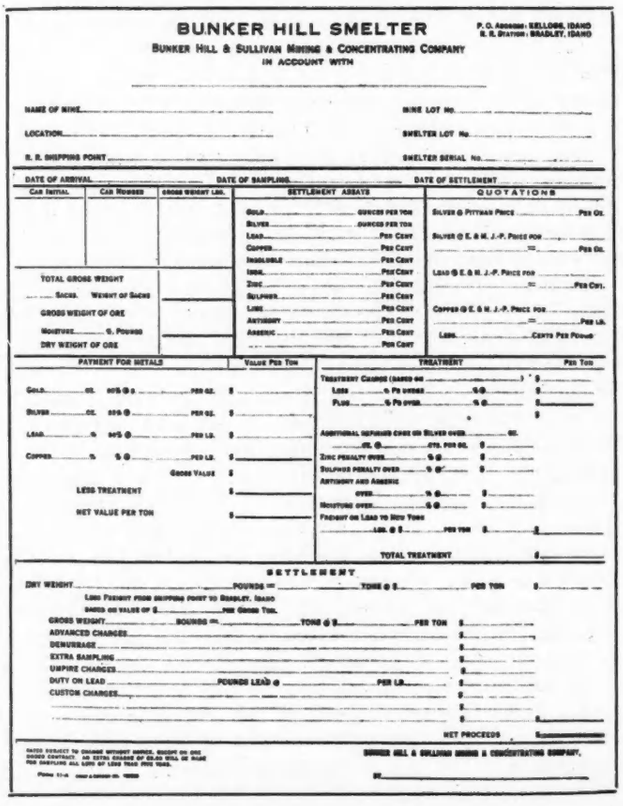
Copper—Average refinery price near New York for electrolytic copper as quoted in the *Journal-Press* for the same week as noted under lead.

Zinc—Average price in St. Louis for ordinary Prime Western brands of slab zinc, for the week covering the date of arrival of the ore at the reduction plant of the purchaser, as quoted in the *Journal-Press.*

It is sometimes provided specifically that except for these four metals and iron no other contents of the ore shall be paid for. This is merely a precaution against dispute.

Taxes and Demurrage—Federal and state taxes imposed in respect to ores or metals purchased under the contract or "in respect to production, extraction, sale, disposition, returns or proceeds thereof," shall be for the account of the seller, and when not prepaid may be deducted from the proceeds of the ore by the buyer in making final settlement.

Likewise, any demurrage charges incurred as a result of causes not controlled by the buyer shall be advanced by the buyer and deducted from the payment for the ore.



BUNKER HILL SMELTER
P. O. Address: KELLOGG, IDAHO
R. R. Station: BRADLEY, IDAHO

Bunker Hill & Sullivan Mining & Concentrating Company
IN ACCOUNT WITH

NAME OF MINE ..... MINE LOT No. .....

LOCATION ..... SMELTER LOT No. .....

R. R. SHIPPING POINT ..... SMELTER SERIAL No. .....

DATE OF ARRIVAL ..... DATE OF SAMPLING ..... DATE OF SETTLEMENT .....

CAR INITIAL	CAR NUMBER	GROSS WEIGHT LBS.

TOTAL GROSS WEIGHT ..... Sacks. WEIGHT OF SACKS .....
GROSS WEIGHT OF ORE .....
MOISTURE ..... %. POUNDS .....
DRY WEIGHT OF ORE .....

SETTLEMENT ASSAYS

Gold ..... Ounces per ton
Silver ..... Ounces per ton
Lead ..... Per Cent
Copper ..... Per Cent
Insoluble ..... Per Cent
Iron ..... Per Cent
Zinc ..... Per Cent
Sulphur ..... Per Cent
Lime ..... Per Cent
Antimony ..... Per Cent
Arsenic ..... Per Cent
..... Per Cent

QUOTATIONS

Silver @ Pittman Price ..... Per Oz.
Silver @ E. & M. J.-P. Price for ..... = ... Per Oz.
Lead @ E. & M. J.-P. Price for ..... = ... Per Cwt.
Copper @ E. & M. J.-P. Price for ..... = ... Per Lb.
Less ..... Cents Per Pound

PAYMENT FOR METALS

			Value Per Ton
Gold	..... Oz.	..... @ ..... Per Oz.	$
Silver	..... Oz.	..... @ ..... Per Oz.	$
Lead	..... %	..... @ ..... Per Lb.	$
Copper	..... %	..... @ ..... Per Lb.	$
		Gross Value	$
		Less Treatment	$
		Net Value Per Ton	$

TREATMENT

Treatment Charges (Based on .....) $ .....
Less ..... % Per Unit ..... @ .....
Plus ..... % Per Unit ..... @ .....
Additional Refining Chgs on Silver over ..... Oz.
..... Oz. @ ..... Cts. Per Oz.
Zinc Penalty over ..... % @ .....
Sulphur Penalty over ..... % @ .....
Antimony and Arsenic
over ..... % @ .....
Moisture over ..... % @ .....
Freight on Lead to New York
..... Lbs. @ $ ..... Per Ton
Total Treatment

SETTLEMENT

Dry Weight ..... Pounds = ... Tons @ $ ..... Per Ton
Less Freight from Shipping Point to Bradley, Idaho
Based on Value of $ ..... per Gross Ton.
Gross Weight ..... Pounds = ... Tons @ $ ..... Per Ton
Advanced Charges
Demurrage
Extra Sampling
Umpire Charges
Duty on Lead ..... Pounds Lead @ ..... Per Lb.
Custom Charges
Net Proceeds

Rates subject to change without notice. Except on ores under contract. An extra charge of $5.00 will be made for shipping all lots of less than five tons.

Bunker Hill & Sullivan Mining & Concentrating Company,
By .....

Freight on Bullion—The cost of transportation of blister copper or pig lead from the smelting plant to the refinery in the east, or of slab zinc to St. Louis, is usually provided for by the buyer in deductions on the payment for metals. However, a clause is often inserted specifying the freight rate prevailing when the contract was drawn, and providing that any increase or decrease shall be for the account of the seller, and that the proper deduction or credit shall be made. This is desirable all around, for, if the smelter must be prepared to absorb possible advances in freight rates, he must protect himself by increasing charges sufficiently to pay him for the risk involved.

Settlement Date—Payment for any lot of ore may be made on a specified date, as, for example, thirty days after the date of sampling; or payment may be made monthly to cover such lots as have been finally agreed upon with respect to assays and analyses.

Settlement Sheets—There are here illustrated, in reduced scale, three typical forms on which settlements are calculated. The last item in each is "Due you," "Net Proceeds," or "Net Payment." The purpose, it would seem, is to show the seller why he gets so little!

Diversion of Shipments—It may happen that the smelter may find it advantageous to divert certain lots of ore under contract to the plant of another smelter. For that reason, it is usually agreed that such diversion can be made by the buyer on the express condition that the seller shall not suffer in any way by such diversion, either through delay or increased charges.

Force Majeure—During the period of high prices for supplies, high wages, and curtailed smelting operations in 1919 and 1920, some of the smelting companies found that they were losing money on ore shipped under old long-time contracts that had once been quite profitable. One smelter served notice on a number of mining companies that it would no longer accept shipments under the terms of the existing contracts, basing its action on the provisions of the Force Majeure clause. The essential part of the clause read, "It is agreed between the parties that acts of nature, strikes affecting its operations, fire, flood, traffic interruptions, war, insurrection or mob violence, requirement or regulation of government, or any other cause whatever beyond its control (without regard to the foregoing enumeration), which shall impede, obstruct, or interfere with the buyer's said operations, shall give the buyer the right, on written or telegraphic notice to the seller, of suspending receipt and purchase of shipments under the contract during the existence of such cause; and the buyer shall not, during the existence of such cause, be liable in damages for failure to receive and purchase the product herein contracted for. . . ."

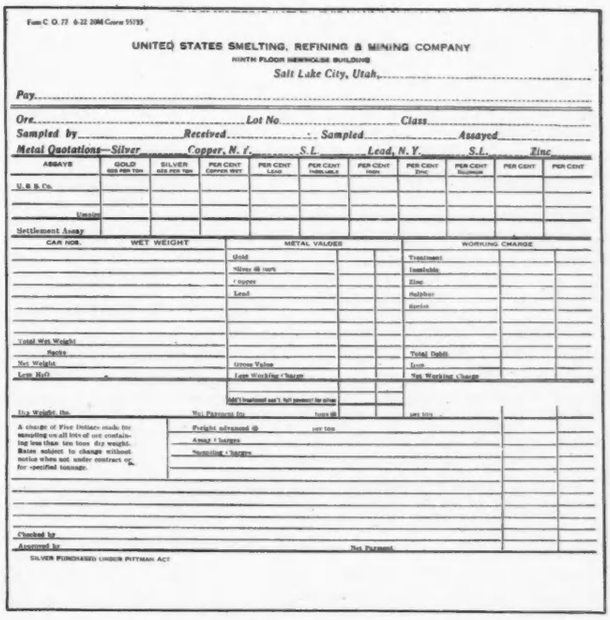
Smelter Protects Himself Against Unexpected Economic Changes

The miners contended that the mere increase in the cost of labor and supplies could not be considered as a valid cause for suspending acceptance of shipments, and threatened legal action. A compromise was reached, but since then the Force Majeure clause of all smelter contracts has provided against such a contingency. One of the simplest and most direct provisions, taken from the contract of another company, is this: "As the seller is under no obligation to produce and ship ore at a loss, the seller similarly grants the buyer reasonable protection in purchasing ore under this contract, and therefore it is understood that if, during the contractual period, the cost of smelting or refining shall increase to an extent resulting in financial loss to the buyer in treating the seller's product, then the buyer shall have the privilege, without liability for damages, at any time after one year from date, of canceling this contract, subject to thirty days' notice in writing to the seller."

Often it is provided that the contract be suspended during the period of disability on the part of the buyer and that it again become operative if and when the cause of the disability be removed.

Succession—This is simply a legal provision to prevent a possible transfer of the mining or smelting property from disrupting the contractual obligations.

The above cover the main clauses in the average contract with a mine of moderate size. Contracts covering the output of exceptionally large established mines naturally contain numerous special provisions and are



UNITED STATES SMELTING, REFINING & MINING COMPANY

NINTH FLOOR NEWHOUSE BUILDING

Salt Lake City, Utah,.....

Pay.....

Ore.....Lot No.....Class.....

Sampled by.....Received.....Sampled.....Assayed.....

Metal Quotations—Silver.....Copper, N. Y.....S. L.....Lead, N. Y.....S. L.....Zinc.....

ASSAYS	GOLD	SILVER	PER CENT COPPER WET	PER CENT LEAD	PER CENT INSOLUBLE	PER CENT IRON	PER CENT ZINC	PER CENT	PER CENT	PER CENT
U. S. S. Co.										
Umpire										
Settlement Assay										

CAR NOS.	WET WEIGHT	METAL VALUES		WORKING CHARGE	
		Gold		Treatment	
		Silver @		Insoluble	
		Copper		Zinc	
		Lead		Sulphur	
				Arsenic	
Total Wet Weight					
Sacks				Total Debit	
Net Weight		Gross Value		Less	
Less H2O		Less Working Charge		Net Working Charge	
		Net Proceeds			

Dry Weight lbs. Net Payments for ..... tons @ ..... per ton

A charge of Five Dollars made for sampling on all lots of ore containing less than ten tons dry weight. Rates subject to change without notice when not under contract or for specified tonnage.

Freight advanced @ ..... per ton

Assay Charges

Smelting Charges

Checked by

Assayed by Net Payment

SILVER PURCHASED UNDER PITTMAN ACT

more favorable to the producer than could be expected by a mine of smaller and less certain output.

To make the examples of actual settlements clear and uniform, I have devised a special form which gives for purposes of comparison (1) the gross value of the marketable metals in the ore at the quotations on which settlements actually were made, (2) the smelter credits, (3) the smelter debits, (4) the actual treatment charge, being the difference between the gross value and the proceeds from the smelter before freight is deducted; (5) freight to smelter, (6) actual value of the ore or concentrate at the mine, (7) the per cent return, and (8) the per cent return excluding freight. In every case just one ton of ore or concentrate is considered, and incidental charges, such as umpire assays, extra sampling, or demurrage, are ignored. I have endeavored to indicate the exact method of calculating the credits and debits according to the terms of each contract. Metal quotations necessarily vary because each settlement except where noted represents an actual sale of ore, and the dates are of course different.

Settlement I is different from the others because it is based on a special long-time contract. This covers large regular shipments of a sulphide concentrate con-

taining about 20 per cent copper and an almost negligible quantity of gold and silver, and requiring only a little lime for fluxing. According to the terms of the contract, the treatment charge is based on the actual operating cost of roasting, reverberatory smelting, and converting, to which is added 90c. per ton to cover plant depreciation, interest, profit, and miscellaneous overhead expense to the smelter. The books and metallurgical records of the smelting company are open to inspection by the miner so that he can verify the cost figures. The refinery charge is $17 per ton of blister. The freight, $14.50 per ton, on the blister from the smelter to the refinery, is paid by the miner, and there is no marketing deduction, for the reason that the miner is paid for his copper in copper, which he markets himself. A deduction is made of 12 lb. per ton of concentrate, the assumed metallurgical loss in smelting and converting; and copper equivalent to the remainder is delivered to the miner at an Atlantic tidewater refinery, 100 days after sampling of the concentrate. He may elect delivery in refined form as electrolytic cathodes, cakes, wire bars, or ingots. The smelter pays for gold and silver in money on the following terms:

Assay gold content less 0.05 oz. at $20.

Assay silver content less 0.03 oz. at Pittman Act price.

The deductions are the estimated actual metallurgical losses.

It should be noted particularly that the miner virtually assumes all the risk of increasing cost of smelting operations and likewise that involved in the fluctuations of the market during the period between the date of settlement and the date when the metal is ready for marketing. The agreement might be described as a "cost-plus" contract for producing blister copper from concentrate, the smelter being reimbursed for his direct expenditures with 90c. per ton added for profit and fixed charges.

SETTLEMENT I

COPPER CONCENTRATE

Gross Value		
Gold, Silver } Negligible		
Copper—410 lb. @ 14c.	$57.40	$57.40
Credit on Smelter Settlement		
Copper—(410—12) lb. @ 14c.	$55.72	
Debit		
Nominal smelting charge	6.00	
Freight on blister to refinery, 398 lb. @ $14.50 per ton	2.88	
Refining charge 398 lb. @ (a) $17 per ton	3.38	
Selling expense—1%	0.55	
Interest for 90 days—1%	0.55	
	$13.36	
Proceeds from smelting		42.36
Actual treatment charge		$15.04
Freight on concentrate		.....
Actual value of concentrate at mill		$42.36

$\frac{\$42.36}{\$57.40}$ = 73.8% return

= 73.8% return, excluding freight

(a) This contract, negotiated in 1912, provided $14 for refining, which was presumed to be $1 more than operating cost. The seller later agreed to $17 on the showing that the actual cost had increased.

Most Favorable Contract

During one recent year the smelting charges on this contract averaged approximately $6 per ton, including the 90c. profit, and the copper content of the concentrate averaged 20.5 per cent. In order to make the figures of return comparable with those given in the other settlements, I have included in the debit column a charge of 1 per cent to cover the expense of selling the refined metal, and a like charge for interest. Were the miner to be paid in the regular way he would have the use of the money about ninety days earlier than he does under the existing arrangement. Since the smelter and the mill are adjacent to each other, there is no charge for freight on the concentrate. This contract may be viewed as being just as favorable as a smelter contract can be. A nearly self-fluxing copper concentrate worth $57.40 returns 73.8 per cent to the miner. The actual treatment charge is $15.04 per ton.

SETTLEMENT II

COPPER CONCENTRATE

Gross Value		
Gold—0.09 oz. @ $20.67	$1.86	
Silver—8.1 oz. @ $1	8.10	
Copper—602 lb. @ 13.875c.	83.52	
		$93.48
Credit on Smelter Settlement		
Gold—0.09 oz. @ $19	$1.71	
Silver—95% of 8.10 oz. @ 99⅛c.	7.66	
Copper—97½% of 602 lb. at (13.875—2.75) c.	65.29	
Iron—13.8 units @ 5c.	0.69	
Bonus on treatment	0.50	
Treatment nil at 15c. copper; 50c. for each ½c. above 15c. to maximum of $2.50. Allowance of 50c. when copper quotation is below 15c.		
	$75.85	
Debit		
Insoluble—20.2 units @ 7c.	$1.41	
Proceeds from smelting		74.44
Actual treatment charge		$19.04
Freight to smelter		6.90
Treatment and freight		$25.94
Actual value of ore at the mine		67.54

$\frac{\$67.54}{\$93.48}$ = 72.2% return

$\frac{\$74.44}{\$93.48}$ = 79.5% return, excluding freight.

Compare this with Settlement II, also covering a copper concentrate—one that is also favorable to the shipper. If there were no freight to pay on the ore the net per cent return to the miner would be higher than in Settlement I. However, the concentrate is more than 50 per cent richer, and $10 of the value is in precious metal. Moreover, the actual treatment would increase materially with an increase in the copper quotation. At 17.5c. copper the nominal treatment would be $2.50 instead of a bonus of 50c. The actual per-ton treatment is $19.04.

SETTLEMENT III

COPPER CONCENTRATE

Gross Value		
Copper—142.4 lb. @ 14c.	$19.93	
Gold—2.54 oz. @ $20.67	52.50	
Silver—4.8 oz. @ $1	4.80	
		$77.23
Credit on Smelter Settlement		
Copper—90% of 142.7 lb. @ (14—3½)c.	$13.49	
Gold—95% of 2.54 oz. @ $20	48.26	
Silver—95% of 4.8 oz. @ 99⅝c.	4.55	
	$66.30	
Debit		
Nominal treatment (flat rate per ton)	$6.00	
Proceeds from smelting		$60.30
Actual treatment charge		$16.93
Freight to smelter		8.50
Treatment and freight		$25.43
Actual value of concentrate at mine		51.80

$\frac{\$51.80}{\$77.23}$ = 67.1% return.

$\frac{\$60.30}{\$77.23}$ = 78.1% return, excluding freight.

In Settlement III the per cent return, excluding freight, approximately equals that in Settlement I, but

the contract is not so favorable when it is considered that two-thirds of the value is in gold and that the freight and refining expense on the blister from each ton of concentrate are therefore much lower. After paying freight on the ore the miner gets only 67 per cent of the assay value of his ore.

SETTLEMENT IV

COPPER ORE

Gross Value		
Copper—265.6 lb. @ 13.725c	$36.45	
Gold—0.015 oz. @ $20.67	0.31	
Silver—3.625 oz. @ $1	3.62	
		$40.38
Credit on Smelter Settlement		
Copper—(265.6—15) lb. @ (13.725—3)c	$26.88	
Silver—3.625 oz @ 99.25c	3.60	
	$30.48	
Debit		
Nominal treatment charge	$6.25	
5% of value of silver	0.18	
3c. on 95% of silver	0.10	
	$6.53	
Proceeds from smelting		$23.95
Actual treatment charge		$16.43
Freight to smelter		2.45
Treatment and freight		$18.88
Actual value of ore at mine		21.50

$\frac{\$21.50}{\$40.38}$ = 53.2% return.

$\frac{\$23.95}{\$40.38}$ = 59.3% return, excluding freight.

The ore dealt with in Settlement IV is a dry copper ore of lower grade than the others, and containing 53.9 per cent silica, which gives it a moderately high nominal treatment rate. The gold content is below the minimum, 0.02 oz., and no payment is made. In this contract the nominal treatment varies with the value of the metal in the ore; less than $25 it is $4.75; between $25 and $40 it is $5.75, and over $40, $6.25.

Settlements V and VI, covered by the same contract, illustrate a number of points. The concentrate is obtained from the ore in the ratio of approximately 10 to 1. The value of 10 tons of ore is $129.30. By spending for concentrating $1.50 per ton of ore, or $15, one ton of concentrate worth $227.18 is obtained. Deducting the cost of concentrating, the net value is $212.18, or $82.88 in excess of the marketable value of the ore as it comes from the mine. As the mill has a capacity of 200 tons of ore, it is earning $1,658 per day for its owners. This also emphasizes the economic importance of freight charges in marketing ore. Although the freight on a ton of concentrate is $15.40 as compared with $7.50 for a ton of ore, a saving of $60 is effected by reducing the bulk of shipping product from 10 tons to 1.

The contract under which these settlements were made was not a good one from the standpoint of the miner—who, as might be deduced, knew nothing about smelting and nothing about ore-purchasing contracts at the time he signed this contract. The nominal treatment charge for low-grade ore was unreasonably high, and the inclusion of a penalty for arsenic and antimony of $2 per unit for the combined content in excess of 1 per cent was the consequence of the inexperience of the miner, who did not know that much of the silver in his ore was in the form of complex sulphides of silver, arsenic, and antimony. The deduction of 5 per cent of the gold is a provision in favor of the smelter that is not usual. I do not blame the purchaser for making the contract; but the seller has, to my knowledge, frequently blamed himself for making it.

SETTLEMENT V

SILVER ORE

Gross Value		
Gold—0.14 oz. @ $20.67	$2.89	
Silver—28.3 oz. @ $1	28.30	
		$31.19
Credit on Smelter Settlement		
Gold—95% of 0.14 oz. @ $20	$2.66	
Silver—95% of 28.3 oz. @ 99⅛c	26.77	
	$29.43	
Debit		
Nominal treatment charge (minimum)	$9.00	
Proceeds from smelting		$20.43
Actual treatment charge		$10.76
Freight to smelter		7.50
Treatment and freight		$18.26
Actual value of ore at mine		12.93

$\frac{\$12.93}{\$31.19}$ = 41.4% return.

$\frac{\$20.43}{\$31.19}$ = 65.5% return, excluding freight.

SETTLEMENT VI

SILVER CONCENTRATE

Gross Value		
Gold—1.28 oz. @ $20.67	$26.45	
Silver—255.3 oz. @ $1	255.30	
		$281.75
Credit on Smelter Settlement		
Gold—95% of 1.28 oz. @ $20	$24.32	
Silver—95% of 255.3 oz. @ 99⅛	241.62	
	$265.94	
Debit		
Arsenic combined with antimony—(5.68—1) unit @ $2	$9.36	
Nominal treatment (maximum)	$14.00	
	$23.36	
Proceeds from smelting		$242.58
Actual treatment charge		$39.17
Freight to smelter		15.40
Treatment and freight		$54.57
Actual value of concentrate at mine		227.18

$\frac{\$227.18}{\$281.75}$ = 80.6% return.

$\frac{\$242.58}{\$281.75}$ = 86.1% return, excluding freight.

Settlements VII, VIII, and IX, taken together, contain an interesting lesson: VII covered lot 7, containing 148.5 tons, and VIII covered lot 8, containing 293 tons; both were actually shipped as one day's output. Settlement IX is an imaginary but exact settlement on a lot

ANALYSIS OF ORES FOR WHICH SETTLEMENTS ARE CALCULATED

Constituent	1 Copper Concentrate	2 Copper Concentrate	3 Copper Concentrate	4 Copper Ore	5 Dry Ore	6 Dry Concentrate	7 Dry Ore	8 Lead Ore	9 Lead Ore	10 Lead Concentrate	11 Zinc Ore	12 Zinc Concentrate	13 Zinc Concentrate
Gold, oz.	....	0.09	2.54	0.015	0.14	1.28	0.02	0.04	0.033	.....	.....	.....	.....
Silver, oz.	....	8.1	4.8	3.625	28.3	255.3	54.4	22.3	33.13	38.3	12.6	18.7	7.4
Copper, per cent.	20.5	30.1	7.12	13.28	.....	0.11	2.665	0.42	1.175	....	....	....	0.38
Lead, per cent.	....	.....	.....	.....	.....	.....	4.5	24.3	17.64	59.3	11.2	9.8	5.0
Zinc, per cent.	....	.....	.....	1.5	.....	.....	2.05	4.30	3.54	8.8	38.5	53.6	43.6
Silica, or insoluble. per cent.	22.0	20.2	.....	53.9	82.0	30.6	58.3	30.4	39.8	8.2	9.1	....	7.7
Iron, per cent.	28.0	13.8	45.8	6.8	4.2	28.5	12.55	15.75	14.67	3.4	8.3	2.4	9.0
Lime, per cent.	....	0.8	.....	.....	.....	.....	0.2	.....	0.06	....	....	....	1.5
Sulphur, per cent.	....	18.7	.....	11.65	4.3	30.8	15.7	22.75	20.37	16.4	....	....	27.65
Arsenic or speiss, per cent.	....	.....	.....	0.8	0.41	4.06	1.0	1.2	1.00	....	....	....	....
Antimony, per cent.	....	.....	.....	.....	0.15	1.62	.....	.....	.....	....	....	....	.....

SETTLEMENT VII

DRY ORE

Gross Value		
Copper—53 lb. @ 13.725c.	$7.27	
Lead—90 lb. @ 5.758c.	5.18	
Silver—54.4 oz. @ $1.	54.40	
Gold—0.02 oz. @ $20.67.	0.41	
		$67.26
Credit on Smelter Settlement		
Copper—(53—15) lb. @ (13.725—3)c.	$4.07	
Lead—no payment.	.....	
Silver—54.4 oz.@ 99.625c.	54.20	
Gold—0.02 oz. @ $19.	0.38	
	$58.65	
Debit		
Nominal treatment charge.	$6.00	
Account full payment for silver—should be 95% @ 99.625c.	2.71	
	$8.71	
Proceeds from smelting.		49.94
Actual treatment charge.		$17.32
Freight to smelter.		2.50
Treatment and freight.		$19.82
Actual value of ore at mine.		47.44

$\frac{\$47.44}{\$67.26} = 70.5\%$ return.

$\frac{\$49.94}{\$67.26} = 74.2\%$ return, excluding freight.

SETTLEMENT VIII

LEAD ORE

Gross Value		
Copper—8.4 lb. @ 13.725c.	$1.15	
Lead—486 lb. @ 5.758c.	27.98	
Silver—22.3 oz. @ $1.	22.30	
Gold—0.04 oz. @ $20.67.	0.82	
		$52.25
Credit on Smelter Settlement		
Copper—(as lead) 90% of 8.4 lb. @ (5.758—1.5)c.	$0.33	
Lead—90% of (486-30) lb. @ 4.258c.	17.47	
Silver—22.302 @ 99.625c.	22.21	
Gold—0.04 oz. @ $19.	0.76	
Iron—15.75 units @ 6c.	0.95	
	$41.	
Debit		
Nominal treatment charge.	$2.50	
Account full payment of silver—should be 95% @ (99.625—3)c.	1.73	
Sulphur—(22.75—2) % @ 25c. maximum.	2.50	
Silica—30.4% @ 10c.	3.04	
	$9.77	
Proceeds from smelting.		$31.95
Actual treatment charge.		$20.30
Freight to smelter.		2.00
Treatment and freight.		$22.30
Actual value of ore at mine.		29.95

$\frac{\$29.95}{\$52.25} = 57.3\%$ return.

$\frac{\$31.95}{\$52.25} = 61.1\%$ return, excluding freight.

SETTLEMENT IX

LEAD ORE

Gross Value		
Copper—23 lb. @ 13.725c.	$3.15	
Lead—352.8 lb. @ 5.758c.	20.32	
Silver—33.13 oz. @ $1.	33.13	
Gold—0.033 oz. @ $20.67.	0.68	
		$57.28
Credit on Smelter Settlement		
Copper—(as lead) 90% of 23 lb. @ (5.758—1.5)c.	$0.89	
Lead—90% of (352.8—30) lb. @ 4.258c.	12.37	
Silver—33.13 oz. @ 99.625c.	33.01	
Gold—0.033 oz. @ $19.	0.63	
Iron—14.67 units @ 6c.	0.88	
	$47.78	
Debit		
Nominal treatment.	$2.50	
Account full payment silver—should be 95% @ (99.625—3)c.	2.65	
Additional treatment based on lead content under 21.5% (21.5—17.64) units @ 8c.	0.31	
Sulphur (maximum).	2.50	
Silicia—39.8 units @ 10c.	3.98	
	$11.94	
Proceeds from smelting.		$35.84
Actual treatment.		$21.44
Freight to smelter.		2.00
Treatment and freight.		$23.44
Actual value of ore at mine.		33.84

$\frac{\$33.84}{\$57.28} = 59.1\%$ return.

$\frac{\$35.84}{\$57.28} = 62.6\%$ return, excluding freight.

of 441.5 tons that would be a composite of lots 7 and 8. As a matter of fact, lots 7 and 8 were obtained by sorting the run-of-mine ore into two classes, and if no sorting had been done the day's shipment would have been represented by the hypothetical lot 9. It cost 20c. per ton, or $88.30, to pass the ore over a picking belt and classify it by hand sorting; the profit to the mine is shown in the following:

Value of lot 7—148.5 tons at $47.44.	$7,044.84	
Value of lot 8—293 tons at $29.95.	8,775.35	
		$15,820.19
Value of lot 9—441.5 tons at $33.84.	$14,940.36	
Cost of sorting 441.5 tons at $0.20.	88.30	
		$15,028.66
		$791.53

Counting a 300-day year, the clear additional profit to the miner would amount to about $240,000; and that without depleting his ore reserves by a single extra ton, or increasing the mining expense by a single dollar.

