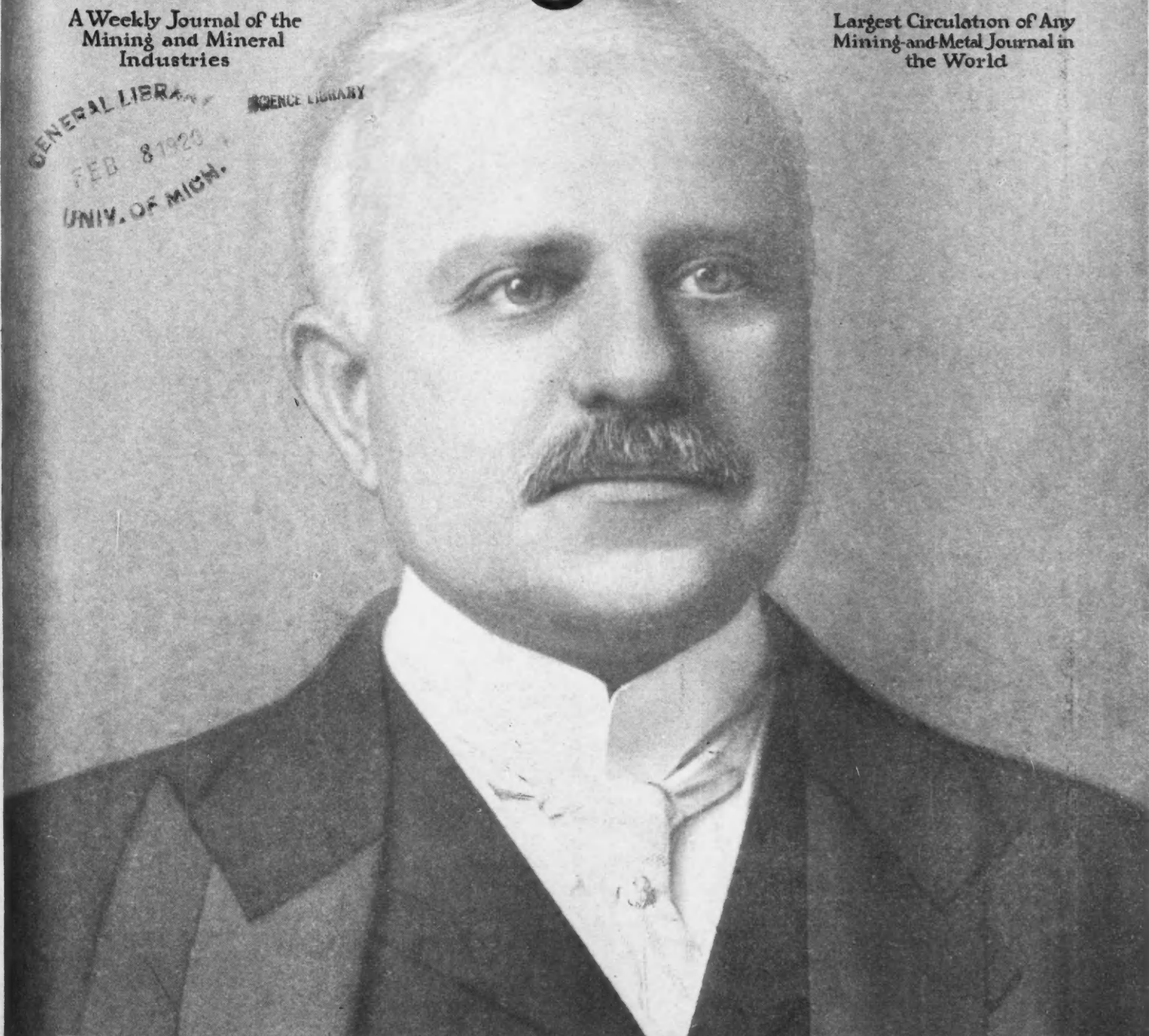


ENGINEERING AND MINING JOURNAL

A Weekly Journal of the Mining and Mineral Industries

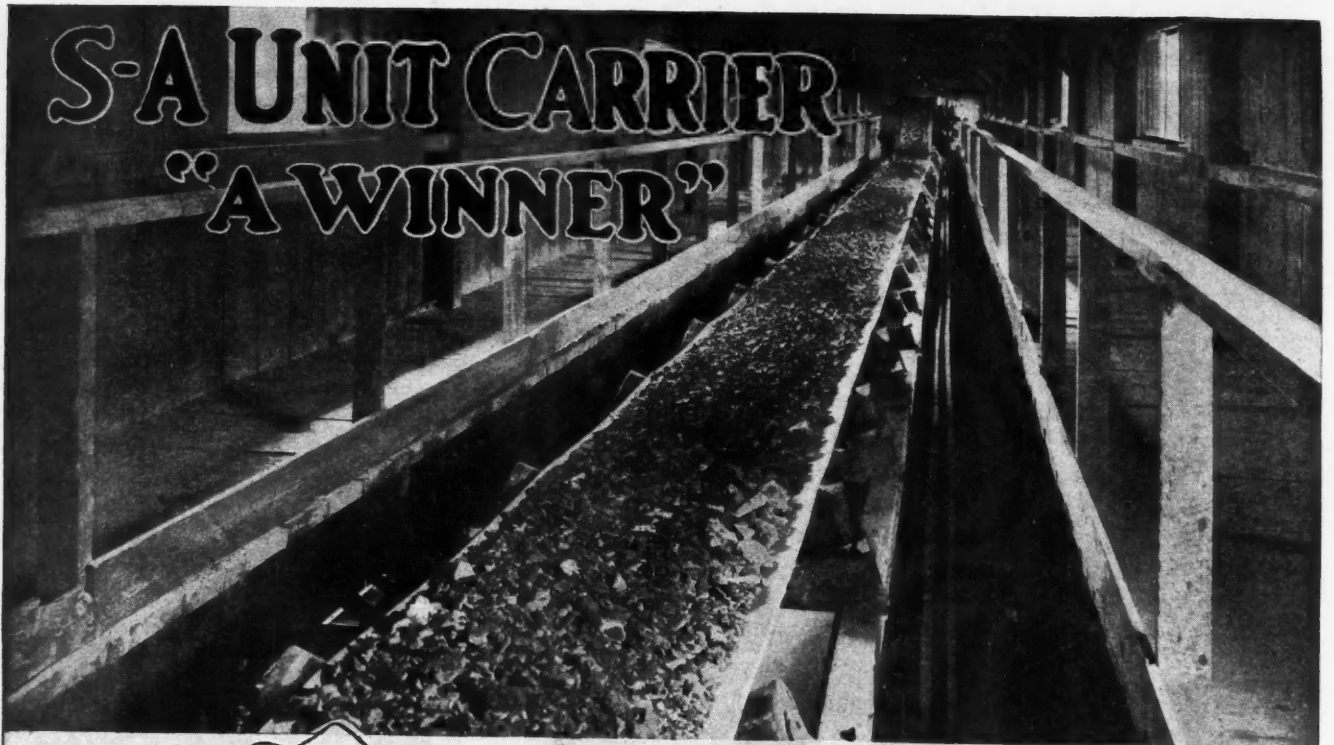
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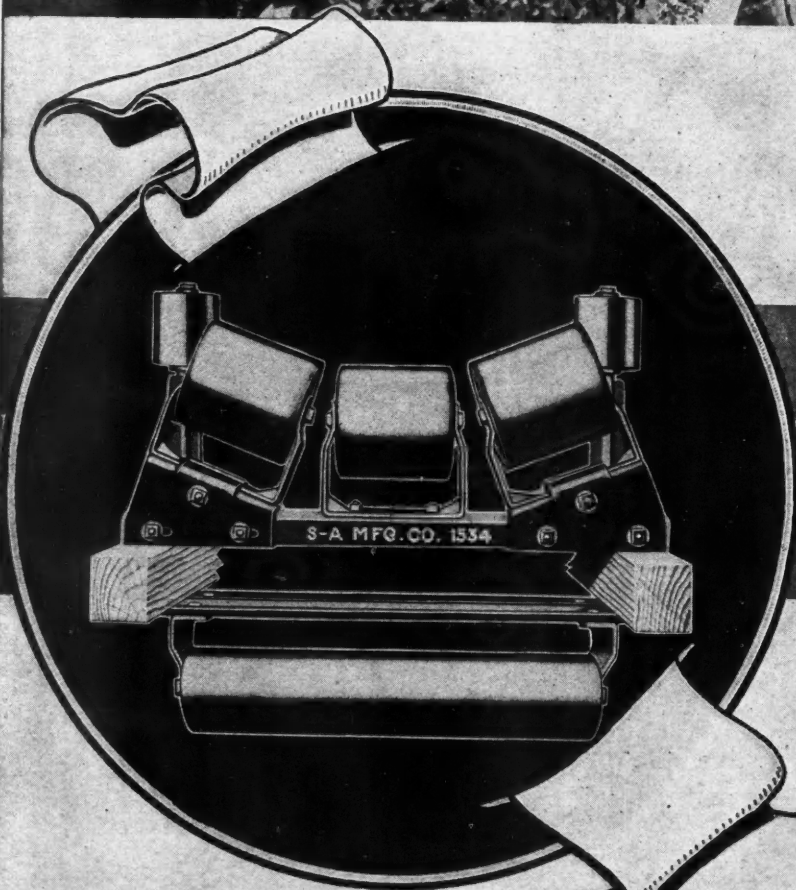
....The nation is master, and both the employee and the employer must recognize this basic principle. Nothing that is contrary to the general welfare of the nation can be tolerated. It is certain that the domination of the country by any single class is not for the nation's welfare, and therefore both the employer and employee must realize they are lesser than the State and cannot be permitted to dictate to it."

Daniel Guggenheim



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Number 4

Are We at War with Russia?

Every now and then some Congressman gets up in the House and puts the above question, demanding that our engineers and their guards be withdrawn from Siberia. Similar protestations against the trade embargo against Russia are urged by various kindly and fatuous groups of lovers of all mankind.

We should be interested in psychological tests made on these Congressmen.

Very recently we hear less from these people—since the Russian-bred revolutionary plot in this country has been unearthed.

We ARE at war with Russia. Russia—a murderous outlaw—is making war on us, and winning—not here, but abroad.

Will we take as long to wake up as we did in the case of Germany? A firm and prompt policy now will save untold misery.

If there were anything in spiritualism, do you think all the powers of the air could keep Roosevelt from talking to us in this crisis?

Daniel Guggenheim's Article

IN THIS ISSUE we are presenting an article by Daniel Guggenheim, perhaps the greatest mining and smelter financier in the world. This article was written at our earnest solicitation, and on our suggestion that, under the present conditions, it is a public duty for the captains of industry to mix freely in the discussion of problems and remedies. Readers will find Mr. Guggenheim's contribution cogent and sound.

The Press and the Gold-Mining Situation

THERE is that in the currency problem which befuddles our intellects and leads to diverse theories, explanations, and remedies. The intricate system of credits which banking has constructed on top of real money, and all the technique of that system, is responsible for that confusion: for if we look through this credit maze the laws of real money (metal) do not seem so perplexing. In considering a mine and its management, we have often been obliged to remind owners and investors that the real mine was underground, in the stopes and the prospective stopes, and not in surface plants and equipment: nor could the greatest perfection of hoisting, milling, and transportation operations be of avail if the crude ore could not be produced. We are inclined to see a similar analogy in the relation of

metal to the currency situation: the banking system is the top works, the metal, the mine. If our financiers forget this fundamental principle of the mining engineer, they may look for hard times or a shutdown.

The bewilderment that springs from any other but the bedrock conception is even shown editorially in the New York "Tribune," whose lucid and independent utterances are usually so convincing. In an editorial of Dec. 4, entitled "The Automatic Shut-Off," it comments on the gold-mining situation as follows:

"Fewer ounces of gold are produced when miners get \$8 per day than when they get \$4. The low-grade gold mines are shutting down, and we are seeing the beginning of an automatic shut-off to rising prices. Inflation is meeting its natural foe.

"When will prices begin to come down? The best guess is that it will be when gold available for money and for the use of bank and currency credits does not suffice to offset the demands of expanding business exchanges."

If the above were true, we have a simple and, nationally speaking, a cheap way to reduce the high cost of living—to shut down the gold mines; and the gold miners who need the reduction in costs so sorely would, we think, be foremost in calling a shutdown if they could look forward to such a desirable result. If it were true, the less gold any country has the more its paper currency will buy. We do

not think we need pursue the discussion of this particular remedy further. Were we really on a basis of real money, it is true that a scarcity of gold would mean a higher purchasing power for it; consequently, lower prices for commodities: but as our "money" is mainly the paper credit currency of the banker's system, the less gold there is behind it the less it will be worth in the popular mind, and the less it will purchase in commodities; consequently, prices will go up farther as the production of gold decreases, and will keep doing so. In other words, the less gold the greater the inflation.

The fact is that we—meaning in general the great business-doing nations which rely on a gold base—are headed for the rocks, and going faster all the time. We wish it were true that the gold-mining industry acted as an automatic shut-off to rising prices and a regulator of the results of extended credit, and paper money machines running three shifts. It would surely be a comfortable provision of providence; but actually providence has placed the problem squarely up to man.

Hoover for President

AS THE INSPECTION of possible candidates for the position of next President progresses, our lack of outstanding figures to which we can confidently turn for leadership becomes evident. For the Democrats, the astonishing choice seems to be between Wilson and Bryan. We believe that further comment is unnecessary. For the Republicans, there stand out mainly dark horses, who promise to make docile and perfunctory presidents. General Wood might be elected as the legatee of Roosevelt, but his staid record does not promise the aggressive leader we need in these days.

Our system does not breed political leaders—our party machines are too strong and the autocratic rule of the Chief Executive is too firmly fastened. We shall need a strong man in the trying days to come—we care not what party he may represent. In the emergency many men are turning to Hoover, the strong and silent American of the period—the greatest American, at the present juncture. "If only we knew his politics," the politicians cry, for they sense him as a winner.

We have been sickened with politics. Politics was played all through the war in this country, with a cheap and disgusting persistency found in no other country. We need not a politician, but a man. Hoover looks like the best bet for us. Unlike all politicians, he owns no boss. If one or both of our political machines want to win, let it or them pick Hoover. After we elect him, they can decide with him who is to be boss. Give us a man!

The Cup That Chills

THE mining engineers and the miners, like the rest of that sturdy people, the Americans, vigorously keep to their banqueting. But their heroism is nothing to that of the guests that they sometimes entertain, as when distinguished Frenchmen, as has

often happened recently, sit through the latest American symbolism for conviviality. A glass of ice-water (with the accent on the first syllable) as a stimulant, a strangely chosen, ill-cooked, and in-artistic dinner served by intense Slavonic waiters who are in a hurry to catch their trains, some ice cream, another glass of ice-water and a hunk of ice to top off with, a little coffee as a pick-me-up, and a fat cigar as an all-too-feeble anesthetic, and our Gallic visitors from the land where *vin ordinaire* and bread are the last necessities of the very poor are called upon to be felicitous.

Who that has watched and marvelled at that heroic race during the last four years would doubt its Spartan bearing in this most trying case of all? As for us Americans, what could overcome such a hardy and stoical people, that can drink either whiskey or ice-water with equal aplomb, and pay highwayman's tribute without a wince for beastly dinners thrown at them in halls of barbaric splendor? The inextinguishable viking breed never comes out more strongly than in these men of action. We are not men of temperament, like our gallic friends. It is lamentable to hear us try to sing our national anthem, and know neither the air or the words, but look out when we get our guns out and follow the flag! We cannot make banqueting a fine art, or an art at all—with us it is an unconscious penance—but we can go through the motions as coolly as if there were cocktails with every course; indeed, we might say, more coolly. There are some of us who have coquetted with the Arctic, who have swum and struggled in ice-water—and drank it betimes—but we always had our tea with our flapjacks and bacon, like good Arctic Brothers, Russian or Englishman. We were now, we realize, sybarites. The matutinal cold bath, at all seasons, of the vigorous sportsman is effeminate beside the voluntary stomachic ice-water bath of the American at his meals, banquets, and feasts. It is his hair shirt, to keep him from getting soft. Can one wonder at the New Yorkers who went straight from Broadway to Belleau Wood, and, when surrounded by the Germans, cut off from food and told to surrender, calmly directed the Teutons to Hell, and nonchalantly went without food till the day came that they were rescued?

We have long ago known and analyzed the evils of alcoholism. We voted for prohibition, and would do so again—but, suffering humanity! Why ice-water?

It was in the most untamed parts of our land that prohibition came first, in the roaring, revolver-snapping West of the movies, and in the fire-eating, julep-drinking South; in Arizona and Georgia and the like. In the Oatman camp, in Arizona, a correspondent (Diamondfield Jack Davis) informed us that vastly more money went into mining stock purchases, with the result of the general prosperity of the camp. And they (the Westerners and Southerners) approved of the results and phoned to us to do likewise, at once—and we did. Then some of them, like "Pussyfoot" Johnson, went abroad, and all is lost in England. Farewell to your ale, you.

British workers, or whatever the English equivalent may be. You'll have to give it up as we did. The man from the West has told you to be good, and you will be. Thank heaven, La Belle France, that the Channel is still between you and England!

Prohibition is still a new thing in the world, but its results are startling. State prohibition was not so striking. In Maine it produced drunkards; in Kansas, daring political and semi-socialistic doctrines. National prohibition in the United States is emptying our jails at an alarming rate. In Georgia one of our mining friends maintained that the roads had to be built with convict labor—"and how we are going to get convict labor, now that we have prohibition, is more than I can see," he complained. At the Soldiers' Home in Washington (as an isolated example) it has reduced the death rate so that the regularly contracted supply of coffins has accumulated until their storage is a problem. It has increased the consumption of soft drinks and candy so that the world's supply of sugar has been immediately lapped up, according to Hoover, Williams, and others. A sugar famine is upon us, and we are lucky to get a pound at any price. According to the New York restaurant keepers, prohibition has enormously increased the consumption of sausage and buckwheat cakes for breakfast. Doubtless it has its part, in the increased appetites, in the scarcity and high price of food, and, in the excess of funds which it creates, in the phenomenal spending of money for luxuries like jewelry, fur coats, and automobiles, which is so striking and which is nursing bolshevism. Doubtless this excess of funds also has had its part, as has been claimed by brokers, in the recent fervid stock speculation in the New York market.

In Russia, the deprivation of the peasant from vodka coincided with the fall of the empire, the murder of the aristocracy and the middle class, and the setting up of a bloody despotism of the unfit and ignorant: who shall say if the deprivation of their alcoholic stupefier did not precipitate the rage that had been smoldering a thousand years?

In America, prohibition is accompanied with a growing bolshevism, an epidemic of strikes, a vast subterranean revolution of the drifters against the solid-footed barnacles on the Ship of State. Do you laugh at any such connection? It is there; we have heard many individual threats of revolution if the "rights" of the workmen to eat and drink what they pleased were denied them. A common type of laborer, especially the alien in the East, who solaces himself with beer and the like, finds himself physically and mentally irritable when the supply is cut off. The greasy cooking of the home or the boarding house is no longer supportable. He lacks the philosophy and the fortitude of the ice-water drinking mining engineer; and he wonders why he is not the overlord rather than the underling. He also thinks many other things out. And, being ignorant and untrained and uninformed, and suffering from maldigestion, he thinks wrong and violently, and is "meat" for the agitator. He also has more money,

and acquires ambition to live as well as the best. He can afford to take a vacation and strikes for higher pay and shorter hours, or, if not on strike, can send funds to strikers elsewhere. As an economic asset to the world therefore, his increased physical efficiency is more than offset by his more hostile mental attitude toward those that have more than he has; and therefore production in general falls off.

The revolution which is following the substitution of the cup that chills for the cup that cheers is still going on. We wonder what the ultimate effect will be. The Mohammedans have been total abstainers for half a millennium, as commanded by Mohammed. As such they were at first mighty warriors, who conquered western Asia, northern Africa and all but conquered the whole of Europe and dominated the world. Their civilization adopted from the wine-drinking Persian and the Arab, was at that time the equal of that of Europe. They sip coffee, smoke cigarettes, and drink sweet milky drinks, and with excellent nerves and health have remained a static, though haughty, brave and dignified race. They have been outclassed in modern time by the vodka-drinking Russian, the whiskey-drinking English, and the Frenchman who substitutes wine for water; and lastly have been attached to the kite of the beer-drinking German.

All of the above is not enlightening, even to ourselves. We all know what Lincoln said of Grant's whiskey drinking, advising his critics to try some of the same brand; and our admiration for France is such that one is tempted to analogous sentiments. Possibly the alcoholic scourge is the test which eliminates all but the toughest, the steely nerves, and the asbestos-lined stomachs who can thrive equally on whiskey or ice-water. Those of us who are weak branches of the tree, who can stand neither, must practice moderation or total abstinence with both.

Silver and Bi-metallism

IN our news section the McFadden act to melt and sell all silver dollars as bullion is reported. Representative McFadden pointed out that with silver at \$1.29 an ounce it is profitable to melt silver dollars; with silver at \$1.38 an ounce it is profitable to melt our subsidiary coins. In 1853 the subsidiary coins were made seven per cent lighter, in proportion, than the silver dollars.

Mr. McFadden, after pointing out that the standard silver dollar is now more valuable than the standard gold dollar, and is accordingly being driven out of circulation by the latter, remarks, "So here is twentieth century proof of the fallacy of bi-metallism." The relation between the fact and his conclusion is obscure. The fact might more logically be made an argument for bi-metallism. With a fixed value for both gold and silver, no fluctuation in the relative value would occur; the present danger of our silver money being melted and exchanged for paper or gold would not exist, nor would Mr. McFadden's second proposal, to further reduce the

standard of subsidiary silver coins, be necessary. A coinage that has to be called in and remelted as the market varies is not desirable. Taking the world at large, bi-metallism is a reality; both metals are used as standards of exchange; but the relative value of the two should be fixed.

Zinc and Spelter

DURING the last few years a tendency toward the elimination of the term spelter has been growing. The American Zinc Institute gave considerable impetus to this tendency when, at its meeting in St. Louis, July 10, 1919, it adopted the following resolution:

Resolved, that the American Zinc Institute recommends that its members substitute the word "zinc" for "spelter" in all quotations, investigations, and contracts, and also the term "zinc plate" for "galvanized iron," and that a publicity committee be appointed to request the Government statisticians, the trade journals, the Associated Press and the newspapers to make these substitutions in their reports.

This resolution was adopted following eloquent and enthusiastic advocacy thereof by several prominent members of the American Zinc Institute, and general acquiescence by the majority. Therefore, it is reasonable to assume that the change in terminology is generally satisfactory and advantageous to those concerned in the zinc industry. That the propaganda in favor of the change has been successful to a considerable extent is indicated by the fact that at the regular meeting of the Institute's Board of Directors in Chicago on Sept. 22, 1919, the secretary reported that the Federal Reserve Board, the Bureau of Foreign and Domestic Commerce, the Geological Survey, the Bureau of Mines, the Bureau of Internal Revenue, and the Chamber of Commerce of the United States of America had agreed to "call zinc by its right name"; and that an examination of trade papers would show that the work which had so far been done in bringing about this change in trade advertisements had been successful except in a few instances, and that it was believed that these "conservatives" would soon be brought into line.

In the discussion of the resolution, prior to its adoption, it was pointed out that in order to make reports clear it might be occasionally necessary to continue to use the word "spelter," although it would not be a difficult matter to get the public accustomed to the new term "zinc," which it had not been in the habit of using.

In the light of this movement to discard the word "spelter" in favor of the word "zinc," it is of interest to investigate the meaning of the word "spelter" and its origin. Although the nomenclature of zinc is somewhat confusing, and not always clear even to those engaged in the zinc trade, the term "spelter" is generally understood to mean the ordinary ingot zinc or slab zinc of commerce. This is the product marketed by the smelter, and is not pure zinc metal, but a commercial alloy consisting

mainly of zinc, between 98 and 99 per cent, but containing 0.07 to 2.0 per cent lead, 0.05 to 0.75 per cent cadmium, 0.03 to 0.08 per cent iron, and sometimes a trace of aluminum or some other element. It is classified according to its purity, and the different grades are designated by such names as "High Grade," "Intermediate," "Special," and "Prime Western," and others well known to those engaged in the zinc trade.

The so-called "conservatives" in the zinc business, who do not seem to be enthusiastic over the elimination of the term "spelter," contend that this term is well understood in the trade, whereas the word "zinc" would require an explanation whenever pure zinc is not meant. They support this contention, further, by pointing out that producers of zinc find it necessary in their advertisements to explain that they refer to what was formerly known as spelter. On the other hand, the advocates of the use of the word "zinc" instead of "spelter" maintain that the practice of emphasizing the use of zinc in this manner will indicate clearly to the public the many virtues and beneficial industrial uses of the metal, and will eventually benefit and stimulate the zinc industry.

The word "spelter" is supposed to be of Low German origin, probably from the Low German word "spialter," as it is not found among Old English words. As the metal was imported from China into Europe by Dutch and Portuguese merchants in the sixteenth and seventeenth centuries, it may owe its derivation to the Middle Dutch "speauter," the Dutch "speauter" or "spiauter," the German, Swedish, or Danish "spiauter," or the Spanish or Portuguese "peltre." Other possibilities are the old French "espeutre," the Italian "pletro," and the Middle Latin "peutrum" or "pestrum." From these Boyle introduced the word "speltrum," whence the English "spelter."

Lindgren and the Gold Problem

IN another column we give an abstract of a portion of the address of Waldemar Lindgren, new president of the Mining and Metallurgical Society of America, at the annual meeting. His discussion of the gold problem is interesting and stimulating. The fundamental thought was, that though gold can never be worth more than \$20.67 in real money, it can go higher in depreciated paper money, as shown in England and in every European country. Falling exchange rates between the United States and Europe are not due mainly to the balance of trade, but to the relative depreciation of currency. Even in the United States the depreciation exists, though less than in Europe. Mr. Lindgren proposes that the Government cease selling to individual consumers an ounce of gold for \$20.67 in paper currency—that it not sell at all, in fact. The industrial market would then gradually establish the value of gold in terms of our depreciated paper, which would lower the costs and allow a resumption of production and profits by the gold miner, and so increase the supply of real money.

We have one argument, which looks strong to us, against Mr. Lindgren's thoughtful proposal. Much or all of the gold coin in circulation might be melted up and sold for a profit in current dollars. This is actually happening in the case of the silver dollar. Such a tendency, of course, is dangerous in the case of silver; in the case of gold it would be disastrous.

The British War-Minerals Relief Problem

THAT the situation which was brought to the producers of war minerals of the United States by the signing of the armistice was not peculiar to this country, but was naturally felt in all other belligerent countries, is shown by the following quotation from an English engineer, whose name we withhold by request. This letter is from Burma, and in part reads as follows:

"I came out here in May, 1917, when there was such a clamor for wolfram, and have taken my part in the production from this district up to the time the government gave notice last April they would take no more. Unfortunately, this came just at the time when I had concluded the erection of a mill and an aerial ropeway to double or treble our output. It was a great disappointment, and we feel hardly treated and badly let down. The compensation the government will pay us producers will not really anything like compensate us for our outlay."

The Efficiency of Petroleum Utilization

IN A PAPER read before the Institute of Petroleum Technologists, Rear Admiral Dumas of the British Navy emphasized the need of conserving the petroleum supply of the world and mentioned, in that connection, the deplorable practice of burning raw fuel before valuable byproducts had been separated, and also the inefficiency of present forms of burners and methods of burning. As a matter of fact, we have progressed farther in these respects with petroleum than we have with coal. In the oil fields a considerable amount of crude oil is burned and burned inefficiently. In most parts of the country, however, what is sometimes called crude oil is not crude oil at all, but fuel oil from which all the more valuable and volatile fractions have been removed.

The product obtained after distillation of the crude, known as fuel oil, has approximately the same heating value as crude oil, and many persons do not know the difference, as, for example, provincial barbers, who occasionally wish to treat us to a shampoo of this substance. Coal, on the other hand, is usually burned raw. It is not treated in byproduct coke ovens as a general rule, for the simple commercial reason that if that were done the value of the products, less the treatment cost, would be less than the price for which the coal could otherwise be sold.

Fuel-oil burners are capable of closer regulation to effect efficient combustion than is most of the apparatus for burning lump coal, though having no advantage over pulverized-coal burners in this respect. When used in Diesel engines, fuel oil is about three times as efficient as coal burned under a boiler

furnishing steam for a condensing steam engine. The Diesel turns 30 per cent of its fuel energy to useful account, against 10 per cent for the steam engine; 28 per cent goes to the exhaust, against 57 per cent in the case of the latter; and 34 per cent goes to the cooling water, against 22 per cent of the heat lost in boiler stack gases.

Opportunities in China

DURING the past few years capitalists have shown a disposition to give more consideration than formerly to the mineral resources of China. Until recently the Chinese Government has offered no encouragement to foreigners who were willing and able to develop the mineral wealth of the country, and consequently its deposits of coal, iron, copper and tin, and precious metals have remained inadequately exploited. As the Chinese laws relating to mining concessions become more liberal, so will American and British capital become available for exploration and development of China's mineral deposits.

In anticipation of the not far distant time when Chinese statesmen will frame laws which will insure to their country the co-operation of foreign capital in the development of its mineral resources, American mining men will do well to inform themselves regarding the possibilities of such development, so that they will not be caught napping when the gates are thrown open to all those pioneers in mining and metallurgy who have the courage to back their judgment with money. Already much exploration has been accomplished, and at present more than one enterprise is under way.

Among the more important mineral resources that are attracting the attention of capitalists are the coal measures in Hu-nan, Hu-peh Shan-tung, Shan-si, Kwei-chow, Sze-ch'uen, Chih-li, Shen-si, Ho-nan, Yun-nan and Kwang-tung; the iron ores of Shan-si, Sze-ch'uen, Hu-nan, Fu-kien, Cheh-kiang and Shan-tung; the copper-bearing ores of Kwei-chow, Yun-nan, Sze-ch'uen and Kiu-kiang; the tin ores in Yun-nan and Hai-nan; and ores of lead, antimony, quick-silver, tungsten, molybdenum, and the precious metals; and finally salt, kaolin, and other non-metallic mineral products.

What Do You Know About Minerals Separation?

THE American Mining Congress has presented a comprehensive brief to the Federal Trade Commission concerning the exploitation of Minerals Separation flotation patents in this country. The commission is now making a thorough investigation to discover whether or not the practices of the Minerals Separation Co. are justified by law. The congress is very anxious to get in touch with all who have had experience in obtaining, or in failure to obtain, a license for the use of this process, in order that all of the facts may be presented to the Federal Trade Commission. Those who have knowledge of or experience in connection with this matter are invited to forward the information to George L. Nye, Equitable Building, Denver, Col.

BY THE WAY

Shipped by Parcel Post?

A shipment of 50,000 ft. of lumber ordered by the Candelaria Mines, of Nevada, which has been on the road from the mill in Oregon since last September, has not yet reached Candelaria.

Comstock Bonanza Uncovered

Thirty-five barrels of whiskey and brandy were found in the old Sutro tunnel at Virginia City, Nev., by revenue officers on Jan. 2. Thus borrasca follows hard upon bonanza. The agents also discovered several large stills in operation which were seized together with the operators. Virginia City was christened with whiskey, according to one of Dan De Quille's stories, but bonanza camps of the future must celebrate with weaker beverages.

Ore Is Where Ore Is

The Granby company several months ago completed docks at Anyox, B. C., for unloading barges bringing coal from its Cassidy collieries on Vancouver Island. It is related that while the construction work was in progress a workman, an erstwhile prospector, in excavating uncovered a lead of ore that looked attractive. He sampled it and, finding that it went high in copper, forthwith staked and recorded a claim. Going to the company officials he told of his discovery and succeeded in disposing of his mineral rights in the property.

Ozark Mushrooms

A mine superintendent in the Joplin-Miami district has visions of making a fortune out of mushroom raising in the abandoned mine drifts in that section. They are continually warm, just about moist enough, and in those where mules have been utilized for ore hauling, there is plenty of good soil. The superintendent has rigged up an ingenious electric lighting scheme, with tinted globes, some one having told him mushrooms must have a little light, even if it is not sunshine, and he has planted his first bed and is awaiting results. If it works he estimates there is enough acreage in the abandoned mines in the district to produce mushrooms for the whole world.

Up in the Air

Ore transportation by dirigible balloon over the rough mountains and canyons of Arizona is promised. Much of the asbestos brought into Globe for railroad shipment east comes on burro or mule back, an expensive method made necessary by the rugged character of the country. But there is to be a very modern improvement in this direction through plans made by A. E. Minium, representative of the Amer-

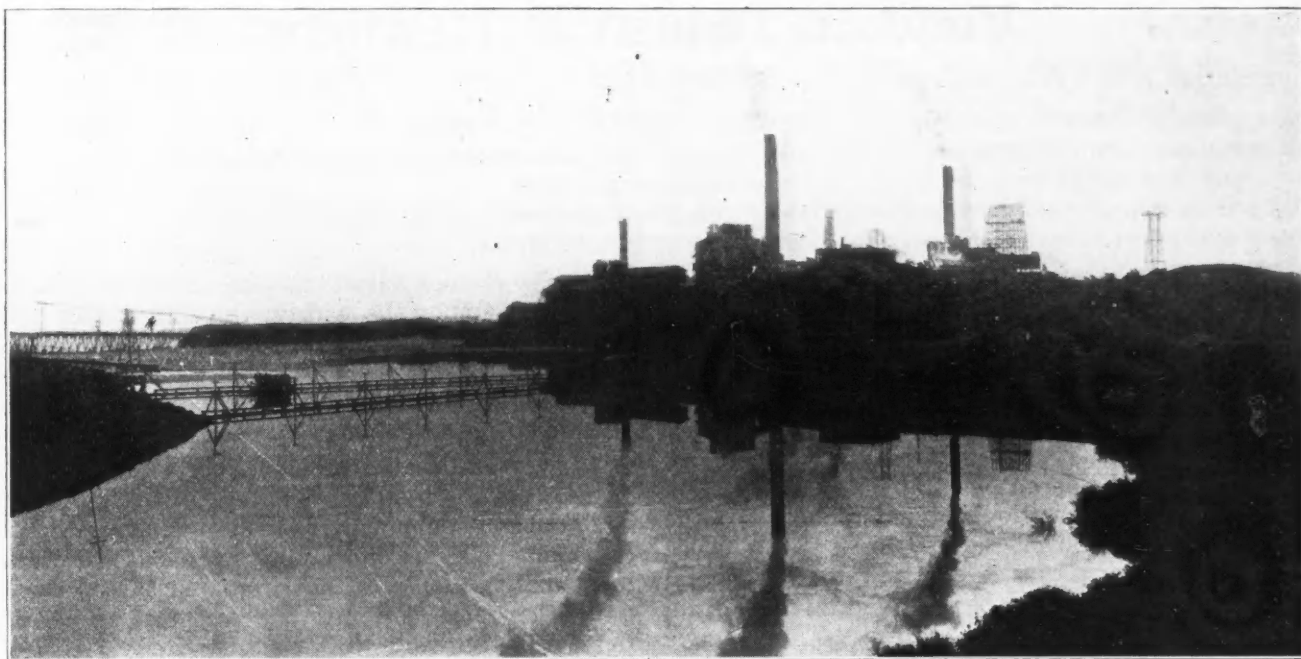
ican Fireproofing & Mining Co., which has purchased the Scanlon & McManus asbestos property of 380 acres, near the western edge of the San Carlos Indian reservation. Mr. Minium also has bought the A. E. T. Alberthal asbestos property of nine claims, west of Chrysotile. He proposes to purchase a couple of dirigibles of the blimp type, each capable of carrying two tons, to transport the sorted asbestos ore over the mountains, 40 miles, to the station of Rice, on the Arizona Eastern R.R. It is believed the loading can be done in places now inaccessible to anything save burro transportation, thus lowering costs greatly.

About Statisticians

All the diamonds mined in history and existing today as cut and polished gems would make a tidy total of 46,355,474 carats and would weigh 10½ tons. Thus runs the revery of a Chicago statistical expert. If these diamonds were piled in the form of a cone (not "cohen" as sometimes spelled), the pile would have a base diameter of eight feet and a height of five feet. Valued at \$300 a carat, the heap would be worth about fourteen billion dollars lacking a few cents. It would contain 710 1/3 gal. worth \$5,539,023 per gal. or 76 1/3 bushels valued at \$51,570,729 a bushel.—The precision with which the human Burroughs clicks out these figures is admirable. A statistician is truly born and not made, and if by reason of penury he be forced into this Sunday supplement stuff, lucky he is if he be born with a sense of humor. There are statisticians and statisticians but all have a love for figures, some favoring thirty-sixes and up, and some worshipping the slender one and all the rest remaining. Senator Sorghum's famous advice, "When in doubt, give them figures" was never meant for statisticians for these are never in doubt. Instead they add five and six and, subtracting ten, declare the answer two with almost papal infallibility.

A Deep One

"An' let me tell you, m'son, this 'ere shaf' is some bloody beauty," said Cap'n Dick. "Nothin' but solid concrete from collar to tha skip pit; wall plates, dividers an' all re'hinforced, so she's boun' to 'old. An' deep too, m'son, but, min' you, I 'as seen deeper shaf's than she, an' it be surprisin' w'ot they be doin' these days in shaf' sinkin'. Some time h'ago I wuz Wes' an' I 'eard baout one o' they big chaps so I took a turn to an' went h'out to see un. There wuz a gert stone 'ouse an' a marble floor in un, an' tha biggest bloody h'engine that ever I did see—runnin' like 'ell, an' peached h'up on a 'igh stool wuz tha h'engineer soun' asleep. I rushed h'over to 'e an' shouted, 'If thee does'nt stop 'er thee'll drag tha bloody skip h'over tha poppet 'eads.' An' sez 'e to me, 'W'ot day of tha week is it, my man?'—an', min' you, me standin' there boilin'. 'Dam-me,' sez I, 'this be Tuesday.' 'Oh, gos' long do', says 'e, 'Er won't be h'up til Friday.' M'son, tha's w'ot I calls some bloody deep shaf'."



THE INSPIRATION TAILING POND AND THE INTERNATIONAL SMELTER, MIAMI, ARIZ.

Photographs From the Field

SURFACE PLANT OF BELCHER EXTENS ON DIVIDE MINING CO., DIVIDE, NEVADA



View on Industrial Relations

Legislation which Affects Present-Day Business Must Be Such as Will Make Proper Provision for the Settlement of Industrial Disputes, Compel Proper Living and Working Conditions, and Eliminate Industrial Unrest—Self-Government System Proposed

BY DANIEL GUGGENHEIM

President Chile Copper Co.; Former President American Smelting & Refining Co.

Written exclusively for *The Journal*

"THE strike proved that this is a really democratic country where public opinion must prevail. . . . Prussianism in the industrial and economic world must not prevail. . . . The nation means to be strong, firm, and just, but always master."—Lloyd George, October, 1919.

Premier Lloyd George has stated the case clearly and concisely. The nation is master, and both the employee and employer must recognize this basic principle. Nothing that is contrary to the general welfare of the nation can be tolerated. It is certain that the domination of the country by any single class is not for the nation's welfare, and therefore both the employer and employee must realize that they are lesser than the State and cannot be permitted to dictate to it.

Prior to the era of the use of steam, and later electricity, the employer and his employees worked together at their tasks. They were often members of the same family, and, if not related by blood, had common interests and ties which made them feel close to each other. Gradually, because of inventions, business became organized first on a partnership, and later on a corporation, basis, so that the employer no longer was in intimate contact with the employee. In fact, this was carried to such an extent that by the last decades of the nineteenth century the owner of the business did not come in contact at all with the employee, and often the managers came in contact with the employee only through their representatives, who were dependent for their opportunities upon the central management of the owners, and not in any way upon the good will of the employee.

Effect of the Organization of Large Industrial Units

The natural result of this increased centralization of business management was twofold: First, the employers became so powerful as to threaten the civil government itself, and, second, this power did not give a fair opportunity to the employee in his bargaining for wages. Public opinion realized this danger before it went to the fullest extreme, and through legislation provided for the curtailment of organized capital's power so far as it affected the political domination of the country, and, encouraged by public opinion, labor began to organize itself into unions and to combat the powerful employer on more nearly equal terms. Public opinion continued to put a check upon the over-reaching ambition of the employer, with the result that the employee by the first decade of the twentieth century came to have an important voice in deciding his working conditions. A large number of employers felt this force

of public opinion almost at its inception—in fact some were among the leaders who helped mold public opinion toward the liberal view. It was soon seen that many of the employers met the public viewpoint more than half way, and of their own accord started to put their houses in order.

War Created Rising Labor Market

In 1914 the war stimulated industry in this country, and demands were made for increasing production. This, in connection with a natural curtailment of the supply of labor, created a scarcity and gave even more power to the employee in bargaining for wages and working conditions. Although during the years we were in the war this condition was intensified by the withdrawal from normal industry of millions of men for the Army and Navy and special industries, such as munition works and other war activities, still the appeal to patriotism was made to both sides, and on the whole that appeal was not in vain.

After the armistice was signed it became evident that labor on its part was in danger of trying to become dictatorial and autocratic, and again public opinion is arising and clearly demonstrating that the people of the country will not permit the domination of any group.

This feeling must be translated into law, with due regard to both sides of the question, so that we will not be constantly in the throes of action and reaction and so that the pendulum will be kept within its proper limits. This is the problem now before Congress, and it must be guided by the fundamental principle that equal opportunities must be had by all; that an industry that cannot pay a living wage should not exist and that all industries must pay this wage; that labor is entitled to its share of any unusual profits; that all men and women within the boundaries of the United States must be thoroughly Americanized and made to realize and value American principles.

New Laws Needed

In order to do this, legislation is needed along the lines of:

1. Providing for proper means of the settlement of industrial disputes, so that they may be decided on the basis of right, and not on the basis of might. To accomplish this, Congress should provide that investigation be made before lockouts or strikes are permitted, so that the facts may be ascertained beforehand: this legislation to follow the lines of the Canadian and Colorado plans, with such modifications as experience demands. This should apply to all industries except public utilities. In those industries where the public's interest is paramount, strikes

and lockouts should not be permitted in any case, but proper machinery should be put into effect to provide for labor's being able to present its views properly, and to compensate for the loss of the strike weapon.

2. Fundamental rules of hygiene and safety to person must be enforced.

3. The compensation laws must be supplemented to include industrial disease as well as industrial accidents, and these compensation laws should be made more uniform.

4. Proper living conditions must be provided.

5. Provision should be made to provide in some way, that will not put a premium on laziness, for old age and unemployment insurance.

6. Laws governing child labor and working hours for women should be made more stringent and uniform throughout the country.

7. A commission consisting of men of the highest standard, and who have had experience in connection with labor matters, should be appointed by Congress, with wide powers. This commission should be non-partisan as to politics, and should be made up of representatives both of the employer and the employee, with a chairman to be appointed by the Government and to represent the public. It would be well to have these nominations made from a list submitted by representative bodies such as the Chambers of Commerce and associations interested in the solution of this great problem, such as the Civic Federation, the American Association for Labor Legislation, and other civic bodies. This commission should be provided with ample funds to make thorough investigations of working conditions, wages, cost of living, and underlying causes of industrial unrest. It should be so constituted as to provide for itself sufficient authority and dignity to draw the leaders of thought along these lines. It should not be in any way subject to political machination, and the tenure of office should be during good behavior and not for specific periods, so that, like our Supreme Court, the commission will be aloof from political turmoil.

The employer has in this crisis an enormous responsibility. He has during the last two decades increased his vision, and many employers have provided means for better industrial relations, decent working and living conditions, and all that these mean, but the employer cannot stop with what has been accomplished; he must go ahead along progressive lines.

The companies in which my firm is largely interested and control are fair examples of the work already done in this direction. They have in general maintained the open shop, that is, no discrimination is made between a union and non-union man, taking the position that a man has a right to join any society he desires so long as that society is a lawful one and does not aim to overthrow the American Government. In order to give specific examples of the work done by progressive employers, I will outline the attitude of some of the companies in which I am interested.

The American Smelting & Refining Co. has established in its continuous operations the eight-hour day, realizing that, where a man has to work hard and continuously, eight hours is a fair day's work.

It has put into effect a life-insurance and pension plan with a view of providing for its employees and their families something toward the evil day when death or old age withdraws the provider of the family from the payroll. In general these plans are as follows:

To day pay workers the following schedule of death benefits is in force:

	If Married	If Single
For an employee 1 year in service	\$ 400	\$200
For an employee 2 years in service	500	300
For an employee 3 years in service	600	400
For an employee 4 years in service	1,000	500
For an employee 5 years in service	1,100	550

Salaried employees are insured in the sum of one year's salary up to a limit of \$10,000.

Pensions: Pensions are granted to employees who have reached sixty years, in case of males, and fifty years, in case of females, and who have been in the service for twenty years or more. For each year of active service an allowance of 1 per cent of the average pay during the ten years next preceding retirement, but no pension shall exceed \$2,500 per annum or be less than \$20 a month.

Its first efforts along welfare lines were in the realm of accident prevention, and the following statistics will show what can be done by a systematic effort in this direction:

Year	ACCIDENT RATE	Per 1,000 Employees
1914	233
1915	217
1916	197
1917	149
1918	107
1919	(a) 91

(a) First ten months on yearly basis.

These results have been obtained by following the most approved lines for safety campaigns, but the greatest success has been through the co-operation of the employees themselves through their safety committees.

It has also been experimenting the last three or four years with various plans of employees' representation or committees to advise with the management on questions affecting the employee. Although the company has not adopted any universal plan in this direction, as local conditions play such an important factor in plans of this kind, the plan toward which the management is leaning is one that is briefly as follows:

To divide the plants into departments along the most natural lines, and to have a representative or representatives elected from each department by the men themselves, voting in secret ballot, and these representatives forming a committee that will advise and consult with the management.

The problem of industrial relations is largely tied up with the attitude of the management toward the men. Any plan is of itself not so important as this general attitude. A manager or superintendent who does not understand and realize that his employees are human beings, actuated by the same human motives that actuate him, is doomed to fail, no matter how great his technical skill or business acumen.

The company has also made considerable progress along industrial service lines. It has employed visiting nurses to help the families and its employees, and it has established clubs of its own and others in co-operation with the Y. M. C. A. All of this work has been done of late years in consultation with representatives of the employees, and not given them either as a charity or imposed upon them as by a benevolent despot.

When the Chile and Braden Copper companies started their work of developing mines in a previously undeveloped country, the problem of obtaining and caring for labor was an extremely important one. The Chile Copper Co., since its inception (six years ago), has expended over three and one-half millions of dollars to take care of the men and their families who came to do the work. At Chuquicamata, Chile, there is a total population now of upward of 11,000, where a few years ago there was nothing but an arid desert.

The Braden company, too, with its population of over 14,000, has spent two and one-half millions of dollars to furnish its property site with all the necessary appurtenances to make it habitable and comfortable.

It is interesting to note in this connection that the progressive ideas of a United States company have acted as inspirations to progress along these same lines among the employers of our sister republic, Chile.

In a report recently made by a committee named by the President of Chile to investigate the conditions of housing, sanitation, living, education, and like matters, existing among the workmen engaged in the nitrate and mining industries in the provinces of Tarapaca and Antofagasta, it was stated concerning accident prevention:

"As has been stated many times, the prevention of accidents and the betterment of hygienic conditions for workmen are an indispensable work of foresight, justice, and of human kindness. In this respect we could cite perhaps only one worthy exception, the Chuquicamata company, which has already done much toward improving hygiene and toward preventing accidents, and where the general management appears to be really seriously carrying out the completing and perfecting of the methods already started with this object in view."