Definite Advantages of Sorting Ore

It will be noted that Settlements VII and VIII are made on different schedules—a dry-ore and a lead-ore schedule respectively. If the unsorted ore had been shipped it would have gone as lead ore. The particular features of the schedules that make this sorting so profitable may be enumerated as follows: (1) Silver in ore assaying 50 oz. or more is paid for at the Pittman Act price, whereas that in ore assaying less than 50 oz. is settled for at the Pittman Act price minus 3c. Accordingly, increasing of the silver content of lot 7 to 54.4 oz. makes a large net gain. (2) Copper in lead ore is paid for as lead at 5.758c.; copper in dry ore is figured at 13.725c. minus 3c. (3) The iron content of lot 8 is higher, and the silica content is lower, than shown in the corresponding analyses of lot 9. Both tend to decrease the actual treatment charge, while the opposite changes in lot 7, which is a dry ore, do not offset the gain. (4) An increase in the nominal treatment charge based on the shortage of lead below 21.5 per cent (an arbitrary arrangement provided in this particular contract) applies to lot 9 but not to lot 8. This, together with the increased lead tenor of lot 8, more than offsets the non-payment for lead in the dry ore.

The question arises, Does the smelter lose an amount equivalent to the miner's gain? Probably not; and yet his loss will be considerable, for the added expense of recovering the lead and copper if lot 9 had been smelted in the lead plant would not have been nearly so much as the additional revenue to the smelter. The amounts of metal actually marketed would have been virtually the same in either event. If smelter schedules were technically perfect the profit to the smelter ought to be the same no matter how the ore was classified. Like other things, however, schedules cannot reach theoretical perfection. The miner in this case took advantage of the fact that the physical condition and the appearance of various kinds of rock in his ore made this separation possible. He displayed unusual and commendable enterprise in arranging his smelter contract as he did. He had the output of his mine to market and he did it so as to make the most money for the stockholders of his company.

Other illustrations of the benefit to be derived from preparing shipments of ore so as to take the maximum advantage of the terms of the contract could be cited. One procedure, the merit of which seems obvious, but which nevertheless is often overlooked, is the simple

process of removing waste rock before loading for shipment. The desire to ship a big tonnage and to mine at small per-ton cost sometimes obscures the main object of the enterprise—namely, to realize the maximum profit.

Comparative Settlements on One Ore

A number of interesting points may be noted in Settlement X. On the actual settlement sheet from the smelter the lead credit is for 90 per cent of the assay content. However, the contract provided that the determination of lead assay shall be made by a wet analysis of the dry-assay button. A charge of $1.50 is included for briquetting, but, as the only shipments are flotation concentrate, this amount might just as well be included in the nominal treatment charge. Sulphur in excess of 2 per cent is to be charged for at 25c. per unit, with a maximum of $2.50, but as the ore is heavily sulphide the chance of falling below the minimum seems remote indeed. The contract is not unfavorable to the shipper, but it looks as though the effort had been made to make it look better on casual inspection than it actually is.

SETTLEMENT X
LEAD CONCENTRATE

Gross Value		
Lead—(1,186 + 30 [a]) lb. @ 5.605c	$68.15	
Silver—38.3 oz. @ $1	38.30	
		$106.45
(a) Settlement assay is wet analysis from button from fire assay.		
Credit on Smelter Settlement		
Lead—90% of 1,186 lb. @ (5.605—1.65)c	$44.22	
Silver—38.3 oz. @ (99.625—3.5)c	36.82	
	$81.04	
Nominal treatment ($2.50 plus or minus 10c per unit above or below 30% lead) $2.93—$2.50	0.43	
Iron—3.4% @ 6c	0.20	
	$81.67	
Debit		
Insoluble—8.2% @ 12c	$0.98	
Sulphur—maximum [(16.4—2)% at 25c]	2.50	
Briquetting	1.50	
Account full payment for silver—5% of $36.82	1.84	
	$6.82	
Proceeds from smelting		$74.85
Actual treatment charge		$31.60
Freight to smelter		8.80
Treatment and freight		$40.40
Actual value of ore at mine		66.05

$66.05 / $106.45 = 62.0% return.

$74.85 / $106.45 = 70.3% return, excluding freight.

SETTLEMENT XA
LEAD CONCENTRATE

Gross Value		
Lead—(1,186 + 30) lb. @ 5.605c	$68.15	
Silver—38.3 oz. @ $1	38.30	
		$106.45
Credit on Smelter Settlement		
Lead—90% of (1,216—25) lb. @ 5.605c	$60.08	
Silver—95% of 38.3 oz. @ 99.25c	36.11	
	$96.19	
Debit		
Nominal treatment	$25.13	
Base	$15.00	
Lead over 50% @ 10c	0.93	
Silver over 35% @ 3c	0.10	
Lead freight to N. Y @ $16.50 per ton plus war tax	9.10	
Zinc—(8.8—5) units @ 50c	$1.75	
Moisture—(8.5—6)% @ 20c	0.50	
	$27.38	
Proceeds from smelting		$68.81
Actual treatment charge		$37.64
Freight to smelter		8.80
Treatment and freight		$46.44
Actual value of ore at mine		60.01

$60.01 / $106.45 = 56.4% return.

$68.81 / $106.45 = 64.6% return, excluding freight.

For the purpose of comparison I have calculated Settlement X-*A* for the same ore as considered in X, but according to the terms of the open schedule of a well-known smelter. It will be observed that in spite of a nominal treatment charge totaling $16.03, and a debit of $9.10 for freight on lead bullion, there is a difference of only $6.04 in the actual treatment charge under the two settlements. The greater part of the remaining $19.09 is accounted for by the deduction of 1.65c. from the *Journal-Press* quotation. A comparison of the two settlements emphasizes the fact that the vital figure is the one that I have designated as the actual treatment charge. It makes little difference in which of a dozen ways the deductions from the full assay value are imposed.

Zinc by the "Base-and-Variation" Method

Settlement XI shows the operations of a base-penalty-premium schedule for zinc ore, a development of the Joplin practice. The base price, $19.50 per ton, is arrived at by figuring the value of 80 per cent of the zinc and 65 per cent of the lead and silver at the full assumed market price and deducting a treatment charge of $24. The arbitrary analyses and quotations are: zinc, 30 per cent, quotation 6c.; lead, 15 per cent, quotation 5c.; and silver, 8 oz., quotation, $1. It is also specified that the combined zinc and lead content shall be not less than 45 per cent. The "unit variation" provides that a premium or penalty of 95c. for each unit of zinc above or below 30 shall be added or subtracted. For lead the amount is 85c. per unit and the standard, of course, is 15. The market variations as indicated in the settlement sheet need no explanation. Although this is by no means an unfavorable schedule, as zinc-ore schedules go, the miner receives from the smelter only 41.8 per cent of the value of the metals in the ore and his realization after paying freight to St. Louis is just under 35 per cent.

A more rational schedule is shown in Settlement XII. In this the fact appears, without any attempt at concealment, that 83, 65, and 70 per cent respectively of the zinc, lead, and silver are paid for. The smelter

SETTLEMENT XI
ZINC ORE

Gross Value		
Zinc—770 lb. @ 6.75c	$51.98	
Lead—224 lb. @ 6.50c	14.58	
Silver—12.6 oz. @ $1	12.60	
		$79.16
Credit on Smelter Settlement		
Base—Zinc, 30% @ 6c. market	$19.50	
Lead, 15% @ 5c market	.....	
Silver 8 oz. @ $1 market	.....	
Insoluble, 7%	.....	
Premiums		
Zinc—(38.5—30) units @ 95c	$8.07	
Silver—(12.6—8) oz. @ 65c	2.99	
Lead—(market variation) 11.2 units x (6.50—5) @ 13c.	2.18	
Zinc—(market variation) 38.5 units x (6.75—6) @ 13c.	3.75	
	$16.99	
Penalty		
Lead—(15—11.2) units @ 85c	$3.23	
Insoluble—(9.1—7) @ 7c	0.14	
	$3.37	
Proceeds from smelting		33.12
Actual treatment charge		$46.04
Freight to smelter		5.50
Treatment and freight		$51.54
Actual value of ore at the mine		27.62

$27.62 / $79.16 = 34.9% return.

$33.12 / $79.16 = 41.8% return, excluding freight.

being in this instance, as in the former one, near St. Louis, and the settlement for zinc being made at the St. Louis quotation, no charge ought to be made for freight on the resulting slab zinc.

SETTLEMENT XII
ZINC CONCENTRATE

Gross Value		
Zinc—1,072 lb. @ 7c.	$75.04	
Lead—196 lb. @ 6.5c.	12.74	
Silver—18.7 oz. @ $1	18.70	
		$106.48
Credit on Smelter Settlement		
Zinc—83% of 1,072 lb. @ 7c.	$62.28	
Lead—65% of (196—30) lb. @ (6.5—1.5)c.	5.39	
Silver—70% of 18.7 @ 99.625c.	13.04	
	$80.71	
Debit		
Nominal treatment charge	$17.50	
Proceeds from smelting		$63.21
Actual treatment charge		$43.27
Freight to smelter		10.50
Treatment and freight		$53.77
Actual value of ore at mine		52.71

$\frac{\$52.71}{\$106.48} = 49.5$ return.

$\frac{\$63.21}{\$106.48} = 59.3$ return, excluding freight.

In Settlement XIII, on the other hand, one of the elements in the actual treatment charge is the freight on the zinc from a Rocky Mountain state to St. Louis or an equivalent railroad point on the way east. This is absorbed probably in the nominal treatment charge.

SETTLEMENT XIII
ZINC CONCENTRATE

Gross Value		
Silver—7.4 oz. @ $1	$7.40	
Zinc—872 lb. @ 7.125c.	62.13	
Lead—100 lb. @ 6.5c.	6.50	
		$76.03
Credit on Smelter Settlement		
Silver—80% of 7.4 oz. @ 99.625c.	$5.89	
Zinc—75% of 872 lb. @ 7.125c.	46.59	
Lead—80% of (100—80) lb. @ (6.5—2)c.	0.72	
	$53.20	
Debit		
Nominal treatment charge—$19.50 + (7.125—4)@$3	$28.87	
Proceeds from smelting		$24.33
Actual smelting charge		$51.70
Freight to smelter		8.80
Treatment and smelting		$60.50
Actual value of ore at mine		15.53

$\frac{\$15.53}{\$76.03} = 20.4\%$ return.

$\frac{\$24.33}{\$76.03} = 32.0\%$ return, excluding freight.

This charge, incidentally, varies with the market quotation for zinc as indicated in the settlement. When the St. Louis quotation as given in the *Engineering and Mining Journal-Press* is 4c. (both buyer and seller earnestly hope that it never will be), the nominal treatment is $19.50; and for each cent or fractional part of a cent that zinc rises, $3 is added to the $19.50, although obviously the cost of smelting the ore remains virtually constant.

I need hardly say that the miner in the contract represented by Settlement XII is a much larger and more important producer than the other sellers of zinc ore that have been considered. Even so, he gets less than 60 per cent return on a comparatively high-grade concentrate. The actual smelter charge on ore containing metal worth $106.48 is $43.27, whereas the treatment of the lead ore of Settlement X, "worth" $106.45, totaled only $31.60.

If this article is helpful to anyone it is to the man who owns the small mine—which he some day hopes to make into a big one; to the smelter and to the big producer the things written here are as elemental as A B C. If the small operator wants to get the most for his ore he should put himself in the place of the ore buyer. That gentleman wants to buy ore, not solely for the sake of any particular lot, but because he wants to see the mine from which it comes developed; he wants to see the industry expand, because on the activity of the mining industry in the particular region tributary to his smelting plant depends the success of his own enterprise. Therefore he is willing to take the ore at a reasonable price; but, like any other business man, he wants to get it as cheaply as possible. There are in his schedules a dozen places where he can get his margin. He can make the nominal treatment charge nothing at all; he can pay you for 100 per cent of all the gold and silver and copper and lead; he can penalize you nothing at all for silica and pay you 20c. per unit for the iron in your ore, and still give you a schedule in which the actual treatment charge is $50 per ton. He can do this simply by making deductions from the market price of the metals. I have exaggerated, obviously, to emphasize the point. When a schedule is offered, you can well afford to analyze it by making hypothetical settlements on ores of various metal contents and with various market quotations. Then, bearing in mind the fact that smelting and refining and transportation cost money, and that the smelter cannot recover all the metal, you will be able to judge whether the contract is reasonable and you will be in a position to get concessions if it is not. Above all, forget the foolish idea that every man who is buying ore is a lineal descendant from, and has inherited all the acquisitive propensities of, that well-known navigator Captain Kidd.

Texas Potash Prospects Good

Although it is genuinely optimistic about the probable opening in Texas of workable potash deposits, the U. S. Geological Survey feels that it must exercise due caution lest its published statements be made the basis of unscrupulous stock promotion. However, the Survey has issued a statement of the results of the examination of samples of cuttings from two wells recently drilled there—the McDowell well No. 4, in Glasscock County, and the Texon Oil Land Co.'s Santa Rita well, in Reagan County. The samples represent cuttings reaching depths of 2,550 and 4,426 ft., respectively, in the two wells, but no samples representing a gap of 680 ft. between 1,010 and 1,605 ft. have been received from the McDowell well. There is also a gap of 2,205 ft. between the 1,683- and 3,888-ft. levels in the Santa Rita well from which no samples have been received. Besides nine samples from the McDowell well containing from 1.5 to 9.95 per cent of K_2O, there were six samples containing more than 1 per cent but less than 1.5 per cent. Among the samples from the Santa Rita well were five containing more than 8.5 per cent K_2O and thirty others containing more than 1 per cent.

The samples analyzed were taken by standard tools from wells drilled primarily for oil. In the Santa Rita well, for example, the original sample taken from the bailer after the drill had cut the beds from 1,316 to 1,325 ft. showed 8.29 per cent of potash, equivalent to 10.78 per cent of the soluble salts, yet it cannot be safely inferred that there is a 9-ft. bed of potash salts of the stated richness at that horizon.

THE PETROLEUM INDUSTRY

The Alaska Oil Fields*

Present Output of Petroleum Entirely From Katalla Region—Yakataga, Iniskin Bay, and Cold Bay Districts Have Seepages and Favorable Structures—Labor Lacking in Districts To Be Drilled

BY H. C. GEORGE
Oil Recovery Engineer, U. S. Bureau of Mines

FROM the operating point of view, the oil fields of Alaska consist of one patented claim of 151 acres, with thirteen small producing wells, situated on the coast near Katalla, in the Controller Bay region.

From the geological viewpoint, or from the viewpoint of indications shown by oil seepages and anticlinal structures, the Katalla and Yakataga districts, located along the coast between Cordova and Yakatat; the Cold Bay and Iniskin Bay districts, on the Alaska Peninsula, and the Arctic Coast district, east of Point Barrow, all have possibilities as regards petroleum production.

Bulletin 719, of the U. S. Geological Survey, by George C. Martin, published in 1921, gives a summary of all previously published information regarding Alaska petroleum and includes additional information secured during 1920 by the U. S. Geological Survey. "Petroleum in Alaska," an advance report of the Geological Survey, released May 18, 1922, gives additional data and information regarding the Cold Bay and Iniskin Bay districts, secured as the result of surveys made during 1921.

At the present time two parties are doing geological and topographical work for the Survey in the Cold Bay district, and a party from the U. S. Land Office at Juneau is doing survey work at Chignik, about 150 miles southwest of Cold Bay.

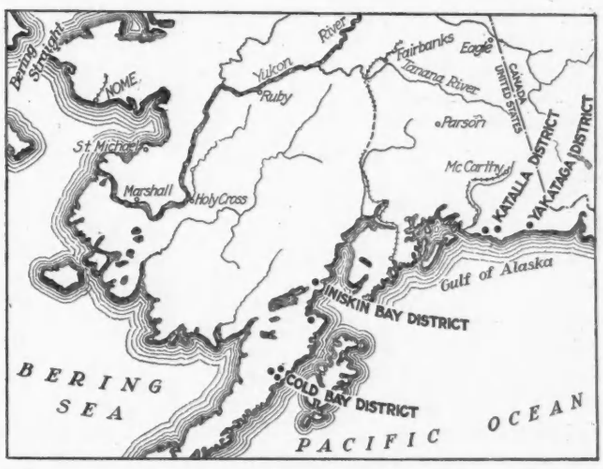
The two areas in Alaska which will probably be first tested for petroleum are the Controller Bay region, including the Katalla and Yakataga districts, and the Alaska Peninsula area, which includes the Iniskin Bay, Cold Bay, and possibly the Chignik districts. The grouping I have thus made is not simply one of geographical character. It is much more than this, as these two areas show marked differences as to structure and geological age, quantity and character of flora, and quality of oil exuding at the seepages.

This article deals chiefly with the Katalla oil field and the Cold Bay district. The former is the only producing oil field in Alaska and the latter district is the only one which will probably be tested by drilling during the next year.

The Controller Bay area, which includes the Katalla and Yakataga districts, is a region of heavy timber, mostly hemlock and spruce, with a dense undergrowth of devil club, and having much tundra and fallen trees. The geological age of the formations in both of these districts is Tertiary. The rocks consist of interbedded shales, sandstones, and conglomerates. At Katalla, faults and intrusions are in evidence, but at Yakataga intrusions have not yet been found.

In the Katalla district, irregularity in the dip and strike in the formations over short distances has been so far an obstacle in the interpretation of the broader scheme of the structure, so that knowledge of the geological conditions existing at a given place is impossible at this time.

In the Yakataga district the most pronounced structural feature is a long anticline showing numerous oil seepages along its crest. This anticline is located along the ocean flank of the low coastal range.



Map showing location of Yakataga, Katalla, Iniskin Bay, and Cold Bay districts

In both of these districts the dense vegetation has been a great obstacle to the study and analysis of the existing geological conditions. The oil secured from the seepages at both Katalla and Yakataga is similar in quality, color, and gravity, being a transparent paraffin-base oil of a green or red color, and of a gravity ranging from 22 to 26 deg. Bé.

The Alaska Peninsula area is practically free from timber south of Latitude 59 deg. The Iniskin Bay district, north of this latitude, has considerable timber, but in other respects is similar to the area to the south and west on the peninsula proper.

The only trees found at most places in the Alaska Peninsula area, south of Latitude 59 deg., are small

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stunted alders and willows which seldom rise more than five or six feet above the ground, on account of the heavy winds which prevail at most times. It is even difficult to secure sticks sufficiently long to use for tent poles. The valleys, hillsides, and even the tops of the lower ridges are covered with moss, but grass is scarce and of poor quality, so that at many places feed has to be carried for the pack horses.

Oil field buildings of Chilcat Oil Co., at Katalla

The geological age of the structures showing oil seepages, so far examined and reported on, is Jurassic. The rocks consist of a series of shales, sandstones, and conglomerates. One peculiarity of the conglomerates that I examined in the Cold Bay district is that the water-worn pebbles of which they are composed are of many kinds of igneous and metamorphic rocks, such as granites, syenites, basalts, quartzites, mica schists, and hornblende schists. Igneous intrusions, faults and volcanic cones are numerous in the area, and some of the anticlines show intrustions.

Two well-defined anticlines have been located in the Iniskin Bay district, as well as oil seepages. Three broad anticlines have been found in the Cold Bay area—namely, the Salmon Creek-Bear Creek and Wide Bay structures, along the southern coast, and the Ugashik Creek anticline, about ten miles inland from them.

Topography and Structure Conform in Cold Bay District

There is a noticeable conformity between topography and structure in the Cold Bay district so far as I could determine from my examination. For instance, the hills and mountains represent the anticlines, and the valleys and lakes represent the synclines in many instances. However, this is not true in the Wide Bay anticline, where the bay occupies the crest of the structure. Of course, the volcanic peaks are not taken into consideration in this connection.

There is a marked similarity in the oil from the seepages from the different structures examined, and that from all other seepages reported is said to be of a similar character. This oil is much darker than the Katalla and Yakataga oil, being brown to black in color. However, it is of paraffin base. Samples of seepage oil were taken from the Bear Creek and the Pearl Creek domes, in the Cold Bay district. The former was of 14.4 deg. Bé. gravity, and the latter was of 22.5 deg. Bé. gravity.

The two known anticlines in the Iniskin Bay district and the three that are known in the Cold Bay district are the only ones in the Alaska Peninsula so far mapped by the U. S. Geological Survey.

Further anticlines will probably be found between the Cold Bay district and the Iniskin Bay district, which are about 175 miles apart. This area, except in the vicinity of Katmai and the Valley of the Ten Thousand Smokes, which are about 40 miles northeast of Cold Bay, is practically unexplored.

Much of Alaska Peninsula Little Known

The Alaska Peninsula extends for about 350 miles southwest from the Cold Bay district. This district has not been surveyed, and little is known of it, except by bear hunters and the natives. The Geological Survey reports that the Jurassic rocks extend for a distance of at least 100 miles south and west of the Cold Bay district.

Oil seepages have been reported from the neighborhood of Chignik, about 150 miles southwest of Cold Bay, and also at a point near the end of the peninsula, about 300 miles southwest from Cold Bay. Further anticlines favorable for the accumulation of petroleum will probably be found in this area.

Chilkat Oil Co. Operates Thirteen Wells in Katalla Field

About thirty-five wells have been drilled in the Katalla oil field. Of this number, twenty have been drilled on the patented claim of 151 acres, where there has been the only prospecting and production in Alaska since the withdrawal of entry of oil lands on Nov. 3, 1910.

Some of the wells drilled years ago on other claims discovered oil, but whether in economic quantities remains to be determined by further tests. I recently visited several of these old wells and saw ample evidence of the discovery of petroleum. At Redwood Well No. 108 (as shown on U.S.G.S. maps) the well was full of fluid and oil was trickling over the top of the open casing. This well is about a mile northeast of the group of operating wells on the patented claim.

The Chilkat Oil Co. owns the patented claim and operates the thirteen producing wells that have been drilled on it. These wells are being pumped by steam, and the production of about 1,000 bbl. a month of 44 deg. Bé. gravity paraffin-base petroleum is piped to the small refinery, owned and operated by the same company, and situated about half a mile to the west on Katalla Slough.

The oil production from this claim from 1904 to 1919, inclusive, was 56,000 bbl. For 1920 it was 10,746 bbl., and for 1921 it was 10,280 bbl. The production per well varies from 15 to 240 bbl. per month. The better wells are pumped regularly every day, but the oil is allowed to accumulate in the smaller ones, which are pumped about once a week. The producing wells vary in depth from 366 ft. to 1,500 ft. One well was completed to a depth of 2,300 ft., but showed no oil and was abandoned. All of the wells drilled on the patented claim, both producing and abandoned, are rather closely grouped and would all fall within a forty-acre tract.

Even the deepest well drilled did not penetrate the shale, which seems to be the only rock outcropping within the limits of the producing area and from the crevices of which the oil finds its way by seepage into the wells. There seems to be no relation in the different wells as to the horizon at which these oil-carrying crevices will be encountered. The drilling of a new well and the encountering of petroleum at

greater depths does not seem to affect or be affected by the adjoining wells, some of which produce oil from a much shallower depth.

Whether the formation which is the source of the oil is sufficiently near the surface to be reached by drill, or occurs within the area of producing wells, will probably only be determined by a few well-located deep tests.

All of the wells of this field have been drilled with standard tools. Well No. 19, on the patented claim, was completed at a depth of 1,500 ft. during my recent trip to the Katalla field. This well has 8-in. casing to 900 ft., and a 6-in. perforated liner to 1,300 ft., where the principal producing horizon occurs. This well, like all of the others in the Katalla oil field, as before noted, was drilled with standard tools, and, like the other wells, it was not cemented, as no water occurs in the formation. Two hundred feet of 10-in. casing was used as a conductor and also served to keep out the surface water. This well, with its proportion of overhead, cost about $10,000.

Simple Process of Refining Used

Refining as conducted at Katalla is a simple fire-still process where operations are directed toward producing the maximum amount of distillate. The residuum from the refining process is kept in tanks for treatment at a later date with improved methods and equipment.

An idea of the proportion of the different refined products is obtained from the statement of oil sales of the Chilkat Oil Co. for 1921, as follows: Gasoline, 51,671 gal.; distillate, 249,212 gal.; Diesel oil, 8,269 gal.; and kerosene, 8,814 gal.

All of the refined products are run into 100-gal. steel drums and are disposed of along the Alaska coast to operators of gas boats, canneries, and mining companies. A thirty-ton gas boat makes a trip with a load of about sixty 100-gal. drums about once a week, delivering at Cordova and various canneries along the coast.

In this way the refined product is readily handled, entrance being made to the slough and wharf at the refinery at high tide, and loading being done between tides, the load being taken out on the following tide. Handling the refined products in this way costs 5c. per gallon delivered at Cordova or other wharfs in the same general region.

In addition to producing, refining, and marketing petroleum, the Chilkat Oil Co. also operates a sawmill at which timbers, planks, and boards needed for derricks and buildings are sawed. The maximum number of men required in the operations of the company is sixteen. This includes operation of sawmill, rig building, drilling, pumping, and refining. Most of the men secure their meals at the company's boarding house and are housed at a group of bunk houses that have been built on the property, but some of them live at Katalla.

High Winds Make Steel Derricks Advisable

Minimum winter temperature at Katalla, Yakataga, and Cold Bay is reported to be about 10 deg. below zero. The annual snowfall is said to be from 4 to 6 ft. at Katalla and Yakataga and from 1 to 2 ft. at Cold Bay. The rainfall in all the districts is reported to be heavy and frequent. Heavy fogs are also frequent, especially in the Cold Bay and other Alaska Peninsula districts. The winds of the Alaska Peninsula are the most striking feature of the climate of the Alaska coast. Even during the period of so-called good weather in June, there were times that it was difficult to stand up or walk, because of the prevailing gales.

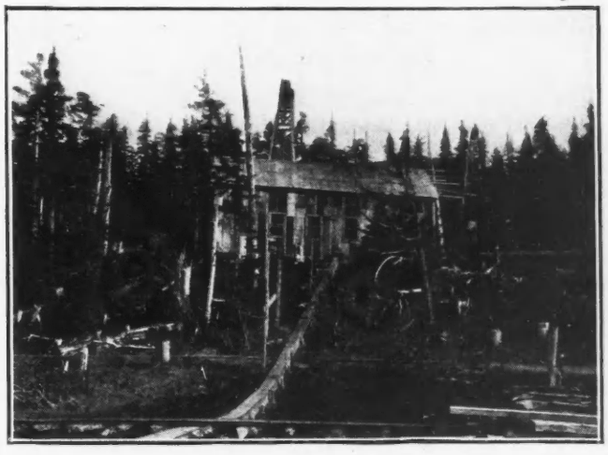
The presence of high winds will greatly interfere with the serviceability and life of wooden derricks, and it would be well for those planning drilling operations to bring in steel derricks as part of their drilling equipment and use a sufficient number of guy wires to hold them in place.

Favorable Structures in Yakataga, Iniskin, and Cold Bay Districts

The petroleum production of Alaska all comes from the Katalla oil field, which shows oil seepages but no evidence of oil sands or favorable structures within the producing area. Wells, such as those already drilled and which are now being operated, probably will be brought in at a number of places in the Katalla district by drilling to corresponding depths in the shale along lines of fissuring, the presence of which are probably indicated by the seepages. Larger wells may be found if the source of the petroleum is ascertained to be in suitable structures for accumulation within drilling depths.

The Yakataga, Iniskin, and Cold Bay districts all show both seepages and favorable structures, though favorable structures are not known to exist in the producing Katalla field.

Regarding the Cold Bay district, a number of years ago four or five wells were drilled near the head of Oil Creek at the northeast end of the Salmon Creek-Bear Creek anticline. These wells are about seven miles northeast of the Bear Creek dome and beyond the northeast end of the anticline near a group of seepages, but also outside of the anticlinal structure as well as near a fault. These old wells are the only ones drilled in the Cold Bay district. They had little possibility of striking oil, and have been of no value in proving whether or not oil exists in commercial quantities in the Salmon Creek-Bear Creek anticline.



Steam power plant of Chilcat Oil Co., Katalla, Alaska

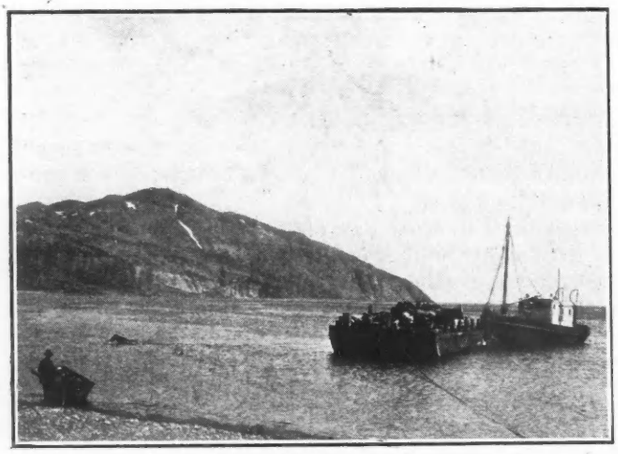
The Salmon Creek-Bear Creek, Wide Bay, and Ugashik Creek structures are broad anticlines, with known oil seepages at the first and last named. I found an important gas seepage on the Ugashik Creek anticline. Sandstones and conglomerates favorable for the accumulation of petroleum are known to form a part of the strata of each of these anticlines, on which wells of 3,000 to 4,000 ft,, with standard tools, undoubtedly

would give a thorough test of all probable oil sands. At the Ugashik Creek and Salmon Creek-Bear Creek structures there are good possibilities of securing large production.

Much of Promising Areas Already Staked—Many Maps Inaccurate

In the Katalla oil field much of the area, other than the one patented claim, is claimed under priority rights under the Leasing Law, because of development done previous to the withdrawal of entry of oil lands in Alaska in 1910. This is also the fact in some parts of the Cold Bay district.

Since the passage of the recent Oil and Gas Leasing Act of Feb. 25, 1920, most of the area on and near the anticlines and oil seepages at Yakataga, Iniskin Bay, and Cold Bay districts, and may other places at or near reported oil seepages, have been staked and application made for drilling permits.