Concerning the general hiring, handling and discharging of labor, the report continues:

"In very singular contrast to the action of the nitrate industry is that of the mining company of Chuquicamata, a company which, being that it is governed by world conditions, has also been deeply affected by economic depression caused by the European war.

"This company has been obliged during the past few months to reduce to a considerable extent the number of its workmen. But the reduction has been effected throughout by degrees and by small numbers at a time, and in all cases the workmen have been advised beforehand and have been given a correspondingly sufficient length of time to prepare,

and the company has taken upon itself the payment of all the costs of transporting the men and their families by railroad to Antofagasta and thence by sea to whatever port to which the men may elect to be sent. Furthermore, the company has allowed each discharged workman a certain sum of money, with which to defray the cost of living during the journey."

In general the report showed that the Chilean government realized the importance of the progressive attitude taken by these companies.

All work along these lines is good, but the employer must realize that he cannot stand still. He must continually bear in mind that the work cannot be done successfully when assuming a paternal attitude, but must be done in conjunction with the employee as well as for him. The employer must be prepared to take the employee further and further into his confidence, so that mutual understanding and good will may result.

The employee must have a greater share in any unusual profits. How this can best be worked out still remains a problem; whether through some profit-sharing plan or bonus system based on output, is still to be decided, but the employee must realize that only by maximum production can he expect to share in any prosperity. The shirker deserves nothing; the worker deserves a fair proportion of the proceeds resulting from his own and other workers' efforts; but only by all working can there be sufficient for all to share.

I am firmly convinced that the solution of this great problem of employer and employee lies in the self-government system. Both parties are interested in the success of the business, the employee as well as the employer. Therefore, both should have a voice in the conduct of the business. Great strides are being made in this direction through various plans for shop committees, and similar arrangements, and along some such lines lies the hope of industrial peace and prosperity.

Rubber-Lined Pump Being Developed

The Allis-Chalmers company is experimenting with a rubber-lined sand and slimes pump, made under the Jones patent. The liners and impeller are covered with soft rubber, which is claimed to have great wear-resisting properties, and which can be easily replaced when worn out. Some of these pumps have been placed in mills for trial, but they are not yet on the market.

Production of Metals in the United States

Metal	Unit	1917	1918	1919
Copper (a)	Pounds	1,922,555,907	1,937,900,887	1,209,614,818
Gold (b)	Dollars	83,750,700	68,646,700	58,488,800
Iron	Long tons	(f)38,621,216	(f)39,054,644	30,900,000
Lead (c)	Short tons	581,716	556,233	454,921
Nickel (e)	Pounds	75,510,793	(e)62,994,376	(e)23,728,733
Silver (b)	Troy ounces	71,740,362	71,740,392	55,285,196
Zinc (d)	Short tons	682,411	525,350	471,684
Quicksilver (g)	Flasks	36,159	32,883	20,750

(a) Production from ore originating in the United States. (b) The statistics for 1916 and 1917 are the final and those for 1918 are the preliminary statistics reported jointly by the directors of the Mint and the U. S. Geological Survey. (c) Production of refined lead from ore and scrap originating in the United States; antimonial lead is included. (d) Total production of smelters, except those treating dross and junk, exclusively; includes spelter derived from imported ore. (e) Imports; for 1918 and 1919, first 10 months only. This nickel is refined in the United States for the production of metal, oxide and salts. (f) American Iron and Steel Institute. (g) U. S. Geological Survey.

New Modderfontein Gold Mining Co. Mill and Treatment Plant at Circular Shaft

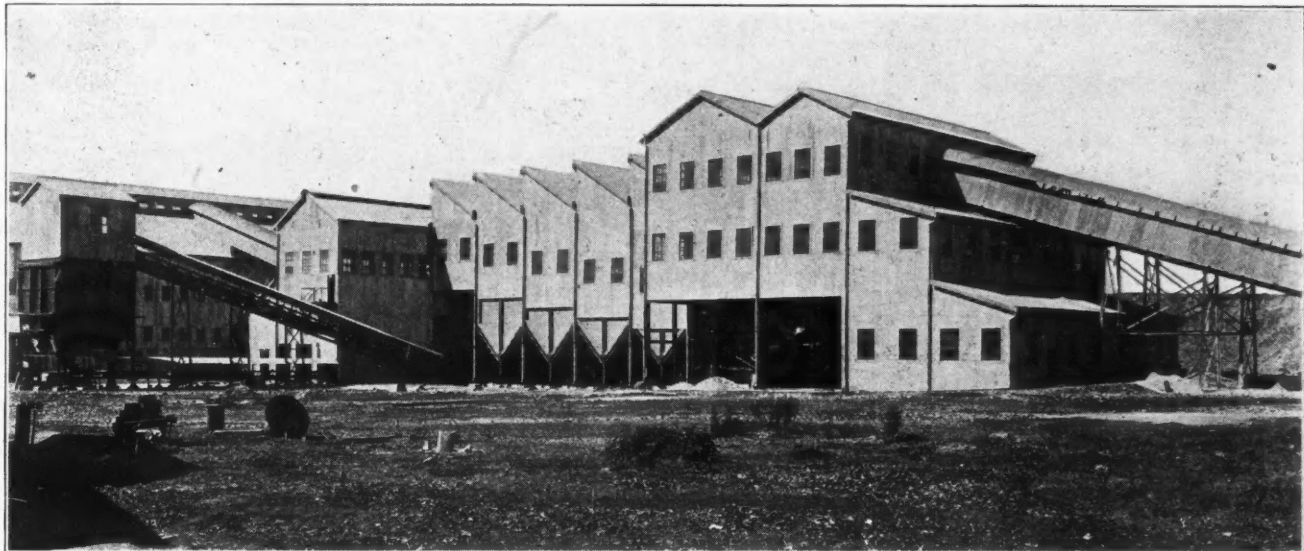
Plant Combines Several Interesting Features Including Elimination of Fines Before Sorting, Gravity Flow from Stamps, Continuous Thickening, Flexibility of Method of Slime Treatment at Low Elevation, and Collection and Treatment of Sand

BY E. M. WESTON

Written exclusively for *The Journal*

THE New Modderfontein Gold Mining Co. operates one of the most remarkable gold mines in the world. It owns 1,264.5 reef-bearing claims. On June 30, 1918, a total of 241 claims were worked out. A claim is approximately 150 x 400 ft. in area. So far, 289 claims had been developed, showing 9,000,000 tons of a value of 8.6 dwt. per ton, and 96 claims contain ore classed as unpayable; leaving 639 claims undeveloped. As mines working on the south-east and west boundaries show ore of high grade,

less rope haulage to the main station on the thirteenth level and tipped into the underground crusher station below this level. It passes over grizzlies, and the oversize through three 1,000 x 550 mm. jaw crushers running 250 r.p.m. and driven by 60-hp. motors, and thence into a bin of 1,000 tons' capacity. The ore is filled into six-ton trucks, which run to the shaft bottom, 120 ft. distant, on a graded, heavily railed track. They are arrested by mechanically operated brakes and finally pushed into the cage.



GENERAL VIEW OF MILL, NEW MODDERFONTEIN GOLD MINING CO.

these claims are almost certain to contain from fifteen to twenty million tons of ore. A profit of about 20s. per ton may be anticipated, or £24,000,000 to £29,000,000.

As there is another reef about 400 ft. in the hanging wall, not now being worked, on which about 200,000 tons of 6.5 dwt. ore is developed, it is probable that these estimates will be exceeded. Ore crushed totals 6,792,480 tons, and the return has been £12,473,590. Dividends declared total £4,003,750; but large sums from profits have been expended in adequately equipping the mine, which is valued on the market at present at about £9,500,000, and presents an interesting problem to the mine valuator.

Circular Shaft Equipped During War

A circular shaft 2,258 ft. deep and 18 ft. in diameter was sunk near the south boundary of the property by the advice of the consulting engineer, H. Stuart Martin, and during the war this was equipped and a new reduction plant erected. The ore from the levels is brought in one-ton coal-type trucks by end-

The empties return to the bin on an endless rope. Hoisting ropes are 2 in. in diameter, of a flattened strand, non-spinning. The electric winder is of the cylindro-conical drum type on a mild-steel shaft of 24-in. diameter on two main bearings. Direct coupled at each end is a 2,000 hp. continuous-rating direct-current motor. These motors are electrically connected with two direct-current generators of the motor-generator set and are operated on the Ward-Leonard system. The drum was designed to be made of cast steel in four quarters, in sections, but it was necessary to make the 15-ft. portions of cast iron. Diameter rope centre, at the small ends, is 15 ft., and at the large ends 24 ft. Number of grooves at small ends, 11, and at large ends, 34. Each cone has five complete grooves. Working lengths of rope on drum 6.7 tons on small part, 5 on cones, and 21 on large drum.

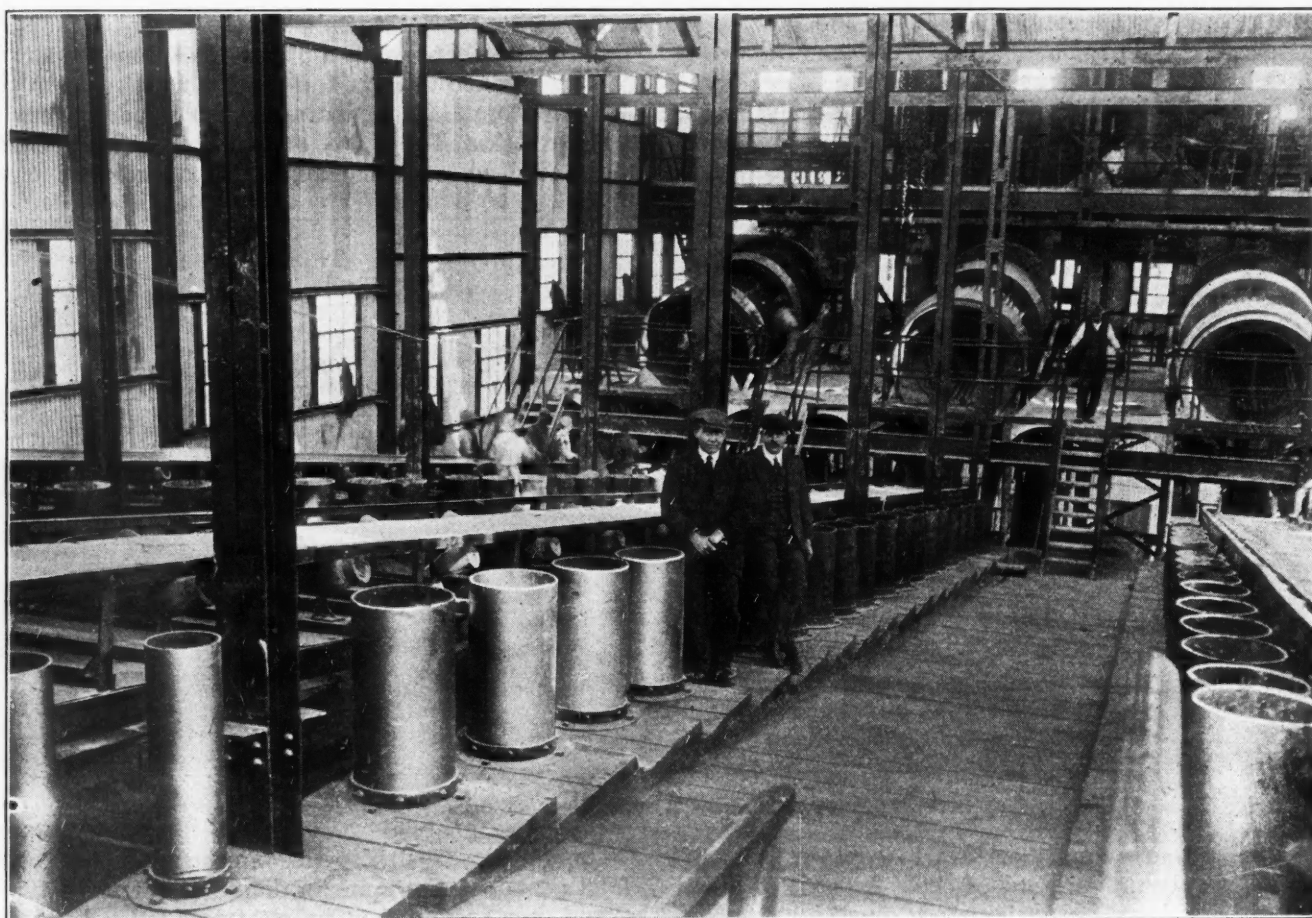
An auxiliary rope reel placed inside both brake treads holds 250 ft. of spare winding rope. The reel is operated with rack and pinion. The post brakes,

with renewable cast brake heads 7 ft. in diameter x 14 in. wide, are fitted, each capable of controlling the winding. Whitmore brake control is used, with safety device. Maximum speed is developed in 15 seconds. Time of stop between trips is 8.2 seconds. The six-ton trucks, on reaching the surface, pass over graded tracks to a small ore bin, and return by creeper chain.

The ore travels along two 26-in. inclined conveyor belts each 193 ft. long running 200 ft. per min., driven by two 25 hp. motors with non-runback stoppers and reduction gears. The ore rises 38 ft. above ground level into the sorting and crusher house.

the screens of the secondary tromeels bypass the mill and are classified, the oversize joining the mill pulp going to the tube mills; and the undersize is collected in tanks and periodically sent to the cyanide plant, thereby avoiding irregular accessions of water detrimental to good classification. The six tromeels are driven by one 25-hp. motor.

With this system the following advantages are claimed: (1) A clean product for sorting; (2) practically no fines smaller than the mill screen are fed to the stamps; (3) the product is more suitable for belt transport; (4) the water system is confined to the sorting and crushing station.



SORTING STATION, SHOWING PIPES IN TO WHICH WASTE ROCK IS DROPPED

Here a necessary item, neglected far too much in some modern plants, is the very thorough washing in tromeels, and the separation and dewatering of the fines by tromeeling. The ore passes three washing and sizing tromeels, 5 x 20 ft., set 10 deg. from the horizontal and revolving 10 r.p.m. Tromeels have holes 3 in. deep and 1½ in. diameter. Oversize goes to three sorting belts, 36 in. wide, 88 ft. long, running 40 ft. per min. Belts are driven by 15 hp. motors with reduction gears. Undersize falls by gravity to three screening tromeels, 5 x 12 ft., horizontal with internal conveying screws. The screens are the same aperture as the mill screens (9 mesh); the washed fines are delivered on a cross belt 24 in. wide and 55 ft. long, and join the product from the breakers. The products passing through

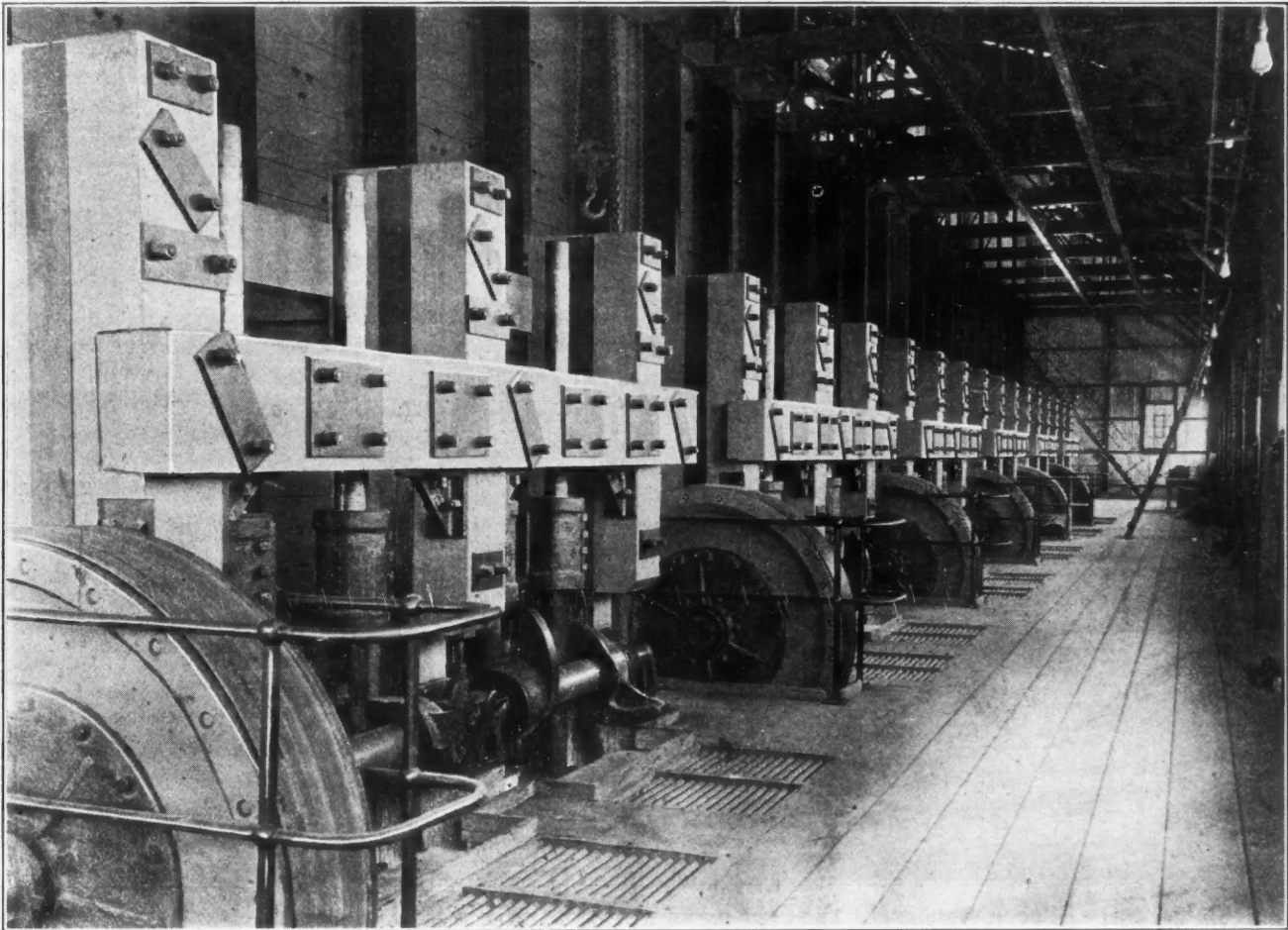
The sorting station is well lighted. Waste rock goes by the pipes shown in illustration into bins, and the waste goes by endless haulage to the sands dump. At the end of the sorting belt the ore goes to four No. 6 Style K Gates gyratory belt-driven crushers, each driven by 60-hp. motor, and a fan withdraws dust produced from these breakers. The screened product from one breaker specially set goes to a storage bin on a cross-belt, to supply the tube mills, and is thence transferred, when required, by the main-mill belt and shuttle belt to the main supply bin for the tube mills at one end of the mill bins. The main product from the breakers falls into a cross-belt 3 ft. wide and 138 ft. long, running 150 ft. per min., driven by a 15-hp. motor, with reduction gear. This delivers to the main belt elevating the ore to the mill.

This belt is 36 in. wide and 212 ft. long, runs 150 ft. per min., and is driven by a 50-hp. motor. The angle of inclination is 16 deg. from the horizontal, and the ore goes to a shuttle belt 45 ft. above ground level. This is 75 ft. long, 36 in. wide, and driven by a 10-hp. motor.

The milling plant consists of fifty-six 2,000-lb. Nissen stamps, each set of eight stamps being driven by a 50-hp. motor. The feeders, one to each stamp, are of the fluted roller type, simple to repair and of low maintenance cost. The stamp duty is thirty tons per day, through 9-mesh screens. The pulp passes over observation tables and gravitates through two launder systems to the tube-mill cones, there being no pumping.

again flows by gravitation to the amalgamating department, which is arranged as an independent section, as it is self-contained and partitioned off from the rest of the plant. A gallery connecting the classification and pulp deliveries with the crushing department runs overhead and facilitates control and supervision. The copper plates are forty in number, five per tube mill, erected on an angle-iron table, with provision for adjusting the inclination. The plates are 5 x 12, with effective surface of 53 sq. ft., equal to 1.2 sq. ft. of plate per ton of ore per twenty-four hours. The amalgam traps occupy minimum space and are secured to the plate covers.

From the plates the pulp runs to two 12-in. sand pumps with a capacity of 1,300 tons per hour at 65



PART OF THE BATTERY OF FIFTY-SIX 2,000-LB. NISSEN STAMPS

The tube mill plant consists of eight tube mills 6 x 20.5 ft., there being one mill to eight stamps, with one in reserve. The mills are fitted with 5-ft. diameter Schmitt feeders, Osborne liners, and scoop discharges, and a ball compartment could be put in if desired. The tubes are driven by 150-hp. motor and run 28 r.p.m.

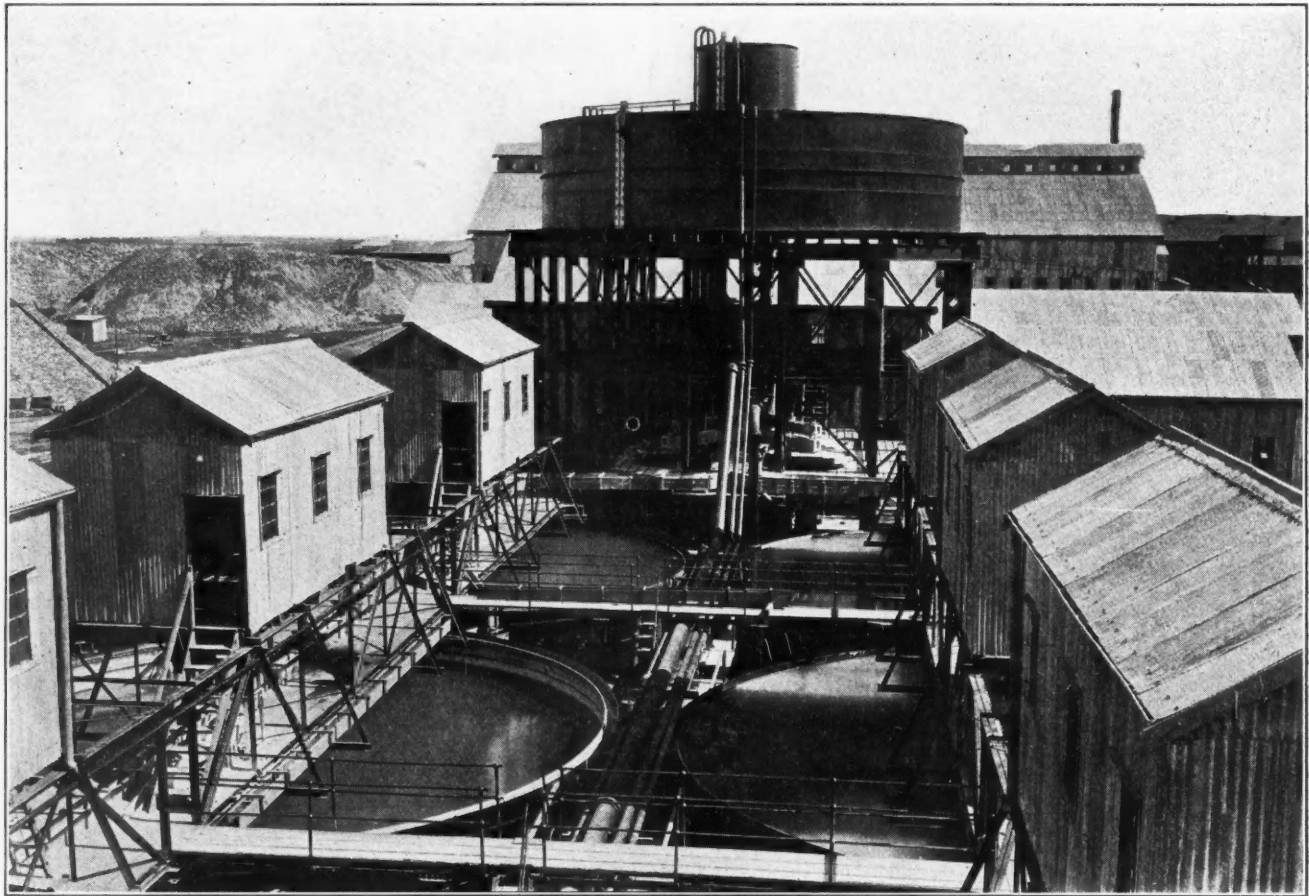
The main tube mill cones are 5 ft. in diameter by 6 ft. 4 in. deep, and each two main cones has a secondary cone 3 ft. 6 in. in diameter and 5 ft. deep, coupled in series. Pebbles are supplied from the storage bin on a 12-in. belt 147 ft. long, driven by 5-hp. motor at a speed of 60 ft. per min. The pulp

ft. head and 430 r.p.m. They are belt driven from two 150-hp. motors. A storage sump of ample capacity guards against failure of current. The pulp is then lifted for the first time to a main distributing cone 7 ft. 6 in. in diameter and 7 ft. 6 in. deep, and thence to eight classifying cones 3 ft. 6 in. in diameter and 5 ft. deep. These cones are fitted with hydraulic devices and parallel sorting columns, and the returns gravitate back to four of the tube mills for regrinding. Provision is made for operating these four mills either as primary plus returns or as independent secondary circuits. The overflow passes to four cones 7 ft. 6 in. diameter by 7 ft. deep, also

fitted with hydraulic devices and parallel sorting columns. These cones separate sand and slime. The situation of the cones quite near the ground level is a departure from usual practice, the slime reaching the settler (Dorr thickeners) by gravity. The sand and water gravitate through a concrete conduit to a sump, and are then pumped to the sand plant. At this point is situated the mill water tank. One structure carries the main steel tank, 50 ft. in diameter and 12 ft. deep, within which is the cone classifier-service tank, 15 x 12 ft., the mill tank being supplied by the overflow of the inner tank, which receives the main supply. The inner tank also supports the pump gland-water service tank, 12 x 6 ft. The four separating cones are supported by this structure.

is continuous and does away with periodical sluicing as in intermittent collecting. The slime gravitates to the main pump house, sufficient cyanide solution being added to fulfill pumping requirements.