Landing horses and freight by gas boat and lighter, Portage Bay, Alaska

In the Cold Bay district, at the Salmon Creek-Bear Creek anticline, the Wide Bay anticline, and the Ugashik Creek anticline, practically the entire area covering these three structures and the intervening syncline has been staked.

Many of the maps and blueprints of these areas made and sold by engineers and others frequently show claims located many miles from where actual staking was done, and often claims are shown as being located on the anticlines when, in reality, they are a considerable distance away. It would be well for those contemplating drilling operations to know that their claim has been surveyed by a Mineral Land Surveyor and tied into a section corner, and that it is located favorably with reference to the structure, before steps are taken to begin prospecting operations.

Anchorage for Small Boats Only at Katalla

Small boats, of 6 or 7 ft. draft, can enter the harbor at Katalla only at high tide. Heavy machinery and equipment for prospecting should be unloaded from steamers at Cordova, then loaded onto lighters and towed by gas boat to Katalla and taken into the harbor at high tide. Extensive developments in the Katalla oil field may warrant the dredging of the channel and the building of a breakwater, which will, of course, entail considerable expense. This would permit, however, the entrance of sixty-ton or seventy-ton gas boats to the harbor at all times.

In the Yakataga district, Icy Bay, at the east end of the possible oil-producing territory, affords the only harbor. Here the features are reported to be similar to those existing at Katalla.

In the Iniskin Bay district, both Iniskin Bay and Chinitna Bay are well protected, and are reported to afford satisfactory anchorage for large vessels with 15 to 20 ft. draft.

In the Cold Bay district, Portage Bay permits the entrance of large vessels, soundings showing from ten to twenty fathoms of water at low tide. However, this bay is not well protected, and before it could be extensively used as a harbor, a breakwater would have to be built on top of the reef which is exposed at low tide and extends about half way across the bay from the north shore.

One of several oil companies planning to drill this fall at the Ugashik Creek anticline has shipped all camp and drilling equipment, amounting to about 500 tons, by ocean steamer to Portage Bay, where it has been unloaded onto a lighter and successfully delivered on the beach at Kanatak.

Wide Bay Best Harbor for Cold Bay District

H. G. Parry, who spent several months at Wide Bay during the summer of 1922, reports that this bay affords a much better harbor than Portage Bay, for the Cold Bay district. The northeast end of the bay has a shore line consisting mostly of abrupt rocky cliffs, and the bay itself is reported to have numerous rocks and reefs. Mr. Parry says:

> "For about eight miles the southwest end of Wide Bay is landlocked, mountains rising from a thousand to three or four thousand feet surround it on the east, south and west, The northwest or off-shore wind, greatly feared along the peninsula, is scarcely felt in this part of the bay. The entrance to Wide Bay, being used by such boats as enter the bay at present, is approximately fourteen miles from the southwest end and just to the north of a reef known locally as 'Channel Rock.' From ten fathoms to sixteen fathoms of water at low tide has been found by those making soundings (shipmasters and fishermen—among them the master of mail steamer 'Starr'); along a center line through the bay southwest of the 'entrance' water from ten fathoms to forty fathoms is to be found. Anchorage in the bay is good."

From the evidence at hand it would seem that the best harbor for the Cold Bay district is Wide Bay. Freight for drilling operations on the Salmon Creek-Bear Creek anticline could be loaded on lighters and towed by gas boat to Portage Bay or Island Bay, and unloaded on the shore.

Some oil men who have examined the Ugashik Creek anticline advise that equipment required there for initial prospecting operations be taken through Unimak Pass into Behring Sea and Bristol Bay, unloaded into lighters in Egegik River, taken up the rapids at the entrance to Becharof Lake, and towed by gas boat across Becharof Lake to the north end of the Ugashik Creek anticline.

Good Roads Lacking Save at Katalla

At Katalla there is a graded road with well-built bridges extending into the Katalla oil field. However, before heavy hauling can be done on this road it will have to be graveled over a considerable part of the distance.

There are no roads in the Yakataga district, and material would have to be sledded overland during the winter months, when the marshes are frozen, or cor-

duroy roads and bridges would have to be built to reach the drilling locations during the summer months.

No roads exist in the Cold Bay district, except the old road from Cold Bay to the Castello wells drilled years ago. This road is still in good condition, but is not within the probable drilling area. There are two trails for pack horses, one from Wide Bay to Ugashik Lake and the other from Portage Bay to the Ugashik Creek anticline. These trails do not follow the best possible route for roads, as they take the most direct route without reference to grades.

For preliminary drilling operations on the Salmon Creek-Bear Creek anticline, the road problem will not be difficult, as the distances to be covered from harbor will be from four to eight miles and the grades moderate.

To reach the Ugashik Creek anticline from Portage Bay will require about fifteen miles of road, crossing one ridge about 400 ft. above sea level on the Salmon Creek-Bear Creek anticline, and crossing another one, about 1,200 ft. above sea level, on the east flank of Ugashik Creek anticline, with an elevation of about 100 ft. above sea level between these two ridges. To reach the Ugashik Creek anticline from Wide Bay will require about twenty miles of road, crossing one ridge about 1,500 ft. high. Both of these routes afford easy grades, with natural roadways for most of the distance. There is no timber and little undergrowth to interfere with road making.

Horses with wide-wheeled wagons would be best suited to haulage over gravel, or corduroy, or plank roads to be built in the Katalla and Yakataga districts. Caterpillar tractors probably could be used to advantage in the Cold Bay district. However, at many places in the Cold Bay district the proposed road will have to be ditched to drain the water away from the loose shale, conglomerate, and sandstone fragments that cover the surface. Moss covers a large part of the surface, especially on the Ugashik Creek anticline.

There is no available labor for drilling operations in the districts described. There is plenty of wood for fuel in the Katalla, Yakataga, and Iniskin Bay districts, but there is neither wood nor coal in the Cold Bay district. It probably would be best to bring in a good grade of coal or fuel oil for fuel needs.

Plenty of timber is available to meet lumber needs in the Katalla, Yakataga, and Iniskin Bay districts. All required lumber would have to be taken into the Cold Bay district. Good water supply is assured in all districts. Costs for the initial wells in any of the districts should not be greatly in excess of the cost of drilling to corresponding depths under similar conditions with standard tools in some of the remote oil fields of the United States.

The difficulties to be encountered in Alaska probably will be no greater than those seen in the early developments at Salt Creek, Wyo., at Ranger, Tex., and at many other Texas oil fields.

Faults or igneous intrusions, one or both of which are known to exist in all of the districts included in this article, may have permitted the escape of most of the oil formerly held in the structures.

The present petroleum production of Alaska is all from the district which has the least favorable surface indications.

The Yakataga, Iniskin Bay, and Cold Bay districts have oil seepages and favorable structures.

The several wells drilled at Iniskin Bay and Cold Bay districts years ago were not favorably located with reference to the structures.

The chances are good for finding commercial production at all of the districts referred to in this article, and some large wells may be found in the Cold Bay district.

Sun Company Completes New Test Near South Bend Field

In Young County, Tex., the joint test of the Sun Co. and M. R. Hemphill, three-quarters of a mile south of the South Bend field, was completed at a depth of 4,005 ft., making 2,000 bbl. of oil and with heavy gas pressure. This is a new producing horizon for this section. The Ferguson pool, in Archer County, has been extended one-half mile southeast by the completion of a good well on the Ferguson tract by the Dillday & Knight interests. It is also believed that a new pool will be developed four miles west of Groesbeck, Limestone County, where recently the Texas Pacific Coal & Oil Co. completed its No. 1 Bowden well, making 40,000,000 cu.ft. of gas from 3,000 ft.

The Laredo district is the center of much activity. In the Schott field the Kanoka No. 3 well of the Kanoka Oil Co. came in recently, making a production of 3,000 bbl. This is one of the largest wells in southwest Texas. Several other wells, ranging from 200 bbl. down to 20 bbl., have been completed in the last few weeks. Among these are the Ross No. 2, Schott field, making 200 bbl., and the Magnolia Petroleum Co.'s No. 1 well, also making 200 bbl.

The Magnolia Petroleum Co. has purchased the Harvey-Cullem interests. These consist of 160 acres in the South Electra field and several small tracts in the Burkburnett and Desdemona fields. The total daily production from these lands is 2,000 bbl., and the reported purchase price was $2,500,000.

In the Gulf Coastal region, the Hull field, in Liberty County, took first place in oil production during the week ended Oct. 14, producing 30,150 bbl., as compared with 26,375 bbl. from the West Columbia field, which previously held first place. This was due to the completion of several large producers on the west flank of the dome. Among these were a 5,000-bbl. well by the Yount-Lee Oil Co., and a 1,200-bbl. well each by the Gulf Production and Humble Oil & Refining companies. The total coastal production during September was approximately 3,125,000 bbl., a decrease of 193,000 bbl. from August.

At Barber's Hill the Mills Bennett No. 1 Japhet well came in at 3,221 ft., making 2,400 bbl. of clean oil. This well is on the southwest side of the dome, and has stimulated deep drilling around this salt dome.

An interesting well is being drilled at Blue Ridge, Fort Bend County, by Neils Esperson, on the Ewing tract. The well is now 5,300 ft. deep, making it one of the deepest tests on the Gulf Coast.

Production of Smackover Field in Arkansas Increasing Rapidly

Production of the field that is being developed at Smackover, Ouachita County, Ark., will soon reach 100,000 bbl. daily, probably before pipe facilities are available, according to a correspondent. The rapidity with which this field has been exploited, as well as the character of the oil companies which for the first time have entered Arkansas, emphasize the fact that low-gravity crude has a market.

CONSULTATION

The Decrease in the Fineness of British Silver Coinage

"Would it be asking too much if you could inform me how much pure silver, in proportion to the amount of alloy, England is putting into her coins at the present time. Also to what extent she is using silver at present. Is there any difference in the amount of alloy she is using now and the amount she used before the war? What made the change necessary?"

These questions can be best answered by giving a little bit of recent currency history of Great Britain. The extraordinarily high price of silver in 1919 and the early part of 1920 threatened to drive every subsidiary silver currency in the world, excepting that of the silver standard countries, out of circulation, because the various silver coins of the world, from the American dollar to the Indian rupee, were either worth more as bullion than as coins or were in great danger of becoming so. The result of such conditions would be to prevent the customary circulation of silver coins and their minting only at a heavy loss. Alarmed at this situation, many nations took steps to safeguard their currencies. The simplest method of doing this was to decrease the silver content of the minor coinage, and action to that effect was taken by several countries and was contemplated at the time by the representatives of the United States Government.

A bill to reduce the fineness of British silver coinage was passed in February, 1920. Previously, the Chancellor of the Exchequer had stated that the change was necessary owing to the unusually high price of silver bullion, which had tended to drive the subsidiary coinage out of circulation into the melting pot. Despite a rapid and heavy decline in silver during the remaining months of 1920, the law was put into effect, and for the first time since the reign of Queen Elizabeth the fineness of British silver coins was altered. The reduction lowered the fineness from .925 to .500, or about 46 per cent. In view of the natural conservatism of the British, this radical change was startling in its suddenness, and many persons hoped that the British Government would give up taking the step, particularly as every indication then pointed to lower silver prices. Regardless of the possibility of a continued fall in price, however, the change was made.

The effect of this large drop in the silver content of British currency is to increase greatly the quantity of silver available for minting purposes.

London bullion brokers estimated last year that forty million ounces of silver metal would likely be added to the world's supply from this step of the British Government. This estimate was based on the assumption that coins minted before 1901 were no longer in existence, and that up to the close of 1919 the net issue by the Royal Mint amounted to £37,095,905. If all this coin returned to the mint, there would be a surplus of 57,330,035 fine ounces. The report went on to state that it is, of course, most unlikely that this reflux can take place in entirety. A certain quantity must have been exported to British colonies and elsewhere, some must have been lost or destroyed, and a considerable part of that remaining must be hoarded in such a fashion that it will not again be in evidence for a generation or so. Other nations in reducing the fineness of their currency have contributed to the stock of available bullion. The situation is an excellent illustration of the effect of erratic and widely fluctuating prices in the silver market of the world.

At the present time silver coins freely circulate in the British Isles. It was reported soon after the new coins of .500 fineness began to circulate, that they did not meet with much favor among the populace. The chief objections had to do with the poor appearance of the coins after they had been circulated a short while. Their bright white color was quickly lost and they became unpleasant to the touch. They also possessed a metallic ring ordinarily associated with spurious coins. However, no attempt has been made to return to the older grade of fineness. In 1921, the last year for which we have complete statistics, the British Government minted domestic silver coinage, .500 fine, to the value of $41,104,846.

A Mine That Will Move More Earth Than the Panama Canal

"Will you kindly answer me the following question: Will the working of the Utah Copper mine involve the moving of more capping and ore than was actually handled in the excavation of material in the construction of the Panama Canal?"

According to the New International Encyclopedia, 232,353,000 cu.yd. of earth was excavated in the building of the Panama Canal. According to the annual report of the Utah Copper Co. for 1921, the total quantity of material—capping and ore—removed from the property to the end of 1921 was 145,000,000 tons, so that at the present time the balance is heavily in favor of the Panama Canal. However, Utah Copper is still a young mine. Ore reserves were estimated at 362,910,000 tons on Jan. 1, 1922, which, added to the quantity of ore already mined, 91,697,600 tons, would indicate that the operations at the Utah Copper mine will easily surpass the Panama Canal in size before the deposit is exhausted. In fact, when the hundreds of thousands of tons of capping that remain to be stripped are considered, the total is much more than twice the amount of material that was moved in building the Panama Canal. In making this comparison, 1½ tons of rock or ore is taken to be equivalent to 1 cu.yd. of material removed from the Panama excavations.

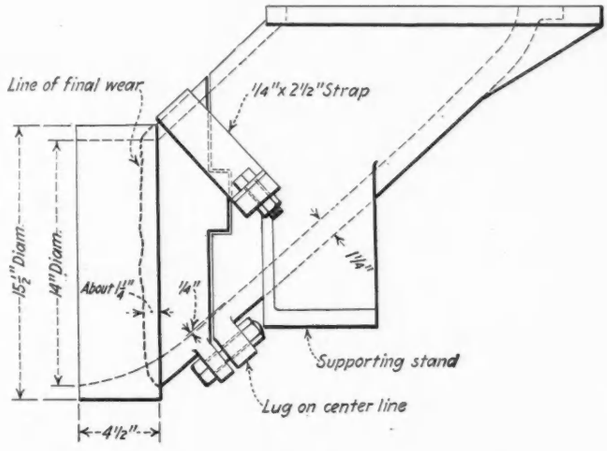
In many ways the working of the Utah Copper mine is just as spectacular as the construction of the canal. A mountain is being razed in Utah, and a route for the canal had to cut through many treacherous topographical hindrances, from hills to swamps. Both enterprises have added greatly to the wealth and progress of the world.

USEFUL OPERATING IDEAS

Renewable Nose for Crusher Feed Spout

BY W. J. TAIT

In crushing a very hard and tough ore, the nose of a Symons crusher feed spout was worn very rapidly, being ground off on the outside by material between the nose and the outer disk. The renewable nose shown in the accompanying drawing was designed to save the waste of material caused by scrapping the body of the spout when only the nose was worn. The



Crusher feed spout with renewable nose.

special features of this design are the absence of any projecting lugs inside the crusher hood, gained by the use of the ¼x2½-in. strap clamp over the top, and the key lugs in the sides of the spout which prevent any relative turning or vertical motion between the two parts. The bottom of the nose is ¼ in. thinner than the bottom of the body, so that no projection is formed at the joint to obstruct the passage of the ore. The joint between the two parts is not finished in any way, the nose castings being used as delivered from the foundry.

Converting an Air Line Into a Water Column

BY ROBERT J. DUNCAN

It is often desirable to be able to convert an air line in a mine into a water column, in the event of fire. The great advantage of using the air line lies in the fact that the air pipes reach all the working places in the mine. The conversion can be accomplished readily, if the appropriate pipe connections are provided in advance at the surface, by merely opening one valve and closing another.

If the pipe going to a deep mine is allowed to fill with water, however, it will burst, owing to the tremendous pressure and the light weight of the pipe. Regulation of this water pressure may be accomplished by introducing a pipe "cross" in the main air pipe at points where a fire-hose connection is required, together with a valve below the cross, so that all that part of the line below the point selected may be cut off from communication with the surface. From one outlet of this cross is a pipe nipple and a valve large enough to pass all water that may come down the main pipe. This valve, when open, merely spills water down the shaft. From the other outlet of the cross a pipe nipple leads to a valve of sufficient size to supply a fire-hose connected to it.

When the large bypass valve is wide open, all the water spills down the shaft and the pressure in the line is nothing. If a pressure gage is provided, a man, by manipulation of the bypass valve, can maintain any desired pressure in the water column. These pressure-control points should be placed just below the take-outs of laterals supplying drifts, stopes, or other working places, so that the system may be used to combat fire in drifts and stopes as well as in the main shaft.

Arc Regulation in Electric Furnaces and Pilot-Light Control

In any furnace where two or more electrodes are used, one of the main problems in operation is the proper regulation of the electrodes, according to C. E. Sims, in *Reports of Investigations*, U. S. Bureau of Mines. There are now available on the market a number of automatic control systems which, when functioning properly, give excellent regulation and an even, well-balanced load. These automatic regulators are expensive, however, and for small furnaces are often cumbersome and impractical, so that a large proportion of the furnaces are and probably will continue to be hand-operated. The principal objects of regulation are to maintain the correct power input, and to prevent surges and large fluctuations in the power. In furnaces depending on hand control, the operator regulates the power by observing ammeters or wattmeters placed within his line of vision from the controls, and moving the electrodes up or down accordingly. On the whole, the prevention of fluctuations is done more out of consideration for the power plant than for the furnace itself. However, there is another phase of regulation, not so often mentioned, which is of greater importance to the melter in the proper operation of the furnace—namely, keeping equal arcs on the various electrodes.

For example, consider a single-phase Heroult type of furnace, such as is shown in the illustration. With the ammeter, wattmeter, and voltmeter showing correct readings, it is possible for one electrode to be buried in the melt and the other to be carrying twice the normal arc. This is obviously an undesirable condition, for in an extreme case one might have the first electrode frozen fast in the furnace charge and the other carrying such an abnormally long arc that the walls and roof would be overheated. Such a long arc is difficult to maintain and is continually breaking. When it does break the operator is often at a loss as to which elec-

trode to lower to re-establish the arc, and about half of the time he will lower the one already dipping in the melt. His only recourse is to lower both electrodes until the circuit is closed and then adjust them by feeling his way out—that is, by raising and lowering each one until a slight movement of either will vary the current. Even then he does not know that the arcs are equal, but only that there is an arc on each electrode, and unequal arcs will cause uneven heating. Also, when bringing up the carbon in a steel melt, to have an electrode dipping into the metal for as little as five

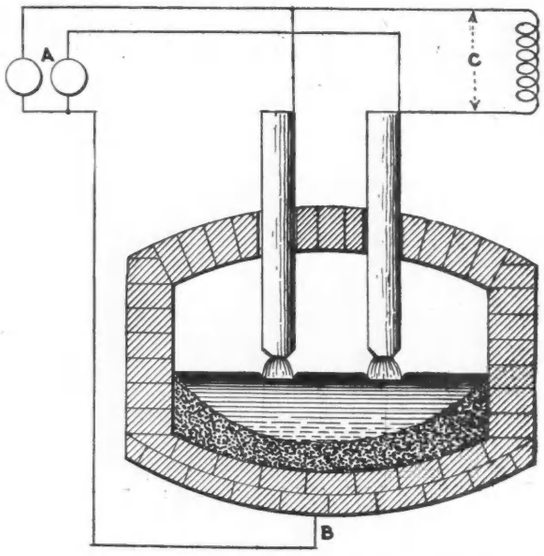


Diagram of connection for pilot lights used to indicate position of electrodes in a hand-controlled furnace. (A) Ordinary tungsten filament lamps. (B) Connection to hearth from both lamps. (C) Busbars.

minutes will often result in having the carbon exceed specifications. Any smelter can mention similar troubles.

The aforementioned conditions were met with during experimental work in a 300-lb. single-phase furnace of the Heroult type used for melting iron and steel. This furnace is part of the equipment of the Northwest Experiment Station of the U. S. Bureau of Mines and is situated in the College of Mines laboratory of the University of Washington. Automatic control for this furnace was not to be procured, and, when close regulation of conditions was wanted, the irregularities of hand control caused annoying troubles, until the apparatus about to be described was installed. So far as the author is aware, the apparatus as used is original. However that may be, it certainly furnishes an accurate and sensitive means of control and can be made by any intelligent workman at low cost. As installed for a single-phase furnace it is as follows:

Two ordinary 40-watt tungsten filament lamps are set upright on a shelf near the meter board and in full view from the hand controls. Each lamp is connected to one electrode (or busbar) as shown in the illustration. For convenience it is well to have the left-hand lamp connected to the left-hand electrode, and so on. Both lamps have a common connection to the metal bath in the furnace. Usually all that is necessary is to connect them to the shell of the furnace, but if that does not work, a steel bar can be buried in the hearth similar to the bottom electrode of a Girod furnace.

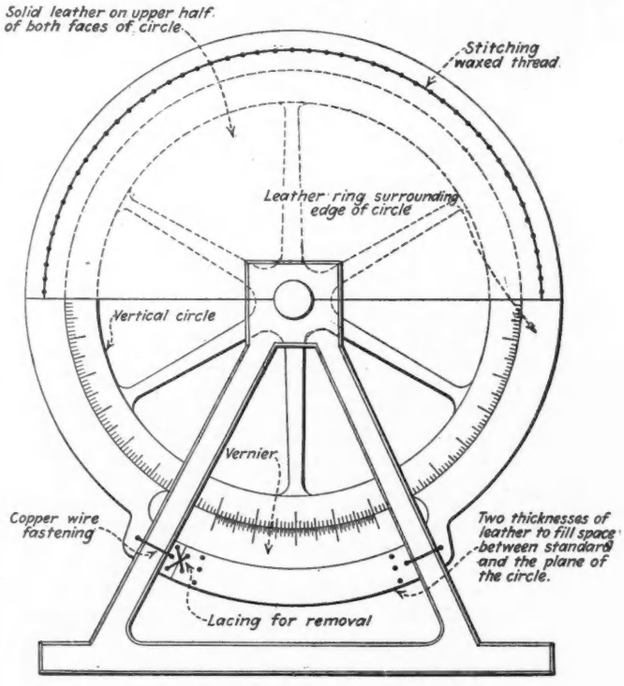
In operation, the brilliancy of the filament will vary with the drop in potential between the electrode and the bath. A lamp of this type will glow dull red at 15 volts and will safely stand surges up to 125 volts. When the power is on and no arc has been drawn, the lamps will simply be in series across the busbars and will glow with equal brilliancy. When current is flowing through the furnace they are lighted equally only when both arcs are exactly the same—that is, have the same length and, therefore, the same resistance. The slightest change in either arc is quickly and accurately indicated by the lamps. If one electrode should touch the bath its pilot light would instantly go black. These lights, therefore, show the exact position of the electrodes at all times, the value of which has already been explained. To install this apparatus for three-phase operation it is necessary merely to add one more lamp.

Homemade Guard for a Transit Circle

BY CLAUD HAFER

A leather guard to protect from the weather the circle of a transit is shown in the accompanying sketch. It costs about $1, whereas the guard supplied by the manufacturer costs $8 or $10.

Three pieces of leather are required: two semicircular pieces and an angular ring. The ring fits the



Leather guard for transit

outside of the vertical circle of the instrument and the vernier. The semicircular pieces are secured to the ring after first having cut flat, wide channels to permit the face of the circle to turn without developing undue friction.

The large circle is divided at the bottom and fits over the telescope axis and easily slips over the circle. It is then laced to the transit standards, and the two ends are laced together. A double thickness of sole leather across the bottom fills the remaining space and gives rigidity.

Recent Patents

Recovery of Metal From Fume—No. 1,435,505. Archibald Scott, Humboldt, Ariz., assignor to Western Metallurgical Co., Humboldt, Ariz. Fume precipitate containing metallic chlorides and sulphur is mixed with a reducing agent and a basic reagent capable of combining with the chlorine present. The mixture is heated in a reducing atmosphere, thereby reducing a portion of the metal of such chlorides to metallic form, forming a matte containing the rest of the metal, and a slag containing the chloride of the basic reagent used. Patent No. 1,435,506 covers the addition of sulphur in sufficient quantity to carry all the metals into the form of matte after heating, and of a basic reagent to form a slag containing the chloride of the reagent used.

Electrolytic Zinc—No. 1,435,703. J. T. Ellsworth, Park City, Utah. The patent covers the removal of antimony from electrolytic zinc solutions by precipitation with hydrogen sulphide and separating the resulting precipitate from the solution.

Treating Zinc-Lead Ores—No. 1,435,891. N. C. Christensen, Salt Lake City. The process covers the treatment of ground zinc-lead ores and concentrates with a hot acid concentrated chloride solution, thereby dissolving the lead and silver in the galena as chlorides, separating the pregnant chloride solution from the residue of ore, and precipitating the lead therefrom by electrolysis, treating the residue of ore with hot concentrated sulphuric acid, thereby dissolving the zinc as a sulphate, separating the hot pregnant acid solution from the remainder of the ore, cooling it, and precipitating zinc sulphate therefrom. Patents Nos. 1,434,085, 1,434,087, and 1,434,088, also issued to Mr. Christensen, cover similar work on zinc-lead ores.

Metallic Arsenic—No. 1,433,533. J. F. Cullen, Midvale, Utah, assignor to U. S. Smelting, Refining & Mining Co. Metallic arsenic is produced by feeding solid arsenic oxide to an incandescent mass of carbonaceous material in a reducing atmosphere, by which the arsenic is reduced and volatilized. The solid elemental arsenic is then removed from the gases in a substantially pure state.

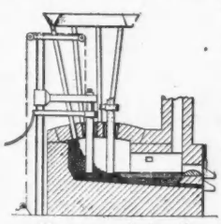
Metal Extraction — No. 1,433,541. Paul Freedman, London, and Ernest Greetham, Hull, England. Metal-containing compounds are fused and reduced in a direct-current arc furnace in an atmosphere of inert gas such as argon or helium.

Dust Settler—No. 1,434,090. N. C. Christensen, Salt Lake City. A dust-settling chamber for flue gases and such materials, comprising a large number of sloping surfaces on which the dust collects and from which it falls into a hopper beneath.

Iron Sponge — No. 1,433,854. Alf Sinding-Larsen, Vestre Aker, near Christiania, Norway. Pulverized iron ore is treated with a gaseous reducing agent in a heated closed reaction chamber for the production of iron sponge. The gases are drawn off, and passed through a condensing chamber by means of which incoming gases are preheated.

Washing Tank—No. 1,434,089. N. C. Christensen, Salt Lake City. A countercurrent washing tank with a series of superposed settling chambers, sealed openings for discharging the settled material from one tray to the next, and means for the upflow of the wash fluid as desired.

Electric Reverberatory Furnace—No. 1,438,381. R. M. Keeney, Denver, Colo. An electric smelting furnace comprising a smelting and a settling chamber, a flue for the gases, outlets for the molten products, and electrodes for supplying the heat, as illustrated in the accompanying cut.



Ore Concentrator—No. 1,434,386. A. S. Hilleke, Birmingham, Ala. A tank containing an adjustable baffle extending lengthwise of the vessel, means of feeding ore above the baffle, and water underneath.

Ore Treatment—No. 1,434,485. A. L. D. d'Adrian, Washington, Pa., assignor to B. F. Drakenfeld & Co., New York. An ore or residue containing chromium, zirconium, vanadium, uranium, cobalt, silver, or nickel is subjected to heat treatment in the presence of chlorine gas, to form iron chloride, which is then removed. According to Patent No. 1,434,486, the heat treatment is continued at successively higher temperatures to form the various chlorides of the metals mentioned, which are separately condensed and recovered.

Zinc Ore Treatment—No. 1,434,693. J. H. Gillies, East Camberwell, Victoria, and P. McP. Gillies, Electrona, Northwest Bay, Tasmania. Zinciferous ores are coarsely crushed and partially desulphurized, the fines collected and separately subjected to a sulphatizing roast, mixed with the ore and carbonaceous material, and agglomerated. The mixture is then volatilized in a furnace and the furnace clinker re-treated to recover precious metals and copper. The zinc and lead fume are treated with sulphuric acid, and the insoluble lead sulphate is separated. The zinc-sulphate solution is purified by heating it to about 80 deg. C. and adding barium sulphide. The purified solution is then electrolyzed.

Tin-Tungsten Ores — No. 1,431,559. F. M. Becket, Niagara Falls, N. Y., assignor to Electro-Metallurgical Co. Tin-bearing tungsten ores of the wolframite type are ground and roasted, and the tungsten is extracted by an alkaline solvent whereby a substantially tin-free solution is obtained.

Chloridizing Leaching—No. 1,432,858. Harry Hey, Melbourne, Victoria. Ores containing silver and lead in the form of chlorides are leached with a hot brine solution containing a substance having a chloridizing effect (as ferric chloride). The leaching is done as rapidly as possible to prevent reversion of the silver chloride by reactions with the sulphides present.

Roasting and Sintering—Nos. 1,433,348-55 inclusive. A. S. Dwight, New York, assignor to Dwight & Lloyd Metallurgical Co., New York. This series of patents covers the Dwight-Lloyd sintering machine. Most of them were originally filed in 1907, the original applications being divided and the applications for the present patents being filed in 1912.

Metallurgy of Radium-Bearing Ores —No. 1,438,357. W. F. Bleecker, Boulder, Colo., assignor to the Tungsten Products Co., Boulder, Colo. The finely divided ore is mixed with a liquid and about 50 per cent of sodium carbonate, heated under pressure to a high temperature, and the alkaline liquor separated from the residue. The residue is then treated with an acid, the solution filtered off, and the radium recovered in solution.