By means of 6-in. slime pumps of 300 tons per hour capacity to a height of 55 ft. at 590 r.p.m., the slime is lifted to the agitators, consisting of six Standard Brown tanks, 15 ft. in diameter and 45 ft. deep. They can work singly, in series, or in parallel. After agitation the pulp gravitates to a 60 x 12 ft. stock tank, fitted with steering gear, and thence to Butters filters, which consist of 300 leaves, and have a capacity of 20,000 tons of dry slime per month. The stock solution is carried at a sufficient elevation in a 40 x 12-ft. tank. The filter vacuum is created



DORR THICKENERS AT PLANT OF NEW MODDERFONTEIN GOLD MINING CO.

Sand and water goes to the main pump house and is elevated to the sand launder by 6-in. sand pumps of 300 tons' capacity per hour at 55 ft. head and 590 r.p.m. The tanks are eight in number, 52 ft. 6 in. in diameter and 10 ft. 6 in. deep, with filter bottoms and distributors. The sand is collected and treated without transfer, this being possible on account of the careful classification and the absence of danger from contamination of the mill water by cyanide.

Slime Plant

The collecting is done in six Dorr thickeners, each tank being 40 x 12 ft. The tanks are fitted with stirrers and diaphragm pumps. The production of thickened slime, containing 40 per cent moisture, with a working ratio of one solid to thirteen water,

by rotary pumps operating through a vertical cylindrical receiver.

The main pump building houses under one roof all the electrically driven pumping plant, viz., three 12 x 15-in. vacuum, two 11-in. mill water, two 6-in. sand, two 6-in. slime, two 4-in. gland water, two 4-in. gland solution, two 3-in. permanganate, and five 6-in. solution pumps. For the filter plant: Two 3-in. diameter valve pressure, two 12-in. diameter slime solution, two 6-in. slime residue, and two air compressors. The control arrangements for the filter plant and the whole pumping system, as well as the telephone arrangements, are in this one building.

The extractor house is of the usual type. The solution passes from steady head tanks to ten mild-steel

boxes 5 x 39 ft., in which solutions are interchangeable.

In conclusion, the interesting features of this plant are: (1) Thorough washing and elimination of fines before sorting; (2) gravity flow from stamps to tubes; (3) new design of tube mills; (4) isolation without decentralization of plate house; (5) continuous thickening by "Dorr system"; (6) separation of sand and slime at low elevation; (7) flexibility of method of slime treatment; (8) collection and treatment of sand in one tank.

State Mining Lease Construed

BY A. L. H. STREET

A case lately before the Minnesota Supreme Court involved an interesting question as to whether royalties under a state mining lease should be computed upon low-grade iron ore before washing, or on the lesser tonnage of concentrates (State vs. Hobart Iron Co., 172 "Northwestern Reporter," 889).

A lease held by defendant on ore lands of the state provides for the mining of "merchantable shipping iron ore," and for a royalty of 25c. a ton for all the "iron ore mined and removed." The mine contains a body of low-grade ore not directly usable in the furnaces under present furnace methods. It is washed on the premises, and the concentrates are shipped to furnaces for sale at a profit. No profit would result if the unwashed ore were shipped, because of the expense of transportation.

The question presented to the court, in this suit brought by the state to recover royalties, whether the royalty should be computed on the ore or on the concentrates, is decided in favor of the state; it being found that the concentrates can be sold at a fair profit above costs, including expenses of mining, washing, and transportation, and royalty based on the ore mined.

Nacozari Consolidated Copper Co.

The annual report of the Nacozari Consolidated Copper Co. for the year ending Nov. 1, 1919, states that the main cross-cut tunnel was advanced 1,440 ft. On the main tunnel level 100 ft. of drifting was performed. In the San Pedro & San Pablo properties, 600 ft. of drifting was performed. The total development for the year aggregated 2,140 ft. The total mine operating expenses amounted to \$28,684.46.

About Oct. 1, the cross-cut tunnel penetrated the large diabase dike, lying on the south wall of the Pilares copper-bearing reef and since that time a heavy flow of water has been draining through the tunnel. At present the main cross-cut shows chalcopryite and bornite stringers, and the east drift exposes a network of pyrite stringers, ranging from 1/2 in. to 2 in. in width.

It is stated that ample funds are available for the completion of the cross-cut tunnel well into the copper-bearing reef. The company has been able to operate during the past year entirely unhampered by labor disturbances and strikes.

Foreign Trade in Metals and Ores

Imports and exports of the more important metals and ores as reported by the Department of Commerce for November, 1919, and the figures for November, 1918, as finally revised, are as follows:

IMPORTS, NOVEMBER 1918 AND 1919

(In pounds, unless otherwise stated)

Metal and Ore	Nov., 1918	Nov., 1919
Antimony ore, contents.....	143,118	4,030
Antimony matte, regulus or metal.....	1,812,139	560,120
Copper:		
Ore, contents.....	4,630,841	6,174,162
Concentrates, contents.....	3,790,030	5,675,732
Matte and regulus.....	6,978,944	2,200,009
Imported from (in part):		
Canada.....	2,442,682	1,949,413
Mexico.....	8,318,313	4,208,966
Cuba.....	723,425	2,419,430
Chile.....	571,292	2,909,731
Peru.....	231,997	136,777
Venezuela.....	Nil	988,086
Unrefined, black, blister, etc.....	27,793,791	21,079,182
Refined, in bars, plates, etc.....	3,132,388	17,654,982
Old, etc., for remanufacture.....	299,641	25,316
Lead:		
Ore, contents.....	1,596,136	611,437
Bullion, contents.....	10,602,379	5,150,133
Imported from (in part):		
Canada.....	210,527	406,179
Mexico.....	10,939,890	5,355,391
Pigs, bars and old.....	1,200	1,353,394
Pyrites, long tons.....	21,775	40,259
Imported from (in part):		
Spain, long tons.....	Nil	22,744
Canada, long tons.....	20,975	11,865
Tin ore, long tons.....	239	1,172
Tin bars, blocks, pigs, etc.....	10,734,179	15,233,671
Imported from (in part):		
Straits Settlements.....	7,704,006	8,861,821
Dutch East Indies.....	1,251,568	2,503,332
United Kingdom.....	280,390	2,918,342
Australia.....	799,112	638,400
Hongkong.....	581,955	1,680
Zinc:		
Ore, contents.....	2,199,426	7,791,389
Imported from (in part):		
Canada.....	381,591	2,913,600
Mexico.....	1,817,835	2,942,315
Blocks or pigs, and old.....	306	1,886
Manganese ore, long tons.....	38,580	11,694
Imported from (in part):		
Cuba, long tons.....	7,897	Nil
Brazil, long tons.....	27,721	8,100
Tungsten ore, long tons.....	2,311	1,423

EXPORTS OF COPPER, LEAD AND ZINC

(In pounds)

	Nov., 1918	Nov., 1919
Copper:		
Ore, contents.....	21,300	10,500
Concentrates, contents.....	30,200	24,904
Unrefined, black, blister.....	110	Nil
Refined, in ingots, bars.....	44,582,893	28,678,709
Exported to (in part):		
France.....	10,563,613	9,979,240
Italy.....	10,451,091	Nil
United Kingdom.....	13,412,203	4,914,560
Canada.....	6,743,543	2,289,733
Composition metal, copper chief value.....	20,060	13,241
Old and scrap.....	22,400	7,223
Pipes and tubes.....	581,992	442,593
Plates and sheets.....	168,530	456,442
Wire except insulated.....	965,295	3,280,167
Lead:		
Pigs, bars, etc., produced from domestic ore.....	1,412,781	1,203,348
Pigs, bars, etc., produced from foreign ore.....	14,960,361	4,431,374
Exported to (in part):		
Canada.....	Nil	133,042
United Kingdom.....	15,521,245	224,000
Argentina.....	224,000	392,000
Japan.....	66,000	3,724,000
Brazil.....	184,532	338,264
Zinc:		
Dross.....	2,402,987	Nil
Slab Zinc:		
Produced from domestic ore.....	12,601,780	11,698,160
Produced from foreign ore.....	2,560,953	522,199
Exported to (in part):		
France.....	1,568,000	503,981
Italy.....	1,899,612	100,604
United Kingdom.....	7,586,519	5,940,102
Canada.....	1,670,377	74,142
Mexico.....	300	3,220
Japan.....	1,910,082	5,543,973
In sheets, strips, etc.....	2,354,823	2,382,519

A New Molybdenum Steel

Professor John O. Arnold, of Sheffield University, England, has recently announced the discovery of a new alloy steel of superior hardness to any hitherto made. The process is not divulged, but it is understood that it involves the substitution of molybdenum for tungsten.

The Silver Problem

Unprecedented Absorption of Precious Metals by Oriental Creditor Nations — Future Integrity of the Gold Standard Demands Revision of European and American Currency Systems—Bright Future for the Silver Miner

BY RENE LEON,

Manager, Bullion Division of the Guaranty Trust Co.

Written exclusively for *The Journal*

THE armistice signed on the battlefield of northern France in November, 1918, marked the close of a struggle unprecedented in world history, not alone as regards the number of men engaged therein, and the resultant loss of life and property, but also with respect to the number of nations and races participating in that struggle. Although the main theatre of operations stretched from the North Sea to the Alps, it must not be forgotten that bitter fighting was taking place as far east as the Persian border and as far south as German East Africa, and naval engagements were fought on the seven seas, from Jutland to the Falkland Islands and from Juan Fernandez, in the South Pacific, to Cocos Island, in the Indian Ocean.

On the European front white troops fought side by side with Hindus and Senegalese, and Chinese coolies in vast numbers were recruited in the British stations at Wei-Hai-Wei and Tsing-Tao and were brought to Europe via the Pacific, Canada, and the Atlantic to help unload munitions in French and British yards and terminal stations. Raw materials were gathered from all parts of the world to feed, clothe, and arm the warring nations. The Argentine contributed its wheat, hides, and wool; Chile its nitrate, and Cuba its sugar, and from the other side of the earth the inexhaustible Orient sent over products of every description. It may therefore properly be said that the Great War was world-embracing in its scope, and as such directly affected in some way or another all the nations of the earth, so that changes without precedent were brought about in the economic life of all peoples.

Historic Preference for Gold and Silver as Exchange Mediums

From time immemorial gold and silver have been chosen by men as favorite means of exchange; they are closely associated with the development of human kind, and we find them accompanying man in his journey westward from the earliest cradle of civilization on the banks of the Euphrates to the Atlantic shores of Western Europe. Throughout history we hear the question of weights and fineness discussed in very much the same way as it is discussed in our times. Names may change with time, and it may be a long call between the "Dinar" of ancient Persia and the "Dineros" of mediaeval Spain, but the relation between them exists, as does the relation of the "Drachma" of modern Greece and the "Dirham" struck by the earliest Mohammedan Caliphs.

In olden times the system of barter sufficed unto the needs of peoples, owing to the limited means of communication, which restricted commerce to nearby points; but the caravans opened the way, and

with the invention of the steam engine rapid means of communication were developed, so that the ramifications of commerce multiplied and extended greatly. Trading, however, had many difficulties, and payment in commodities was not always advantageous, in that the vendor was compelled to accept in payment those goods of which the purchaser might happen to be possessed. Facilities had to be found, and the banker came into his own. Credit was needed. It was created, and was availed of in ever-increasing amounts, and to the economic machinery was given added impetus by the adoption toward the middle of the last century of the gold standard, upon which rested the ever-growing structure of credit. Gold became the yard-stick of value, and the white metal was relegated to the rank of a commodity.

The attachment of man to silver was, nevertheless, recognized and expressed through its general adoption for fractional coinage. The price of gold was fixed by law, and silver coins were struck as mere tokens, for the economists of the times realized that the masses could find no objection to accepting token coins made of silver, so long as these coins were exchangeable for gold of a greater intrinsic value than that possessed by the metal contents of the silver coin so exchanged. The silver production of the world had always sufficed to satisfy the requirements of the arts and the coinage needs of the Occidental nations, leaving enough to meet the payment of balances favorable to those countries which had not adopted the credit system but were on a purely metallic basis. These latter included all the Oriental nations, prominent among them India and China.

War Created Balance in Favor of Orient

The war brought about a complete change in that the Allied nations were obliged to draw on the Orient for vast quantities of men and raw materials needed to prosecute it to a successful end, and in this wise India and China rolled up against the Allies balances of such magnitude as to make the question of their settlement a precarious one. The reason therefor was that neither India nor China possessed the economic machinery which makes possible the postponement of the settlement of balances by means of bank credits or bond issues. The status of the individual Oriental is exceedingly lowly, and few are those who lay aside funds in sufficient amounts to permit of their indulging in foreign investments. Settlements of balances had, therefore, to be effected either in commodities or in precious metals.

With the dislocation of European industry, the entire machinery of which was diverted from commercial ends to the immediate war needs, the

settling of adverse balances by means of shipments of commodities of European origin was out of the question. Precious metals were, therefore, the only alternative; but to what extent could the European nations draw upon their gold reserves? These reserves are the foundation stones on which rests the edifice of credit, and this credit had been largely expanded through war necessities. If the foundation is weakened the whole structure is threatened. It was preferable to ship silver rather than gold, so the white metal began to flow eastward. All visible stocks quickly found their way to the Far East, until Europe found herself entirely denuded of the metal. Even the reserves of silver dollars held in the Treasury of the United States were called upon to relieve the situation. About two hundred million ounces were obtained under the provisions of the Pittman Act and shipped to India, which absorbed them with alarming rapidity. We had but postponed the evil day.

Hoarding of Metals an Aftermath of the War

The war finally came to an end; it had unsettled a great many things—among them the theories of most economists, who had evolved these theories according to economic precedents. Warfare had ceased, but peace was not yet at hand; the demobilization of troops and the repatriation of the colonial contingents were necessarily slow and expensive operations, and the needs of Europe at the close of hostilities were very great indeed. Credit possibilities were stretched to the utmost; paper currency was nearly as freely issued after the war as during it, and the ratio of metallic reserves to indebtedness, both domestic and foreign, was constantly decreasing.

The dislocation of the foreign exchanges lent an added premium to the hoarding of precious metals, which the masses in Europe preferred to the ever-depreciating paper currency. This depreciation caused the intrinsic value of the fine-metal contents of the heretofore token silver coins to cross their face value. These coins were gathered, melted and sold for bullion, and as time passed the precious metals became more and more precious in their relation to the paper currencies. Meanwhile the general work of reconstruction had to be undertaken. Expedients had been used in financing the war, but the true bill had to be met sooner or later. Europe was greatly impoverished, and the majority of the leaders of the Occidental nations became agreed on the point that rehabilitation was largely dependent upon thrift on the one hand and increased production and exchange of commodities on the other. But where was Europe to turn for raw materials wherewith to manufacture the finished products? The arrow pointed once again to the Far East with its wealth of raw materials. The Orient not only possesses these in vast quantities, but it also has labor in numbers adequate to develop them. There, labor is as cheap as it is plentiful—but herein cropped up once more the embarrassing question of payment.

In the absence of the necessary shipments of silver, up rose the Oriental rates of exchange so that

the figures of Oriental balances became larger than ever when expressed in terms of European exchanges. True, the Indian government is attempting to educate the Hindu in modern economics. In doing so, it has been able to increase enormously its issue of rupee notes, but the educational progress of the Oriental is slow, and certain amounts of metal had, nevertheless, to be shipped. Meanwhile both gold and silver production was falling perceptibly. The total output was insufficient to meet pressing demands for payment. The problem was a grave one. Again expedients were used—but no solution was found.

Record Silver Production in 1911

The world's production of silver reached its high mark in the year 1911, when, according to the report of the Director of the Mint, about 226,000,000 oz. was produced. Since that time production has fallen steadily, owing chiefly to the disturbed political conditions in Mexico, which resulted in the dislocation of railway communications, with corresponding difficulty in shipping ores to the smelters and obtaining the necessary mining supplies. Labor there became thoroughly disorganized, rendering operations costly as well as uncertain, and many mines in the outlying districts were obliged to suspend operations. In normal times Mexico is the second largest producer of silver, and though it still maintains that position, its production has steadily fallen—the low point being reached in 1916, when production was about 50 per cent of normal. The rich Cobalt district of Canada, which at one time contributed 15 per cent to the world's total production of silver, also found its output diminishing through gradual exhaustion. This was made up somewhat by greater production in Central America and Peru, as well as by the intensive copper production stimulated by the war needs for the baser metal.

World production for 1918 is estimated at 197,000,000 oz., and the figures for 1919 are likely to show a further improvement of about 10,000,000 oz., owing to increased Mexican production. High prices have also acted as a stimulant, although the higher-grade mines profit thereby to a much greater degree than those possessing low-grade ore, owing to increased cost of production. Labor conditions have been a distinctly adverse factor in all mining enterprises—prices of mining machinery, cyanide, and explosives having risen considerably.

Under the terms of the Pittman Act, the Government fixed a price of \$1 per fine ounce for silver within the United States; this figure was later increased to \$1.01½. The American price may safely be said to have been the world price of silver, in view of the fact that almost the total amount of silver produced outside of the United States is sent to this country for reduction. Upon the removal of Government restrictions last May, silver quotations began a series of violent fluctuations before finally striking a level. During May, June, and early July prices ranged between \$1.03 and \$1.19, while the market was groping in its endeavor to determine the exact proportions of supply and demand. It was

soon seen that China, which is the second largest consumer, and which had been starved out of metal during the greater period of the war, was coming boldly into the market. The Asiatic demand, which developed in the middle of July, has continued unabated until today, and has resulted in record shipments to Shanghai and Hongkong, from which points the metal has found its way into the interior of China.

China Absorbing Gold as Well as Silver

The latent power of Chinese absorption was a revelation to the world; for as steamer after steamer left our Pacific ports laden with the precious metal, it was naturally expected that the Chinese demand must soon be satisfied. However, these expectations were not fulfilled, and ever-increasing prices only served to whet the metallic appetite of the Chinese. Bars by the thousands were unloaded at the Shanghai and Hongkong wharves, and, after an all too brief journey in the native melting shops, disappeared as if by magic. It was hoped that a substantial proportion of this metal would go to reinforce the stocks of the various Chinese commercial centers; but such was not the case, and it was only through the exercise of the greatest care that the foreign banks in China succeeded in maintaining metal reserves sufficient to conduct business. When unable to obtain silver, owing to its scarcity, the banks resorted to gold, and yellow metal in large quantities was engaged in the United States for export to China. This gold was absorbed with equal facility.

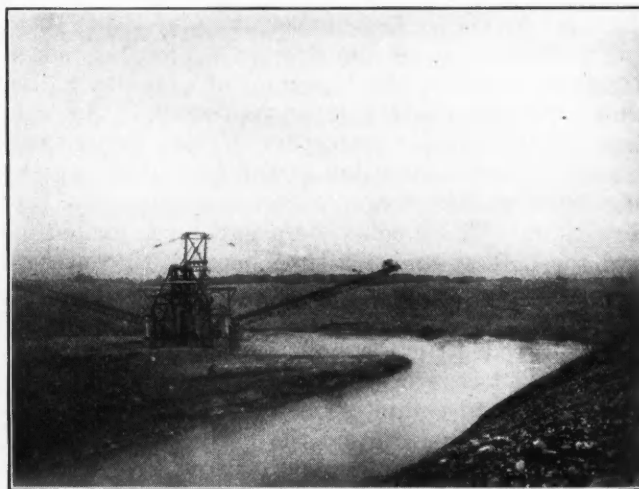
On Nov. 25 silver sold in the London bullion market at the unprecedented price of 76d. the "standard" ounce. Available English statistics dating back to the Napoleonic times fail to reveal so high a quotation. The melting price of the British fractional coin which is 66d. had been reached and easily crossed. This caused the British government immediately to issue an order forbidding the export of silver coin or specie and making it a crime to melt them. There is no legal measure, however, which can prevent hoarding and the corresponding impediment to commerce of that practice. The everyday life of a nation is based on an infinity of small individual transactions payable in fractional currency; if that currency disappears, the entire commercial life of a nation is disturbed. If, for instance, the purchase of the humble loaf of bread in the corner bakery is rendered impossible through the absence of the small coin, the business of the flour mill, and through it, the interests of the wheat grower, are at once affected. Furthermore, the premium which hoarding per se automatically places on the fractional coin over the paper currency disturbs the currency system of a nation, in that discrimination is made between two currencies issued by that nation which are related one to the other through a legally fixed ratio. Discrimination is, therefore, illegal, but unfortunately no way has yet been found to prevent hoarding. Governments might resort to the issuance of fractional paper currencies when they find themselves in such predicaments; but this

promotes inflation and in no way releases the hoarded coins; on the contrary, fiat money promotes hoarding on the principle of the immutable law of Gresham according to which "la mauvaise monnaie chasse la bonne."

Unlike the European governments, the Government of the United States is in fortunate possession of a considerable stock of silver which may be used to correct any situation threatening the stability of our currency system, but the ever-growing demand for silver is conjuring a problem which our economists must face; expedients will not do where a definite solution is needed. If the gold standard is to endure, then European and American currency systems must be revised and silver coins debased to the point where they will once more become tokens of value. When that is accomplished, silver prices should be permitted to soar in the knowledge that high prices bring their own correctives; otherwise we must revert to the bi-metallic basis. In either case, the silver miner may look to the future with complete confidence, for, after a period of some fifty years the white metal has finally come into its own—there to remain for some time.