Grinding Mill—No. 1,437,599. P. T. Lindhard, Brooklyn, assignor to F. L. Smidth & Co., New York. A screening arrangement within a tube mill to seggregate the fine and coarse material in each end of the mill.

Leaching Copper Ore—No. 1,438,869. H. B. Slater, Riverside, Calif. Copper ore containing in part, at least, sulphide, is leached with an excess of acid solution and thereafter treated with a chlorine oxygen compound in the presence of free acid.

Zinc Slag Treatment—No. 1,438,643. K. S. Guiterman, Lawrence, N. Y. Zinc slags containing large amounts of iron are smelted in the presence of a reducing agent and an iron-replacing agent which will minimize the solvent action of the iron present and which will permit the formation of a secondary slag substantially free from iron. From this secondary slag, the zinc or other nonferrous metal is separated.

Flotation Reagents — No. 1,438,590. C. N. Forrest, Rahway, N. J., assignor to the Barber Asphalt Paving Co., Philadelphia. This patent covers a flotation process using a liquid hydrocarbon obtained from the destructive distillation of gilsonite, and characterized by a high percentage of unsaturated hydrocarbons.

No. 1,438,435. H. E. Fredrick, San Francisco, assignor of 23.34 per cent to W. H. Bissell; 23.33 per cent to F. S. Sinnicks; and 23.33 per cent to G. H. Henry, all of San Francisco. In this case the reagent consists substantially wholly of an acridine constituent.

No. 1,438,436. H. E. J. Fredrick, and assigned as in the immediately preceding patent, covers a substantially neutral flotation agent consisting of a hydroxy acid compound and a nitrogen-cyclo compound in substantially neutralizing proportions.

SOCIETIES, ADDRESSES, AND REPORTS

Code of Ethics Adopted by Mechanical Engineers

A.S.M.E. First to Act on Draft of Joint Committee of Five National Societies

Adoption of a code of ethics, governing its membership of approximately 20,000, is announced by the American Society of Mechanical Engineers. Ultimately, it is expected, this code, which was prepared by a joint committee of the national engineering societies, will apply to the entire engineering profession, embracing more than 200,000 professional engineers.

The text of the code, as given out in New York City by John L. Harrington, of Kansas City, new president of the A.S.M.E., follows:

"Engineering work has become an increasingly important factor in the progress of civilization and in the welfare of the community. The engineering profession is held responsible for the planning, construction, and operation of such work, and is entitled to the position and authority which will enable it to discharge this responsibility and to render effective service to humanity.

"That the dignity of their chosen profession may be maintained, it is the duty of all engineers to conduct themselves according to the principles of the following code of ethics:

"1. The engineer will carry on his professional work in a spirit of fairness to employees and contractors, fidelity to clients and employers, loyalty to his country, and devotion to high ideals of courtesy and personal honor.

"2. He will refrain from associating himself with or allowing the use of his name by an enterprise of questionable character.

"3. He will advertise only in a dignified manner, being careful to avoid misleading statements.

"4. He will regard as confidential any information obtained by him as to the business affairs and technical methods or processes of a client or employer.

"5. He will inform a client or employer of any business connections, interest or affiliations which might influence his judgment or impair the disinterested quality of his services.

"6. He will refrain from using any improper or questionable methods of soliciting professional work and will decline to pay or to accept commissions for securing such work.

"7. He will accept compensation, financial or otherwise, for a particular advice, from one source only, except with the full knowledge and consent of all interested parties.

"8. He will not use unfair means to win professional advancement or to injure the chances of another engineer to secure and hold employment.

"9. He will co-operate in upbuilding the engineering profession by exchanging general information and experience with his fellow engineers and students of engineering and also by contributing to work of engineering societies, schools of applied science and the technical press.

"10. He will interest himself in the public welfare, in behalf of which he will be ready to apply his special knowledge, skill, and training for the use and benefit of mankind."

The representatives of the A.I.M.E. on the joint committee which drew up the code were J. Parke Channing and Philip W. Henry, of New York.

San Francisco Section of A.I.M.E. Condemns Labor Editorials

A resolution condemning certain editorials on labor that have appeared in *Mining and Metallurgy*, published by the A.I.M.E., has been adopted by the San Francisco Section of the Institute. It was introduced by Wilbur H. Grant, C. E. Grunsky, Jr., and Charles E. Bunker. It reads as follows:

"Whereas, it is vital to the future usefulness of the American Institute of Mining and Metallurgical Engineers, as a body, and to the members individually, that all editorials and contributions printed in the official organ of our Institute represent the sentiments of the majority of its members; and,

"Whereas, it is the function of engineers to take the lead in eliminating waste in industry, which includes securing the co-operation of labor with capital for the benefit of society; and,

"Whereas, our Institute, through the Federated Engineering Societies, is endeavoring to perform dignified constructive work on basic problems for the public welfare; be it

"Resolved, that sarcastic or abusive editorials against labor are inconsistent with the desire of the Institute members to secure efficient labor in American industry; and be it further

"Resolved, that the San Francisco Section of the A.I.M.E. respectfully offers the constructive suggestion that no editorials or papers be published in *Mining and Metallurgy*, with the approval of our executive officers, that cause distrust on the part of either labor or capital of our ability to deal fairly with either, considering the same destructive rather than constructive, and tending to increase the difficulties involved in securing efficiency in industry."

Gold-Mining Conditions To Be Studied

A report on the status of the gold-mining industry as of Dec. 1 is to be prepared by the American Gold and Silver Institute for use in connection with the gold legislation which is to be considered at this session of Congress. A questionnaire has been sent to each member of the institute's advisory board.

Industrial Standardization Progressed in 1922

Chairman of A.E.S.C. Reviews Advance Made During Year—Hoover's Organization Has Helped

Albert W. Whitney, chairman of the American Engineering Standards Committee, in reviewing industrial standardization in 1922, says:

"The year 1922 has seen greater activity in industrial standardization than any other year in the history of American industry. Notable progress was made during the year in standardization of raw materials, of manufacturing processes, and of finished products by individual firms, by industrial and technical associations, and by bodies that are working on national and international lines.

"One of the most far-reaching accomplishments of the year was the organization, on a working basis, of the Federal Specifications Board, which develops and approves the specifications under which all government purchases are made, and the development of a plan of co-operation between this board and the American Engineering Standards Committee; the carrying out of this plan should go far toward eliminating the difference between specifications for government purchases and specifications for ordinary commercial supplies, and should thereby result in the saving of millions of dollars both for the government and for industry.

"The organization of Secretary Hoover's Division of Simplified Practice and its entrance into the industrial field has had a highly stimulating effect on the industrial standardization movement and has helped in particular to press home to the business man that standardization is one of the main approaches to efficiency and the elimination of waste. The Division of Simplified Practice has already brought about standardization of paving brick, of beds, mattresses and springs, and of metal lath. It now has under way the standardization of lumber and other products. The distinction between the basis for this work and that of the American Engineering Standards Committee lies in the fact that the Division of Simplified Practice devotes itself particularly to that part of the field in which the decision must be made on a non-technical basis.

"Great advances have been made by industry itself on the more technical side. More than 120 standardization undertakings now have an official status before the American Engineering Standards Committee, forty-three of them having been initiated within the last year; this is an increase of more than 50 per cent. Of the twenty-eight industrial standards developed and approved by the American Engineering Standards Committee since its organization in 1918, thirteen were approved within the past year. The efforts to develop

national safety codes, which have been under way for a number of years, began for the first time to bear fruit. . . .

"Another outstanding accomplishment in the industrial standardization work of this year was the development of the 'standardization-by-conference' idea, in which all of the interests involved in the subject, including producers, consumers, and representatives of the public and government, participate in deciding: first whether standardization is to be undertaken; second, what shall be its scope, and, third, what shall be its relation to other standardization work.

"The year 1922 saw also the development of an increased interest in industrial standardization and an increased appreciation of its effect on production efficiency, distribution of costs, and consumer demand, on the part of such important commercial bodies as the International Chamber of Commerce, the Chamber of Commerce of the United States, and the New York State Chamber of Commerce. . . .

"The last year saw important developments in international standardization. There are now national standardization bodies in fifteen foreign countries, and a report recently received by the American Engineering Standards Committee indicates that plans are under way for the development of such work in each of the South American republics. . . . "

Arizona Business Men Hold Second Annual Convention

The second annual convention of the Arizona Industrial Congress, which was organized Dec. 16 last year, was held at Phoenix, Dec. 18-19. The major industries of the state were included in the scope of the program, the various sessions being devoted to consideration of topics dealing with livestock, public utilities, agriculture, mining, business and finance, and other topics of a general nature. P. G. Spilsbury, president of the Congress, delivered an address on "Results of Co-operation" at the opening session.

T. H. O'Brien, general manager of the Inspiration Consolidated Copper Co., presided at the session on mining. The speakers at this session included James F. Callbreath, secretary of the American Mining Congress, who spoke on "National Mining Problems," and Robert E. Tally, general manager of the United Verde Copper Co.

Jules Boulvin Prize Offered by Belgian Society

The Association of Engineers of Ghent, Belgium, composed of alumni of the Special Institutes of Ghent, have founded a prize, under the name of the "Jules Boulvin International Prize," to be awarded to the author of the best paper on "Mechanics as Applied to Machines." The prize is to be triennial and is to consist of the interest at 6 per cent on 14,000 francs represented by bonds of which the association will remain the holder. The amount of the non-awarded prizes is to be added to the original capital of the foundation. The prize will be awarded in February, 1925, for the first time.

MEN YOU SHOULD KNOW ABOUT

Sidney J. Jennings is in San Francisco.

J. C. Kinnear was recently in San Francisco.

Stanly A. Easton paid a short visit to San Francisco early in December.

J. A. Agnew has become a director of the Consolidated Goldfields of South Africa.

W. B. Mean, of New York, is now in San Francisco, where he has established an office.

Colonel O. B. Perry and **E. E. McCarthy,** of the Yukon Gold Co., are in San Francisco.

C. W. Purington has arrived at Vancouver from Yokohama, and will proceed shortly to Boston.

Dr. W. L. Goodwin, who has been in charge of the prospectors' classes in northern Ontario, has returned to Toronto.

D. L. H. Forbes, manager of the Teck-Hughes Gold Mines, Ltd., attended the annual meeting of the company in New York.

J. A. Burgess has returned to Berkeley, Calif., after completing several mine inspections near Rochester and Winnemucca, Nev.

Bulkeley Wells, president of the Metals Exploration Co., returned to his Denver office on Dec. 5, from a three weeks' visit in New York.

Samuel Lewisohn, treasurer of the Miami Copper Co., has completed his annual visit to the company's property, and has returned to New York.

Dorsey A. Lyon, chief metallurgist of the Bureau of Mines, has returned to Washington after an inspection visit to the Columbus and Urbana experiment stations.

Chris. G. Dobson, who has been an instructor in the College of Engineering at the University of Washington, is now associated with the Glenville A. Collins Engineering Co. as superintendent of the Drum Lummon mine, Hartley Bay, B. C.

G. F. Loughlin, head of the mineral resources division of the U. S. Geological Survey, has been appointed secretary of a committee consisting of producers, manufacturers, and representatives of government bureaus which is considering ways of improving the arsenic situation.

Kio Sudzuki, mechanical engineer, and **Zenji Indo,** mining engineer, both of the Hitachi mine, Kuhara Mining Co., Ibaraki-ken, Japan, are in San Francisco. They plan an extensive trip for the study of flotation and concentration of low-grade cupriferous pyritic ores.

Gelasio Caetani, Italian Ambassador to the United States, arrived in New York on Dec. 21, and the following morning a delegation of mining engineers visited him at the Ritz. Prince Caetani is now in Washington. He has accepted the invitation to speak at the dinner for the members of the A.I.M.E., to be given on Feb. 21.

James F. Callbreath, secretary of the American Mining Congress, was in Denver on Dec. 20, conferring with officials of the state mining organization regarding legislation pending in Congress, and also respecting questions that will come up for consideration at the annual meeting of the Colorado Metal Mining Association to be held in Denver, on Jan. 16 and 17.

R. A. F. Penrose, Jr., has been elected president of the Academy of Natural Sciences, of Philadelphia, succeeding John Cadwalader, who was elected in 1918.

Dr. Penrose is the author of a number of papers and books dealing with economic geology. He was one of the delegates from the United States who attended the International Geological Congress held at Brussels last August.

Dr. Penrose is a distinguished geologist and mining engineer. He was born at Philadelphia in 1863. He received in 1884 the A.B. degree at Harvard, and in 1886 the degrees of A.M. and Ph.D. He was first appointed by the Texas Geological Survey as geologist in charge of a survey of eastern Texas, and the following year he made detailed reports on the manganese and iron-ore regions of Arkansas. He lectured for a year on economic geology at the Leland Stanford University, then became special geologist for the U. S. Geological Survey to examine and report on the gold districts of Cripple Creek, Colo. For the next sixteen years he was professor of geology at the University of Chicago.

OBITUARY

John Owens, aged seventy-eight, pioneer of the iron region of St. Louis County, Minn., and first president of the villages of Tower and Virginia, died recently at his home in Duluth. He was the first to reside in the township bearing his name, and with a mining crew located the famous Commodore mine, at Virginia. This was the first mine in the Virginia group where actual development was done.

Captain William White, superintendent of mines in the Virginia district of the Mesabi Range for the Republic Iron & Steel Co., died Dec. 16 at Virginia, Minn. He was a pioneer of the Michigan copper district and the Mesabi Range. He was a native of Cornwall, England, where he was born in 1851. Prior to entering the employ of the Republic company, in 1905, he was in charge of operations at the Grant mine for the Jones & Laughlin interests. He also served as superintendent of the Meadow and Fowler mines.

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

TWO good-sized copper producers will resume early in the new year, say reports. These are the Calaveras Copper Co. at Copperopolis, Calif., and the Magma Copper Co. at Superior, Ariz.

The Inspiration Copper Co. is buying equipment for its new "Porphyry" shaft at Miami, Ariz.

Colorado Metal Mining Association will endeavor to have proposed "blue-sky" law amended.

A consolidation of twenty companies in the Lake Superior iron-mining region will include the M. A. Hanna Co. and sundry furnace and shipping interests.

Mine operators in eastern British Columbia protest against "excessive" government inspection, which they claim has obstructed development of the industry.

The Keystone Mining Co. is ready to start its concentrator at Park City, Utah. The ore averages 35 per cent lead and 10 oz. silver.

The Verde Central, at Jerome, Ariz., has ore on the 800 level.

Budget trimmers in Congress ask the Geological Survey and the Bureau of Mines to justify appropriation for their continued existence.

Colorado Metal Mining Association Will Fight "Blue-Sky" Law in Present Form

At the Twenty-fourth General Assembly of Colorado, which will convene in Denver on Jan. 2, 1923, legislation affecting the metal-mining industry is embraced in a proposed "blue-sky" bill, amendments to the Industrial Compensation Act, and a reapportionment of legislative districts which would deprive the mining counties of a large part of their representation in the Colorado Legislature. A drastic "blue-sky" bill has been proposed, providing for a state commission to pass upon and authorize the issue of securities if approved by the board. This measure will be opposed by the substitution of a measure approved by the Colorado Metal Mining Association, which provides for the simple filing of a declaratory statement of essential facts concerning a promotion before its securities can be offered for sale to the general public. The bill also strengthens the Colorado law against fraud and misrepresentation.

Calaveras Copper Co. Almost Ready to Resume

The Calaveras Copper Co. will resume operations at Copperopolis, Calif., early in 1923. The mine has been shut down for more than two years. More or less development has been in progress, however, and the 500-ton concentrator and smelting plant has been rehabilitated and are ready for operation. S. M. Levy, manager of the plant and mine, has announced that improvements to cost $200,000 will be made in the plant to increase tonnage and reduce costs.

Merger Will Include Twenty-two Lake Superior Companies

Iron Mining, Coal Mining, Shipping, and Furnace Operations Are Included in New Corporation

A consolidation of twenty-two companies, including M. A. Hanna & Co., one of the largest independent iron ore operators in the Lake Superior district, has been recently announced. The new corporation will be known as the M. A. Hanna Co. and will control or have a large interest in iron mines, bituminous and anthracite coal mines, Lake vessels, and blast furnaces. It is proposed in the reorganization that $12,000,000 of 7 per cent cumulative first preferred stock shall be offered for sale. From the proceeds of this sale certain obligations shall be met and the remaining sum will be used as a working capital.

New Cyanide Plant Proposed for Bellehelen, Nev.

It is reported on good authority that the Wellington Mines Co., of Breckinridge, Colo., has secured an option on the property of the Bellehelen Merger Mines Co., at Bellehelen, about 50 miles east of Tonopah, Nev., and will start construction on a 50-ton cyanide plant immediately after the first of the year, the plant to be completed late in April. Ore reserves above the tunnel level are stated to be 14,000 tons of positive and probable ore, of an average value of $32 per ton. The best showing and possibilities are below the tunnel level in a winze, where the vein is said to be wider and stronger than above; in one place assays average $200 per ton across 3 ft. This shoot will be developed further.

Too Much Inspection Already, Say British Columbia Operators

The Mining Association of Interior British Columbia held its annual meeting at Nelson recently, when the following officers were elected: P. R. Bruce, president; J. P. MacFadden, vice-president; W. H. Burgess, secretary-treasurer, and H. Giegerich, auditor. T. H. Bingay, S. G. Blaylock, Wilfred Cameron, and W. T. McDowell directors. The meeting was well attended by representative mine and smelter operators, and a vigorous protest was made against the appointment of a government electrical inspector, with arbitary powers. It was pointed out that already there were about twenty different inspectors, of one kind and another, that the mine operators had to satisfy, and the multiplication of inspectors markedly hampered effective operations. Disappointment was expressed that up to the time of the meeting the government had not advised the association as to measures alleviating excessive taxation.

Severe Weather Has Hampered Mining in Northwest

Mining operations throughout the Northwest and in British Columbia have been greatly retarded the last two weeks on account of severe winter weather, the worst that has been experienced in forty years. The ground is covered with from two to six feet of snow and the thermometer registers from 6 to 32 deg. below zero. Shippers are busy blasting ore from frozen ore bins and cars and a famine in water from frozen streams has made operation impossible at some properties.

Equitable Trust Co. Serves Writ on Canada Copper Corporation

More Than $8,000,000 Has Been Invested in Development in British Columbia—Plant Operated One Month in 1920

A writ involving the holding of $2,500,000 in debentures of the Canada Copper Corporation was filed at the court house at Vancouver, B. C., on Dec. 14, by the Equitable Trust Co., of New York. The plaintiff asks that a receiver be appointed and that an injunction be issued, restraining the defendant from disposing of any of its property. The plaintiff also seeks a decision by the court that it is entitled to the first lien on the assets of the corporation.

The Canada Copper Corporation was organized in March, 1914, to take over the property and good will of the British Columbia Copper Co., which had been operating mines and a smelter at Greenwood for some years, and which had started to develop a group of mining claims at Copper Mountain, 12 miles from Princeton. The Canada corporation continued to develop the Copper Mountain property, and now claims to have 11,000,000 tons of ore averaging 1.75 per cent of copper and small quantities of gold and silver in sight. It has built a 2,000-ton concentrator at Allenby, four miles from the mine, and the Kettle River Railway Co. built a 12-mile spur from Princeton to the mine and concentrator, while the West Kootenay Power & Light Co. built a long high-tension line to provide mine and plant with power. What lien the last two concerns, which are virtually subsidiaries of the Canadian Pacific Railway Co., have is not known, but it is likely that it is a strong one. Including railway spur and power line, more than $8,000,000 has been spent in the development of this property.

The corporation put the plant into operation in the fall of 1920, and ran it for a little less than a month. The plant was closed at the end of October, 1920, and has not been operated since. Without doubt, the corporation encountered a great deal of hard luck. The plant was built and the mine developed at a time when supplies were at their highest and when labor was costly and recalcitrant. Strike followed strike, delaying construction work, and finally when the mill was finished it was put into operation at a time when well-established and strongly financed concerns were closing in all parts of the country. It is believed that the property is a good one, but its development and the construction of the plant have been far too costly.

Spanish Mines to Resume

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

Madrid, Dec. 19.—The Cote Minero Profunda intends to resume activity at the Profunda mine, at Carmenes, in the Province of Leon. The ore contains 3 to 4 per cent copper and 1 to 1½ per cent cobalt.

Magma Copper Co. Will Resume Output Early in 1923

It is reported that stoping will be resumed by the Magma Copper Co. at Superior, Ariz., early in the coming year. Work there now consists mainly of development and construction, and the only ore produced is that coming from the development work. The mill is being doubled in size, and when completed will have a capacity of 600 tons per day. Excavation for the foundations for the new smelter is under way, and is expected to be completed by the time shipments of the structural iron begin to arrive. Material for the construction of this smelter has been delayed awaiting the completion of the standard-gage railroad that is being built from Magma Junction to the mine to supplant the narrow-gage line that has become inadequate.

Inspiration Company Progresses With "Porphyry" Shaft

Representatives of large equipment houses are at the Inspiration Consolidated Co.'s mine at Miami, Ariz., figuring on the needs of the new Porphyry shaft, which is to be equipped with a 2,000-hp. hoist of the semi-automatic type similar to the one at what is now the main shaft. This shaft is the largest in the state, and the installation when completed will be among the largest in the United States. It is connected to the Live Oak mine with a large haulage drift through which ore from the Live Oak orebody is to be hauled by means of the compressed air locomotives. The Porphyry shaft has been under construction for over a year. A new railroad is being run to the shaft head, and it is expected to be a year before the hoist is installed and the equipment is ready for operation.

Sacrifice Right Eye to Save Left, Says Industrial Commission

In the case of Steve Zdunich, who received injury to his right eye in an accident occurring in the course of his employment at the Daly West mine, in Park City, Utah, the possibility of injury to the left eye owing to the diseased condition of the right has arisen. The State Industrial Commission has ordered that Zdunich submit to the removal of his right eye, or that he forfeit all rights to compensation for injuries which may result to the left eye by reason of the ailment of the right. Oculists who have examined the eye are unanimous in the opinion that it is desirable to remove the injured eye for the benefit of the good one. The operation, it was ordered, was to be performed at the expense of the mining company or insurance carrier on or before Dec. 26, 1922. In the event that Zdunich complies with the order, he is to receive $16 a week for 120 weeks beginning Sept. 22, for such total disability as may result from the operation, and in addition $16 a week for thirty weeks for the loss of 15 per cent bodily function, suffered in the accident.

Britannia Company Is Completing Concentrator in British Columbia

Splendid Recovery From Recent Catastrophes—Ore Reserves Are Largely Increased—Total Estimated at 10,000,000 Tons

By Robert Dunn

The rehabilitation of the enterprise of the Britannia Mining & Smelting Co., after the almost total destruction of its surface plant by fire and flood, is one of the notable features of 1922 relative to mining in British Columbia. Not only has the management extensively developed the mines, but it has almost completed the construction of a concentrating plant of 2,500-ton capacity. The building is of steel and concrete. New residences have been built for employees, wooden railway bridges have been replaced by steel bridges, and, incidentally, every claim against the company as a result of the loss of life by flood has been settled.

Mine development has been confined principally to the Victoria mine, on the northerly side of Furry Creek, about 2,000 ft. southeasterly from the Empress, owned by the same company. This work consists of about 9,000 ft. of workings, in addition to 1,500 ft. of diamond drilling. The surface at the Victoria was virgin forest on June 23, 1921. Now there is a camp consisting of a three-story bunk house, 20 x 100 ft.; a change house, 25 x 40 ft., a cook house with dining room and recreation hall, and offices for assistant foreman and storekeeper. There also is a sawmill with a cutting capacity of 25,000 board feet per day; and a rope tramway, 1,600 ft. long, with terminals; bunkers; and a large shaft-house at the Victoria shaft. The mill is to be used chiefly for cutting and framing timbers for use in the underground work in the Victoria, where the formation is such that square sets will have to be used to mine the ore economically.

The new concentrating plant is expected to be ready to receive ore about the beginning of next February. The company also has entered into a contract with the B. C. Electric company for electric current equal to about 6,000 hp. to supplement the Britannia power plant.

The company figures on 10,000,000 tons of ore in sight made up as follows: Broken ore in stopes, 1,700,000 tons; reserves of "positive" and "probable" ore in place, 8,300,000 tons. Of this quantity about a million tons of ore have been blocked out in the new Victoria.

Broken Hill Junction Mines Exploit Carbonate Ore

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

Melbourne, Dec. 20.—The Broken Hill Junction Mining Co. is arranging to resume the exploitation of its carbonate siliceous ores, of which a considerable tonnage is available.

Granby Consolidated to Increase Power Plant Capacity

The Granby Consolidated Mining, Smelting & Power Co., is constructing an addition to its power plant at Anyox, B. C., and will install therein a 5,000 hp. vertical reaction turbine, designed by the Pelton Water Wheel Co., and which is to be built at the works of its associated company, the Dominion Engineering Works, Ltd.

The main power plant of the Granby company was constructed in 1913, and is situated on tidewater, the turbines discharging directly into Granby Bay. A notable feature is the fact that normally all requirements of both mine and smelter have been supplied by water power. Not only are the electric generators driven by Pelton impulse turbines, but other similar units drive blowers, blowing engines, and compressors. The total installed water-wheel capacity is 8,400 hp. During the war, a steam standby plant was constructed and it is largely to eliminate the necessity for operating this plant that the extension of the hydro-electric plant is being made.

Water is obtained from Falls Creek, a diversion dam, which also provides a small amount of storage, having been constructed about a mile from the plant. To insure sufficient flow during the low-water period to provide for the increased requirements, an additional dam for storage alone has been constructed.

Nicholson Resolution Seeks to Stabilize Silver Market

To provide for the situation which will arise when the 207,000,000 oz. of silver provided for under the Pittman Act have been purchased by the Treasury at $1 per ounce, Senator Nicholson, of Colorado, on Dec. 27 introduced into Congress a concurrent resolution providing "that the President of the United States appoint a commission of nine, to be known as a Silver Commission, of whom not more than three shall be members of the United States Senate and not more than three shall be members of the United States House of Representatives; that such commission be authorized to communicate with such nations as may be feasible, either individually or in a joint conference to be arranged for that purpose; that such commission shall use its influence toward the resumption of the use of silver in the various monetary systems of nations which have abandoned or lessened its use, and shall also lend its influence toward the adoption of any step that may tend to stabilize the value of silver in the world's markets; that the commission, after such investigation and conferences as it may deem advisable, shall report to the President its recommendation and findings; that no compensation shall be allowed to any member of such commission, as such, but the actual necessary expenses of the commission shall be borne by the United States." Hearings on the resolution will begin during the first week of January.

News from Washington

By PAUL WOOTON
Special Correspondent

The "Survey" and the "Bureau" Justify Their Existence

Called Upon by Committee on Appropriations, Directors Summarize Their Accomplishments in Behalf of the Mining and Other Industries of the Country

SPECIAL REQUESTS were recently made by the Committee on Appropriations of the House of Representatives, in connection with the budget, for concise statements of the activities and accomplishments of various government bureaus.

Dr. P. S. Smith, acting director of the Geological Survey, said:

"As to accomplishments during the past year, we count the following in the purely geological lines: Surveys and investigations of geologic phenomena in thirty-two states; investigations covering practically all the mineral subjects—not all the mineral deposits, but all the minerals that are useful to man—the iron, the coal, the copper, their occurrence, and the amounts of their production; investigations of the potash materials that may be of prime value to the development and continuation of agriculture; studies of the building stones that are of use and the various non-metalliferous products that go into our everyday economies; investigations in purely geologic lines which have been the base on which many government and private activities have been conducted; examination of the various geologic conditions on which many engineering construction projects are based, such as dam sites and features of that sort. In our chemical works thousands of chemical determinations, both quantitative and qualitative, of the materials of the earth's crust have been made.

"In our topographic surveys we have surveyed over 13,500 square miles of territory and run more than 3,000 miles of level lines.

"In our water-resources work we have made over 11,000 measurements of streams at more than 1,500 gaging stations, and have conducted studies of the quality of water as to its mineral content for domestic and industrial use and irrigation. Nearly 700 samples of water were analyzed."

In response to a query as to what period of time was covered, Mr. Smith said: "In all cases the one fiscal year 1922. We have made studies of potential and developed water resources and made field investigations on which the classification of public lands under the various appropriate acts have been performed. In the land classification work we have passed on 25,000 cases. During 1922 the Geological Survey has published 159 reports and issued some 75 new maps and have 35 or more in progress. We have printed 1,000,000 copies of topographic maps and have sold nearly 600,000 of them and are doing a large amount of co-operative work for the other government departments. Our correspondence, which in many instances might be regarded as individual reports, runs up into the hundreds of thousands of letters. We have also maintained, undoubtedly, the best geologic library in this country, if not in the world, and during the year over 13,000 people have consulted this library."

The accomplishments of the Bureau of Mines are listed by the Bureau officials as follows:

"Studied and experimented as to mine accident prevention and established a system of permissibility tests and regulations for explosives, electrical and other apparatus suitable for use in gaseous mines; demonstrated the danger due to dust in coal mines, and showed methods, through dampening or using rock dust barriers, of localizing any explosion. Since 1911, of the total fatalities in coal mines, the percentage due to large explosions has fallen from 15.5 to 1.7.

"Assisted in rescue and recovery work at 567 mine fires and explosions and trained 82,299 men in first aid and mine rescue work. These men and the bureau specialists formed the nucleous of the gas defense sevice in the war and permitted prompt organization by the bureau of the gas research station later transferred to the Chemical Warfare Service.

"Together with the Army and Navy developed helium to a production stage for balloon gas use.

"At a cost of $45,000 to the government developed a public process of radium recovery and deposited at hospitals for treatment of government patients $216,000 worth of radium aside from that held in government laboratories for research.

"Sampled and tested millions of tons of coal bought by the government; tested for improvement in operation numerous government heating and power plants; conducted extensive researches on fuel combustion resulting in marked improvement in general practice, and developed a method of feasible treatment of lignite on public land yielding a domestic fuel equivalent to anthracite.

"Established and maintained a government fuel yard, assuring uninterrupted supply to government buildings in the District of Columbia at a marked economy.

"Established mining experiment stations in various parts of the country and conducted research in mining, metallurgy, and mineral technology fundamental to safety and efficiency in those industries.

"Organized and directs a system of inspection and control of mines, gas and oil wells on the public lands essential to the enforcement of the leasing act and collection of public revenues and introduced methods of control of oil and gas wells resulting in savings many times larger than the cost.

"Stimulated the conscience of the in-

dustry to appreciation of the lamentable loss of life and the waste of irreplaceable national resources, and served as the nucleus around which has gathered a country-wide concerted effort of mining men of all classes to better the conditions under which they live and work."

Apropos of the appropriation for mining experiment stations, H. F. Bain, the director of the Bureau, offered this information:

"The Berkeley station is devoted to solving the more abstruse chemico-physical problems arising in all the stations studying metallurgy. Within the year studies of the behavior of silver in chloride volatilization were made and improved methods of assaying for silver developed. Purification of copper sulphate solution was studied as one step in the work of developing methods for treating the large bodies of low-grade oxidized copper ores of the West. Several similar studies were under way.

"The Reno station is devoted to study of the rare and precious metals. As a result of studies made on the precipitation of gold and silver from cyanide solution, a cheaper form of cyanide has been adopted for metallurgical use of the big silver-mining companies in Nevada.

"At the Salt Lake City station the work of the year was mainly on (1) application of volatilization processes to treatment of low-grade ore; (2) fundamentals in the treatment of oil shale; (3) application of the microscope to solution of various complex ore-dressing problems.

"At Moscow, Idaho, following preliminary work at the station, a mining company applied sodium phosphate to experimental treatment of zinc-lead ore with conspicuous success. The research of the year on flotation also paved the way to more scientific control of this important process.

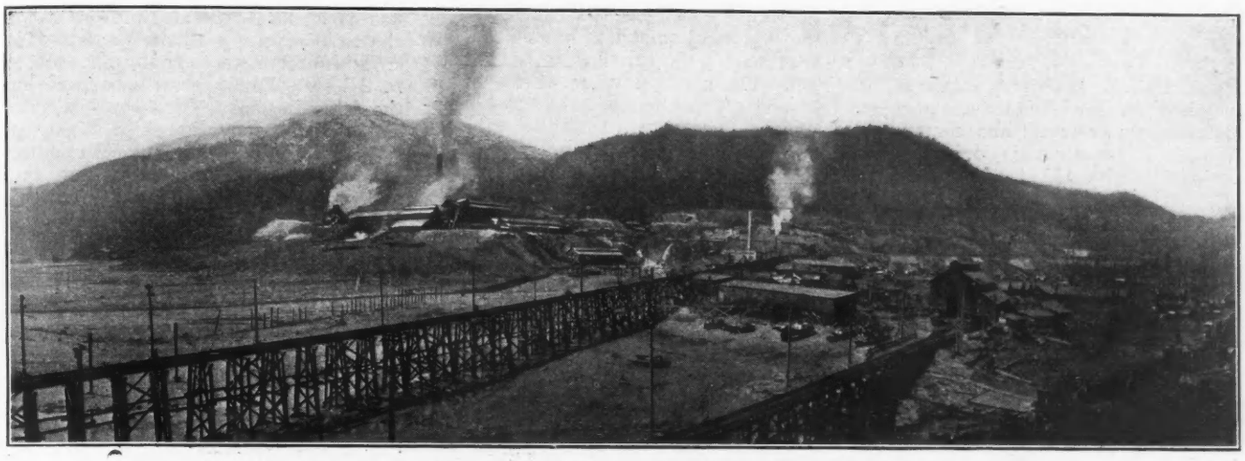
"In the study of health and sanitation in metal mines special surveys were made of dust and ventilation problems in selected mines in California, Nevada, Arizona, and Montana, and important recommendations made looking to improvements where needed.

"In the effort to utilize the rare minerals several series of molybdenum and cerium steels were made up at the alloy laboratory at Ithaca, N. Y., and studied as to availability for use. Endurance tests were made on 600 pieces of such special steels.

"The War Minerals Supply Division was created during the year to handle problems arising through the work of the General Staff of the Army and having to do with keeping constantly informed as to availability, price, metallurgical recovery, etc., of certain critical war minerals. It is a small skeleton organization capable of being expanded or taken over at the beginning of any war, and meanwhile serving important functions as a source of authoritative information."

60,000,000 Oz. More

Purchases of silver under the Pittman Act during the week ended Dec. 16 totaled only 68,000 oz. To the week's total, however, was added the aggregate of a considerable number of small purchases made at San Francisco and at Denver. The San Francisco purchases totaled 925,000 oz. and those at Denver 325,000 oz. These purchases were made between July 1 and Nov. 30. This brings the total purchase under the Pittman Act to 146,922,412 oz.



Smelter of the Granby Consolidated Mining, Smelting & Power Co. at Anyox, B. C.

News by Mining Districts

By Special Correspondents in the Field

Johannesburg Letter

Chilean Earthquake Recorded in South Africa

BY JOHN WATSON

Johannesburg, Nov. 21—On Saturday, Nov. 11, at 6:45 a.m., the seismograph at the Union Observatory began to record vibrations and continued to do so till 9:45 a.m., the earth quivering for three hours. A second less pronounced vibration was recorded between 10:10 and 10:20 a.m. These vibrations were announced in the evening paper of Nov. 11 and it was fully expected that a big earthquake had taken place. Later, cables announced the earthquake at Coquimbo, La Serena, and Copiapo, in Chile. The second series of vibrations were said to be due to the earthquake tremors having traveled around the world and reached Johannesburg a second time. The distance from Coquimbo to Johannesburg is 5,900 miles, and the vibrations took seventeen minutes to travel.

On Nov. 16 the manufacture of calcium carbide and carbon electrodes, at Driehoek, on East Rand, was described by W. Elsdon Dew and William Alderson to the South African Institute of Electrical Engineers. On Nov. 18 the combined scientific societies paid a visit to three works near Driehoek, where they were shown: (a) the casting of steel shoes and dies; (b) the manufacture of carbon electrodes and calcium carbide, and (c) the foundry of the East Rand Engineering Co., Ltd. A large party of visitors was present, including several ladies.

The Kareepoort alluvial diamond diggings, in the Wolmaranstad district, will be open to the public for pegging, from 11 a.m., on Dec. 9, according to government proclamation.

On the Johannesburg Stock Exchange, during the past week, there has been a considerable falling off in the volume of business. This is probably due chiefly to the Turkish political crisis. The return of the conservative party to power in Britain is generally regarded as a "bull" point. Most of the leading gold stocks have moved slightly upward in value.

A native riot broke out on the afternoon of Nov. 19 at the Kaalplaats diamond diggings, on the Vaal River, about 18 miles from Vereeniging. A population of about 3,500 white diggers and about the same number of natives are living there. The whites live in the central area and are surrounded by three native locations on their outer ring. Rumors have been afloat of the natives adopting a threatening attitude.

A white and a native constable went to effect the arrest of a certain native and found quantities of Kafir beer being consumed. They arrested two natives and were then attacked and overpowered by a mob of 200 natives,

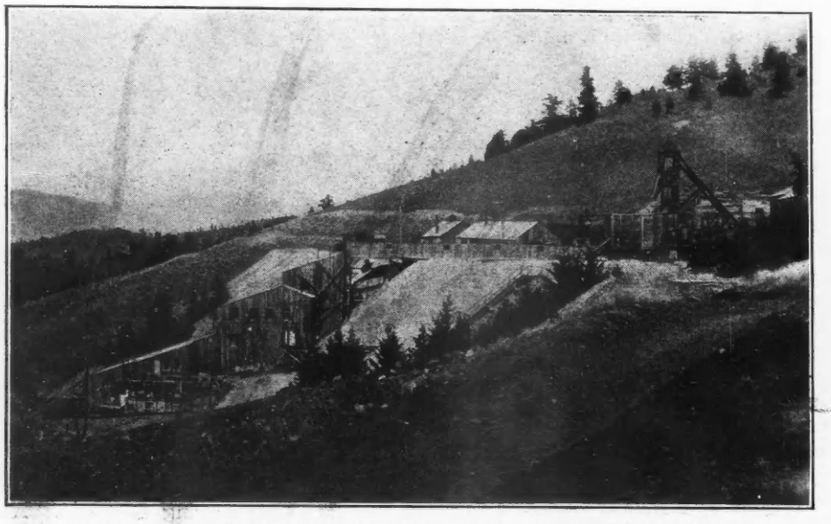
who stoned the police and started a general attack.

Other police arrived, (some armed with rifles and revolvers), from neighboring stations, and with the help of the white diggers, forty-six natives have now been arrested. In the melée, one native was shot dead and two were wounded. Work is now proceeding at the diggings and the neighborhood is quiet once more.

BRITISH COLUMBIA

Hydro-Power Plant for Slocan Silver Mines, Ltd.

Three Forks — The Slocan Silver Mines, Ltd., R. A. Grimes, manager, has installed on the McAllister property, a Pelton water wheel and compressor. A 1,500-ft. crosscut is being driven, designed to give 450 ft. additional depth on the vein, the principal oreshoot of which is 700 ft. in length in the present workings. It is stated that the McAllister will prove one of the important mines of the interior if the crosscut referred to accomplishes what the management expects.



Main shaft and mill of the Iron Mask company, at Kamloops, B. C.

Alamo — The Alamo concentrator, Clarence Cunningham manager, has been closed down temporarily owing to exceedingly cold weather. With the thermometer 14 deg. below zero at Alamo the hoist became unworkable, the water freezing at the valves.

Salmo—The Nugget Mines Co., Ltd., and Sheep Creek Syndicate 1922, Ltd., have been amalgamated; ratification was completed by a meeting of the stockholders in Vancouver, B. C., Dec. 12. A new company known as the Selkirk Gold Mining Company, Ltd., takes over the pooled interests. The Sheep Creek Syndicate, known as the Mother Lode, has been a prominent gold producer, while the Nugget mine has been in continuous operation the last year. Physical connection has just been completed between the Mother Lode mine and the Nugget mine by means of a raise driven from the lower tunnel of the Mother Lode to the Nugget workings, a distance of 1,000 ft. The consolidation insures the new company extensive ground and milling facilities for operations of considerable magnitude. Harold Lakes is general superintendent.

The Queen mine has been taken over by the Yellowstone Mines Co., a new organization formed in Spokane. The new company is unwatering the mine preparatory to resumption of mining operations. The mine was shut down six years ago on account of a mine accident, but prior to that time was the most consistent gold producer in the Kootenay district, having an approximate gross production of $1,500,000. The average value of the ore is around $12 per ton in gold. The property is equipped with a twenty-stamp mill operated by water power. The equipment is in fair condition.

ONTARIO

No Dividend for Teck Hughes—Shining Tree Consolidation Projected

Kirkland Lake—During November the Lake Shore milled 1,912 tons, of which 1,087 tons was from surface dumps. The recovery was $32,764, or an average of $17.14 per ton.

The Continental has started shaft sinking on its Kirkland property, and is in the market for mining equipment.

At the annual meeting of the Teck Hughes, held in New York a few days ago, no announcement was made regarding the retiring of the bonds or the declaration of a dividend. Mine officials stated that the ore found a short time ago on the 700 level is much the best that has yet been discovered in the mine, and that chances for continuance with depth are good.

Porcupine—Vipond is understood to have made an important discovery on the 1,000 level, and to have cut 8 ft. of $32 ore.

Goldale has done 200 ft. of drifting on the 500 level, and while some encouraging values have been found no orebody has yet been opened. Judging from some of the results on the McIntyre, it is thought that the work may be on the apex of an orebody.

At a special shareholders' meeting of the Thompson-Krist, it was decided to proceed with the re-purchase of the three Thompson-Krist claims from the Porcupine Crown for $40,000.

West Shiningtree—The Tonopah Mining Co. is now crosscutting on the 300 level of the Herrick property, which it has under option.

The Shining Tree Consolidated Co. has recently been formed to take over twenty-nine claims in the district. It has also been decided to purchase shares in several companies and to offer stock in the new company for shares in the old. Exchange will be made on the following basis: One share of Consolidated for four shares of Wakenda, Algonquin, West Tree, and Wasapika; one share of Consolidated for two shares of Atlas and Churchill; and two shares of Consolidated for three shares of the Miller-Adair; shares in the Buckingham Mines are also to be taken up by the new company.

QUEBEC

Asbestos Mining More Active

Thetford Mines—Owing to the good demand for asbestos in the United States, the mines and mills in the province have been able to keep busier than they did last winter. Stocks on hand are being diminished, and unemployment is not sufficient to cause hardship among the workers.

MEXICO

Mexican Mining Corporations Pay Dividends

Mexico City—The following mining companies have declared dividends, now payable. Negociacion Minera Socavon de San Fernando, coupon No. 9, of $2, payable since Nov. 28. La Victoria y Anexas, of San Pedro, dividend 178, of 1 peso per share, declared payable from the first of December.

C[a]. Minera Santa Margarita, coupon No. 1, $5 per share declared in November and now payable.

Cananea—More than 3,000 Mexicans and about 200 Americans are employed at the mines, smelter and concentrating plants of the Cananea Copper Co. About 3,000,000 lb. of blister copper is shipped monthly. In 1920 the year's output reached about 50,000,000 lb. The Cananea Consolidated Copper Co. is managed by Tindall Evans, with R. E. Howe as assistant. W. M. Mitchell is general superintendent of the mines, A. D. Wilkinson of the smelter, and F. J. Stacham of the concentrator. The ores from some of the mines contain considerable zinc, which is shipped to the east, the lead concentrates going to the El Paso smelter.

Nacozari—Hoval A. Smith and Fred Bostwick recently made a trip of examination through the district of Sahuaripa; they report having found some promising prospects. They came from San Xavier to Nacozari in a touring

car, by way of Suaqui and Moctezuma. They say the roads are in good condition considering that no traffic has passed over them for two years. They expect to make a return trip in the near future, when a more thorough survey of the district will be made. Also, it is planned to do some development work on the Torabusi and Fiera properties, denounced by them several years ago.

George W. Fast and Bill Jensen are at the San Julian mine, at Santa Ana, in the Sahuaripa district. The mill which was built to treat the molybdenum ore from the San Julian and Tres Piedras mines has been shut down for two years on account of the low price of molybdenum. Fast is looking over the neighborhood with the hopes of finding enough milling ore with silver and gold values to justify the operation of the mill until the molybdenum market improves.

The Las Chispas mine, of the Pedrazzini Gold & Silver Mining Co., shipped two cars of ore and concentrates in November, which netted about $40,000. Another shipment will be made about the end of December. The preliminary work has been completed on the plans of the power house and line to be constructed between Nacozari and the mine, a distance of 31 miles. Diesel engines of Belgian make will be installed.

CALIFORNIA

Wideawake, Neversweat, and Anteup All Wake Up

San Andreas—The Apex Mining Co. has been formed by residents of San Andreas with the consolidation of the Ford, Moro, and Bruno claims. The old Ford shaft is now being retimbered. It has been unwatered to the 100 level. The company expects to recover the old workings. A crosscut will be driven on the 100 level to intersect the west and east veins. An east and west vein intersects the Ford vein and also a talc-schist vein parallel with the Ford. The Ford shaft is an incline and was sunk to a depth of 750 ft. The company expects to find high-grade ore which was left in the property at the time of shut down.

Downieville—The Wideawake Mining Co. has recently been incorporated to work the Wideawake and Neversweat gravel mines near Downieville. The incorporators are said to be W. A. Moses, of Los Angeles, President; E. V. Lacey, L. Garibaldi, J. S. Frickselton, Antone Peckwith, and J. G. Marcum, directors. The Anteup Gold Mining Co. has been incorporated to work the Brush Creek mines near Mountain Horse. The incorporators are Fred Searls, Jr., W. A. Simpson, M. D. Coughlin, C. Ferguson and C. Searls. A bond has been taken on the property.

Sierra City—Announcement has been made that the Keystone mine is to be reopened in the near future.

Placerville—The Fort Jim mine, at Newtown, is being prospected by J. W. Hyatt. An adit is being extended to intersect the Newtown gravel channel.

Nevada City—The Brunswick mine has been unwatered to the 600 level by means of skips and pumps. The new shaft has been found to be in good condition, but more or less retimbering will be required in the old shaft. The Tonopah Mining Co. has bonded the Oriental and Dead River properties, in the Alleghany district. Both are to be developed through the Oriental tunnel.

Mariposa—The Mariposa mine, in Mariposa, is to be reopened after a shutdown of more than twelve years. Operations are in charge of Thomas Carpenter.

Top of asbestos pit, Thetford mines, Quebec

ARIZONA

Verde Central Has Ore on 800 Level, According to Reports

Jerome—Chalcopyrite ore has been found on the 800 level of the Verde Central mine, where a drift south from the 802 crosscut has averaged 4.65 per cent copper for a distance of 25 ft. This crosscut had been driven to intersect a contact between greenstone and quartz porphyry which had before been partly developed on the 600 level. This was intersected by about 320 ft. from the shaft on the 800 level and contained no ore, but drifts started from this working soon came into the ore described above. The entire face of the south drift is now in ore that is of better grade than any yet encountered.

The recent strike of ore in the Verde Central mine has stimulated interest in several important groups of claims adjoining that property, and it is thought that development will be started soon.

One of the oldest mining properties in Arizona, the Apache Chief, is again being operated after being idle for many years. It is a copper-silver property, credited with having rich ore, but, because of its inaccessibility, has never been extensively worked. Last summer the holdings were purchased by the Old Apache Mines syndicate, composed of California and Utah investors, and it is now being operated by lessees.

Shipments from the newly opened oxide ore that is being worked by steam shovel at the United Verde are continuing regularly, about 1,500 tons having been sent to the smelter during the last week. The high-grade siliceous ore that occurs above the oxide ore is also being mined and shipped to the smelter. It is expected that the steam shovels will open one of the old fire stopes before the end of the month. Production is being increased, and men are being added to the force regularly.

Kingman—Ore that assays $28 per ton over a width of 5 ft. is being mined from the Adams vein on the 200 level about 300 ft. from the shaft. Another drift at 300 ft. is also said to be in rich ore.

The Alcoyne property, below Oatman, is developing gold ore in a dike that is about 100 ft. wide. Charles F. Pugh is in charge of the work.

Seven carloads of 4-in. pipe are being delivered at Yucca station for the construction of a 10-mile pipe line that is to extend from Big Sandy Creek, near Signali, to the McCracken mill. It has been found necessary to build this line to secure water for the mill.

There is a lift of 1,600 ft. between the creek and the mine. Two pumping stations will be installed.

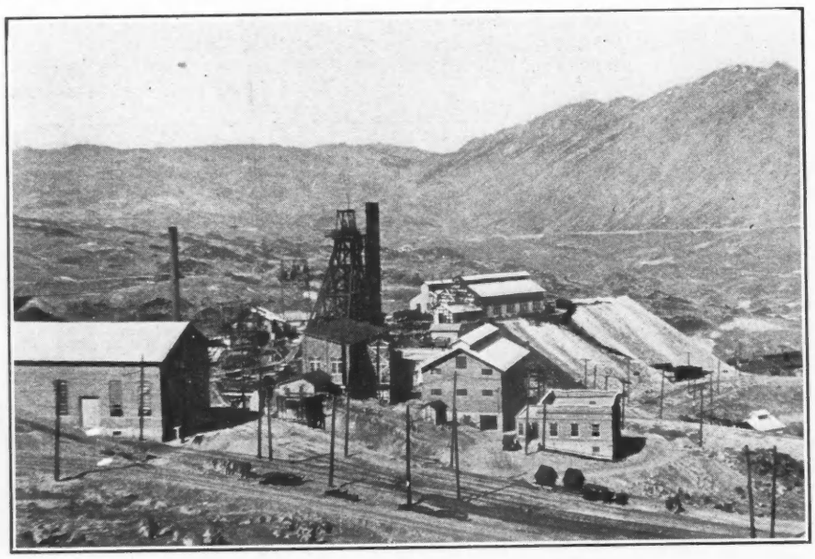
High-grade concentrates are being shipped regularly to the Humboldt smelter by the Highland mill, and it is hoped by the management that a satisfactory market can be secured soon for the zinc ores that are available at their Golconda property.

Morenci—The Phelps Dodge Corporation has increased the daily tonnage

milled from 700 to 1,400 by starting an additional remodeled unit of its concentrator. A shallow 40-ft. flotation cell is one of the features of the new unit. It has proved so satisfactory that all new cells will be designed along similar lines. Plans are complete for the remodeling of No. 6 concentrator to treat 5,000 tons per day, but construction work will not be started until a marked improvement has been recorded in copper market conditions.

just above the 800 level, but the majority of tonnage is coming from the Windlass vein above the 500 level.

Divide—Revised figures on the November production of the Tonopah Divide mine are 1,575 tons, average value $32.59 per ton. Net earnings were $21,634. Work on the 1,400 has been delayed by the work of installing fans for ventilation. On the 1,200 level the southeast drift is out 150 ft. from the crosscut without change.



The Elm Orlu mine at Butte, Montana

NEVADA

Comstock Merger Is Developing Regularly—Results Not Announced

Virginia City—Regular crosscutting and drifting from the Hale and Norcross tunnel and laterals is being accomplished at the Middlemines by the Comstock Merger Mines Co. No facts regarding results of recent development have been made public. About thirty men are employed.

Promising developments are reported by the Comstock Silver Mining Co. on the 320 level. East of the Overland shaft a shoot of $100 ore has been opened in ground which has never been thoroughly prospected on the upper levels. The 10-stamp mill of the Comstock Silver is not in operation, but a few necessary changes are being made preparatory to resumption of milling.

Rochester—A new strike has been made in the southern portion of the Rochester district, in the Nevada Packard mine. The strike was made east of a dike which previously appeared to limit the pay ore and shows a width of 20 ft. which assays from $8 to $10 per ton. The Nevada Packard was placed in the hands of a receiver on March 1, 1921, and at present rate of production the indebtedness, which amounted to about $74,000, will be entirely paid off by March 1, 1923.

November production of the Rochester Silver Corporation was $49,631 gross, with net profit of $10,099 from mine operations. Ore of good grade, but in narrow stopes, is mined from

IDAHO

Platinum Recovery Process Being Investigated

Wallace—The Home Builder Mining & Development Co., operating the Home Builder mine, on Wolf Lodge Bay, on Lake Coeur d'Alene, is making metallurgical investigations to determine a process for the recovery of platinum said to exist in the ores of the property. It is claimed that experiments have been successful with a pilot mill installed on the property and that a larger plant will be installed. The property has been developed with an 1,800-ft. crosscut tunnel and the vein has been followed for 800 ft. in a drift which attains a depth of 500 ft. from the surface. The ore is peridotite, which, it is claimed, contains platinum in sufficient quantity to insure profitable operation, according to Frank M. Slage, president.

Lake View—Tom Cunningham is installing a new pump and hoist on the Conjecture mine near here, and will resume development work soon on the property, which was an important producer of silver ore some years ago. It is planned to erect a concentrator.

MONTANA

Anaconda Sues Davis-Daly

Butte—The long-expected litigation over disputed ore has been started by a suit for $2,000,000 damages instituted by the Anaconda Copper Mining Co. against the Davis-Daly Copper Co.

UTAH

Keystone Company Will Start Milling Lead-Silver Ore at Park City

Salt Lake City—The Columbia Steel Co., which is seeking to develop a steel industry in Utah to utilize the large resources of iron in the southern part of the state, has adopted resolutions accepting the blast furnace site selected by the Provo-Springville holding company lying along Utah Lake, midway between Provo and Springville, in Utah County. It is planned to meet the purchase price of the ground covering the site by public subscription. The Provo Chamber of Commerce is taking an active part in the movement, and it is thought that, although the sum to be raised is considerable, the necessary money will be available, inasmuch as the project is one of great benefit to the community.

Park City—Shipments for the week ended Dec. 15 amount to 3,409 tons, compared with 3,257 tons the week preceding. Shippers were: Silver King Coalition, 1,077 tons; Park-Utah, 1,034; Judge, 799; and Ontario, 498. At the Keystone, lying near the Silver King Coalition, and for some time in the past inactive owing to litigation with its neighbor, the Silver King Coalition, a new 150-ton concentrating plant has been completed in four months. This record was made possible by the fact that the building was already on the ground, new work being confined to the placing of the equipment. The ore bins are said to be full of ore, and regular shipments of both crude ore and concentrates are expected to be started soon. The shipping ore carries 30 to 40 per cent lead and 12 to 15 oz. silver, and the mill ore 8 to 10 per cent lead and 6 to 8 oz. silver. The concentrates are expected to be about equal to the shipping ore in value. J. E. Bamberger and associates, of Salt Lake City, are the principal owners.

Eureka—Tintic shipments for the week ended Dec. 15 amount to 178 cars, compared with 154 cars the week preceding. Shippers are: Chief Consolidated, 56 cars; Tintic Standard, 48; Dragon, 146; Iron Blossom, 11; Victoria, 10; Eagle & Blue Bell, 7; Colorado, 6; Swansea, 3; Bullion Beck, 2; Centennial-Eureka, 2; Mammoth, 2; Yankee, 1; Alaska, 1; Empire Mines, 1.

Ore has been opened in the Plutus by the 1,300 level drift from the Grand Central. This occurs in the same fissure as that from which ore is now being mined on the 1,300 level of the Grand Central, under the community leasing system as is done in the larger stopes of the Chief Consolidated, which controls both the Grand Central and the Plutus. The shaft at the Eureka Hill has been retimbered to the 900 level. The upper levels will be placed in order before continuing work in the shaft, so that operations may start as soon as possible. Work is expected to begin about the first of the year, although there is still much to be done. The property will be operated under the leasing system.

MICHIGAN

The Copper Country

Calumet & Hecla Merger Would Produce 10,000,000 lb. Per Month

BY M. W. YOUNGS

Houghton—The proposed consolidation of Calumet & Hecla and four of its subsidiaries, and the plan to acquire manufacturing facilities to utilize a large part of the output of the combined properties, would practically assure, it is believed in mining circles, the steady operation of these mines. Production by the group, made up of Calumet & Hecla, Ahmeek, Allouez, Centennial, and Osceola, would be approximately 10,000,000 lb. of refined copper per month. Increased earnings are expected and, through a share in the profits obtained from the sale of fabricated products, would be reflected in improved conditions in the copper-mining industry so far as the Michigan district is concerned. Fabricating plants probably would not be located at or near the mines, but more likely at some recognized center of distribution and at a source of labor skilled in the copper and brass trades.

In Gratiot No. 2 shaft, Seneca, a station is being cut at the 9th level preparatory to starting a drift to the south. If the ground proves up as well as in the 11th and 13th level south drifts, a drift also will be pushed south from the 7th level. All levels in this shaft will be 200 ft. apart. The 13th level south drift has been pushed to the Ahmeek boundary, but the 11th is still proceeding south, in good copper rock.

In addition to development in Mohawk Nos. 4 and 6 shafts, sinking is under way in No. 6, in which splendid ground is being opened. Rock of fair quality is being exposed in the new drifts in No. 4. Sufficient rock is being sent to the mill to keep better than two heads in operation, Wolverine using the remainder of the mill capacity.

With the enlargement of the underground force in the Champion shafts, a more extensive opening program has been undertaken by Copper Range. Champion also will show a considerable increase in production this month, probably to the extent of 300,000 lb. of refined copper. All new openings are in rich rock; uniformity in copper tenor enables Champion to maintain a steady yield per ton. Development and mining work in Baltic also are proceeding satisfactorily.

Isle Royale is working but two shafts, Nos. 4 and 5. No. 5 is the richer of the two, and the greater tonnage is coming from this shaft. The greater part of the ground opened has sufficient copper to warrant stoping. Close selection is giving Isle Royale an estimated return of 21 lb. to the ton.

Marquette Range

Michigamme—Henry Ford's Imperial mine shipped 73,083 tons or iron ore during the season just closed. Some ore remains in stock and would have been sent to the Ford furnaces if boats could have been chartered during the latter part of the period of navigation. It was the first year that shipments were made since Ford secured possession.

Ishpeming—The Cleveland-Cliffs Iron Co. shipped a total of 2,600,446 tons of iron ore from its mines in the Lake Superior region in 1922. Of this amount 1,846,583 went from the Marquette Range, 718,740 from the Mesabi and 35,123 from the Menominee. The total in 1921 was 987,424 tons. There is considerable ore remaining in stock at the company's underground properties.

Cuyuna Range Power Co. to furnish sufficient power during the severe winter months, the Marquette Ore Co. has been forced to suspend hydraulic stripping operations at its Maroco mine here. An extensive winter stripping campaign had been planned, which will now not be undertaken until the milder weather.

Mesabi Range

Hibbing—Stripping operations over the Mesabi Range are fast coming to an end with the approach of the real winter season. Some of the operations were closed down in November, and the

Hillcrest mine, at Ironton, on the Cuyuna Range in Minnesota

MINNESOTA

Cuyuna Range

Ironton Mine Is Leased to Inland Steel Co.