Channel Construction by Gold Dredge

The accompanying photograph shows an 18-cu. ft. bucket dredge of the Yuba Consolidated Goldfields Co., constructing a 500-ft. channel. The work is being done in the debris excavated in dredging the flood-plane gravels of the Yuba River at Hammonton, Cal. The dredge is of the two-stacker type, and the discharge from the stackers is so manipulated



CHANNEL CONSTRUCTION BY DREDGER AT HAMMONTON, CAL.

as to leave a well-leveled bottom to the channel and a north wall paralleling a south wall already constructed. A similar channel of the same width will be constructed south of the one shown and the river diverted into these channels, enabling a portion of the present bed of the Yuba to be dredged. The great depth, 80 ft. below water level, at which gold dredges of this type can operate, has made possible the redredging of a considerable area of ground once worked over by smaller machines.

A Water Problem in Shaft Sinking

Excessive Flow Struck in Sinking Shaft in Atacama Desert—Pumping from Nearby Churn-Drill Hole Resorted to as Aid to Shaft Pumps—Shaft Finally Abandoned

BY JAMES E. HARDING
Andes Copper Mining Co., Potrerillos, Chile

Written exclusively for *The Journal*

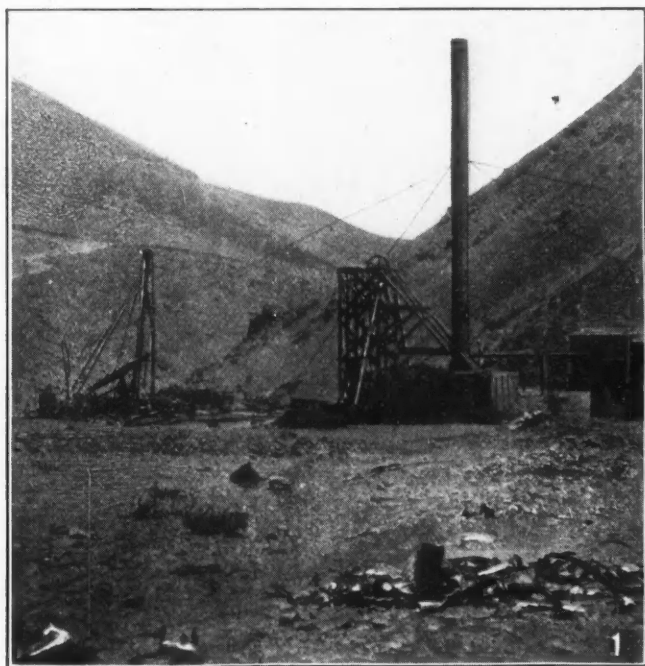
IT SEEMS anomalous that the chief difficulty encountered in sinking a shaft in the Atacama Desert of Chile should be caused by water, yet such was the case when the Andes Copper Mining Company attempted to sink a shaft to the level of the tunnel which it is driving to attack its orebody from below. The company is developing a large deposit of low-grade copper-bearing porphyry, at Portrerillos, Chile, 100 miles from the coast, back in the foothills of the main Andes cordillera, and at an altitude of slightly over 10,000 ft.

The tunnel referred to will be about 12,000 ft. long when finished, and will cut the orebody at 1,030 ft. depth. To expedite the work of driving this adit

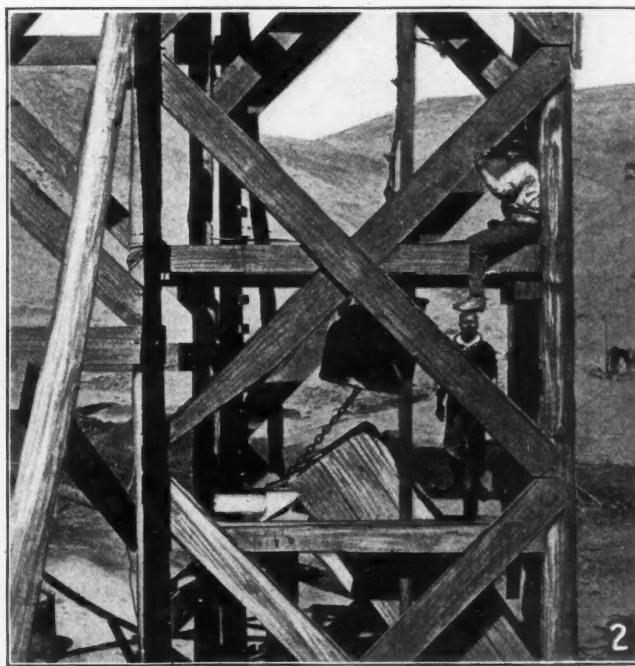
at the start and was later replaced by a standard single-drum mine hoist.

The dumping device shown in Fig. 2 was installed in the headframe. The trough seen in the lower part of the cut is made of plank, and lined with steel plate and railroad iron to stand the battering which it receives. It swings on hinges at the bottom, and is counterweighted in such fashion that very little force is required to move it in and out of the shaft compartment. At the center of its upper end there is attached a steel fishtail which engages a chain fastened to the bottom of the bucket when dumping.

The trough is in a vertical position when the bucket is being hoisted or lowered. When dumping,



1. HEADFRAME OVER SHAFT IN ATACAMA DESERT, CHILE, IN WHICH HEAVY WATER WAS STRUCK; CHURN DRILL RIG AT LEFT.



2. BUCKET DUMPING DEVICE USED IN HEADFRAME

it was decided to sink a shaft at a point 9,364 ft. from the portal, which would reach the tunnel level at a depth of 665 ft., and then from the bottom of the shaft to drive headings in two directions, one toward the orebody, and the other to meet the incoming heading, forming thereby one straight tunnel.

Owing to war conditions the necessary material was exceedingly hard to obtain. For a headframe, round poles 40 ft. long were secured, and, when set up, were trussed with whatever 2 x 12-in. plank happened to be on hand, with 6 x 8-in. sawed timber for struts. With this material a satisfactory headframe was constructed, as shown in Fig. 1. A winch from a steamship was installed to serve as a hoist

it is swung back into the compartment under the bucket. Dumping takes less than five seconds with this device, the rock running down the trough into a car placed at the bottom. The entire operation can be handled by the hoistman.

After sinking was begun and the shaft had passed through the wash into bed rock, water in large quantities was encountered. A No. 7 pump was installed; later a No. 9, followed by a No. 11, and finally all three in various combinations, but sinking was always greatly retarded by the water. By this time it was seen that it was impossible to sink deeper with the pumps in use, owing to the fact that the power plant was running at full capacity. It was

therefore decided to try pumping from a churn-drill hole at one side of the shaft. Accordingly a churn-drill rig was moved to the position shown in Fig. 1. After much difficulty a 10-in. hole was sunk to a depth of 344 ft. and the bottom of it shot with dynamite, making a chamber to accelerate the flow of water. The effect on the surface when shooting the hole is shown in Fig. 3.

The deep well jack shown in Fig. 4 was made in the company's machine shop for pumping from the drill hole. This pump consisted merely of an intake valve, inserted and fastened in the pipe just above the strainer, and a plunger with a by-pass valve within itself. The pump was first lowered into the



3. SURFACE EFFECT UPON SHOOTING CHURN DRILL HOLE.

hole on the end of a string of drill casing, with the plunger attached to an ordinary steel cable.

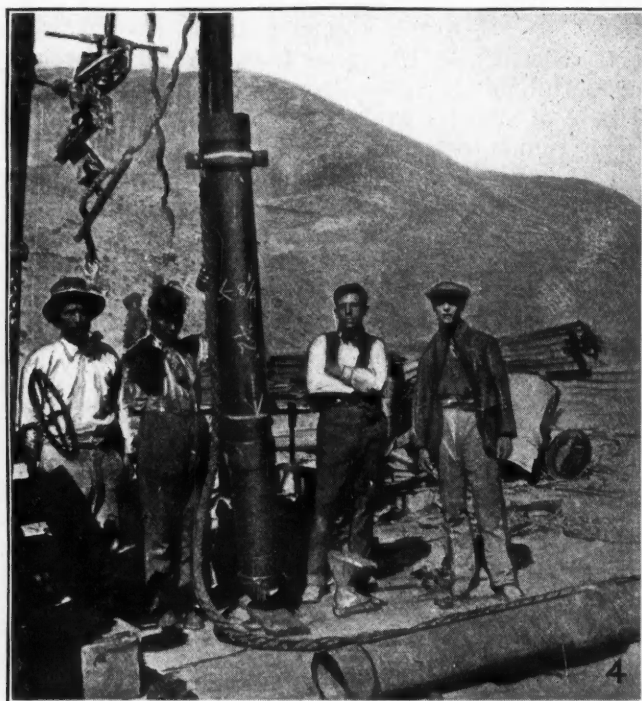
The capacity of the pump was estimated at nearly 300 gal. per minute, 28 to 30 strokes per minute being figured in the calculation. After pumping with this installation for a short time it was found that, owing to friction caused by dirt getting into the cylinder, the plunger did not fall fast enough, after it was lifted, to give a full stroke. An idea was therefore borrowed from Cornish practice, and a two-inch square pump rod was put down, one end attached to the beam of the churn-drill rig and the other to the pump plunger. Thus operated, the pump gave fairly satisfactory service.

The combined capacity of the pumps in the shaft and the deep well jack was about 600 gal. per minute, but this was not sufficient to permit resumption of sinking, and the shaft had to be abandoned.

Selenium is recovered as a byproduct in the electrolytic copper refineries operated by the Raritan Copper Works, United States Metals Refining Co., Nichols Copper Co., and American Smelting and Refining Co.

"Amosite"—A New Type of Asbestos*

ABOUT the year 1907 a new type of asbestos was discovered in central Transvaal, South Africa. The name "Amosite" was given to the fiber in 1918, from the initial letters of the "Asbestos Mines of South Africa," the company chiefly interested in its production. Amosite is a monoclinic ferrous amphibole, with or without soda, and containing variable amounts of aluminum, magnesium, and calcium. It thus most nearly resembles crocidolite or blue asbestos. The deposit occurs along the Eli-fants River, in the Lydenburg District, the fiber-bearing rocks occurring in an area sixty miles in



4. DEEP WELL JACK USED FOR PUMPING FROM DRILL HOLE

length and with a maximum width of six miles. Commercial production began about 1916, and though no figures are available for the production of this particular variety, the increase in production for the Transvaal of 55 tons in 1915 to 3,192 tons in 1917 is to be attributed chiefly to the recent active development of the amosite deposits.

The material occurs as interbedded cross-fiber veins in banded siliceous ferruginous slates. The productive veins vary from two to seven inches in thickness. The most remarkable feature of the fibre is its great length. A maximum fiber length of eleven inches has been noted, and the bulk of the supply from the most important mine averages about six inches in length. The fiber is said to be strong, flexible, and therefore of spinning quality, though, on account of the unusual fiber length, certain modifications are necessary in spinning machinery. The chief production is from two mines, the Egnep, producing about four-fifths, and the Amosa, one-fifth of the total.

*From Monthly Reports on Investigations, U. S. Bureau of Mines.

Early Days in the Cariboo

Reminiscences of the Golden Days of the Camps of the Canadian Northwest—The Rush to Yale, B. C., and Other Early Bonanzas—Record of Historic Clean-Ups

BY ROBERT DUNN

Written exclusively for *The Journal*

CARIBOO! To old British Columbia prospectors the name breathes romance. It recalls the first discovery of gold in the Canadian Northwest. It brings to mind the struggle of sturdy pioneers, through an unknown, unexplored, trackless wilderness, for that prize possession of which civilization has decreed means material ease and affluence. What hardships did not these hardy men endure! How gallantly they faced and overcame difficulties which today would be thought insuperable!

In summer there were madly rushing rivers and creeks, apparently impenetrable forests, and formidable mountain ranges to conquer. In winter, the

ands of miles they came from the California fields and from the extreme east of Canada and the United States. Over land and sea, on boats, horses, and afoot, they traveled. Some blazed their own trails across the continent, passing through the heart of the Rockies with nothing better for transportation than a yoke of oxen; and the Cariboo was their goal.

I made a trip recently over the Pacific Great Eastern Ry. Paralleling the line of steel over which our locomotive panted was a trail, blocked by fallen trees, overgrown with moss and undergrowth, but still distinct enough—the old Lillooet Cariboo Trail. Over hill and mountain, along river and stream,



THE BRITISH COLUMBIA EXPRESS CO.'S STAGE WHICH OPERATED BETWEEN YALE AND THE CARIBOO IN THE DAYS OF THE GOLD EXCITEMENT

same a thousand times accentuated by the rigors of the season. Yet all this, added to the problem of a hostile native population, they faced cheerfully. Many fell, but the fittest survived, except when cut off by misunderstandings, which in those days were instantly and forever decided by appeal to quick wit, strength, and endurance.

Cariboo Pioneer of Sturdy Indomitable Type

And it was for years a matter of comment that the Cariboo, from the placer ground of which were taken millions in gold, was populated by the finest men physically to be found on the North American Continent. Is it any wonder that it was and even today is so? There were men in those days, and their descendants are chips off the old blocks. Thous-

through verdant valleys and dense forest, bridging chasms into which a pebble may be thrown half a mile, runs this ancient thoroughfare from the Pacific Coast into what, over fifty years ago, was the land of golden promise.

A Vision of the Past

As I glimpsed this historic road I drew fanciful pictures of the pioneer prospectors of the last century. There, rounding that bluff overlooking, from a height of a thousand feet, the foaming torrent of a mountain stream, is a pack train. There are mules and horses heavily laden with supplies more remarkable for their bulk than for variety. There are men, husky and rough—flushed of face and bright of eye—who lope along, covering the ground

with a swing and a stride which, if not military in style, is effective in results. There are their pans and their long-handled shovels, with which the earth's treasures are to be recovered, not less well cared for than their rifles, which are ever ready to repel attack or to replenish the larder.

The day's tramp is nearing an end. The sun's rays are a trifle less burning, and the adventurers—though they wouldn't care to confess it—are weary. The sweat of their toiling bodies has caked their underclothing, and yet they are not keen to call it a

miles for them. But the gold fever was in their veins. They burned to arrive, fancying, like the gold-crazed pioneers of Klondike fame, that the yellow dust carpeted the sand, and possibly grew on the fir trees. Some lived to dig fortunes; but few to keep and enjoy them.

For the most part, the glamour of the great new country got into their blood, gripped and held them, and they are to be found even today, scattered and comparatively few old men, living alone in cabins alongside of mountain



THE BLACKJACK AND BURNS HYDRAULIC CO.'S PROPERTY, WILLIAMS CREEK, AS IT WAS IN THE EARLY DAYS

day. For them rest is a painful necessity; for there is something irresistible which beckons them.

The Old Stage Coach

Again in the distance is caught the rumbling noise of an approaching vehicle, and presently the foam-flecked heads of the horses appear—not the fine, upstanding, prancing turnout of the exhibition ring, but the heavy, work-a-day horses of the trail. And behind is the cumbersome, dust-covered Cariboo stage. Inside, a capacity load of passengers, all tired to the bones, as would be expected, for it was not an asphalt pavement over which they trundled, nor did a high-powered modern motor car burn up the

streams, with their placer claims which they have the will but not the strength to work. That these old-timers are able to keep body and soul together, finding the means to continue dreaming the glories of the past and to confide confidentially to cronies that "if I had a grub-stake I would take you to a stream throught the waters of which you can see the nuggets, pure gold, glowing in the sunlight," is a commentary worthy of note on the richness of the country.

Retrospection

And so, as I say, lying back in idle comfort on the cushioned seats of the Pacific Great Eastern's parlor

car, I watched the old Cariboo trail, and envisioned these prospectors of the early days on their way to the gold fields. I saw the old stage and the pack trains. I saw them pitching camp; men going down to the streams with bits of red flannel on bent pins and catching trout for their evening or morning meals. And, later on, the coach returning, carrying shipments of the raw gold, and heavily guarded; and I thought, if the curves and grades of this old, abandoned roadway were articulate, what a fund of story they could tell; what thrillers they could recount—how thoroughly would Jesse James and dime novel adventurers be outdone.

An Old-Timer

Living at the Provincial Home for the Aged, Kamloops, B. C., is one of these "Pioneers of Pioneers." His name is James Moore, and he is over



JAMES MOORE

eighty-seven years old, and one of the very few "fifty-eighters" remaining. Mr. Moore recently put some of his early recollections, particularly as to the gold that was taken out of the district in the early days, on paper. To my mind they are very interesting, and I'm going to give them substantially in his own language.

"There is no account whatever," he says, "of placer being found in what is now known as British Columbia prior to 1856 and 1857, when Indians, living on the Thompson River, in the vicinity of Nicomen, found nuggets of gold in the crevices of rocks at low water. These they took to Kamloops and offered them to Donald McLean, the Hudson Bay store

keeper, in trade. McLean did not know their value, and, therefore, sent them to Governor Douglas, in Victoria, for advice. The Governor sent back word to McLean to get all he could of the metal. At the same time he sent McLean iron spoons for the crevassing. This statement I got from McLean in the early '60s, and I remember it distinctly. It was this gold that caused the great excitement of 1858.

"When the Hudson Bay Co.'s steamer 'Otter' left Victoria for San Francisco in February of that year, the purser had some of the gold found on the Thompson River. He took it to the mint of that city, where it was coined as souvenirs of the first gold discovered in the province. In those early days in San Francisco the only excitement was to belong to the Volunteer Fire Department. One evening a party of us met at No. 3 Engine House, and the conversation drifted to gold excitements. The superintendent of the mint, who was present, remarked: 'Boys, the next excitement will be the Fraser River.' He then explained that gold of good quality had been brought to the San Francisco mint by the purser of the steamer 'Otter.'

Exploration in Fifty-Eight

"On the strength of this we formed a small party to explore and report on the Fraser River, and in March, 1858, about eighteen men, of whom I was one, took passage to Port Townsend, Wash., and thence to Victoria, B. C. From the latter city we crossed the Gulf of Georgia in our own boats to the Fraser. The population of the provincial mainland at this time was made up of Indians and Hudson's Bay Co. traders. Our first camp on the river was at Fort Langley, and two days later we camped at Fort Hope.

"The trader at this point was Donald Walker, who died a short time ago at Kamloops. He was much excited when we arrived at Hope, and could not answer our simple questions as to the country before us. When we became better acquainted, he told us that he thought we had come to capture the fort, as he had a lot of furs ready for shipment to Victoria. I remember Walker saying that we were the first party of white men he had seen in the country for years, with the exception of Hudson Bay people. It was only a short time, however, following the news of the discovery of gold, before he saw thousands travel past the fort, as it was estimated that at least 20,000 miners were camped at Yale, B. C., during the high water of the year 1858.

The Discovery

"After leaving Fort Hope we camped on a bar about ten miles above the fort to cook lunch, and while doing so one of our party noticed particles of gold in the moss that was growing on the rocks. He got a pan and washed some of this moss, getting good results. Consequently, our gastronomic wants satisfied, we all prospected the bar, and found it rich in gold. With our crude way of working with rockers we made on an average of fifty dollars a day to the man. We named this bar in honor of the man who washed the first pan, viz, Hill's Bar. Some years ago I met the last owner of Hill's Bar, a Mr.

Ladd, who estimated that approximately \$2,000,000 had been recovered from the time the first pan of moss had been washed until the bar was worked out. This was the beginning of mining in this province.

Indians Wash Gold at Hill's Bar

"As we had only a prospecting outfit, we sent a few of our party down the river to Fort Langley to get supplies from the Hudson Bay Co.'s store. At this time the store was not well equipped with groceries, and our men came back with a very limited quantity. While at Langley they related the story of our discovery on Hill's Bar. The news soon spread to the other side of the line, there being quite a number of sawmills in operation on Puget Sound. Meanwhile, a tribe of Indians moved from Yale to Hill's Bar, where they camped, about three hundred men,

"Next day, the bacchanalian feast continuing, we concluded that the only thing to be done was to take matters into our own hands. We marched down to Taylor's camp and took possession of his supplies, and with axes smashed in the head of every keg of whiskey, dumping the contents on the bar. We then gave Taylor twenty minutes in which to strike camp and get away, which he did in less than the allotted period. This was British Columbia's first Prohibition Act, and it was put into force with much less to do than that which now regulates traffic in spirituous beverages.

Trouble With Indians Avoided

"One of the Indians, named White Cap, became angry when he found that the whiskey was gone. When working, we allowed the Indians to use our picks and shovels, providing we were not using them.



VIEW AT SHAFT OF THE FAMOUS CAMERON AND WATTIC CLAIMS, WILLIAMS CREEK, B. C. PHOTO TAKEN AUGUST, 1863

women, and children. They also began to wash for gold.

"A few weeks later we noticed a boat coming up the river loaded, and thought supplies were in sight. When the boat landed, however, it was found that its cargo consisted of nothing but liquor. Taylor, the owner of this stock, finding that the Indians had gold, began to exchange the whiskey for gold, the selling price of the former being \$5 per bottle. Taylor was the judge of the quantity of dust required to make up his selling price, helping himself to the Indian's gold as the latter proceeded to make away with the fire water. We whites held a meeting that evening, and decided to purchase all Taylor's liquor. The latter, however, refused to sell wholesale, and that night the Indians became very drunk and kept up a hideous howling.

One day White Cap, having a pick belonging to one of our party, refused to give it up when requested. After some exchanges my friend picked up a shovel and broke it on the Indian's head. This, of course, provoked a row. The Indians congregated and we mustered our forces. Thus we faced each other. Then the chief of the tribe mounted a stump to make a speech to his braves, and was in the midst of an impassioned address when a barge from a sloop-of-war hove in sight. Shortly a dozen blue-jackets landed on the bar and we fired a salute in their honor. We then stated our case to Governor Douglas, who was among the visitors, and he took the Indians back to Yale, pacifying them later with a feed of hardtack and molasses.

"Our next visitor was Billy Balou, an old California expressman, who started the pioneer express

of British Columbia, charging one dollar each way for letters and one dollar for papers. Of course, we all sent letters and samples of gold to our friends in the outside world. On reaching California these stimulated the great Fraser River stampede of 1858. Merchants and others sold valuable property on Montgomery and Kearny streets, in San Francisco, for a song, so anxious were they to get to the new gold fields. Some of these merchants located in Victoria and helped by their capital and energy to make British Columbia what it is today.

"On Governor Douglas' second visit to Hill's Bar he appointed George Perrier the first Justice of the Peace in that section, with the result that law and order became established. We therefore were the forerunners of the rush which swept up the Fraser and the Thompson valleys until it reached the treasure vaults of Williams and Lightning creeks of the Cariboo.

Further Wanderings

"As I was of a roving disposition in my younger days, I could not long remain in one camp. Selling my interest in Hill's Bar, I joined a party of four others, and, buying a boat and six month's provisions, we left Yale on the seventeenth of December, 1858, and ascended the Fraser River for further prospecting and exploration. This gave us some knowledge of British Columbia winters, and after making several ice portages, we reached Lytton on the twenty-sixth of January, 1859. There we remained until the spring advanced, when the party divided, some taking the boat and going up river to try other bars for gold, while I and a number of companions got pack horses and went inland. We crossed the Thompson River, went thence to Fort Alexander, and so to Beaver Lake and up the Beaver Lake Valley to Horse Fly Creek. There we stayed for the remainder of 1859, although we found Horse Fly a poor camp.

Riches of Williams Creek

"The next year, 1860, a number of the creeks were discovered which paid very well. However, it was the following year before the richest creeks of the district were found, namely, Williams Creek, first located on by Dutch Bill and Mike Brown. They staked in the canyon of the creek, and although the ground a short distance away, when opened, proved to be very rich, they scarcely made working expenses.

"I will now try to tell something of what was taken out of the placers of this waterway. From about 80 ft. of ground on the Steel claim was taken about \$120,000; from 500 ft. of ground on the Cunningham claim was taken about \$270,000; 50 ft. on the Diller claim paid \$240,000; 80 ft. on the Burns claim paid \$140,000; 100 ft. on the Watty claim paid \$130,000; 120 ft. on the Canadian claim paid \$180,000; in two years' work the Ericson claim paid \$160,672; 150 ft. on the Adams claim paid \$59,000; 120 ft. on the Neversweat claim paid \$120,000; 140 ft. on the Tinker claim paid \$120,000, and 50 ft. on the Moffit paid \$90,000. In addition to these were the Barker, the Baldhead, the Grear, the Griffon, the

Wilson, the Beauregard, the Raby, the Cameron, the Prince of Wales, and many others that became well known for their production.

"The above figures are approximately correct as far as they go as to Williams Creek, but it must be remembered that the claims were but partly worked when I got the facts years ago. The Diller, for instance, consisted of 300 ft. of ground. There were three partners, Diller, Loring, and Curry, who took from 300 ft. of ground over \$500,000, the difference being made up subsequent to the compilation of the statistics. The greatest clean-up on any claim for twenty-four hours' work stands to the credit of the Diller, when the day shift recovered 102 lb.¹ weighed on platform scales, while the night shift cleaned up 100 lb., making for the full day a total of 202 lb.

"Easy" Money Quickly Spent

"Money to the old Caribooans was 'easy.' If, however, it was plentiful it was readily spent. Take Long Abbott as an illustration. He was the first to sink through to bedrock, and recovered \$40,000. That winter he went to Victoria and spent all his money in gambling, wine, and women. He was known to go into a saloon and for amusement break a mirror with \$20-gold pieces. Next day he would return to pay the damages. Abbott was soon dead broke, and never made a raise again.

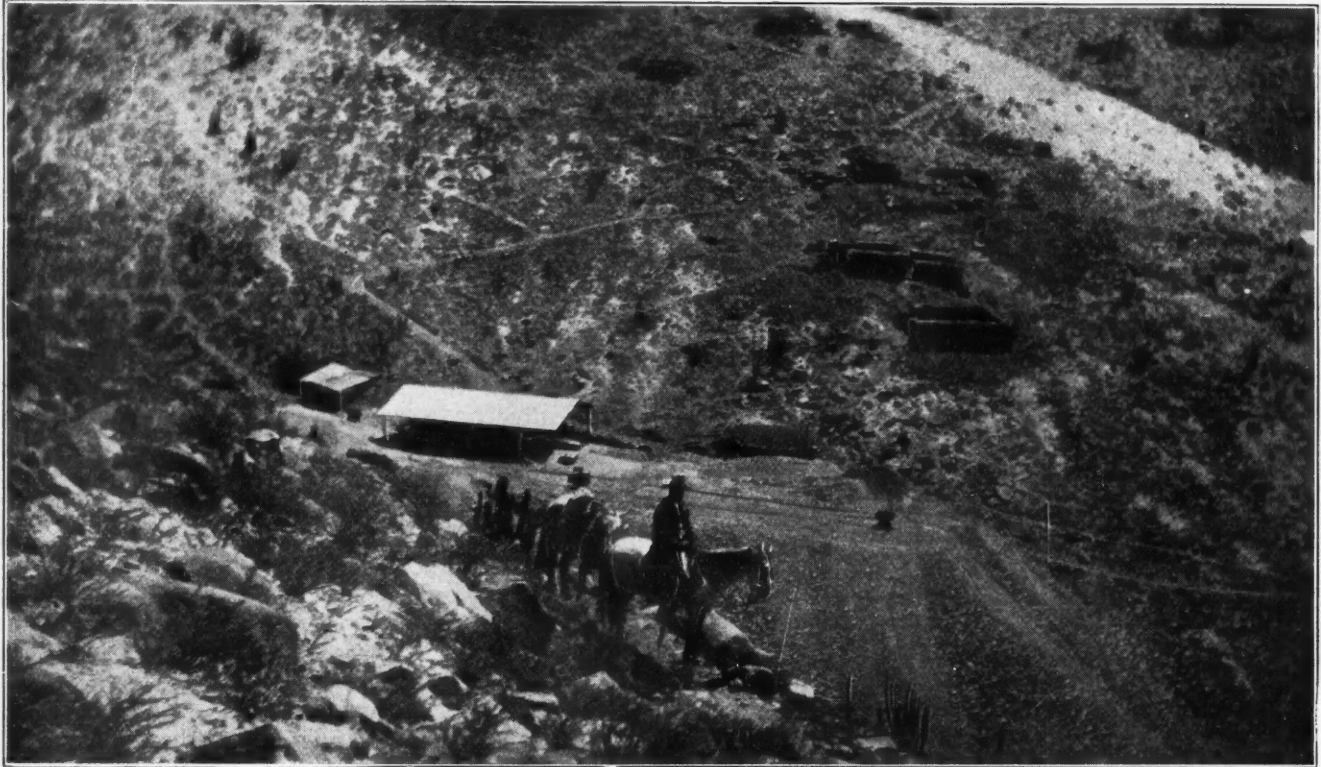
"Now let us take a glance at what happened on Lightning Creek. Discovery paid \$130,000; Whitehall, \$200,000; Victoria, \$457,642; the Point, \$136,625; Vancouver, \$274,190; the Van Winkle, \$363,983; the Dutch & Siegel, \$130,000; the South Wales, \$141,531; the Lightning, \$153,968; the Spruce, \$99,908; the Costello, \$20,406; the Vulcan, \$56,955. These were the full amounts of gold cleaned up when the claims were worked out."

Mr. Moore, in closing, denies the story that a keg of gold from the Cariboo was seen on the table of the captain of the ship "Norman Morrison," consigned to the Hudson Bay Co. He asked where this gold came from, and observes that apparently it did not find a place on the ship's manifest. He reiterates that his version of the first discovery of gold on the Fraser River is the correct one, and that none other is to be credited.

The assertion that the miners on Hill's Bar panned out each day from \$100 to \$150 also is branded as a fable, the facts being as he has stated them. As Mr. Moore is one of the very few survivors of the adventurous prospectors of the Cariboo gold rush, and as he has quite clearly been at pains to keep records of events and of such facts as seem to him of importance, I have quoted him freely. It seems to be a matter of historic interest that such observations as these should be preserved as far as possible. He gives us not only some inkling of the hardships with which he and his fellow miners contended in those early days, but he furnishes statistics from which one may obtain some conception of the richness of the placer claims of the old Cariboo camps.

¹104 lb. 10 oz., according to Henry Boursin, who states that the second shift cleaned up a little more than 88 lb.

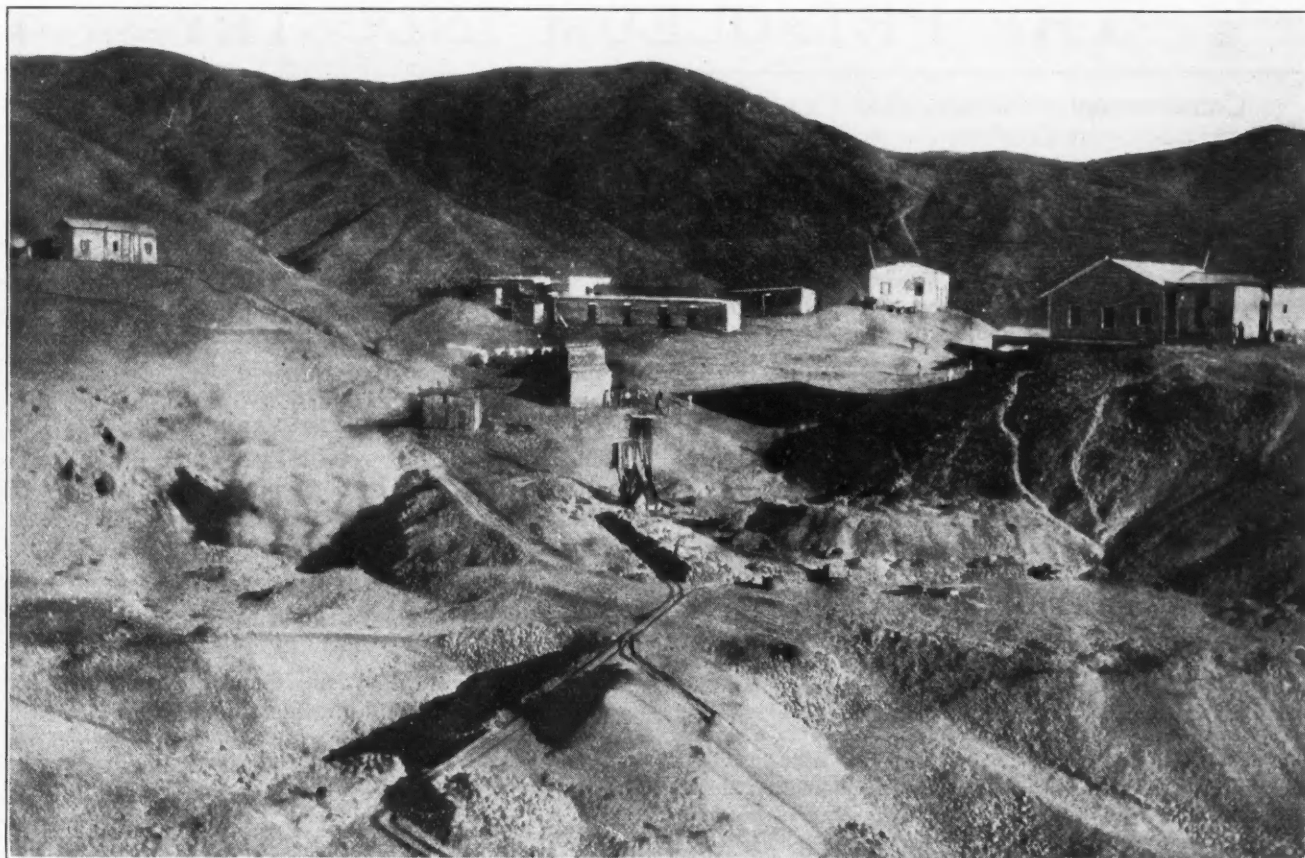
Mines in Peru and Chili



DUMP AND PORTAL OF ADIT, COPPER MINE AT AREQUIPA, PERU



ABANDONED AMALGAMATION "PATIOS" NEAR CERRO DE PASCO, PERU



COPPER MINE AND BUILDINGS AT MICHILLA, CHILE



HILL AT CHUQUICAMATA BEFORE COMMENCEMENT OF OPERATIONS BY CHILE COPPER CO.

THE PETROLEUM INDUSTRY

Conservation of Natural Gas Urged at Conference

Resolutions adopted at the recent Conference on Natural Gas in Washington read as follows:

Whereas the supply of natural gas is limited in quantity and is not being replaced by nature, and whereas there is no other fuel that can replace natural gas which is as cheap and convenient and as efficient, and whereas the supply of natural gas is failing in many communities, be it resolved, in order that the supply of natural gas may be prolonged and the service improved, this Conference recommends that the appropriate agency in each state which uses natural gas take measures to discover what amount of natural gas is now being wasted by the consumer, various causes of such waste, and adopt such measures as may be available to reduce such waste and effect economies in order that the benefits from this natural resource be prolonged, and

Be it further resolved, that the appropriate agencies, both State and Federal be urged to stimulate research in perfecting plans and methods for more efficient use of natural gas, and

Be it further resolved, that the appropriate State and Federal agencies be urged to conduct educational campaigns to instruct consumers and the public in the importance of the waste of natural gas, how economies in the use of natural gas may be effected and on the natural gas situation in general, that the public may be informed on the subject, and deal with it in the most intelligent manner, and

Be it further resolved that an effort be made towards arriving at understandings between the natural gas industry and the communities using natural gas as to how the supply of natural gas can best be conserved and its life prolonged, and

Be it further resolved that a committee of ten be appointed by the chairman of this Conference to represent the natural gas industry, and the public and Federal institutions to cooperate with the Director of the Bureau of Mines in working a constructive program for the conservation of natural gas and the bettering of the natural gas service, and in collecting and distributing information on this subject.

California Pipe Line Companies Declared Common Carriers

Oil pipe line companies in California are now common carriers and are under the jurisdiction of the State Railroad Commission. This is the result of a recent decision of the U. S. Supreme Court. The statute passed by the state in 1913 declaring pipe line companies to be common carriers was challenged by the Producer's Transportation Co. The case was speedily carried first to the Supreme Court of California where the decision was against the pipe line company, and finally to the U. S. Supreme Court where the Railroad Commission was again upheld.

Oil Exploration in Arizona

Prominent mining men of Bisbee, Ariz., have recently become interested in oil development in Arizona, and have taken over the United States Oil and Refining Co., which has been drilling a well near Bowie. The syndicate includes James Brophy, J. L. Overlock, Dr. N. C. Bledsoe, Frankenberg Bros. and

others. They have subscribed \$40,000 to carry on the operations started by the United States company, who had drilled to 750 ft., the hole being spudded in at 16 inches. During the sinking several narrow oil stratas were cut. Preparations have been made to drill to 3,000 ft. in depth. The well is situated on Section 35, Township 10 South, Range 28 East, on San Simon creek, about 15 miles north of Bowie in Graham County, Ariz., and two miles east of the Arizona Eastern railroad. The formation is reported to be compact blue clay, adobe, and gypsum, all showing traces of oil. This basin is estimated to extend north to Solomonville and Pima, a distance of about 50 miles, and to be from 25 to 30 miles wide. In this area many water wells are reported as showing oil and gas in small quantities.

Bureau of Mines Would Lower Requirements of Petroleum Engineers

In a memorandum to the Reclassification Commission made by the Chief Petroleum Technologist of the U. S. Bureau of Mines on Dec. 17, the need for a differential schedule of qualifications for petroleum engineers in the bureau is argued. This is asked, it is stated, because the petroleum industry, with which the bureau competes, is making special demands on the production engineer.

Rather than increase salaries, in the effort to attract men, it is thought better to lower the requirements for the various positions below that of the average engineer's service, for a period of not less than three years, subject to review at the end of this period. It is proposed that the years of experience for the various classes of engineers be reduced to the following. Senior petroleum engineer, ten years' experience, six in charge; petroleum engineer, eight years' experience, four in charge; assistant petroleum engineer, four years' experience, one year in charge; assistant petroleum engineer, not less than two years' experience; and junior petroleum engineer, no experience necessary.

The difficulties of obtaining and holding competent engineers are said to be increasing. Such engineers have been obtained only by personally soliciting qualified men, paying the highest entrance salary, and reducing the experience required.

Substituting Oil for Coal in Britain

Upset conditions in the coal industry in Great Britain are causing more and more interest in the substitution of oil fuel for coal, says the American Chamber of Commerce in London. Sir Auckland Geddes, president of the Board of Trade, speaking recently on Britain's industrial outlook, said that the remedy of substituting oil for coal was being applied wherever possible.

The use of oil would transform the basis of the whole pre-war industrial system. Special ships

would have to go out to get oil; the ships that went out for raw material would not be carrying the coal cargoes of the past, and would therefore make the outbound voyage partly empty; the goods coming back would have to pay double freights. No longer would the export of coal pay for the raw materials imported.

The American Chamber in London points out that the trend toward the use of oil fuel is well illustrated by the conversion of two of Britain's greatest liners to oil burners. Both the "Olympic" of the White Star line, and the Cunarder "Aquitania" are being reconditioned and fitted with oil burners. Greater efficiency is expected and the engine-room personnel will be reduced from perhaps 350 to 40 or 50.

Oil Prospects in Washington County, Utah

The prospects of discovering oil in commercial quantities in Washington County, Utah, are being investigated by geologists of the U. S. Geological Survey. A study has already been made of the small oil field at Virgin City, the only place in that part of Utah where producing wells have been drilled, to determine the geologic features that govern the occurrence of oil in that general region, in order that the results may be applied to unprospected territory.

The Virgin City oil field is near the town of Virgin City, about 80 miles south of Lund, on the Los Angeles & Salt Lake R. R. Oil was discovered in this field in 1907, and for a short time thereafter drilling was active, but the money panic of 1907 interfered, and exploration ceased abruptly. In 1917 the Dixie Oil Co. bought the wells, cleaned them out, and installed a refinery having a capacity of 800 gal. of oil per eight-hour shift, designed to supply the local market. There are now four producing wells, having a total estimated production of 20 bbl. a day.

The oil comes from a 1-ft. bed of porous limestone, which is encountered at a depth of 550 to 600 ft. The wells find no oil until they reach this bed, and deeper drilling gets no increase. This oil-bearing bed forms a part of the beds at the base of the Moenkopi formation that have been called "Super-Aubrey" limestone. Above this limestone are red shales, some sandstones, and a few thin limestones, which comprise the bulk of the Moenkopi formation. Below the "Super-Aubrey" limestone is the massive flinty Kaibab limestone. The original source of the oil has not been definitely determined. No carbonaceous matter is apparent anywhere near the oil sand, either in the red beds of the Moenkopi above the limestone or in the Kaibab limestone below the oil-bearing bed. The most probable source of the oil seems to be the layers of fossiliferous limestone. The oil is reported to vary in gravity from 25 to 35 deg., Be., to have a paraffin base that includes some asphalt, and to contain some sulphur. It is dark brown and is very fluid.

The producing wells are not on anticlines, such as are believed to have caused the formation of oil pools in most of the large fields of the United States. The rocks in the Virgin River field dip strongly to the

northeast, although the dip is not uniform, but is modified by local steepenings and flattenings. The producing wells are on one of these local flattenings, where the rocks dip much less steeply than they do in the immediate vicinity, suggesting that the change in dip may have caused the formation of the oil pool, a suggestion that is strengthened by the fact that most of the dry holes have been drilled in areas where the dip is steep. If this view is correct, there are several untested locations near Virgin City that are structurally as favorable at least as the small area from which oil is now obtained, and the relation of the producing wells to these flattened areas is sufficiently close to justify the recommendation that other localities where the structure is similar be tested.

The fact that the oil is not found on anticlines may be regarded as distinctly favorable to prospects in the surrounding region where anticlinal structure may be found, for as the oil in the Virgin City field has gathered on local terrace-like flattenings, generally regarded as only moderately favorable for the accumulation of oil and gas, much better results may be expected where the altitude of the rocks is more favorable, provided they afford the proper requirements of a reservoir.

The present Virgin City field appears to be of value only for supplying local demand. The thinness of the oil "sand" seems to preclude the possibility of production adequate to repay the expenses of distributing the oil to refineries outside the field. However, at some distance from Virgin City the oil-bearing beds may thicken so much that they will furnish an adequate reservoir for greater accumulations of oil. Therefore, any pronounced anticlinal structure that may be detected in the beds of the Moenkopi formation in this general region should be prospected to test this possibility.

The Survey geologists are now trying to determine whether oil may be found in the Supai formation, some distance below the Virgin City "sand."

Only One Producing Well in New Mexico

It is reported that prospecting for oil is going on in at least fifteen counties in New Mexico, and that thirty-five operations are in progress. At present there is but one producer in the state, this being in McKinley County, which is making only five barrels a day at shallow depth.

Petroleum Found in Alsace

According to the N. Y. "Evening Post" of Dec. 13, petroleum has been struck in a well at Pechelbronn, Alsace, at a depth of about 1,300 ft. The well is reported to be yielding slightly over 200 bbl. of oil per day, and is the first to be completed in France.

The Huasteca Company, which is reported to control the greatest potential production of petroleum in Mexico, is now drilling eleven wells. The Aguila company, another large petroleum concern, is drilling eighteen wells. The sites for 131 new wells were reported located, according to the Nov. 1 figures.

Where Oil Is King

Wonderful Transformation of Ranger, Tex., From a Forsaken Village Two Years Ago to the Bustling City of Today

BY R. STOLLEY

ON THE way to El Paso on the Texas & Pacific Ry., ninety-five miles from Fort Worth, is Ranger, which, two years ago could hardly be found on the map, being then only a "whistling station." In those days, the business section consisted of one block of inferior buildings, the freight receipts were \$8,000 a month, and the population numbered 700.

Ranger was slowly dying after a three years' drought, and those who owned land considered it a

At the present time, two years after the first producing well was brought in, Ranger has a population of approximately 30,000, and 40,000 people get their mail at the post office. A commission form of government has been adopted. The mud streets are gradually being replaced by pavements of well-laid concrete and brick; contracts for 63 blocks have recently been let to cost \$750,000.

A sewerage system is being installed, and bonds have been voted to the amount of \$100,000 for a City Hall. A splendid fire department with the latest type of motor-driven equipment has been purchased and a \$300,000 waterworks is in operation. The electric light station is equipped with a 500-kw. generator and a 400-kw. unit is on order. Natural gas is



FIRST PRODUCTION WELL AT RANGER WITH THE McCLESKEY HOME IN FOREGROUND



EVEN GRAVEYARD LOTS ARE IN DEMAND

liability. A certain man who was able to exchange his big holding for a team of mules was looked upon with envy by his neighbors. But one day, the first producing oil well was found on McCleskey's farm, about 3 1/2 miles from town, and lo! the scene was changed. The country went wild with excitement.

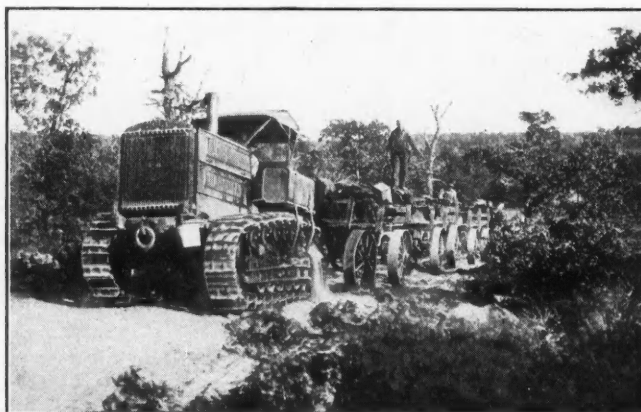
pipled to the town and costs 50c. per 1,000 cubic feet. Nearly three and a half million dollars' worth of modern fire proof buildings are in course of construction, including four churches.

Industries of every kind are well represented, and of course, branches of all the large oil-well supply houses are in evidence. Six passenger trains a day



CONDITIONS WHICH ARE BEING REMEDIED

Farms that were only covered with rocks, oak, and scrub, suddenly became valuable. Drilling for oil was carried on feverishly, and as well after well was drilled, and most of them found to be producing, land-holders, who were practically down and out became millionaires over-night. The tales that are told sound like those from the Arabian Nights with the one great difference that they are true.



HAULING OIL WELL EQUIPMENT WITH CATERPILLAR TRACTORS

bring in an ever increasing stream of humanity. The streets are crowded with people from every part of the country although the Texan, with his typical headgear, outnumbers the others. Thirty-eight freight trains a day bring in some 80,000 tons, the receipts now being larger than those of the T. & P. R. R. freight offices at New Orleans, Dallas, and Fort Worth combined.

A new railway is being constructed between Wichita Falls and a place called Dublin, ultimately with a southern terminal at San Antonio. This road is now completed as far as Newcastle. From this



BEFORE MAIN ST. WAS PAVED

point the grade is complete as far as Dublin, and only awaits the ties and rails. This is a private line financed by Jake Hamon and Frank Kell, which will help to relieve the freight congestion and prove a great boon to the whole oil field.

The Ancient History of Oil

The Commercial Use of Oil from the Baku Field in Persia was First Mentioned in the Sixteenth Century

HOW far into the past can the history of oil be traced? asks the London "Financial Times."

"Mark Twain got back to 900 B. C., when he declared that the water which Elijah poured over the altar at Mount Carmel and then ignited to confound the phophets of Baal was not water at all, but really petroleum. With the bituminous region of the Jordan so handy, this is a highly feasible theory, and we know that Elijah was a very smart man in his profession. Baku, which, as distances in the East go, is not such a far cry from Palestine, is undoubtedly the oldest oil field of which we have any record.

"In Hakluyt's Voyages,' mention is made of the Baku field as far back as the sixteenth century. The reference will be found in the account of the fifth voyage which Thomas Banister and Geffrey Duckett made to Persia for the Moscovy company in 1568-74. Master Duckett, who wrote the account, says: "There is a very great river which runneth through the plaine of Javat, which falleth into the Caspian sea, by a towne called Bachu, neere unto which towne is a strange thing to behold. For there issueth out of the ground a marveilous quantitie of oyle, which oyle they fetch from the uttermost bounds of all Persia; it serveth all the countrey to burne in their houses. This oyle is blacke, and is called Aapte; they use to cary it throughout all the Countrey upon kine and asses, of which you shall oftentimes meet with foure or five hundred in a company. There is also by the said towne of Bachu another kind of oyle which is white and very precious; it is supposed to be the same that here is called Petroleum.'"