Ironton—Winona M. Kreitter and the Lamb Estate, fee owners of the Ironton mine, here have closed a deal with the Inland Steel Co. whereby the mining company takes a fifty-year lease upon the property. The Ironton mine adjoins the workings of the Armour No. 2 mine, now being operated by the Inland Steel Co., and contains the southwestern extension of the Armour orebody. The new owners will mine the Ironton ore through their present workings and the No. 2 Shaft, by virtue of an agreement reached with the Weyerhauser interests. The Ironton mine was formerly under lease to the Cuyuna-Duluth Iron Co., a subsidiary of the American Manganese Manufacturing Co., which mined out the deposit down to the 280 level, shipping some 350,000 tons of ore. The property has been idle for two years and reverted to the fee owners several months ago, due to default in royalties. State estimates place the ore reserve at 600,000 tons, and indications point to a possible greater reserve below the depth of present exploration.

The Inland Steel Co. plans to start mining on the newly acquired property soon after Jan. 1. The Ironton orebody contains a high-grade non-bessemer hematite, similar in characteristics to the Armour No. 2 ore.

Trommald—Owing to inability of the work at the Albany mine, a property of the Pickands Mather Co., and at the Boeing mine, operated by the Mesabi Cliffs Iron Mining Co., closed on Dec. 15.

Virginia—The work of electrifying the Lincoln mine, a property of the Interstate Iron Co., is practically complete. The equipment installed was of the very latest design and the work included the electrification of every unit of the whole plant, both on surface and underground.

Chisholm—The Shenango Furnace Co. has added another shift to its present operations at its Shenango property. The property is now working to full capacity, with a production of 700 tons per day.

Buhl—The No. 300 Marion electric shovel which has been operating with a dragline outfit at the Wabigon pit, a property of the Hanna Ore Co., has been converted for use with an 8-yd. dipper and will continue to use this equipment until the completion of the present stripping work.

Duluth—The shipments for the 1922 season of the Oliver Iron Mining Co. from the iron ranges in Minnesota are approximately 16,500,000 tons, with the Mesabi Range shipping 15,700,000 tons of this amount and the Vermilion Range 800,000 tons. The total tonnage from the Minnesota ranges is approximately 85 per cent of the company's total shipments from the Lake Superior district, which was 19,400,000 tons.

THE MARKET REPORT

Daily Prices of Metals

Dec.	Copper, N. Y., net refinery* Electrolytic	Tin 99 Per Cent	Tin Straits	Lead N. Y.	Lead St. L.	Zinc St. L.
21	14.45	37.00	38.125	7.25	7.05	6.90 @6.95
22	14.50	37.25@37.50	38.50	7.25	7.05	6.90 @6.95
23	14.50	37.25@37.50	38.50	7.25	7.05	6.85 @6.95
25	.....	.....	.....	....	....	.....
26	14.50	37.25@37.75	38.875	7.25	7.05	6.90 @6.95
27	14.5	37.50	38.875	7.25	7.05@7.075	6.90 @6.95

*These prices correspond to the following quotations for copper delivered: Dec. 21st, 14.70c.; 22d to 27th inc., 14.75c.

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 quotations are for prompt deliveries. Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

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

London

Dec.	Copper Standard Spot	Copper Standard 3M	Copper Electrolytic	Tin Spot	Tin 3M	Lead Spot	Lead 3M	Zinc Spot	Zinc 3M
21	64¼	65⅛	71⅝	179⅝	181	26½	26¼	37¼	34¼
22	64¼	65⅛	71⅝	180¾	182¼	26⅜	26⅛	37½	34½
25	...	...	...	....	....	...	...	...	...
26	...	...	...	....	....	...	...	...	...
27	64⅛	65⅜	71¾	182⅛	183½	26⅜	26⅛	37⅜	34⅜

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

Dec.	Sterling Exchange "Checks"	Silver New York Domestic Origin	Silver New York Foreign Origin	Silver London	Dec.	Sterling Exchange "Checks"	Silver New York Domestic Origin	Silver New York Foreign Origin	Silver London
21	4.63⅝	99⅝	63	30¾	25	.....	...	...	...
22	4.64	99⅝	62⅞	30⅝	26	4.64½	99⅝	62¾	...
23	4.65	99⅝	62¾	...	27	4.63½	99⅝	63¼	30 15/16

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, Dec. 27, 1922

The week has been an exceedingly inactive one in the metal markets, with the Christmas holiday coming on Monday, and Tuesday also being a holiday in the London market. Prices are substantially unchanged.

Copper

All of the producers who were selling copper at 14⅝c. a week ago seem now to have raised their prices to 14.75c., delivered, though it might be possible for large consumers with plants in and about New York City still to obtain copper for early delivery at the lower price. There is some tendency among producers who are well sold up to quote 14⅞c., but this price so far has been largely a nominal one, although it would be difficult to obtain copper for April or later delivery at much under that figure. Fundamental conditions are so good that producers are decidedly optimistic. Consumption in all lines continues excellent, and it seems likely that production must be increased considerably to take care of the spring demand. Export sales will have a great bearing on the strength of the market, and these will depend largely on what international financial arrangements can be made.

Lead

The official contract price of the American Smelting & Refining Co. continues at 7.25c., New York.

The lead market has been decidedly inactive, and few important orders have been placed, and these mostly at average prices. Plenty of lead seems to be available at 7.25c., New York, even for prompt delivery. In the Middle West supplies of spot metal are not so large, but most consumers are satisfied with January shipment. St. Louis prices are showing a slight tendency to advance during the last day or two, and though most of the business has been done at 7.05c., and some could still be done at that level, at least one producer is reported holding for 7.10c. Desilverized is commanding about 5 points' premium at some consuming centers in the Middle West. There is no weakness yet apparent in the lead situation, and the lack of buying is purely seasonal; it is expected to continue through the next week.

Zinc

The slightly weaker zinc market is attributed by some producers to a stagnant domestic market and by others to a poor demand from abroad compared with a few weeks ago. Probably both are correct. At any rate, it has not been difficult to obtain metal for both prompt and forward delivery, in ordinary tonnages, at the prices which we quote. Although some business has been done at 7c., it has practically all been confined to carload lots. The premium for prompt shipment has disappeared. The price of high-grade zinc is still 7.75@8.25c. per lb., with usual freight allowances. Business continues satisfactory in this class of metal. New York quotations on Prime Western continue at 35 points above St. Louis.

Tin

Prices are somewhat higher, and the advance has stimulated buying by jobbers, but consumers remain aloof. The 99 per cent market is rather more below Straits than is usual, owing to a large supply of Chinese tin now available, and also to the fact that some consumers have been disappointed in its quality. The prices asked for forward deliveries have been the same as asked for spot to ¼c. higher.

Arrivals in tin, in long tons: Dec. 26th, Straits, 500; China, 450. Total so far in December, 6,045.

Gold

Gold in London: Dec. 21st, 89s. 1d.; 22d, 88s. 9d.; 27th, 88s. 8d. Stock of money in the United States, Dec. 1, 1922: Gold coin and bullion, $3,908,616,985; standard silver dollars, $428,274,-

404; subsidiary silver, $269,664,609; United States notes, $346,681,016; Federal Reserve notes, $2,718,474,010; Federal Reserve Bank notes, $49,044,400; National Bank notes, $761,499,127; total, $8,482,254,551. Circulation per capita, $41.80.

Foreign Exchange

Exchanges have been irregular, with the holidays interfering considerably with the volume of business. On Tuesday, Dec. 26, cable quotations for francs were 7.385c.; lire, 5.135c.; marks, 0.0147c.; and Canadian dollars, ⅜ per cent discount.

Silver

Over the Christmas holidays the market has been quiet but steady with an advance on Dec. 27 to 30 1/16d. for spot silver in London, due to bear covering for India account. The spread of ⅛d. between the spot and forward quotations indicates urgency of spot demand.

Mexican Dollars — Dec. 21st, 48; 22d, 47⅞; 23d, 47⅞; 26th, 47⅞; 27th, 48⅛.

Other Metals

Quotations cover large wholesale lots unless otherwise specified.

Aluminum—General market for 99 per cent grade, 22@23c. per lb. London quotations, £92 10s.

Antimony — Chinese and Japanese brands, 6.35c. W. C. C. 6.75@7.25c. Cookson's "C" grade, spot, 7⅞@8⅛c. Chinese needle antimony, lump, nominal, 4.50c. per lb. Standard powdered needle antimony (200 mesh), 5½c. per lb. White antimony oxide, Chinese, guaranteed 99 per cent Sb_2O_3, 6.75@7c.

Bismuth—$2.45 per lb. London quotes 10s

Cadmium—$1.15 per lb. London quotes 4s. 6d. @ 5s. 6d.

Iridium—$240@$275 per oz.

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

Palladium—$65 per oz.

Platinum—$118 per oz.

Quicksilver—$74 per 75-lb. flask. San Francisco wires $71.30. London £12.

Selenium—$2 per lb.

The prices of **Cobalt, Molybdenum, Monel Metal, Osmium, Radium, Rhodium, Tellurium** and **Thallium** are unchanged from prices given Dec. 2.

Metallic Ores

Chrome Ore—Indian chrome ore, $18.50 per ton, c.i.f. Atlantic ports. Rhodesian and New Caledonian, $26 per ton. Market quiet.

Magnetite Ore—F.o.b. Port Henry, N. Y.: Old bed 21 furnace, $5 per long ton; old bed concentrates, 63 per cent, $5 25; Harmony, cobbed, 63 per cent, $5.25; new bed low phosphorus, 65 per cent, $7.50.

Manganese Ore—29c. per long ton unit, seaport, plus duty. Chemical ore, $75@$80 per gross ton.

Molybdenum Ore—70c. per lb. of MoS_2 for 85 per cent MoS_2 concentrates.

Tungsten Ore — Wolframite, $7.50; scheelite, $8.50@$8.75 per unit of WO_3, f.o.b. New York.

Iron Ore, Magnetite, Tantalum, Titanium, Uranium, Vanadium, and **Zircon** ore are unchanged from the quotations published Dec. 2.

Zinc and Lead Ore Markets

Joplin, Mo., Dec. 23—Zinc blende, per ton, high, $46.60; basis 60 per cent zinc, premium, $42@$42.50; prime western, $40; fines and slimes $39@$37; average settling price, all grades of blende, $45.03; calamine, basis 40 per cent zinc, $20@$22.

Lead, high, $95.20; basis 80 per cent lead, $93; average settling price, all grades of lead, $90.44 per ton.

Shipments for the week: Blende, 24,263; calamine, 166; lead, 1,963 tons. Value, all ores the week, $1,273,900.

The larger portion of the 11,610 tons of blende purchased yesterday and today for future delivery was bought on the $40 basis price level. About 900 tons was purchased as premium ore, on $42 to $42.50 basis. Less than 300 tons of sludge and slimes were sold. In four weeks 84,240 tons of ore have been loaded from the bins at the mines. In that time 52,600 tons were produced, reducing the stock 31,640 tons.

Platteville, Wis., Dec. 23—Blende, basis 60 per cent zinc, $42.50 per ton. Lead, basis 80 per cent lead, $93 per ton. Shipments for the week: Blende, 5,371; lead, 130 tons. Shipments for the year: Blende, 39,858; lead, 1,614 tons. Shipped during the week to separating plants 1,323 tons blende.

Non-Metallic Minerals

China Clay (Kaolin)—Crude, $6@$8; washed, $8@$9; powdered, $12@$20; bags extra, per net ton, f.o.b. mines, Georgia; powdered clay, $14@$20, f.o.b. Virginia points. Imported lump, $15@$22, f.o.b. American ports; powdered, $40@$45, f.o.b., New York. 1A grade, refined, $14@$15 per ton, Delaware. Canadian, in lumps, $16@$18, f.o.b. Quebec points.

Fluorspar — Fluxing gravel, 85 per cent CaF_2 and not over 5 per cent silica, $21.50, f.o.b. mines; not over 6 per cent silica, $21; 80 per cent grade, not over 5 per cent silica, $20; ground acid grade, $45 in bulk; ground enameling grade, $35 in bulk; packages, $4 extra, all f.o.b. mines, Illinois. No. 1 lump, $30; No. 2, lump, $25, f.o.b. Illinois mines.

Magnesite—$15 per ton for crude, $40 for unground calcined magnesite, f.o.b. California points. Northwest American magnesite industry shut down. Dead-burned magnesite grains, $43.50 per net ton, f.o.b. Baltimore; $45, Chester, Pa. Demand increasing for white plastic magnesite.

Mica—Scrap material, $22 per short ton, New Hampshire points; disk, 15c. per lb.; washer, 8@10c. For other mica quotations see issue of Dec. 2.

Talc—Ground from 150 to 200 mesh, $6.50@$8.50 per ton, bags extra ($1 for 50-lb. paper bags or 10c. each for burlap bags, 12 to the ton). f.o.b. Vermont. Competition keen. Demand has dropped about 20 per cent lately. For other talc prices see issue of Dec. 2.

Asbestos, Barytes, Bauxite, Chalk, Diatomaceous Earth, Emery, Feldspar, Fuller's Earth, Graphite, Gypsum, Limestone, Monazite, Phosphate, Pumice, Pyrites, Silica, Sulphur and **Tripoli** are unchanged from the Dec. 2 prices.

Mineral Products

Arsenious Oxide (white arsenic)—Actual sales averaged about 12.50@13.50c. per lb. Small amounts only available.

Copper Sulphate—Large crystals, 6c. per lb., small crystals, 5.90c.

Potassium Sulphate, and **Sodium Sulphate** are unchanged from quotations of Dec. 2.

Ferro-Alloys

Ferromanganese — Domestic, 78@82 per cent, $100 per gross ton, f.o.b. furnace. Spiegeleisen, 19@21 per cent, $36, f.o.b. furnace; 16@19 per cent, $35.

Ferrosilicon—10 to 15 per cent, $38@$40 per gross ton, f.o.b. works; 50 per cent, $75@$80; 75 per cent, $115@$120.

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

Ferrocerium, Ferrochrome, Ferromolybdenum, Ferrosilicon, Ferrotitanium, Ferro-uranium, and **Ferrovanadium** are unchanged from the prices published Dec. 2.

Metal Products

Copper Sheets—22.25c. per lb.; wire 16.375@16.625c.

Nickel Silver—30c. per lb. for 18 per cent "Grade A" quality sheet metal.

Yellow Metal — Dimension sheets, 20c. per lb.; rods, 17c.

Lead Sheets and Zinc Sheets are unchanged from the prices published Dec. 2.

Refractories

Bauxite Brick, Chrome Brick, Chrome Cement, Magnesite Brick, Magnesite Cement, Silica Brick and **Zirkite** are unchanged from the Dec. 2 prices.

The Iron Trade

Pittsburgh, Dec. 26, 1922

The outstanding feature in the steel industry this week is the continuance of production at substantially the October and November rate. Steel prices are steady. The 2.00c. price on bars, shapes and plates is perhaps subject to less irregularity than was the case a month or two ago. Nails and pipe are very strong, and sheets and tin plates are quite steady.

Pig Iron—Foundry pig iron has advanced another dollar a ton, to $27, Valley. The heavy buying for first quarter was at $25. Meanwhile coke has advanced. Basic, which is offered by steel works, does not advance, being available at $24.50, Valley. Bessemer remains at $27.50.

Connellsville Coke—The market has advanced farther on account of heavy absorption by Eastern buyers for domestic consumption, furnace and foundry being both quotable at $8.50 to $9.

Recovery in the German Metal Trades

SPECIAL CORRESPONDENCE

Charlottenburg, Dec. 7, 1922—There has been a rally in the German metal trades. The requirements of the copper- and tin-manufacturing industries are being filled again as manufacturers are becoming bare of metallic raw materials. The imports of copper into Germany are estimated as high as 10,000 metric tons a month. I am told that some fresh credit arrangement has been made between American capitalists and German metal consumers, partly on the basis of the Edge Law. The metal people here believe that the big American producers will be forced in the long run to resume operations on the large scale of war time, because the increased volume of smelting and refining operations can alone warrant the maintenance of mining with lower costs and consequently larger dividends for shareholders. The increased output will, so it is argued, be sent to the foreign countries that are by nature big foreign metal users, of which Germany is foremost. Amid all the crushing difficulties of the present era, German metal consumption is 50 to 60 per cent of the 1913 level, and is bound to rise further as the supply of old metal from foreign countries diminishes. Because America is now absorbing great quantities of British and other ammunition scrap, little remains to be had by Germany, so that at the moment she has no available brass and bronze reserves. This results in a diminishing production of cathodes, which since war days have been turned out from copper-zinc alloys. The Ilsenburg refinery of the Hirsch concern, as well as some other refineries, have ceased to turn out cathodes, to which wire and sheet makers were more accustomed than to American wire bars, so cathodes are being imported in greater proportions than before. The same is the case with fine zinc that comes in from the United Kingdom, being mostly of American origin, of which the manufacturers of high-quality brass are greatly in need.

Formerly remelted zinc material had been abundant throughout Germany. This material served through the years of the blockade as an important substitute for foreign metals in different types of war manufacture. The "Metallwirtschaftsbund" freely gave permits to export half of existing stocks of secondary zinc. But in this respect the interests of the traders were contrary to those of the industrial concerns that were to become bare of zinc materials, especially after the loss of Upper Silesia. The visible supplies of zinc now in this country are only 3,000 metric tons, so that zinc users are turning toward a supply from the United States again. The chief difficulty for German users is the credit stringency. Money lenders generally fear lest the paper mark may depreciate further, and they may receive back a debased return. Therefore they anticipate that contingency by enhancing money loan rates up to unheard-of levels. The money rates in financing commodity businesses run to 20 per cent (or more) per month; that is to say, 240 per cent (or more) per annum. Recently, under the weight of heavy money obligations, a metal merchanting house of Berlin has become insolvent, but soon it was relieved by the solidarity of the Berlin brotherhood, who lent ample support to the weakened colleague.

Another important result of the continually disturbed metal markets are the mergers of different concerns, the absorption of smelters by merchanting firms, of rolling concerns by importers (or vice versa), and so on. An example at random is the forthcoming fusion of the big Berzelius Metallhütten Aktiengesellschaft, at Frankfort-on-Main, with the Blei und Silberhütte Braubach. Another outstanding example has been recently the merger of the Obeinisch-Nassauische Bergwerksgesellschaft with the Aktiengesellschaft für Zinkfabrikation at Stolberg. Time is not yet ripe to reveal the respective projects of the great copper producing firm, the Mansfeld Co. of Eisleben. The volume of copper output of this firm, which during the war amounted to around 24,000 metric tons of virgin copper a year, now has fallen to nearly 15,000 tons. The copper of Mansfeld is highly refined, the brand M.R.A. (Mansfelder Raffinade) assaying 99.8 per cent of pure copper on the average, besides some content of nickel, which renders this brand valuable for hardening and rolling purposes. Unluckily, the Mansfeld deposits are old and were, moreover, worked heavily during the war. Financial reorganization took place a year ago, in consequence of which overcapitalization is evident. At the moment a profit is had, however, by metal scarcity and the high prices ruling. Moreover, the Mansfeld concern is a producer of silver and some other metals and chemicals. Much of the silver handled in Switzerland and Sweden is of this origin, although it does not reach England directly, on account of the existence of the British Recovery Act, involving a 26 per cent discount on the invoice value of the consignment. This firm furnishes "German" hardening metals, especially molybdenum, and sulphuric acid. Besides ferrochromium, the importation of hardening stuffs is mostly limited here in order to afford competitive chances for German producers. For instance importation permits for tungsten are being given only after it has been ascertained that German offers are not to hand. But the revival that has been witnessed in these days in the iron and steel trades of western Germany has given a fillip to the ferro-alloys business, too, and producers regard somewhat coolly the shipments coming in from America or Asia, not being themselves able to respond to the actual demand. As for sulphuric acid, since Upper Silesian zinc-ore mining is no more under the control of Germany, the remaining producers have a monopolistic power, for the different important chemical trade branches of Germany are dependent on having plenty of acid.

French Metal Market Active

SPECIAL CORRESPONDENCE

Paris, Dec. 15, 1922.—The violent fluctuations of exchange rates have made French purchasers of non-ferrous metals very shy of buying, and so long as exchanges do not become more stable the metal absorption of France will not be as large as the general state of business would warrant. At this time of the year, the proximity of the making out of inventories always restricts purchases of copper. However, manufacturing works have orders extending over three or four months; and the volume of unexecuted orders in the books of one of the largest French transforming concerns is 100 per cent greater than it was one year ago.

War stocks of old copper have become more and more depleted; they are, however, supplemented by the coming into the market of stocks bought two or three years ago at excessive prices, and this fact tends to show that the holders of these stocks believe that prices of copper scrap have now reached a maximum. Some time ago, Germany was purchasing in France old copper from ammunition and war material, especially shell cases. She shipped that scrap to America, where, against her paying transformation costs, she obtained, in exchange, supplies of fresh copper. We are told that, in consequence of the extreme depreciation of the mark, this business has now entirely ceased.

According to information received in France, Germany has consumed about 12,000 tons of copper during each of the first three quarters of this year, but is consuming only half that tonnage now.

The French market for tin is inactive. Though present prices are generally considered slightly too high, those interested in the market, however, believe that they will rise to £200 and even to £220. Before the war, France consumed normally about 10,000 tons of tin per annum, but her present consumption of that metal does not exceed 7,000 tons. Existing tin stocks in France are not important.

France is not a lead-producing country, as so insignificant is her ore production of that metal that it is not worth while to mention it. Before the war, lead ores from Sardinia were treated in the north of France, at the Malfinado works (named after the Sardinian mine). These works were destroyed during the war, and they are now being rebuilt for the account of the Société Minière Peñarroya, which is already treating in France a small part of the ore it is getting from its Spanish mines. But the high rate of exchange of the Spanish peseta is hindering the development of that trade.

French consumption of lead is now seasonally slow, and a fall of prices in December and over January is not unlikely.

French imports of lead aggregated, during the first nine months of 1922, 58,400 tons, against 19,000 tons and 54,000 tons, respectively, during the same periods of 1921 and 1920. Mexico this year supplied 14,200 tons, Belgium 12,400 tons, Tunisia 11,600 tons, the United States 7,800 tons, Great Britain 5,100 tons, and Spain 4,200 tons.

Owing to the important demand for zinc sheets, due to reconstruction work in devastated French areas, the zinc market has become rather animated of late in France, and this activity was concomitant with the reduction of the zinc output of Upper Silesia.

France does not produce any raw zinc. However, the Cie. Royale Austrienne is treating at its works of Auby (Nord) ore from its mines in the north of Spain and is rolling raw zinc into sheets; it also works a few ovens for argentiferous lead. On the other hand, the Société de la Vielle Montagne, which is the owner of powerful zinc plants in Belgium, also owns a small factory in the south of France (dèpartement de l'Aveyron), where it is making zinc sheets.

Industrial interests are now endeavoring to infuse new life into the zinc industry of Upper Silesia, and the organization, for that object, of a Franco-Belgian and of a Franco-British company is reported. Although there is no shortage in the supply, and the consumption has seasonally diminished, available prompt supplies of zinc are well sought after and prices are high.

France imported, during the first nine months of 1922, 28,544 tons of raw zinc (15,100 tons from Belgium, 6,160 tons from the United States, and 3,010 tons from Germany), against 27,600 tons during the same period of 1920. She imported, besides, 12,728 tons of rolled zinc, against 18,800 tons during the same period of 1920.

From declarations made at the last general meeting of the Compagnie Française des Métaux — one of the most important, if not the most important, of French concerns engaged in the treatment of non-ferrous metals—it is apparent that an improvement of business has been going on since September last, but that this improvement is bearing more on tonnages than on prices.

The Cie. Française des Métaux has acquired an interest in the Austrian metallurgical works at Bendorf, which, before the war, were among the most important metallurgical concerns of Central Europe and were then selling white metals in France. The action taken by the Cie. Française des Métaux will have, among other consequences, that of suppressing Austrian imports of white metals.

At the general meeting of the Société d'Electro-Métallurgie de Dives, similar declarations were also made about the present situation of business.

I mentioned above French imports of lead and zinc, and shall complete that information by giving like data for other metals (after French customs returns):

	French Imports During the First Nine Months of 1922 Metric Tons	1920 Metric Tons
Copper (all forms except ore)	74,859	62,007
Tin (all forms except ore)	6,702	5,518
Nickel (all forms except ore)	2,203	2,504
Mercury (all forms except ore)	46.8	144
Antimony (all forms except ore)	378	474
Copper ore and semi-products	4,802	2,745
Lead ore	13,388	27,698
Zinc ore	64.731	33,744
Tin ore	899	655
Nickel ore	899	709
Antimony ore	1,451	4,095
Manganese ore	163.937	139,215

Bauxite is almost the only ore which France is exporting to any considerable extent: 109,710 metric tons during the first nine months of 1922, a good part of which went to Germany. The present average price for bauxite 60 per cent is 60 fr. per ton f.o.b. Mediterranean ports.

Stibnite deposits of the center of France might suffice to cover the antimony requirements of the whole world. The price quoted is 6 fr. 50c. per unit. France exported in 1922 (first nine months), 281 tons of sulphide and 82 tons of metallic antimony. Chrome (oxide) from New Caledonia, 50 per cent, sells for from 250 to 260 fr., c.i.f., per ton. Chrome (oxide) from Greece, 45 to 49 per cent, is quoted at 200 fr., c.i.f., per ton.

Wolfram is quoted at 45 fr. per unit of tungstic acid.

Copper Statistics Encouraging

A slight decline in export and domestic shipments with an increase in refined production of copper in November caused a small increase in surplus stocks at the end of the month compared with Oct. 31, says the *Boston News Bureau*. The refined surplus on Nov. 30 amounted to something over 285,000,000 lb., an increase of 3,500,000 lb. in the thirty days. This is the first month since November, 1921, that surplus stocks of refined copper have increased. Notwithstanding the heavy increase in monthly refinery production, surplus stocks have steadily dwindled and now represent a decline of approximately 235,000,000 lb. from surplus stocks of Jan. 1, 1922.

Production of copper in United States and South America continues apace. In November refined output was 165,000,000 lb., compared with 91,000,000 lb. in January of this year.

Domestic and foreign shipments in November approximated 160,000,000 lb., a decline of about 32,000,000 lb. from October, and 3,500,000 less than production.

When it is remembered that the accumulation of refined copper in this country amounted to nearly 750,000,000 lb. no longer ago than April of last year, the splendid improvement that has taken place in the statistical position of the metal is apparent. Refined production a year ago was running at the rate of only 80,000,000 lb. of copper monthly; today it is over 160,000,000 lb., or just double 1921. Yet during this time surplus metal has been steadily whittled down until today it is equivalent to only about six weeks' production.

Total exports for the first ten months of 1922 were 609,705,600 lb. against 489,664,000 lb. for the same months last year. Shipments to Germany in the first ten months of 1922 were 168,725,760 lb.; to France, 109,621,120 lb.; to England, 78,438,080 lb.; and to the Orient, 49,029,120 lb.

It will be seen that Germany continues much the best foreign customer of American copper, though she is not taking proportionately so much as before the war, when about one-third of American exports went to that country.

Mining Dividends in December

The following dividends were paid by mining and metallurgical companies during December:

Companies in the United States	Situation	Per Share	Total
Ahmeek, c	Mich.	$1.00 K	$200,000
American Metal	Various	0.75 Q	402,000
American Metal pfd	Various	1.75 Q	87,500
American Smelting & Refining pfd	Various	1.75 Q	875,000
Butte & Superior, z	Mont.	0.50	145,099
California Rand Silver	Calif.		
Calumet & Arizona, c	Ariz.	0.50 Q	321,261
Calumet & Hecla, c	Mich.	5.00 K	500,000
Federal Mining & Smelting, pfd., s. l.	Idaho	1.25 Q	150,000
Great Northern Iron Ore	Minn.	1.00 K	1,500,000
Hecla Mining, s. l.	Idaho	0.50 QX	500,000
Homestake, g	S. D.	0.50 M	125,580
Inland Steel	Minn.	0.25 Q	251,752
Isle Royale, c	Mich.	0.50 K	75,000
Mother Lode Coalition, c	Alaska	0.50 SA	1,250,000
National Lead	Various	2.00 Q	413,108
National Lead pfd	Various	1.75 Q	426,433
Osceola, c	Mich.	1.00 K	96,150
Park Utah, s. l. z	Utah	0.15 K	150,000
Rochester Silver	Nev.	0.025 Q	44,377
St. Joseph Lead	Mo.	0.50 QX	774,684
Texas Gulf Sulphur	Texas	2.00 QX	1,270,000
Tintic Standard, s.l.	Utah	0.10 QX	117,470
U. S. Steel	Various	1.25 Q	6,353,781
United Verde Copper	Ariz.	1.50 Q	450,000
Utah Copper	Utah	0.50 Q	812,245
West End Consol., s g	Nev.	0.05 Q	89,424
Companies in Canada and Mexico			
Amparo Mining, s.g	Jal.	0.05 X	100,000
Hollinger Consolidated Gold	Ont.	0.05 4 wks.	246,000

Q, quarterly; K, irregularly; X, includes extra; M, monthly; SA, semi-annually; c, copper; s, silver; l, lead; z, zinc; g, gold.

Ahmeek, Calumet & Hecla, Isle Royale, and Osceola made the same payment in December that they did in August last. Butte & Superior paid its first dividend since 1917. Great Northern Iron Ore properties paid half the dividend that it did at the last previous distribution in April of this year. Several extra dividends were paid, among them Hecla, of 35c.; St. Joseph Lead, of 25c.; Texas Gulf Sulphur, of 75c., and a raise in the regular dividend from $1 to $1.25; Tintic Standard, of 5c.; and Amparo Mining, of 5c. National Lead increased its regular distribution from $1.50 to $2 per share. Park Utah repeated the disbursement made Oct. 1.

COMPANY REPORTS

Arizona Copper Co., Ltd.