Three Distinct Oil Fields in Mexico

The Southern "Light Oil" District Is Most Important—
Pipe Lines Run to Tidewater—Flow is
Extremely Steady

THE Mexican oil fields are divided into three distinct fields as regards location as well as quality of crude produced.

The Isthmus of Tehuantepec has not been a profitable field. The oil found is of good quality, about 36 Be. In this field a total of 221 wells have been drilled, which today have a production of about 500 bbl. from 75 producing wells, all others having been abandoned. The Pearson interests initiated their efforts in the Mexican field in this region, and built a refinery at Minatitlan, which now depends principally on the other Mexican fields for crude, which it receives by tank steamer.

Another oil producing region is generally known as the northern field and produces a heavy crude varying from 8 to 15 deg. Be. This field lies from twenty to fifty miles west of Tampico. It includes the fields of Ebano, Panuco, and Topila. Panuco furnishes about 85 per cent of the production of the field, and its crude has a gravity of 12 Be. In the northern field approximately 250 wells have been drilled, of which 150 are at Panuco.

The most important Mexican field is the southern, or so-called "light oil" district, which starts at Tpetate, about seventy miles south of Tampico, and extends in a southerly direction to the Tuxpam River, a distance of about thirty-five miles. In this field the oil is about 21 deg. Be. and the potential production is over 500,000 bbl. a day. This production is the result of drilling 185 wells, of which 68 are productive.

In the southern field, the oil is transported by pipe line, but it is the usual practice to maintain a railroad from tidewater to the field. These railroads are about twenty miles long, fully equipped for handling freight direct from the wharves to the fields.

An extraordinary characteristic of the wells in both the northern and southern fields is the steadiness of the flow. The production is obtained, more especially in the southern field, in the very porous limestone known as the Tamasopa. Where this formation outcrops, about sixty miles further west, enormous caverns are found. The samples of the rock which are flowed from the wells when drilling them in look almost like honeycomb. The thickness of the formation is generally spoken of as from one to three miles, which is, in a measure, an explanation of the unusual staying qualities of the wells.

The wells, when shut in, show a pressure of from 300 to 1,000 lb., depending on the locality. When the wells are being flowed, the gate valves on the big ones are generally opened from one to three turns, where full opening of the eight-inch valve used is about twenty-seven turns. While the wells are being flowed under such conditions, they hold back pressure of from 200 to 700 lb. The oil as it comes from the well is 120 to 150 deg. F.

*Excerpt from the October number of "The Lamp."

ITEMS FROM TEXAS AND LOUISIANA OIL FIELDS

State Commission Rules as to Drilling Near Boundaries

Oil and Gas Division's Rule 37 Defined—Severe Penalty Prescribed for Violation

In regard to Rule 37 of the Oil and Gas Division of the Texas Railroad Commission, the Commission has issued an explanation stating that the rule prohibits drilling for oil nearer than 150 ft. from any boundary line. Drilling on a tract, when compliance with this rule is physically impossible, is permissible if the tract was acquired before Nov. 26, 1919, and an application has been sent to the Commission stating all the circum-

stances. Work on this line, which will be 350 miles long and require ten months to build, will start soon. It is also reported the company will purchase a fleet of tank steamers and enter the export business, handling some petroleum products from Bayonne, N. J.

Jurisdiction Over Pipe Lines in Question

A temporary injunction has been granted by the District Court of Travis County, Tex., against the Texas Railroad Commission at the petition of the Crude Oil Marketing Co., of Wichita Falls, restraining the Commission from exercising control over the oil company's pipe lines, the company claim-

Humble Company Expanding Rapidly

New Refinery, With Capacity of 60,000 bbl. Daily, Will Be Largest of Its Kind in Existence

The Humble Oil & Refining Co.'s property was inspected recently by W. C. Teagle, president, and A. C. Bedford, chairman of the board of directors, of the Standard Oil Co. of New Jersey. One-half interest was purchased in the Humble company last summer by Mr. Teagle. Since then, the capitalization has been increased to \$86,000,000, and the operations of the company have been greatly expanded, making it the third largest oil producer in Texas. The



PANORAMA OF THE RANGER OIL FIELD IN TEXAS

stances. In such a case, the Commission will make an individual ruling. Subdivision into smaller tracts so that compliance with Rule 37 is made impossible is prohibited as from Nov. 26. Anyone operating on such a tract acquired since Nov. 26 is liable to a fine up to \$5,000 a day, and cannot get his oil accepted by a pipe line company, as such company must demand from the operator before making pipe line connections a certificate from the Commission stating that the operator has complied with the oil and gas conservation laws of Texas.

White Oil Corporation's Plans

It is stated that work on the new 15,000-bbl. oil refinery of the White Oil Corporation, to be built at Texas City, Galveston County, Tex., will be started in the near future. This corporation recently secured a right-of-way for an 8-in. pipe line from Ranger to this re-

ing these are only gathering lines. The Commission bases its claim to jurisdiction over all pipe lines, large and small, on the oil conservation act of the last Texas Legislature.

The Texas Central R. R. has declared an embargo on all freight between Waco and Rotan, Fisher County, Tex., on account of the congested condition caused by the immense increase in business due to oil development, and aggravated by a shortage of rolling stock.

If the present plans of the Lone Star Gas Co., which now supplies Dallas and Fort Worth with gas from Oklahoma, are carried out, an expenditure estimated at \$5,000,000 will be made in pipe-line extensions and other improvements, in order to use more of the natural gas production of west Texas.

new refinery, on the Houston ship channel, near Goose Creek, will be the largest of its kind in the world when completed, having a total capacity of 60,000 bbl. daily. One unit is nearly finished. A tank farm has been built at Webster City, and pipe lines are being built to it from the West Columbia and Ranger fields, and also from Webster City to Texas City, where ocean-going tank steamers will be loaded.

The Hull field production is gradually increasing, although some of the wells brought in recently making a large initial production have not maintained their top flow.

According to the November statement of the Cities Service Co., of New York, recent drilling in Liberty County by the Empire Gas & Fuel Co., a subsidiary, has demonstrated the value of a large acreage of leases in that section.

Production of West Columbia Field Increased

The production of West Columbia field in Brazoria County, Tex., is estimated at 23,000 bbl. of oil daily. This sudden increase is due to the bringing in recently of No. 11 Japhet well of the Humble Oil & Refining Co., which made an initial production of 7,000 bbl. daily, increased somewhat, and was then choked down to flow through a 2-in. pipe. Approximate production of the larger companies: Humble Oil & Refining Co., 15,000 bbl.; Texas Co., 3,500 bbl.; Crown Oil & Refining Co., 2,700 bbl.; Gulf Production Co., 2,300 bbl. Near Brazoria, the State Farm well is down 1,800 ft. At Stratton Ridge, the Freeport Sulphur Co.'s well No. 3 Tolar and Dannenbaum is making a little oil with much water. A new well will be

that this tract belongs to the state, but the land commissioner contends that an adjacent land owner has a preference right under the new statute, and that while said owner is endeavoring to acquire title the commissioner will not do anything to cloud the title. This case is the first of the kind to come before the courts under the recent act of the thirty-sixth legislature.

The constitutionality of the Oil Land Act will be tested when the cases involving the permits granted to M. K. Fletcher, of Beaumont, and W. M. Flores, of Liberty, on oil land in the Hull field, Liberty County, are heard in the district court of Travis County, Jan. 12. The cases will be consolidated and decided at one hearing.

The title to Hogg Island, across from Goose Creek, Harris County, will be

in the Beaumont section will now start drilling. When oil was \$1, the margin of profit was too small to make the oil business attractive to the small producer.

In Lampasas County, many wells have been started, but few completed. Delays are due to shortage of labor, supplies or funds, in different cases. The deepest wells to date are the two of the New York Syndicate on the Corryell-Lampasas county line, each 1,400 ft. deep, and showing oil and gas indications. Other wells drilling are the Western Lampasas, at 500 ft.; Groves well, six miles north of town, 1,200 ft. deep; Waxa-Tex well, 300 ft. deep; the White well on the Smith ranch, 100 ft. deep; and the Boston-Lampasas, derrick completed and machinery on the ground.



IN THE VICINITY OF THE McCLESKEY FARM

drilled. Other companies drilling in the field are the Humble Oil & Refining Co., Crown Oil & Refining Co., and Castell Oil Co. Some wild cat drilling is being done southwest of Angleton.

Legal Notes from Austin

County clerks cannot act as an oil man's agent, according to an opinion of Assistant Attorney General E. F. Smith, and approved at a conference of the Attorney General's staff. The case arose when an application was made to a county clerk for an oil and gas prospecting permit on a certain piece of ground, twenty-four hours before the outstanding permit was cancelled.

Mandamus proceedings against Land Commissioner J. T. Robison will be started by A. G. Davis, if the Supreme Court will grant permission, to test his right to a mineral permit on a tract in Eastland County. The claimant asserts

tried, if application for mandamus against State Land Commissioner J. T. Robison is granted. A. N. Fitzgerald and associates desire a permit to prospect for oil and gas on this island, and claim that the present owners, the Humble Oil & Refining Co. and John T. Gaillard, base their title on that granted to Ashland Smith in the days of the Texas republic, and that this title was never perfected.

Texas Oil Output Decreased in November

Estimates of the oil production of Texas for November place the figure at about 9,000,000 bbl. North Texas fields showed an increase, but most of the other parts of the state showed a decrease in production.

The new rate of \$1.25 per bbl. on Gulf Coast crude oil will stimulate production in that region and many lessees

Refiners Deny Profiteering Charge

The Western Petroleum Refiners' Association will meet the Government representatives more than half way in the investigation of charges of profiteering against the refiners. The president of the association, Pat Malloy, states that for ten days preceding Dec. 6 the average price of fuel oil at the refineries was less than 6c. per gal., instead of 9c., as charged. This price is not at all excessive, he claims, when it is considered that the price of crude oil has gone up 25c. to 50c a barrel, and that tank-car rentals and costs of labor and supplies have increased greatly. Furthermore, the prices of coal oil and lubricants have decreased slightly. He claims that twenty refiners were forced to close their plants in Oklahoma during the present season.

SOCIETIES AND ADDRESSES

New York Meeting of A. I. M. E. to Open February 16

The annual convention and business meeting of the American Institute of Mining and Metallurgical Engineers will be held at the Engineering Societies Building in New York, Feb. 16-19. The committees so far as appointed to date for this meeting are as follows:

Executive.—E. P. Mathewson, chairman, William Y. Westervelt, R. M. Atwater, F. D. Aller, Wilbur Judson, Lucius W. Mayer, Edwin S. Berry, Allen H. Rogers.

Entertainment.—L. W. Mayer, chairman, L. Addicks, D. M. Liddell.

Finance.—Karl Eilers, chairman, Walter H. Aldridge, George D. Barron, W. A. Clark, Arthur S. Dwight, Albert R. Ledoux, Robert M. Raymond, L. D. Ricketts, Benjamin B. Thayer, Robert M. Thompson.

Banquet.—C. C. Burger, chairman, Colonel T. C. Du Pont, D. M. Liddell, E. B. Sturgis.

Luncheon.—P. A. Mosman, chairman, C. A. Bohn, F. D. Carney.

Excursion.—Philip W. Henry, chairman.

Ladies.—Mrs. Arthur S. Dwight, chairman.

On Monday night, Feb. 16, the usual smoker will be held, and on Tuesday night, the usual banquet, followed by dancing, to be held this year at the Waldorf-Astoria. Wednesday, the 18th, being Ash Wednesday, no entertainment program has been provided for the evening. Thursday, the 19th, will be devoted to excursions which it has been impossible to decide definitely this far in advance; those suggested are to iron and zinc mines and zinc and steel plants in the vicinity of New York or within two hours' ride. In connection with the important oil sessions, a trip to one or more oil refineries is projected. There are several around New York Bay.

Through the efforts of Dr. Ralph Arnold and the very active Petroleum and Gas Committee, a program was laid out to secure oil papers of greater diversity than has been heretofore attempted by any Institute.

A joint meeting with the Electrical Engineers for one day of the session is also being arranged.

All members who plan to come to New York City to attend this meeting are urged to reserve hotel accommodations immediately, because most of the hotels in the city are full, and it is frequently necessary to make reservations more than two weeks in advance in order to secure a room.

Knox and Lindgren Speak at New York Mining and Metallurgical Society Annual Dinner

The annual meeting of the Mining and Metallurgical Society of America was held at the Columbia University Club, in New York, Jan. 13. Addresses were read by the retiring president, H. H. Knox, and the new president, Waldemar Lindgren; also by J. A. Church, Jr., chairman of the New York Section.

Mr. Knox's subject was the function of the Mining and Metallurgical Society, which he defined as philosophic rather than technical—a society of technical men gathered to discuss, compare, and further the broader problems of the industry. His paper was thoughtful and searching, discussing the significance and value of culture to the engineer. In so far as culture extends the "fringe of consciousness," it is incontestably practical.

In parts of the world a mining engineer would at times be willing to exchange half his knowledge of geology for a knowledge of anthropology, as in examining ancient mines in Africa, Greece, and Asia. The engineer must also study the social crisis now at hand, in which the issue is between individualism and socialism. Socialism is predicated on the equality of all men, and involves the assumption of all powers of the government by the workers. Individualism recognizes the inherent inequality of men. If we believe man was made for the state, we are socialists; if the reverse, we are individualists. Socialism is now permitted to claim identity with democracy. Democracy is a relative word; absolute democracy has never existed.

The intense modern diffusion of ideas due mainly to newly perfected means of communication brings swift progress in thought and invention. On the other hand, among the workers, manual skill is declining; but the farmers, by organization and association, are progressing. The mining industries have not yet organized manual labor along the lines of "industrial democracy." The mental stagnation of the laboring classes is due to a stagnant environment; education will develop their latent mentality. The application of this to mine and smelter problems must be worked out. The term "industrial democracy," however, is inaccurate. The idea is not strictly democracy, but that each should have a just share—better the "humanization of industry."

Democracy or kindred conceptions are only a means toward an end—liberty.

Mr. Lindgren, who has given much study to the gold problem for many years, chose this subject for his address. He traced the fluctuations of increase and decrease in the gold production of the world for many years. The present alarming decrease of gold production in the United States he held to be about 60 per cent due to higher costs; the rest to labor inefficiency and exhaustion of mines. As a remedy for present industrial and financial conditions, he held the increase of gold production desirable, characterizing as absurd the theories of political economists who hold the increase of government-held stocks of gold responsible for the present currency inflation. The production of the United States has decreased from 100 million dollars in 1915 to about 58 million in 1919, after having trebled between 1892 and 1915.

Various remedies have been proposed. That of bimetallism, recently proposed by the "Engineering and Mining Journal," has an objection in the difficulty and hazard of establishing a rate between gold and silver. The plan proposed by the American Mining Congress, for a bonus of \$10 an ounce on gold, might be feasible, but it looks doubtful. Recent events in the Transvaal may point a possible remedy. Until recently producers were obliged to sell their gold to the British government, receiving pay in paper money. This worked a hardship, and last summer permission was granted to sell in the best market—which was the United States; and that price, translated at the current American-British exchange, fixed gold quotations in British paper money at a premium over the standard. Thus the relative depreciation of British paper money was acknowledged.

Here in the United States the situation is far better, but it is beyond question that the currency has an inflated value, and that the paper dollar has ceased to be on an equality with the gold dollar. At present we have a depreciated currency, and we pretend not to know it.

Now, in the United States the industrial uses of gold consume 55 to 60 million dollars' worth, or more than the present annual production. Suppose the Government should cease selling gold to the industries; should receive, but not sell. Then the users of gold for industrial purposes would be obliged to bid for it in the open market, and gold

would probably go to a premium—say \$23 or \$25—in paper money. With the market-value ratio of gold to paper currency thus established, the mint would recognize this market value, and would pay miners for their gold, either the exact equivalent in gold coin, or the value in paper money plus premium—that is, the market value in paper money. This premium would stimulate gold production and tend to promote deflation and the return to normal conditions.

The new officers of the society for 1920 were announced as: President, Waldemar Lindgren; vice-president, W. Y. Westervelt; councillors, New York district, H. H. Knox; Washington district, F. G. Cottrell; Middle West, H. V. Winchell; Pacific Coast, Albert Burch.

San Francisco Section, A. I. M. E.

At a meeting of the San Francisco section of the A. I. M. E., held Jan. 13, the following new officers were elected: Corey C. Brayton, chairman; W. J. Loring, vice-president; W. H. Shockley, secretary-treasurer; C. E. Grunsky, Jr., and Edwin Higgins, executive committee.

Stanly A. Easton stated that he believed the success of the Columbia section was due to the fact that the men were encouraged to discuss technical questions among themselves.

Being asked why it was that the Bunker Hill & Sullivan was the only company to escape the Coeur d'Alene strike, Mr. Easton said that the physical conditions favored and that continued operations over the past twenty years has resulted in the selection and maintenance of a working crew well above the average. Mr. Easton's talk dealt largely with the unobtrusive manner in which the Bunker Hill company conducted welfare work among its men.

F. W. Bradley, in response to the chairman's request, continued the discussion and stated that the Bunker Hill & Sullivan company, of which he is the president, gave its moral support to the Wardner Industrial Union and the Y. M. C. A. of Kellogg.

Curtis Lindley, Jr., described his experience with the Bunker Hill & Sullivan company. T. A. Rickard pointed out in an inspiring way the fact that the success of the company was due to the sincerity and personality of two men, F. W. Bradley and Stanly A. Easton. Professor E. A. Hersam of the University of California told of his students' appreciation of this great company. Percy A. Robbins briefly discussed his experience with the housing and handling of men. D. M. Riordan and others joined in the discussion.

The Function and Ideals of a National Geological Survey*

BY F. L. RANSOME

The reasons why a government should undertake work in geology while investigations in other sciences are in general left to private enterprise differ with the point of view. The geologist realizes that whereas some sciences may be pursued at any one of a number of localities, geology is regional in its scope and is primarily a field science, requiring well-equipped expeditions and operations over large areas. Its larger problems, as a rule, can not be undertaken by individual geologists or by local organizations. The preparation of a geologic map of a whole country, with the essential explanatory text—generally recognized as desirable fundamental work—requires long-continued effort by a central organization. The intelligent laymen as well as the geologist must recognize that the development of a country's natural resources so as to secure their maximum use by the greatest number must depend upon reliable information concerning these resources and that this information should be available before they are fully exploited. Such information can best be obtained and published by an impartial national organization. Knowledge of the mineral resources of a country must rest upon a geological foundation. Finally the citizen of narrower vision will appreciate the opportunity to obtain information for his own use. As a matter of fact, most of the progressive countries maintain geological surveys, so that the desirability of such an organization appears to have been generally recognized, whatever may have been the reasons that set in motion the machinery of organization in each country.

Emphasis is sometimes laid on "usefulness" as the chief or only criterion by which to judge the value of scientific research under government auspices; but when it is said that science must be useful no great advance has been made. Probably the most idealistic scientific man will admit that ultimate usefulness is the justification for science. It is well known to all scientific men, although not as widely recognized by others as it should be, that the utility of research is not generally predictable. Quite independently of any recognized usefulness, investigations that yield results of popular interest are willingly supported by the people—a

significant fact in connection with what will be said later on education. In brief, the term usefulness as applied to science covers a wide range and when employed by people of imagination and liberal culture includes much more than when used by those whose only standard of value is the unstable dollar. It is as important for man to have his bodily needs supplied and in ministering to either requirement science may be called useful or valuable.

If government were in the hands of a wise and benevolent autocracy, a national geological survey would be so conducted as to be useful to the people in the broader sense outlined. It would aim to encourage and promote the study of geology by undertaking those general problems and regional investigations that would be likely to remain untouched if left to private enterprise. It would lay the foundation for the most economic and efficient development of the natural resources of the country by making known the location, character and extent of the national mineral resources. As an aid to the intelligent utilization of these resources and to the discovery of deposits additional to those known, it would occupy itself with problems concerning the origin and mode of formation of mineral deposits. Last, but not least, it would accept the responsibility, not only for making known the material resources of the country but for contributing to the moral and intellectual life of the nation, and of the world, by seeing to it that the country's resources in opportunities for progress in the science of geology are fully utilized.

Our government, however, is democratic in plan and intent and suffers from certain well-known disadvantages from which no democracy has yet been free. The wishes of the politically active majority control, and these wishes may not coincide with those of the wisest and most enlightened citizens. A national scientific bureau, if it is to survive, must have popular support, and to obtain and hold such support it must do at least some work that the majority of the people can recognize as worth doing. Here evidently some compromise with scientific ideals is necessary. The most delicate and critical problem in the direction of a scientific bureau is to determine the nature and extent of this compromise so as to obtain the largest and steadiest support for research with the least sacrifice. Complete surrender to popularity may mean large initial support, but it is sure to be followed by deterioration in the spirit of the organization and in the quality of its work, by loss of scientific prestige and by final bankruptcy.

*Abstract of an address delivered by Mr. Ransome when retiring as president of the Washington Academy of Sciences on Jan. 13, 1920, and to be published in full in the "Journal" of the Academy.

even in popular favor. The extent to which concessions must be made will depend largely on the general intelligence of the people. The more enlightened the people, the more general and permanent will be their support of science.

This leads to the conclusion that a very important function of a national geological survey is the education of the people in geology and the increasing of popular interest in that science; yet it is surprising how little this function has been recognized and exercised. The results of such education are cumulative and a direct and permanent gain to science, whereas, on the other hand, the consequences of prostituting the opportunities for scientific work to satisfy this and that popular demand for so-called practical results in any problem that happens to be momentarily in the public eye, is a kind of charlatanism that is utterly demoralizing to those who practice it and that must ultimately bring even popular discredit on science. A bureau that follows such a policy can neither hold within it nor attract to its service men animated by the true spirit of investigation.

A geological survey should include on its staff one or more men of high ability who are especially gifted in interesting the public in the purposes, methods and results of geologic work—men of imagination who can see the romance of science; men of broad sympathy who know the hearts and minds of their countrymen from the Atlantic to the Pacific; men imbued with the truthful spirit of science; and finally men skilled in the art of illuminating the cold impersonal results of science with a warm glow of human interest. In connection with the subject of education attention may be called to the fundamental importance of establishing and maintaining close and cordial relationship between a government scientific bureau and the universities.

In the present age of specialization we are apt to forget how much geology owes to amateurs, particularly in Britain and France. In this country at the present time, the amateur geologist, due partly to the way in which the subject is taught, is rare, and few indeed are the contributions made to the science by those who follow geology as an avocation. An improvement of this condition should be one of the major objects of the educational program of a national geological survey.

There has been considerable difference of opinion as to the kinds of work that should be undertaken by a national geological survey. Shall its field be confined to what may be included under geology or shall it embrace other ac-

tivities, such as topographic mapping, hydraulic engineering, mining engineering, the classification of public lands, the collection and publication of statistics of mineral production and the mechanical arts of publication such as printing and engraving. These various lines of activity may be divided into two main classes—those that are more or less contributory to the publication of geologic results, and those that have little if any connection with geology. The speaker is one of those who believe that a geological survey should be essentially what its name implies, that it should confine its activity to the science of geology. This opinion is held, however, in full realization of the fact that here as elsewhere some compromise may be necessary. This may be dictated by law or may be determined by policy. Only one of the lines of collateral activity mentioned, namely, that of mineral statistics, can be discussed in this brief abstract.