A report of operations of Arizona Copper Co., Ltd., for the year to Sept. 30, 1922, states that:

Dividends for the year on the company's holding in Phelps Dodge Corporation, discount received on Treasury bills, bank interest, and transfer fees, amounted to	£49,450	13	4
There was transferred from reserve account	50,000	0	0
Total	£99,450	13	4
The expenses for the year, as detailed in the profit and loss account, were	3,066	12	7
Balance	£96,384	0	9
Out of this balance there was paid on Nov. 1, 1922, a dividend on the ordinary shares of the company, in respect of the year to Sept. 30, 1922, of 1s. per share, free of income tax, amounting to	75,994	16	0
Balance	£20,389	4	9

The balance, £20,389, 4s. 9d., was carried forward, subject to provision for income tax, corporation tax, and directors' fees for the year. For the year to Sept. 30, 1922, the Phelps Dodge Corporation paid quarterly dividends to its shareholders of 1 per cent actual, thus making 4 per cent for the year. The company's share of these dividends was $200,000, the sterling equivalent £45,763, 16s. 5d.

The company's claim for repayment of the whole of the excess profits duty the company had paid has now been admitted by the revenue authorities, and £300,000 has been received on account thereof. On the other hand, the British Government claims for income tax involve large figures. The adjustment may take some time yet, as important and complicated questions involving the basis on which the company falls to be assessed, in the past and for the future, have still to be settled.

At the meeting of the company on Feb. 27 last, Norman Carmichael was nominated as the company's representative on the board of the Phelps Dodge Corporation, and on this being intimated to the Corporation, Mr. Carmichael was, on March 16, duly elected one of its directors.

In order that the annual report of Phelps Dodge Corporation, which is issued about the month of March each year, may be available at the same time as the annual report by the directors of this company, it is proposed to make the financial year end on March 31, instead of on Sept. 30.

Santa Gertrudis Co., Ltd.

Silver; Mexico

The general manager's report on the working operations of the Santa Gertrudis Co., Ltd., for the quarter, from July 1 to Sept. 30, 1922, states that the mill during the above-named period crushed 36,816 dry short tons of ore from the Santa Gertrudis mine.

	United States Currency
Value of bullion produced	$319,291.94
Less working expenses (including development and shipping and selling)	221,914.06
Estimated profit at mines	$97,377.88

In addition to the above noted tonnage, the mill crushed 88,130 dry short tons of ore, delivered by the Inversiones Co., from its El Bordo, El Cristo, and Malinche mines.

A total of 960 ft. of development was accomplished throughout the mine, of which 68 ft. was in payable ore, 85 ft. in vein below pay, and 807 ft. in country rock. The average milling rate was at 84 per cent of full capacity.

The price of silver was taken at $0.7085 per fine ounce. The figure quoted for value of bullion produced is subject to correction, as the prices realized by actual sales are higher or lower than that taken.

The El Bordo group produced 88,130 dry short tons of ore, of which 64,149 tons came from the El Bordo mine, 20,763 tons from El Cristo, and 3,218 tons from Malinche. All this ore was shipped to the mill of the Compania Beneficiadora de Pachuca, S. A., for treatment. The excess of revenue over expenditure, on the treatment of this ore, amounted to $101,062.72. This figure is subject to the proportion accruing to the owners of the El Bordo properties. The excess of revenue over expenditure is subject to correction, as the prices realized for the actual bullion sales are higher or lower than those taken.

The figures given for the quarter are based upon silver at $0.65 per fine ounce, whereas the monthly returns are based upon that price plus bullion sales adjustments.

The Inversiones company's estimated revenue for the quarter under review, after allowing for certain development expenses and charges to construction and equipment at Malinche, was $5,081.97.

Burma Corporation, Ltd.

Silver, Lead; Burma

A report of the operations of the Burma Corporation, Ltd., for the quarter ended Sept. 30, 1922, states that 41,427 tons of ore was extracted, having an average assay value of 23.9 oz. silver; 26.25 per cent lead and 16.3 per cent zinc. The tonnage extracted is equivalent to an output of 0.41 tons per man-shift employed underground. A total of 50,460 tons of ore was milled, averaging 22.2 oz. silver, 24.8 per cent lead, and 16.2 per cent zinc. This included 8,426 tons of stock material from the mine ore dumps averaging 21.9 oz. silver, 23.9 per cent lead and 18.9 per cent zinc; 27,414 tons of lead concentrates was produced, averaging 36.4 oz. silver, 40.6 per cent lead and 20.9 per cent zinc. A total of 32,962 tons of lead-bearing material was smelted, for a production of 11,763 tons of hard lead, assaying 97.26 oz. silver per ton. The refinery produced 10,290 tons of refined lead and 1,090,987 oz. refined silver.

ESTIMATED REVENUE AND EXPENDITURE

		Total		
Estimated gross revenue	Rs. 69,00,200	£460,013	6	8
Estimated operating expenditure	38,03,000	253,533	6	8
Estimated surplus over working expenditure	Rs. 30,97,200	£206.480	0	4
Debenture interest	Rs. 3,06,700	£20,446	13	0
Estimated income tax	4,20,000	28,000	0	4
Estimated depreciation on machinery and plant	6,08,600	40,573	6	0
Capital expenditure	5,57,800	37,186	13	8

Progress with the improvements to the treatment plant continued steadily and some units are completed and others approaching completion, with the result that its capacity has been greatly increased and is now in excess of the tonnage extracted by the available labor force at the mine.

Only a small number of the Chinese recruits have adapted themselves to underground conditions. These were entirely from the Chen "Nan" Chou district, to which an agent has been dispatched to continue recruitment of labor.

As a result of this disappointment, the labor position at the mine is unsatisfactory, and the number of shifts worked underground shows a progressive decline since May, when the seasonal laborers returned to their homes.

A recruiting agent has also been dispatched to India to investigate the possibility of obtaining labor.

Increased revenue due to increased output and improved metal prices necessitated increased provision for income tax.

Provision for depreciation increased approximately to the figure written off in 1921.

The sterling figures shown are based on the rate of exchange—Rs. 15 to the £.

MINING STOCKS

Week Ended Dec. 23, 1922

Stock	Exch.	High	Low	Last		Last Div.
COPPER						
Ahmeek	Boston	59	57½	57½	Dec. '22, Q	$1.00
Alaska-Br. Col.	N. Y. Curb	2	1⅛	1⅛	.....	....
Allouez	Boston	25¼	22	24½	Mar. '19	1.00
Anaconda	New York	51⅝	49¼	49¼	Nov. '20, Q	1.00
Arcadian Consol.	Boston	4¼	3	4	.....	....
Ariz. Com'l.	Boston	8	7⅛	7⅛	Oct. '18, Q	0.50
Bingham Mines	Boston	†18¼	†17¼	18	Sept. '19, Q	0.25
Calumet & Arizona	Boston	58	56	58	Dec. '22, Q	0.50
Calumet & Hecla	Boston	290	282	289	Dec. '22, Q	5.00
Canada Copper	N. Y. Curb	*3	*2	*3	.....	....
Centennial	Boston	8⅛	8	8⅛	Dec. '18, SA	1.00
Cerro de Pasco	New York	46⅜	44½	44⅞	Mar. '21, Q	0.50
Chile Copper	New York	28⅜	27⅝	28	.....	....
Chino	New York	26⅞	25⅛	26⅞	Sept. '20, Q	0.37
Copper Range	Boston	38	37	38	Mar. '22, Q	1.00
Crystal Copper	Boston Curb	1 3/16	1 3/16	1⅛	.....	....
Davis-Daly	Boston	3⅛	3	3	Mar. '20, Q	0.25
East Butte	Boston	8⅜	8¼	8⅛	Dec. '19, A	0.50
First National	Boston Curb	*44	*40	*40	Feb. '19, SA	0.15
Franklin	Boston	1⅛	1⅛	1⅛	.....	....
Gadsden Copper	N. Y. Curb	*70	*70	*70	.....	....
Granby Consol.	New York	27	26½	26½	May '19, Q	1.25
Greene-Cananea	New York	27	26½	27	Nov. '20, Q	0.50
Hancock	Boston	3	2½	2½	.....	....
Howe Sound	N. Y. Curb	2⅞	2½	2⅝	Jan. '21, Q	0.05
Inspiration Consol.	New York	37⅛	35⅛	36	Oct. '20, Q	1.00
Iron Cap	Boston Curb	5⅜	5⅛	5⅜	Sept. '20, K	0.25
Isle Royale	Boston	22¼	21⅛	22⅛	Dec. '22, K	0.50
Kennecott	New York	38	36⅛	36⅛	Dec. '20, Q	0.50
Keweenaw	Boston	1¼	1	1	.....	....
Lake Copper	Boston	3¼	3	3	.....	....
Magma Copper	New York	32⅝	31	31⅛	Jan. '19, Q	0.50
Mason Valley	N. Y. Curb	2	1⅛	1⅛	.....	....
Mass Consolidated	Boston	1⅛	1⅛	1⅛	Nov. '17, Q	1.00
Miami Copper	New York	27⅜	27	27⅛	Nov. '22, Q	0.50
Michigan	Boston	2½	2	2⅛	.....	....
Mohawk	Boston	59	57½	58	Nov. '22, Q	1.00
Mother Lode Coa.	New York	11⅜	10⅞	11	June '22, I	0.50
Nevada Consol.	New York	16¼	15½	16	Sept. '20, Q	0.25
New Cornelia	Boston	17⅞	17	17½	Nov. '22, Q	0.25
North Butte	Boston	10	9	9¼	Oct. '18, Q	0.25
Ohio Copper	N. Y. Curb	*61	*53	*55	.....	....
Old Dominion	Boston	19	17½	18	Dec. '18, Q	1.00
Osceola	Boston	32½	30¾	32	Dec. '22, K	1.00
Phelps Dodge	Open Mar.	†165	†155	....	Oct. '22, Q	1.00
Quincy	Boston	37	35	36½	Mar. '20, Q	1.00
Ray Consolidated	New York	15	14½	14⅝	Dec. '20, Q	0.25
Ray Hercules	N. Y. Curb	1½	1⅜	1⅜	.....	....
St. Mary's Min. Ld.	Boston	41	40	40⅛	Apr. '22, K	2.00
Seneca Copper	Boston	8⅛	7⅞	7⅞	.....	....
Shannon	Boston	*85	*60	*80	Nov. '17, Q	0.25
Shattuck Arizona	New York	9	8⅛	8⅛	Jan. '20, Q	0.25
South Lake	Boston	*25	*25	*25	.....	....
Superior & Boston	Boston	2⅛	1⅜	2⅛	.....	....
Tenn. C. & C. cfs.	New York	10⅛	9⅛	10⅛	May '18, I	1.00
Tuolumne	Boston	*65	*55	*55	May '13,	0.10
United Verde Ex.	N. Y. Curb	28	27	27	Nov. '22, Q	0.25
Utah Consol.	Boston	2	1½	1 1/16	Sept. '18,	0.25
Utah Copper	New York	65	63¼	64	Sept. '22, Q	0.50
Utah Metal & T.	Boston	*99	*93	*93	Dec. '17,	0.30
Victoria	Boston	1⅜	1⅜	1⅜	.....	....
Winona	Boston	1¼	1¼	1¼	.....	....
Wolverine	Boston	8	8	8	.....	....
NICKEL-COPPER						
Internat. Nickel	New York	14	13⅜	13⅜	Mar. '19,	0.50
Internat. Nickel, pfd.	New York	65⅛	64⅜	64⅜	Nov. '22, Q	1.50
LEAD						
Carnegie Lead & Zinc	Pittsburgh	4⅜	4⅜	4⅜	.....	....
National Lead	New York	129	122	127	Sept. '22, Q	1.50
National Lead, pfd.	New York	112¾	112¼	112½	Dec. '22, Q,	1.75
St. Joseph Lead	New York	19	18¼	18⅜	Dec. '22, Q, X	0.50
ZINC						
Am. Z. L. & S.	New York	16⅛	16	16¼	May '20,	1.00
Am. Z. L. & S. pfd.	New York	52	50	51	Nov. '20, Q	1.50
Butte C. & Z.	New York	10	9½	9½	June '18,	0.50
Butte & Superior	New York	33⅜	31⅜	31⅞	Sept. '20,	1.25
Callahan Zn-Ld	New York	9⅜	9	9½	Dec. '20, Q	0.50
New Jersey Zn.	N. Y. Curb	173⅜	169	172⅝	Nov. '22, Q	2.00
Yellow Pine	Los Angeles	*75	*75	*75	Sept. '20, Q	0.03
SILVER						
Batopilas Mining	New York	⅛	⅛	⅛	Dec. '07, I	0.12½
Beaver Consol.	Toronto	*29	*28½	*28½	May '20, K	0.03
Candelaria	N. Y. Curb	*31	*27	29	.....	....
Coniagas	Toronto	1.90	1.90	1.90	May '21, Q	0.12½
Crown Reserve	Toronto	*31	*30	*31	Jan. '17,	0.05
Kerr Lake	N. Y. Curb	....	....	3	Oct. '22, Q	0.12½
La Rose	Toronto	*25	*23	*25	Apr. '22,	0.10
McKinley-Dar.-Sav.	Toronto	*22	*19	*21	Oct. '20, Q	0.03
Mining Corp. Can.	Toronto	*97	*97	*97	Sept. '20, Q	0.12½
Nipissing	N. Y. Curb	6	5⅜	5⅜	Oct. '22, Q, X	0.30
Ontario Silver	New York	†6½	†5½	5⅝	Jan. '19, Q	0.50
Temiskaming	Toronto	*33	*32	*33	Jan. '20, K	0.04
Trethewey	Toronto	5	3¼	3¼	Jan. '19,	0.05

Stock	Exch.	High	Low	Last		Last Div.
GOLD						
Alaska Gold	New York	⅛	⅛	⅛	.....	....
Alaska Juneau	New York	1⅛	1⅛	1⅛	.....	....
Atlas	Toronto	*14	*10	*14	.....	....
Carson Hill	Boston	7½	6½	7⅜	.....	....
Cresson Consol. G.	N. Y. Curb	2⅛	2⅛	2⅛	Oct. '22 Q.	0.10
Dome Mines	New York	44	42½	44	Oct. '22, Q	0.50
Golden Cycle	Colo. Springs	*91	*50	*91	June '21, Q	0.02
Hollinger Consol.	Toronto	12.10	11.95	12.00	Dec. '22,	0.05
Homestake Mining	New York	†81	†79	80¾	Nov. '22, M	0.50
Keora	Toronto	*8½	*8½	*8½	.....	....
Kirkland Lake	Toronto	*40	*40	*40	.....	....
Lake Shore	Toronto	2.86	2.83	2.85	Nov. '22, Q	0.02
McIntyre- Porcupine	Toronto	18.30	18.15	18.30	Sept. '22, K	0.25
Porcupine Crown	Toronto	*18	*18	*18	July '17,	0.03
Portland	Colo. Springs	*38	*38	*38	Oct. '20, Q	0.01
Schumacher	Toronto	*45	*45	*45	.....	..
Teck Hughes	Toronto	*81¼	*75	*81¼	.....	..
Tom Reed	Los Angeles	*70	*70	*70	Dec. '19,	0.02
United Eastern	N. Y. Curb	1⅛	1⅛	1 1/16	Oct. '22, Q	0.15
Vipond Cons.	Toronto	*75	*61	*70	.....	..
White Caps Mining	N. Y. Curb	*10	*9	*10	.....	....
Wright-Hargreaves	Toronto	3.15	3.05	3.05	Oct. '22,	0.05
Yukon Gold	N. Y. Curb	*80	*76	*80	June '18,	0.02½
GOLD AND SILVER						
Boston-Mont. Corp.	N. Y. Curb	*25	*14	*17	.....	....
Cons. Virginia	San Francisco	*12½	*10½	*11½	.....	....
Continental Mines	N. Y. Curb	5	4½	5	.....	....
Dolores Esperanza	N. Y. Curb	2	1⅞	1⅞	Oct. '22	2.50
Tonopah Belmont	N. Y. Curb	1 1/16	1 1/16	1 1/16	July '22, Q	0.05
Tonopah Divide	N. Y. Curb	*70	*68	*68	.....	....
Tonopah Extension	N. Y. Curb	4	3⅜	3⅜	Oct. '22, Q	0.05
Tonopah Mining	N. Y. Curb	1 1/16	1 1/16	2 1/16	Oct. '22, SA, X	0.07½
West End Consol.	N. Y. Curb	1⅛	1⅛	1⅛	Dec. '22, Q.	0.05
SILVER-LEAD						
Caledonia Mng.	N. Y. Curb	...	...	*8	Jan. '21, M	0.01
Cardiff M. & M.	Salt Lake	...	...	*35	Dec. '20,	0.15
Chief Consol.	Boston Curb	5⅛	4⅞	5	Nov. '22, Q	0.10
Columbus Rexall	Salt Lake	*16½	*13	*16½	Aug. '22,	0.03
Consol. M. & S.	Montreal	...	...	24¾	Oct. '20, Q	0.62½
Eagle & Blue Bell	Boston Curb	†3	†2	3	Nov. '22, K	0.05
Federal M. & S.	New York	†12½	†9	10	Jan. '09,	1.50
Federal M. & S. pfd.	New York	52¼	51	52¼	Dec. '22, Q	1.25
Florence Silver	Spokane	*37	*36	*36	Apr. '19,	0.01½
Hecla Mining	N. Y. Curb	8	7⅞	7⅞	Dec. '22, Q, X	0.50
Iron Blossom Con.	N. Y. Curb	*29	*28	*29	Apr. '22, Q	0.02½
Marsh Mines	N. Y. Curb	*7	*5	*6	June '21, I	0.02
Park City	Salt Lake	3.40	3.35	3.40	.....	....
Prince Consol.	Salt Lake	...	...	*8½	Nov. '17,	0.02½
Silversmith	Spokane	*50½	*47	*50	Oct. '22,	0.01
Simon Silver Lead	N. Y. Curb	...	...	*30	.....	....
Tamarack-Custer	Spokane	3.50	3.10	3.45	Jan. '21, K	0.04
Tintic Standard	Salt Lake	3.25	2.90	3.25	Dec. '22, Q, X	0.10
Utah Apex	Boston	3	2 1/16	3	Nov. '20, K	0.25
IRON						
Bethlehem Steel "B"	New York	64	59½	59½	Oct. '22	1.25
Char. Iron	Detroit	⅜	⅜	⅜	.....	....
Char. Iron, pfd	Detroit	1¾	1¾	1¾	.....	....
Colorado Fuel & Iron	New York	25	24½	24½	May '21	0.75
Col. Fuel & Iron, pfd.	New York	...	...	105	Nov. '22	2.00
Gt. North'n Iron Ore	New York	31½	30⅝	31	Dec. '22	1.00
Inland Steel	N. Y. Curb	43½	43½	43½	Dec. '22	0.25
Mesabi Iron	N. Y. Curb	12⅝	12⅛	12⅛	.....	....
Reologle Steel	New York	26⅜	23½	23½	.....	....
Republic I. & S.	New York	47½	44	45½	May '21	1.50
Republic I. S., pfd.	New York	82¼	81½	82½	Jan. '22	1.75
Sloss-Sheffield S. & I.	New York	39½	39½	39½	Feb. '21	1.50
U. S. Steel	New York	108¼	105⅝	106½	Sept. '22	1.25
U. S. Steel, pfd.	New York	121½	120⅜	121	Nov. '22	1.75
Virginia I. C. & C.	New York	54½	53⅜	53⅜	Jan. '22	1.50
Virginia I.C.&C., pfd.	New York	†85	†77½	80	July '22	2.50
VANADIUM						
Vanadium Corp.	New York	36¼	33¼	33¼	Jan. '21, Q	1.00
ASBESTOS						
Asbestos Corp.	Montreal	...	...	66½	Oct. '22, Q	1.50
Asbestos Corp. pfd.	Montreal	...	...	85	Oct. '22, Q	1.75
SULPHUR						
Freeport Texas	New York	20	16½	20	Nov. '19, Q	1.00
Texas Gulf	New York	60⅛	56¾	60	Dec. '22, QX	2.00
PLATINUM						
So. Am. Gold & P.	N. Y. Curb	3½	3½	3½	.....	....
MINING, SMELTING AND REFINING						
Amer. Metal	New York	51¾	49⅜	51¼	Dec. '22, Q	0.75
Amer. Metal pfd.	New York	115	112½	115	Dec. '22, Q	1.75
Amer. Sm. & Ref.	New York	58	55⅜	56	Mar. '21, Q	1.00
Amer. Sm.& Ref. pfd	New York	99⅞	97¼	99⅜	Dec. '22 Q	1.75
Am. Sm. Sec. pfd. A.	New York	†102	†100	101½	Oct. '22, Q	1.50
U. S. Sm. R. & M.	New York	38⅛	36⅞	36⅛	Jan. '21, Q	0.50
U.S. Sm.R.& M. pfd.	New York	46¼	46¼	46¼	Oct. '22 Q	0.87½

*Cents per share. †Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. K, Irregular. I, Initial. X, Includes extra.

Toronto quotations courtesy Hamilton B. Wills; Spokane, Pohlman Investment Co.; Salt Lake, Stock and Mining Exchange; Los Angeles, Chamber of Mines and Oil; Colorado Springs, Colorado Springs Stock Exchange.

NEW MACHINERY AND INVENTIONS

Electric Welding Machines

Two portable electric arc welding machines have recently been placed on the market by the Ohio Brass Co., Mansfield, Ohio. The lightweight welder is a particularly convenient machine, which weighs 46 lb. and is intended primarily for rail bonding. The resistance is made up of coils of nickel-chromium wire mounted, by a patented method, on refractory porcelain insulators. Ventilation has been well taken care of in the machines, which operate well below the critical temperature of the resistance wire. This welder operates on any line potential from 175 to 275 volts. Four knife switches control the welding current.

Machine for repair welding and rail bonding

It is possible with these switches to get ten combinations giving current values from 20 to 150 amperes.

The shunt welder is also a resistance machine, but with a shunt connection which is used when the work is positive in polarity and the electrode negative. With this shunt in use, the machine has practically the same characteristics as a motor-generator outfit—that is, low voltage, short arc, and uniform welding heat. The welds made in this manner are tough and machinable.

If desired, the shunt machine may be used, unchanged, as a straight resistance machine. It may be used with the shunt for repair welding and without the shunt for rail bonding. The resistance element in the machine is the same type as the other new welder. The welder will stand a continuous short circuit at 280 volts without overheating. It is used on any line potential from 150 to 280 volts. It weighs about 100 pounds.

INDUSTRIAL NOTES

Possible Markets for Mining Machinery and Mill Equipment

Recent reports indicate a possible market for mining machinery and mill equipment among newly developed and large producing gold mines in northern Ontario, says Vice-Consul H. S. Tewell, of North Bay, Ontario, in a dispatch to the Department of Commerce. Since many new mines are far removed from railroads, the winter season is generally found the most desirable for delivering heavy machinery, as it may be easily hauled over the snow.

The Hollinger Consolidated Gold Mines, it is reported, has decided to increase the present mill capacity from 4,000 to 8,000 tons a day. It has also been said that this company will proceed at once with work preliminary to developing hydro-electric power at Three Carrying Places, on the Abitibi River. The cost of the project is estimated at $2,000,000.

It is also reported that the McIntyre-Porcupine mine will increase its mill capacity from 750 to 1,000 tons a day. The daily capacity last year was 550 tons.

The Nighthawk Peninsula mine plans the installation of a 400-ton mill in the early spring. Concrete work for the building has already been completed.

The Goudreau gold mine reports the discovery of large quantities of rich ore, after extensive development, covering a period of six months. Information is current that arrangements will be made to construct a mill for spring work.

The Davidson Consolidated gold mine is said to be financed for development on a large scale, including the construction of a mill. English capital is largely interested in this enterprise.

The property of the Buffalo-Kirkland mine is understood to have been acquired by the Kirkland-Hudson Bay mine, which will be equipped with a mining plant at once.

American Pumps in South Africa

Seventy-five per cent of the centrifugal pumps used in South Africa are of American manufacture, says Consul Charles J. Pisar, in a report to the Department of Commerce. They are used mostly where water can be obtained from rivers or streams. As there are not many streams in South Africa, and none at all in a large part of the plateau region, there are no extensive areas where centrifugal pumps can be used. The cost of fuel for the engines operating these pumps has always been high, and this has militated against a more extensive use of such pumps. There are, however, in the Cape Province, a number of rivers which flow in deep channels so much below the level of the adjoining irrigable ground that the cost of irrigating by means of canals or dams is prohibitive, and the only method available is to raise the water onto the land by means of pumps. This method is not yet being used extensively, as the cost per acre of irrigating in this manner has been too high to be of any economic value.

The duty on pumps imported is 3 per cent ad valorem, except for those imported from Great Britain or its colonies, on which no duty is charged. This, however, does not offer a serious handicap to American pump manufacturers, and the increasing demand for windmills and pumps, the consul believes, offers them an excellent opportunity to enlarge their business in South Africa.

Most of the large pumps used in the mining industries, in raising water from the lowest levels in the gold mines, 4,000 to 6,000 ft. below the surface, are imported from England and Switzerland, and to a smaller extent from the United States. Fully 90 per cent of the pumps imported for farm use come from the United States.

The Bucyrus Co., South Milwaukee, Wis., announces the addition to its sales force of John J. Gault. Mr. Gault will be attached to the Chicago office of the Bucyrus company, at 622 McCormick Building, Chicago.

TRADE CATALOGS

Driers—A new 4-p. bulletin, covering in a concise manner the principles of operation of the various types of Ruggles-Coles driers, has just been published by the Ruggles-Coles Engineering Co., 120 Broadway, New York. This publication is the result of the demand of many engineers to get information on drying problems in a concrete way so as to save their time and yet present facts which are of particular importance to them and allow them to get preliminary information at least on the class of drier they would require for the particular problem at hand.

Valves—Reading Steel Casting Co., Inc., Bridgeport, Conn., has issued an 8-p. circular illustrating and describing the company's new cast-steel gate valves. Important features of this valve include: Special design of the main castings; design of split wedge, particularly the method of securing the wedge to face ring; metal-to-metal bonnet joint, with studs of 100,000 lb. metal used for the bolting; provision for easy and sure operation under emergency conditions by machining body guides and cars on wedges; deep stuffing box and condensing chamber; ball joint between steel gland and bronze follower to prevent binding of spindle; bonnet and yoke cast integral to insure strength and straight bore for the spindle, and all parts of steel.

Volume 114 December 30, 1922 *Number* 27

ENGINEERING & MINING JOURNAL-PRESS

JOSIAH EDWARD SPURR, *Editor*

TENTH AVENUE AT 36TH STREET, NEW YORK CITY

Contents

*Illustrated Article

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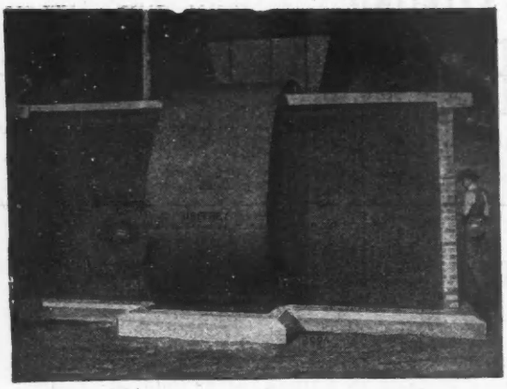
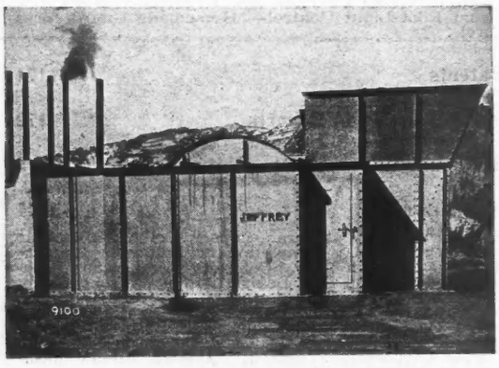


Double Inlet Primarily Exhaust Reversible Fan installed at a drift mine. Normal capacity 150,000 cu.ft. at 3-in. water gauge.



Double Inlet Exhaust Fan fitted with steel side drifts installed at a slope mine. Capacity 130,000 cu.ft. at 2-in. water gauge.

Double Inlet Reversible Fan. Capacity 200,000 cu.ft. at 3-in. water gauge.

Double Inlet Blowing Fan installed at a shaft mine. Note displaced propeller type in back-ground. Capacity 100,000 cu. ft. at 3-in. water gauge.

Efficient Ventilation a Vital Problem to the Mine Owner

With the vast and urgent demand now being made upon the mines, production must be speeded up beyond a normal output.

If your miners and underground workmen are to bring production records up to top-notch, your mine must be equipped with an adequate ventilation system.

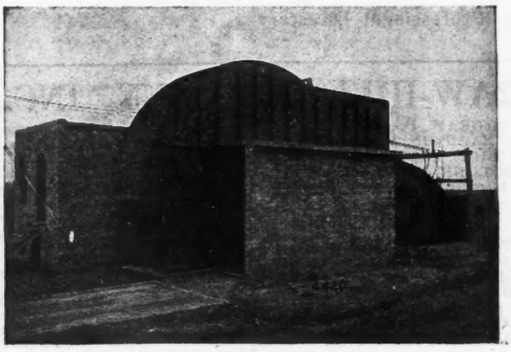
The old wooden housed fans still found in many mines today are not only a source of danger but should be scrapped on account of their wasteful power consumption.

JEFFREY
MINE FANS

are built to meet every condition found in the mining field, and the services of our mine ventilation experts are furnished free to any one who may desire to increase or improve their ventilation.

Send for Mine Fan Catalog No. 280-A, also Straitflo Fan Bulletin No. 348-E.

The Jeffrey Manufacturing Co.
974-99 North Fourth Street, Columbis, Ohio



Double Inlet Primarily Blowing Reversible Fan installed at a shaft mine. Capacity 350,000 cu.ft. at 4-in. water gauge.

9745B

Records Prove Worth of Leyner-Ingersoll Drifters

Consult repair part cost sheets, also consult figures showing the footage drilled by Leyner-Ingersoll Drifters.

Notice how low is the upkeep cost per foot of hole drilled.

These records will prove that "Leyner-Ingersolls" stay underground on the job doing satisfactory work.

Results are what count with you.

These records form the best basis for your future drill specifications. After a careful analysis you will always specify "Leyner-Ingersolls."

Ask the drill operator. Talk to the drill "Doctor," consult the records and

Request Bulletin No. 4038.

Ingersoll-Rand Co., 11 Broadway, New York

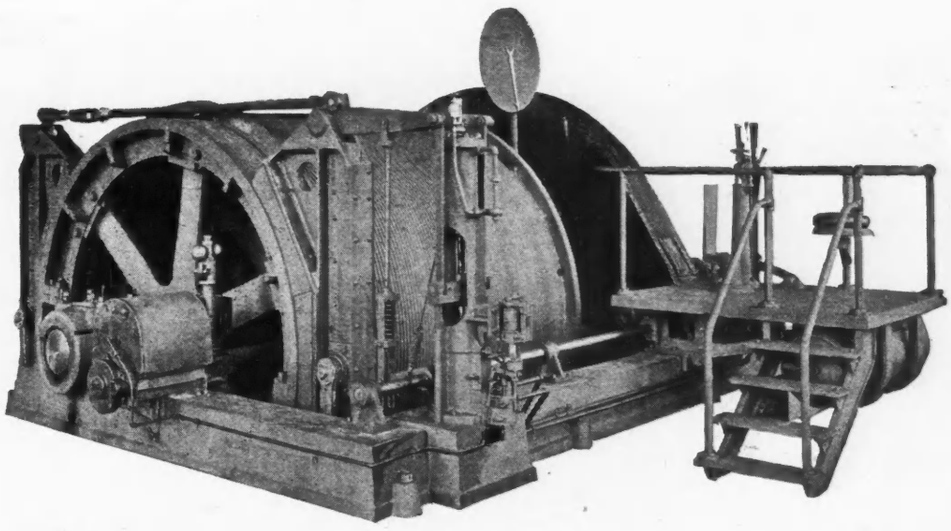
The Ingersoll-Rand Company manufactures all types of rock drilling and accessory equipment

Jackhamers
Stopehamers
Drifters
Drill Sharpeners
Oil Furnaces
Compressors
Pumps
and

PRICE · PR · OIL ENGINES

112-L1

Ingersoll-Rand



Hoisting iron ore up a 2,000 foot shaft—

Other Products:

Electric Hoists
Steam Hoists
Steam Locomotives
Gasoline Locomotives
Rotary Kilns, Dryers, Coolers and Roasters
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Cages and Skips
Sheave Wheels
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Gears, Moulded and Cut Teeth
Special Machinery

At a Michigan Iron Mine we have a single cylindrical 10-foot drum Hoist, hoisting cars up a 2000-foot shaft.

The hoist is operated by a 400-hp. motor and two lines of rope hoist "in balance."

Complete protection to life and property is afforded by Vulcan Safety Devices and the Vulcan Power Brake.

Vulcan Engineers can advise you the type to suit your conditions

VULCAN IRON WORKS
1733 Main St., Wilkes-Barre, Pa.

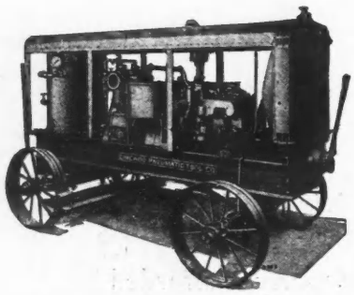
VULCAN OF WILKES-BARRE
HOISTS

BQ-46 Hammer Drill. Widely used for demolishing old buildings, concrete walls, heavy concrete forms and concrete foundations; also, drilling anchor bolt holes.

CP-8D Light Drifter. Does the work of heavier drifters. Combines light weight, 79 pounds, with high cutting speed. Successfully used in hard, difficult or soft formations. Sixteen to forty pounds lighter than other similar-class drills.

Boyer Clay Digger. Indispensable for excavating in close quarters, trimming walls, headings and similar work.

Chicago Pneumatic Products for



CP Class P2-DGL Gasoline Driven Portable Air Compressor, similar to three used by the Beaver Engineering and Contracting Company in laying gas mains at Poughkeepsie, N. Y. Auto-Pneumatic Throttle effects a marked saving in fuel and lubricant. Capacities, 128, 160 and 210 cu. ft. per minute. Request Bulletin 647.

LIKE the Beaver Engineering and Contracting Company, New York, laying 20 and 24-inch gas mains at Poughkeepsie, New York, and Mason and Hanger, driving a tunnel at Readsboro, Vermont, through which will be supplied water power for the New England Power Company, and Dan Pfahl and Company, Cleveland, scores of contractors are using CP products. Captions underneath products illustrated and the following data explain why:

CP-5S Mounted Sinker Rock Drill, Wet, weight 112 pounds, tripod 287 pounds, using 1¼-inch round hollow steel with lug shank, averaged 150-200 feet of hole in a large limestone quarry, as against 3¼-inch piston drill weighing about 330 pounds, tripod 550 pounds. Over twice the work with 55% less weight.

CP-5 Mounted Sinker Rock Drill, Dry, in several tests conducted in varying formations, equalled and even excelled 160 and 170-pound drifters on opposite face.

BQ-46 Hammer Drill, for all kinds of de-

*Sales and*Service Branches all over the World*

*Birmingham	*Cleveland	Erie	*Los Angeles	*New York	Salt Lake City	*St. Louis
*Boston	Denver	Franklin	Milwaukee	*Philadelphia	*San Francisco	Tulsa
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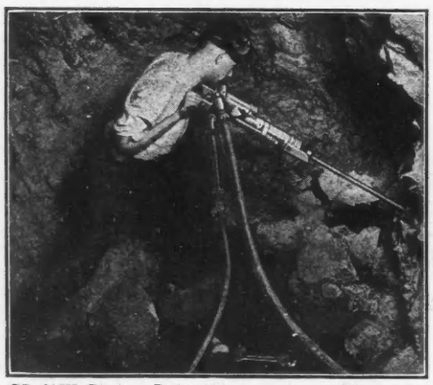
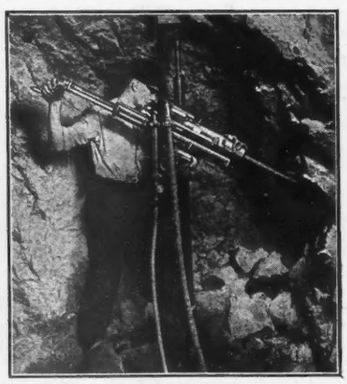
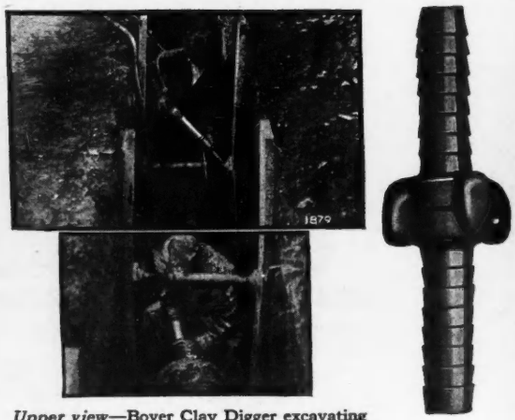


CP-10W Sinker Drill, Wet, cutting drilling costs for the Princeton Gold Mines, Mt. Bullion, Cal. In contracting field, useful for excavations, road work, digging pipe-line and conduit trenches, breaking boulders and pavement.



CP-5W Mounted Drifter, Wet, speeding-up drilling for the United Mine Company, Oatman, Arizona. High cutting speed in various formations is assured by rapid, powerful blows with strong rotation. Weight 112 pounds. Economical drilling depth, 8-12 feet.



Upper view—Boyer Clay Digger excavating trench. *Lower view*—Boyer BK-2 Calking Hammer calking water main. *At right*—Chicago Universal Hose Coupling.

BK-2 Calking Hammer. Widely used for calking water mains, etc. Same type as used by the Beaver Engineering and Contracting Company, and other prominent contractors. Request Bulletin 810.

CP-5 Drifter, column mounted. Thirty to 60 pounds lighter than heavy mounted drifters. Insures quicker set-ups.

CP-10 Sinker Drill, Dry. Especially adapted for heavy sinking and long down-hole drilling in stubborn formation. Weight, 56 pounds. Economical drilling depth, 14-16 feet.

Contracting — Mining — Industrial Fields

molition work, is as productive as from 10 to 12 men. For example, two BQ-46 Hammer Drills, in 7½ hours, broke 112 feet of concrete, 15 inches thick, 2½ feet wide—the equivalent of 10 men using hand methods, working 24 hours, or a difference of 225 man-hours.

CP-8 Rock Drill drills three feet in about two minutes.

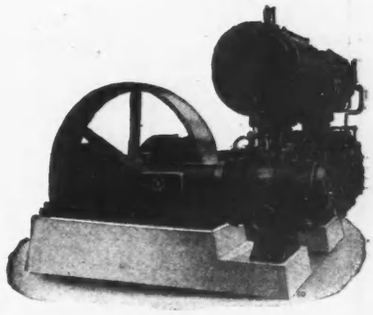
Boyer Clay Digger "keeps three shovelers busy."

Boyer BK-2 Calking Hammer sets a new pace in calking water main joints.

CP Class P2-DGL Portable Air Compressors, combining liberal capacity and light weight, quickly *go to the job!* Obtainable in three capacities and two types.

CP Type AR Backfill Tampers do more and better work in backfilling. They tamp the earth with a lasting hardness, replacing all removed earth, and reducing repair expense by making street repairs less frequently necessary.

Name your contracting needs—there's a CP product to meet them. Engineering Service, try-outs, demonstrations, and bulletins available without obligation. Telegraph, telephone, write or call nearest CP Branch—*today!*

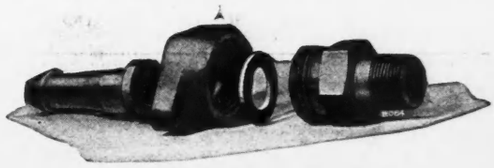


CP Class O-CB Two-Stage Belt-Driven Air Compressor, capacities, 511 to 1884 cu. ft. per minute, similar to three used by Mason and Hanger, contractors, in tunneling operation at Readsboro, Vermont. Request Bulletin 400.

Chicago Pneumatic Tool Co.

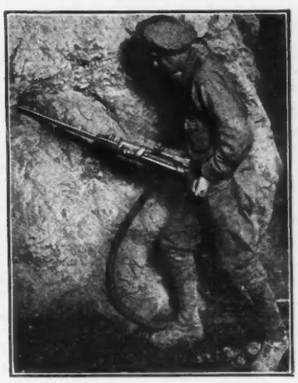
Chicago Pneumatic Building **6 East 44th Street, New York**

CP Rock Drill Hose Coupling, assembled.



CP Rock Drill Hose Coupling, disassembled.

CP Cord Air Hose. Strong. Durable. Tough covering. Braided construction. Request Folder 593.



CP-8W Sinker Drill, Wet, adapted for general, all-around drilling, serving the Golden King Mining Company, Randsburg, Cal.

CP-10 Sinker Drills, Dry, team-working for the Brooklyn Edison Company, Brooklyn, N. Y.

J-89

No. 5

OF A SERIES OF ARTICLES PICTURING THE INFLUENCE OF THE ENGINEER IN THE AFFAIRS OF THE WORLD. PRESENTED BY THE McGRAW-HILL COMPANY, INC , WHOSE PUBLICATIONS HAVE SERVED THE ENGINEER THROUGH HALF A CENTURY OF INDUSTRIAL PROGRESS

THE SAFETY OF INDUSTRY

SOME four centuries ago Leonardo da Vinci wrote a treatise on flying in which he endeavored, though not with entire correctness, to describe the mechanism of a bird's flight. It took the intervening centuries to make his theory a fact; and theory is valuable only when it becomes a fact.

¶ It is the irrefutability of basic facts which gives the modern engineer the leadership in many of our greatest and most essential undertakings.

¶ In his hands he holds the safety of this industrial age. Not merely its commercial stability, but the solution, as well, of many of our problems of government, of the revision of ethical principles, the defining of international agreements. From his statistical data will be gleaned much of the means for the social and material reconstruction of the world.

¶ The rise of the engineer as a leader in thought development has been rapid. It has come through proof of his ability to analyze, deduce and conclude; and then to put these findings into action, to express energy in terms of fact.

¶ An impressive proof of his leadership is his being found among the directors of many important financial, commercial and industrial corporations. And when an engineer speaks his associates give heed. For he does not surmise, he states facts; he does not offer conjecture or guesses, he submits statistical evidence.

¶ These newly risen leaders are the producers of facts, the originators of statistics, the developers of proofs. Theirs is the science of truth. They deal with absolutes, yet have no dogmas, for their absolutes are bases for operations, not limitations of practice.

¶ No new truth startles the engineer. He is able to see the combinations of circumstance which lead to the one and only possible conclusion which the new truth proclaims. The engineer gives the safety of certainty to industry.

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Electrical World

Electrical Merchandising

American Machinist

Industrial Engineer (Published in Chicago)

Engineering and Mining Journal-Press

American Machinist European Edition (London)

Power

Engineering News-Record

Bus Transportation

Electric Railway Journal

Ingenieria Internacional (Printed in Spanish)

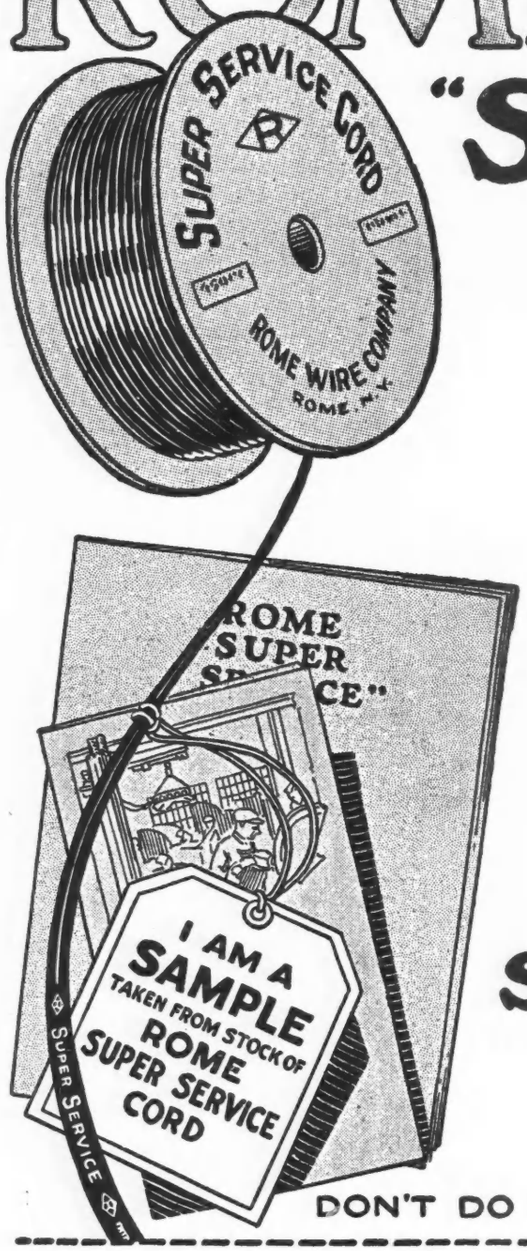
Chemical and Metallurgical Engineering

Journal of Electricity and Western Industry (San Francisco)

McGRAW-HILL COMPANY · INC ·

NEW YORK

ROME WIRE



"Super Service" Cord and Cable

1 Rome Super Service Cord and Cable is new—new in construction—new in the service it renders—new in the terrific tests it withstands. Fit for the toughest job in every service where endurance counts.

2 Fine stranded copper, effectively insulated and built up with cotton and rubber, over all a heavy layer of Super Service 60% rubber with embedded cords, vulcanized in steel molds under tons of pressure.

3 Send for a sample, get a bit of it between your hands, feel that moulded-on name, try to break it, tear it, cut it—treat it to the most destructive tests you know—and know why we call it Super Service.

So— You Snip the Coupon— We Ship the Sample

DON'T DO IT TO DAY — DO IT NOW !!!

TO THE ROME WIRE COMPANY, 155 RAILROAD STREET, ROME, NEW YORK
PLEASE SEND THAT SAMPLE OF ROME SUPER SERVICE PERSONALLY TO:

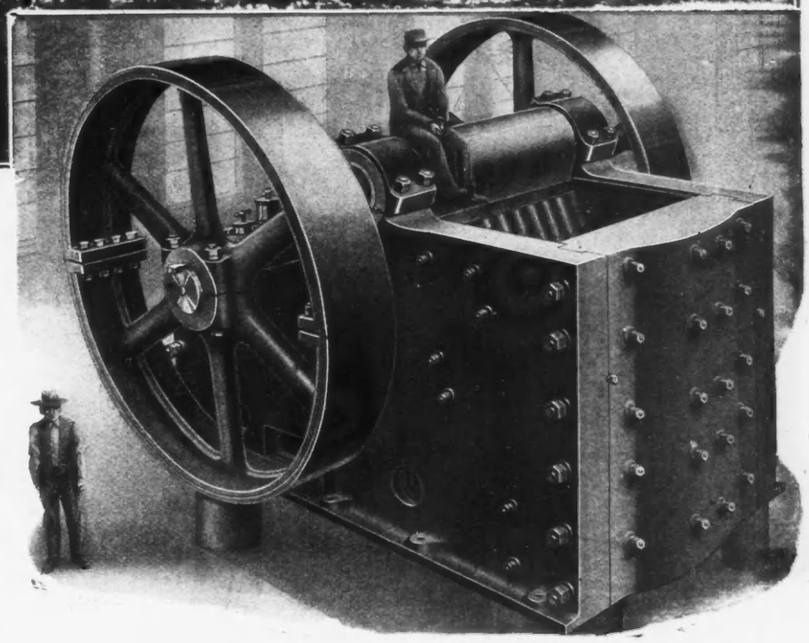
*Name:*_____ *Company:*_____

*Address:*_____

Check Kind Wanted
- Super Service Cable ☐
- Super Service Cord ☐
- Super Service Heater Cord ☐

2109-L

WIRE-ROME



Back of the Plant
Stands the Crusher
and
Back of the Crusher—

Co-operation

The time has passed when you look upon the purchase of a Rock Crusher as simply buying so much tonnage in steel or in iron, or as an isolated piece of equipment without reference to your *whole plant.*

The time has passed when Mine Operators can afford to ignore the importance of *better methods in plant* operation—methods in which correct crusher purchase and crusher operation play a vitally important part.

Not simply to buy an ore crusher, *but to do more efficient ore crushing*—in this direction lies the path to greater profits.

The old-time crusher salesman is out of date. It is not so important to know how any given crusher is *built* as it is to be certain what it will *do* for you—how it will fit into your operations—whether you are operating in a way calculated to work the crusher to full 100% capacity and efficiency.

There are many crushers running today at 50 to 75% capacity that might be running at 100% under different conditions.

There are many 600-tons-an-hour Crushers being bought by plants which use them to crush only 300 tons per hour—other crushers running idle a good part of the time.

Many circumstances are to blame for this—the manner of blasting, the size of steam shovels in service, the arrangement of primary and secondary crushers, etc.

It is clear, then, that in the purchase of a crusher you need the skilled co-operation of an experienced company whose aim is to sell **efficient crushing first and efficient crushers second.** In some cases you may discover —with their help—that you can use a smaller, less expensive crusher than you thought possible. In others, that a given crusher will produce far greater tonnage by different methods in blasting, shovel operation or plant arrangement.

These considerations apply to the large and small mine operator — to any man who owns and operates a crushing plant. They apply to the purchase of any type of crusher—but in particular to Buchanan Crushers, backed as they are by an organization prepared and competent to co-operate, to study your problems, to work with your men as regards methods of blasting and the many other factors that influence production—in short, prepared to assist you in securing more efficient crushing as opposed to the mere sale of more crushers.

C. G. BUCHANAN CO., Inc.

West and Cedar Streets, New York

"Not simply to sell Rock Crushers-but more efficient Rock Crushing!"—

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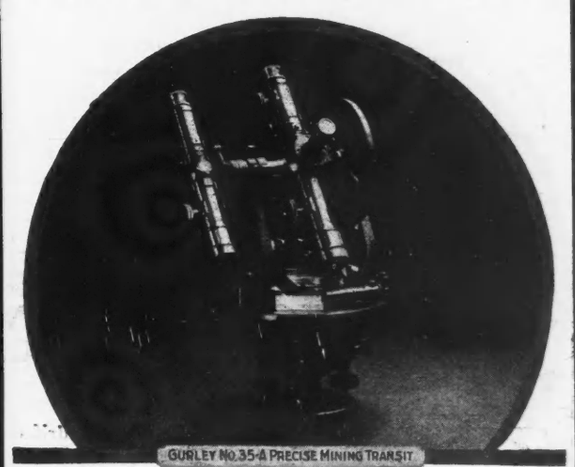

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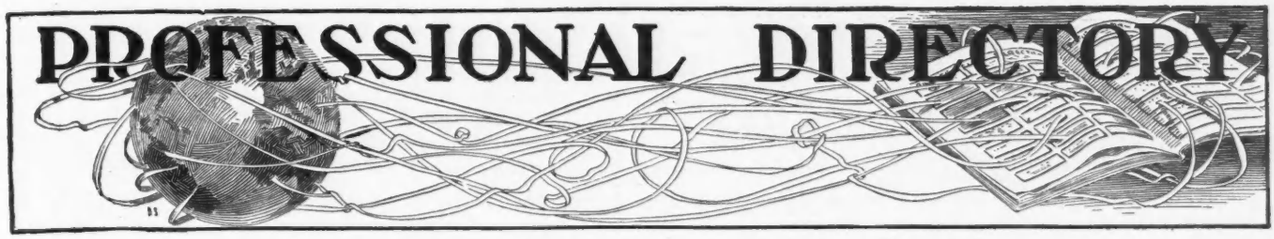

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New York Engineering Co.
Union Construction Co.
Yuba Manufacturing Co.

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Bucyrus Co.

Dredges, Elevator
Marion Steam Shovel Co.

Dredges, Placer
Bucyrus Co.

Dredging Machinery
Mundy Hoisting Engine Co.

Drill Rock
Cleveland Rock Drill Co.

Drills, Air
Chicago Pneumatic Tool Co.

Drills, Churn
Union Construction Co.

Drilling, Core
Longyear Co., E. J.
McKiernan-Terry Drill Co.
Pennsylvania Drilling Co.
Sullivan Machinery Co.

Drills, Air and Steam
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Drills, Core
Dobbins Core Drill Co., Inc.
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Longyear Co., E. J.
McKiernan-Terry Drill Co.
Std. Diamond Drill Co.
Sullivan Machinery Co.

Drills, Diamond
Diamond Drill Contracting Co.
Longyear Co., E. J.
Std. Diamond Drill Co.
Sullivan Machinery Co.

Drills, Electric
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.
Jeffrey Mfg. Co., The

Drills, Hammer
Chicago Pneumatic Tool Co.
Cleveland Rock Drill Co.
Denver Rock Drill Mfg. Co.
Ingersoll-Rand Co.
McKiernan-Terry Drill Co.
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Drills, Piston
Ingersoll-Rand Co.
Sullivan Machinery Co.

Drills, Prospecting
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Sullivan Machinery Co.

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Vulcan Iron Works

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Engineers, Metallurgical
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Worthington Pump & Mchy. Corp.

Engines, Gas and Gasoline
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Chicago Pneu. Tool Co.

Engines, Hoisting
Mundy Hoisting Engine Co.
Ottumwa Iron Works

Engines, Oil
Chicago Pneu. Tool Co.
Ingersoll-Rand Co.

Engines, Steam
Allis-Chalmers Mfg. Co.
Ingersoll-Rand Co.

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Excavating Machinery
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Braun-Knecht-Heimann-Co.
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Braun-Knecht-Heimann-Co.
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For refining minerals and ores—

Many engineers are surprised at the unusually wide range of service performed in the mining field by the different types of Dings Magnetic Separators.

Among the uses suggested here, it is likely there is an application that will prove profitable for you.

* * *

Millions of tons of magnetite ore are produced in the Appalachian iron ore district by means of magnetic separation of low grade, high phosphorous ores.

* * *

One of the world's largest zinc mines (in New Jersey) is employing magnetic separation in producing thousands of tons of zinc yearly.

* * *

Magnetic separators are extracting tungsten from the mixture of tin and wolfram. These are usually found together, and together they are worthless. Magnetic separation is the only known means of separating them satisfactorily.

* * *

In placer gold mining the free gold is associated with substances of more or less magnetic susceptibility. An adjustment of magnetic intensity may be made to extract these substances either individually or together.

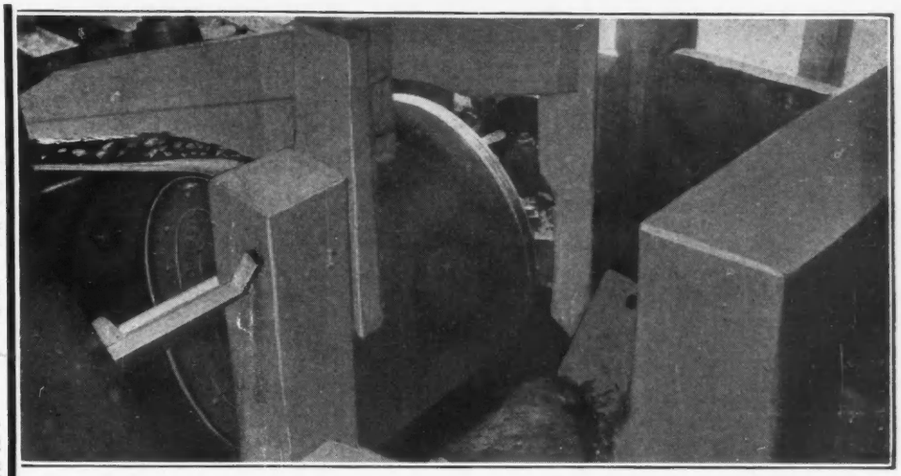
* * *

The sulphide in copper ores when slightly roasted becomes magnetic and may therefore be extracted from its associated gangue.

In addition to the foregoing uses, magnetic separation is used in the concentration or refining of manganese, barytes, asbestos, salt, corundum, garnet, lead, clay, nickel, titanium—to mention only the more important uses.

Laboratory Service Free

A laboratory is maintained for determining the results of magnetic reduction of specimens of ore or minerals submitted. This service is free and incurs absolutely no obligation.



The Pulley Type Dings Magnetic Separator shown above is handling 35 tons of lead ore an hour at Shattuck-Arizona Copper Company, Bisbee, Arizona. 1923 will be another "tramp-iron-less" year.

Resolve to make 1923 a "tramp-iron-less" year

THE birth of a new year . . . resolve to do away with the bad practices of 1922 . . . figure what tramp iron has cost you in the last year.

In obtaining this figure think not of the cost of repairing damaged crushers alone, for that is a small item in comparison with the cost of plant shutdown and interruptions in tonnage handled.

Then consult Dings engineers; ask for a comparison of this figure with the maintenance and operating costs of Dings Magnetic Pulleys. Installed usually as head pulleys on belt conveyors, Dings Pulleys remove even the finest fragments of iron before they reach the crushers. The comparison will surprise you—it will show you why many of the more modern plants have long since adopted magnetic separation.

DINGS

Magnetic Separator Co. ▲ Specialists in —

Magnetic Separation

673 Smith Bldg. Milwaukee, Wis.

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Before You Buy—

Sum up all that you have heard for years about ¾-yd. revolving shovels—steam, gasoline or electric.

Consider carefully the many features of design that have been submitted for your consideration.

Compare construction, performance or maintenance—any one or all of these qualities.

Weigh every argument carefully.

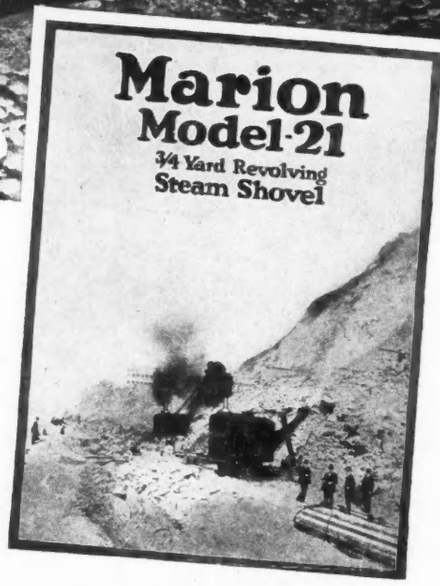
Then check each item with the new Marion 21—the most highly perfected shovel in the ¾-yd. class.

See one of these shovels at work and you'll be convinced—

That the essential qualities of Power, Speed, Capacity and Endurance are built into this new Shovel in a most surprising and striking manner.

That every claim of action and ability is abundantly substantiated.

That it surpasses all other ¾-yd shovels in quality and performance, making it the *best buy on the market today.*



SEND for Bulletin No. 305 just off the press and get complete information on the New 21. It shows by actual illustrations and data why the New 21 has:

More Power
Wider Range of Usefulness
Better Materials
Finer Workmanship
Easier Steering.

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The Marion Steam Shovel Company

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Marion Crawler Trucks Make Hard Going Easy