When shortly after the organization of the U. S. Geological Survey the collection of mineral statistics was begun, those geologists who were most influential in urging that the Survey should undertake statistical work adduced as the principal reason that the people desired such figures, and if the Geological Survey did the work it would be able to secure larger appropriations than if the task were left for others. It does not appear to have been thought at that time that geologists were the only men who could satisfactorily do statistical work or that it was necessary to impose this duty on them. Subsequently, however, the work was apportioned among the geologists. It is undoubtedly true that the statistical reports of the United States Geological Survey have greatly improved since this plan was adopted. It is also true that some geologists have turned their opportunities as statistical experts to good account both in enlarging their experience and by gathering material for geological studies. Nevertheless, the policy has, in my opinion, been a mistake both economically and scientifically. It has taken highly trained men who have shown originality and capacity for geologic research and has tied these men down to comparatively easy and more or less routine tasks. Some geologists who were once scientifically productive no longer contribute anything to geological literature, but are immersed in work that men without their special geological training could do as well. If there are particular reasons why a geological survey should gather statistics of mineral production, this work should be performed by a special non-geologic staff.

Finally a few words may be said concerning the relation between the personnel of a geological survey and the results obtained by the organization. If such a survey is to attract to its service men of first rate ability and to hold these men after their development and experience has made them of the highest value, certain inducements must be offered. Salary is unfortunately the first of these that comes to mind under conditions that continually force the scientific men in government service to recognize painfully how inadequate is the stipend upon which he had existed before the war. It is all very well to insist that the scientific man does not work for money and should not trouble his thoughts with such an unworthy consideration.

However, salary, important as it is, is by no means the only determinant. If it is reasonably adequate, most men who are animated by the spirit of science will find additional reward in their work itself if this is felt to be worthy of their best efforts. A man of first-rate scientific ability, however, will not enter an organization in which consecutive application to a problem is thwarted, in which he is expected to turn to this or that comparatively unimportant task as political expediency may dictate or in which the general atmosphere is unfavorable to the initiation and prosecution of research problems of any magnitude. If a man of the type in mind finds himself in such an uncongenial environment he is likely to go elsewhere. The final effect upon the organization will be that its scientific staff will be mediocre and it will become chiefly a statistical and engineering bureau from which leadership in geology will have departed.

If, on the other hand, a young geologist can feel that every possible opportunity and encouragement will be given to him in advancing the science of geology; that results on the whole will be considered more important than adherence to a schedule; that imagination and originality will be more highly valued than routine efficiency or mere executive capacity; that he will not be diverted to tasks for which, important as they may be, his training and inclination do not particularly fit him; that those directing the organization are interested in his development and will give him all possible opportunity to demonstrate his power of growth; and that appreciation and material reward will be in proportion to his scientific achievement; he will then be capable of the best that is in him and will cheerfully contribute that best to the credit of the organization that he serves.

THE MINING NEWS

LEADING EVENTS

Flin Flon Option Dropped by Hayden, Stone & Co.

New Syndicate Negotiating for Property Wants Time for Thorough Metallurgical Test

The deal that was pending between Hayden, Stone & Co., of New York, and the owners of the Flin Flon copper prospect on the lake of the same name in northern Manitoba has fallen through. A strong New York syndicate, that is negotiating for the property, is reported to be desirous of ob-

body was discovered in 1914 by Tom Creighton and Jack Mosher, of Toronto, and others. The accompanying photographs give an idea of the character of the country in which the deposit occurs. The Mandy mine of the Tonopah Mining Co. is at Schist Lake near by.

Litigation Over Cliff Mine Re-opened at Valdez

Litigation involving the famous Cliff mine near Valdez, Alaska, has been re-opened before Judge R. W. Jennings, of Juneau, sitting in Valdez. This prop-

Canada's Indian Lands to Be Opened to Prospectors

Placer and Mineral Acts Amended—British Columbia Provincial Restrictions Removed

BY ROBERT DUNN

An order-in-council has been passed by the Dominion Government of Canada throwing open Indian reserves for the mining of gold and silver. Hitherto these lands have been closed to miners and to mining operations except by means of a surrender from the Indians



UPPER LEFT—OFFICE AT FLIN FLON PROPERTY, NORTHERN MANITOBA. UPPER RIGHT—DISCOVERERS OF FLIN FLON. FROM LEFT TO RIGHT THEY ARE: DAN MOSHER, LEON DIJON, ISIDOR DIJON, DAN MILLIGAN, JOHN MOSHER AND TOM CREIGHTON. LOWER LEFT—FLIN FLON LAKE. LOWER RIGHT—TRENCH ACROSS FLIN FLON OREBODY, SHOWING 150 FT. OF SOLID SULPHIDES

taining sufficient time to mine and ship 2,000 tons of ore from the claims in order to make a metallurgical test, this at a cost of \$100,000 to \$150,000 and requiring about eight months time. The vendors want cash payment, which is holding up the deal. It is said that the syndicate is willing to spend \$1,000,000 for preliminary work.

The Flin Flon deposit, as has already been stated in the "Journal" of Oct. 25, contains 20,000,000 tons of primary sulphides running 1.7 per cent copper, 1.5 oz. silver and \$1.40 gold. The ore-

erty, which is credited with a production of approximately one million dollars, has been in litigation for the last five years, having reached the U. S. District Court and the U. S. Court of Appeals. H. E. Ellis, the original locator, represented by Maurice D. Leehy, attorney, is resisting the claims of George C. Treat, Edmund Smith and Logan Archibald for a one-fifth interest in the property as a reward for financing it. The latter are represented in the suit by the Seattle law firm of Lyons & Orton.

affected of their rights, and confirmatory authority from the Department of Indian Affairs, Ottawa. These steps were not often taken, chiefly because negotiations with the Indians almost invariably are prolonged and their outcome always uncertain. Recognizing that this condition constituted a handicap to mineral development William Sloan, Minister of Mines, introduced amendments to both the Placer and the Mineral Acts at the last session of the provincial legislature.

These amendments were carried and

will become law when the provincial government has them proclaimed effective. They remove all provincial restrictions to entrance upon Indian reservations by free miners for purposes of prospecting or mining gold or silver.

However, it was futile for the province to make this declaration until the Dominion government, which absolutely controls the Indians and the Indian lands, had taken similar action. Mr. Sloan, therefore, made representations to Ottawa and the result was the order-in-council referred to. With this federal order recorded, all the provincial government has to do is to proclaim its amending acts law, and miners, subject to the terms of the Ottawa order-in-council, may enter on Indian lands in search of the precious metals.

These terms give the Federal Minister power to issue leases for surface rights on Indian reserves upon such conditions as may be considered proper in the interests of the Indians and covering such area only as may be required for purposes of mining, provision being made for compensating any occupant of land for any damage that may be caused thereon. It is further set out that a permit must be secured from the Indian agent, with whom the miner must deposit a certified copy of his provincial license.

Upon locating and recording a claim upon an Indian reserve and obtaining a lease for mining thereon from the province, the lessee must then apply to the superintendent-general through the Indian agent for a lease of the surface rights, at the same time submitting a plan and description of the lands and offering to pay a yearly rental of such amount as the Indian agent shall designate. Any timber required for mining purposes must be purchased at a price agreed upon by the Indian agent and the lessee.

Title to Claim Unaffected by Grade of Mineral

The Secretary of the Interior has decided that a prospector is entitled to hold location title to a mining claim whereon there is mineral in place, even though that mineral be not of commercial grade. The case in question especially affects the right of Sam Clark to hold title to ground on which is the greater part of the village of Clarkston, Ariz., near Ajo, whose residents lately petitioned that the ground be declared a townsite. The petition was granted by the Phoenix land office, though with proviso that the action should not affect prior rights to mineral within the ground. Mineral examiners for the Government reported the Clark holdings non-mineral.

Utah Power Co. Embarrassed by Sudden Strike

Electrical Workers Quit Without Warning, Though Under Contract

The Utah Power & Light Co. is making an aggregate wage increase of \$125,000 for the present year, this sum to be divided among employees who receive less than \$200 a month. The company is also arranging to provide modern cottages and living conditions for employees working in remote and outlying districts. On the heels of the announcement of the above increases and betterment plans, comes a strike on the part of a number of electricians, members of the Electrical Workers' Union, which occurred without warning at four o'clock on Jan. 13. Company officials became cognizant of the proposed walk-out only an hour and a half before it took place, although the men were under individual contract to the company. Gaps in the force were filled in from among the employees themselves, and it has been possible to maintain uninterrupted power service. The power company operates under the open shop system and, although refusing to treat with outside men claiming to represent its employees, has expressed itself as ready at all times, as in the past, to meet with committees of its own men.

Arizona Copper Co.'s Leaching Experiments at Clifton

An account of the leaching experiments conducted by the Arizona Copper Co. at Clifton, Ariz., during the last eighteen months, was given by Arthur Crowfoot, superintendent of concentration for the company, at the recent meeting of the Arizona section of the A. I. M. E. at Ajo. These experiments, according to Mr. Crowfoot, were largely confined to the treatment of mill tailings containing copper both in the sulphide and the acid soluble form, although some tests were also made on the treatment of crude ore containing copper in both forms. Old slime tailings chiefly were handled, but there was also some experimental work done on the treatment of the slime content of current mill tailings. The old slime tailings are contained in ponds in South Clifton and consist of a mixture of practically untreated oxide slime and slime tailings from a sulphide mill. Mr. Crowfoot added that the company is now preparing to treat in the experimental plant 2,000 tons of tailings from the deposit in Morenci Canyon made by the company's No. 6 concentrator at Morenci, this material containing both sand and slime. The plant has been equipped with crusher, roll, and primary table equipment, so that a mixed run of ores may be tested.

U. S. Court Dismisses Receivers of Christmas Mine

Property Restored to Gila Copper Sulphide Co.—New Organization Has Ample Capital

The Gila Copper Sulphide Co. has emerged from its troubles, with formal action by Judge Sawtelle in the United States Court for Arizona in dismissing the receivership and turning the property back to the owners. The company has been reorganized and has fresh and ample capital with new stockholding interests, represented by the new president, F. T. Perkins, of Boston. The discharged receivers were Allan Forbes, of Boston, president of the Bay State Trust Co., and George D. Morris, of Phoenix, who continues in charge at the property under the new conditions. They have been represented in a legal way by former Governor Richard E. Sloan, of Phoenix. The mine is making regular shipments to the Hayden plant of the American Smelting & Refining Co. of 250 tons a day of ore that returns substantial profit.

The Gila Copper Sulphide property is at Christmas, nine miles up the Gila River from Hayden, and is favored by the proximity of an extension of the Arizona Eastern R. R. It is the old Saddle Mountain mine of the George Chittenden interests and had its own smelter long before the railroad came. The Gila Sulphide company was organized by Frank M. Murphy, Cheney and others, but was not involved in the failure of Murphy's other mining interests. There was an attempt at foreclosure by the New Haven Trust Co., under a trust deed, for collection of \$690,000 bonds, but this was denied by Judge Sawtelle and the receivership was established by the prayer of the London-Arizona Consolidated Copper Co., which had a small account of \$10,000 for the purchase price of several mining claims. There was an incidental action when the smelting company refused to handle the Gila Sulphide ores under the very favorable contract in force, but this was decided in favor of the mining company by former President Taft, in New York, acting as master. It was shown that the mining company was in really good shape, that it had paid off \$300,000 of its bonded indebtedness and that it was being economically managed.

The Arizona Tax Commission has recommended that non-productive patented mining claims be assessed on the basis of \$36.30 per acre, or \$750 for a full claim, \$36.30 per acre for patented mill sites and \$10 an acre for non-productive patented placer claims and coal lands.

Taxation Suit of Copper Range Co. Settled by State Court

Case May Go to U. S. Supreme Court—Decision Practically Endorses Present Method of Taxation

The decision of the Michigan Supreme Court in the taxation suit of the Copper Range Co. is practically an endorsement of the methods of fixing mining property valuations in use in Houghton County. The system in vogue here is recognized by the mining corporations and by disinterested taxpayers as not the best but no better way is obtain-

Co., which owns the Baltic mine. He is now consulting engineer for the same company. Therefore, in starting this suit he was compelled, by the technical phase of the situation, to start action against the township of which he was the executive head. The Baltic company paid its taxes under protest. The local circuit judge upheld the board of supervisors. The highest tribunal in the state does the same thing. As a matter of fact the decision has great interest to mining corporations for it settles the question once and for all. The

Schwarz Zinc Oxide Process Requires Short Burning

New Method Takes Twenty to Thirty Minutes Compared With Eight Hours Needed by Old

The new process for making zinc oxide developed by A. Schwarz, consulting engineer of Joplin, Mo., has been thoroughly demonstrated and checked on smaller furnaces, according to Mr. Schwarz. By it the production of oxide requires only twenty to thirty minutes of burning as against the old method of about eight hours. The oxide is pro-



UPPER LEFT—BOAT AND SCOW AT STURGEON LANDING, WHITHER ORE FROM MANDY MINE, NEAR FLIN FLON PROPERTY, IS HAULED FOR SHIPMENT DOWN RIVER TO RAIL AT LE PAS. UPPER RIGHT—WINTER TRAVEL IN NORTHERN MANITOBA. LOWER LEFT—DUMP OF MANDY ORE AWAITING SUMMER FOR TRANSPORT DOWN RIVER. AVERAGE TEAM LOAD LAST WINTER SIX TONS, 200 TEAMS BEING USED. LOWER RIGHT—SCOW USED FOR CARRYING ORE AND SUPPLIES

able. The idea of having physical valuations placed on copper producers in a native copper district has proven out of question, both by practice as well as theory. The present system, that of averaging the market valuations of copper shares, is looked upon generally as the best yet suggested.

As to whether there will be an appeal from the state supreme court to the United States courts no decision has as yet been announced. This suit presented many interesting features. At the time it was instituted, F. W. Denton was supervisor from Adams township to the county board. He was then general manager of the Copper Range

Copper Range company did the other copper mining interests of the district an unselfish service in getting a final legal decision on this matter.

Owing to the disappearance of much of the Canadian silver currency from circulation, the coins having been melted down as the value of the silver is greater than their face value, the Canadian government has issued an order reducing the silver content. The former standard was 925 parts of silver to 75 of alloy. An order-in-council provides that the standard for silver coins shall be 800 parts (of every 1,000) fine silver, and 200 parts of alloy.

duced directly from sulphide without roasting. The analysis of the oxides produced from Joplin blende has been pronounced an excellent one. Mr. Schwarz expects to produce lead-free oxide in a new plant and also cadmium-free oxide.

A plant is now under construction that is capable of producing ten tons of oxide per day. This is being built as a semi-commercial equipment and will be followed by one of larger capacity later. It is expected that the new plant will be in operation by March or April at the latest. The advantage of such a process over the old method, if successful on a large scale, is great.

Marsh Mines Co. Shows Claims Against Hecla in Drawings

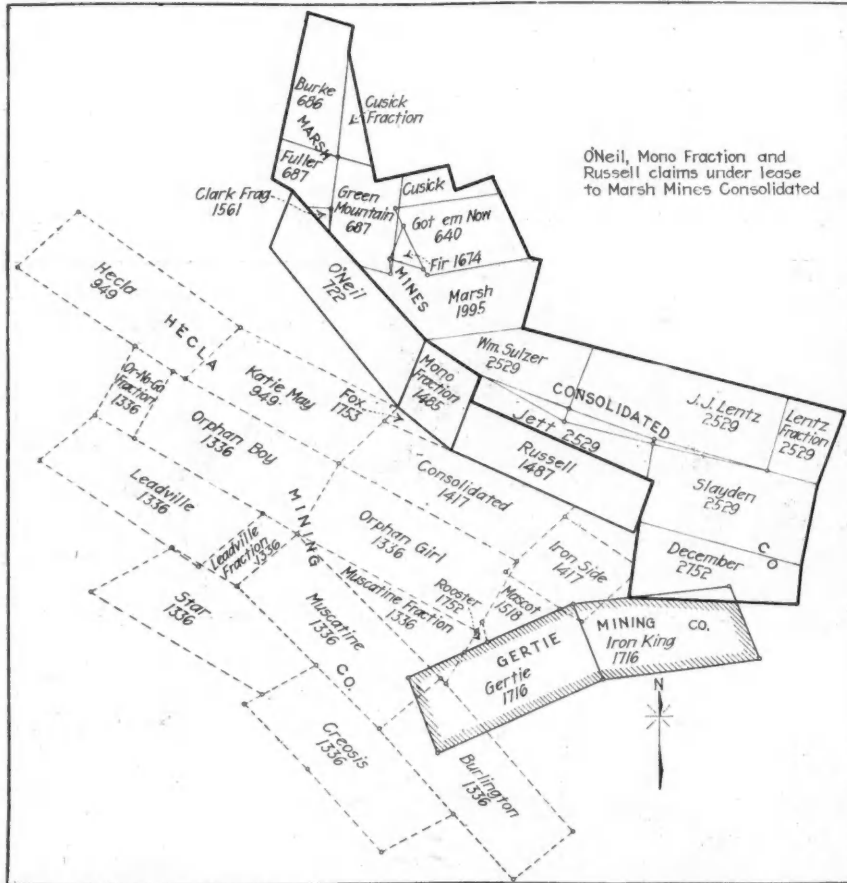
The accompanying illustrations show the drawings prepared by the Marsh

ed ground is owned by the Federal and is under lease to Marsh.

Both of these companies have their main offices at Wallace, Ida. The Marsh lease on the ground involved expires in

Effect of New York Exchange on Mining at Cobalt

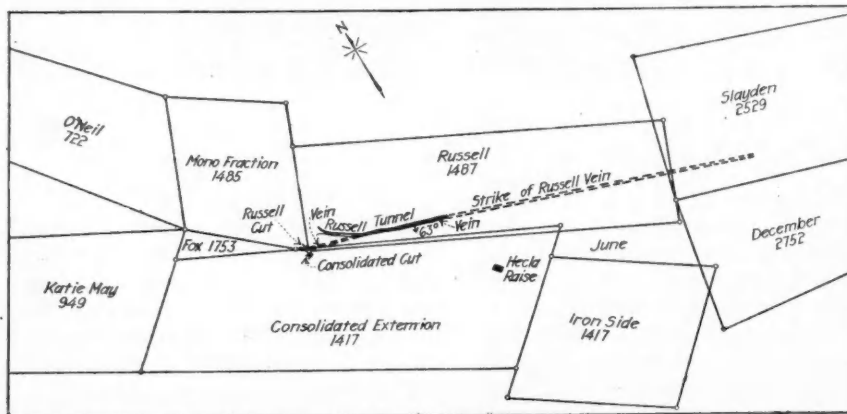
The present price of New York exchange is helping the Cobalt mining companies to a very considerable extent. Those companies selling their ore in the United States are paid in American funds, while those selling to Canadian smelters usually get at least part of the exchange. Some of the companies produce bullion, and those are in a still more favorable position, because in addition to getting the premium which now amounts to about 8 per cent on New York funds, they are often able to get a considerable advance over the official quotations for the silver. At the present time the price for silver is made in New York but there are a number of well informed people who expect to see the market go back to London. The present New York supremacy is due to



PROPERTY MAP PREPARED BY MARSH MINES CONSOLIDATED, WALLACE, IDA., TO DEMONSTRATE ITS CLAIMS AGAINST HECLA MINING CO.

Mines Consolidated to demonstrate its contentions in the coming litigation with the Hecla company. The plan showing the

1926. It is held, therefore, that this company can not hope to profit, whatever the outcome of the litigation. The

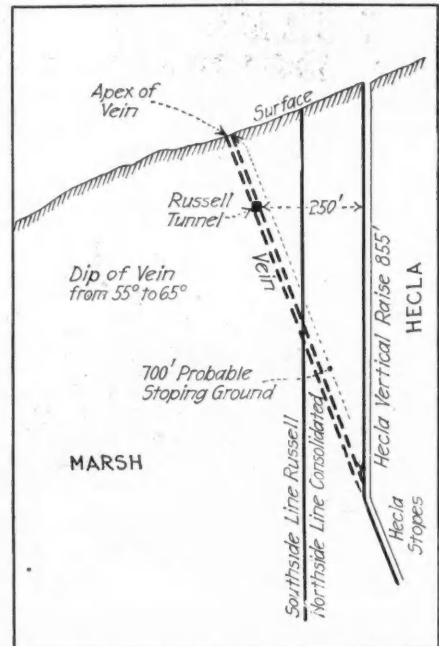


PLAN PREPARED BY MARSH MINES CONSOLIDATED, WALLACE, IDA., SHOWING ALLEGED APEX WITHIN MARSH GROUND

alleged apex and the cross section showing the dip into Hecla ground are, of course, largely guess work to strengthen the Marsh side. The general plan showing the Marsh ground owned by Federal and under lease to Marsh, and the Hecla and Gertie is correct, being taken from official surveys. The shad-

real interests involved in the dispute are the Hecla Mining Co. and the Federal Mining & Smelting Company.

The annual winter short session mining course at College of Mines of the University of Washington at Seattle recently opened with a class of fifteen.



CROSS SECTION PREPARED BY MARSH MINES CONSOLIDATED, WALLACE, IDA., SHOWING ALLEGED DIP OF VEIN INTO HECLA

the demand for China and the bidding for the bullion by several banks having Chinese connections. There is, however, little co-operation among the different silver brokers, and sometimes it is impossible to sell the amount of silver desired. Payments are made for ore on the price of silver ruling a certain number of days after the arrival of the car at the smelter, and as the Canadian smelters do not gamble on the price of silver, they sell the actual silver called for on the day of settlement. If they are unable to dispose of this amount, as sometimes happens in New York, they may suffer a loss. In London this never happens, because if there does not happen to be the actual market the brokers will buy it themselves.

Trethewey Sale to Coniagas Probable

The Coniagas mine is negotiating for the Trethewey mine which adjoins it in Cobalt and it is understood that the price has been settled at \$100,000. This does not include the Gowganda property which the Trethewey has under option, and also calls for certain reservations in the way of machinery and supplies which the Trethewey will hold. The deal will be a good one for the two companies. The Trethewey gets the cash and the Coniagas the ore which it needs to keep its large mill running. The property can be economically worked from the Coniagas levels.

Arizona Mines Pay Over Half of State Taxation

In Arizona, nearly 58 per cent of the state's taxation is borne by the mining industry, which has a gross assessment of \$496,262,861. There has been a

gradual percentage increase since 31 per cent was assessed in 1912, the first year of Arizona's statehood, save that in 1916 there was a jump of 12 per cent. In 1912 the mines assessment was \$45,145,000, in 1913 \$140,488,000, in 1916 \$216,879,000, in 1917 \$393,421,000 and in 1918 \$491,679,000. The assessment now is based upon a production record and surface valuations.

Reorganization of Tonopah Company Proposed

Announcement has been made by the directorate of the West End Consolidated Mining Co. that stockholders will be asked to approve organization of the West End Mining, West End Chemical and West End Opoteca companies to operate separately the properties owned by the corporation at Tonopah, Searles Lake, Cal., and Opotec, Honduras.

In exchange for turning over all its properties to the three new corpora-

tions the present West End company is to receive 1,788,486 shares of the capital stock of each enterprise, corresponding with the total issued stock of the parent concern. This is to be followed by voluntary dissolution of the West End Consolidated Mining Co. It is declared that ratification of the proposed plan will be of pronounced benefit to all stockholders, and will enable the varied enterprises of the corporation to be more advantageously carried forward.

The Denver, Boulder & Western R. R., which was bought some time ago by Morse Bros. Machinery & Supply Co., of Denver, at a price reputed to be \$260,000, is being torn up as the weather permits. The salvage value is said to be \$450,000. Opportunity was given the local civic and commercial organizations to acquire title to the road, but no offer was made.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Question of Relief for Producers of War Minerals Again Taken Up by House Committee

More Liberal Legislation Seems Probable—Chestatee Case Reviewed in Detail—Attacks on Commission Answered by Chairman Shaffroth and Philip N. Moore

Extended hearings are being held by the House Committee on Mines and Mining on Joint Resolution No. 170. Numerous witnesses have been heard. Judging from the attitude of most of the members of the Committee, it seems probable that the Committee will vote for some liberalization of the statute covering war minerals relief. It is not a foregone conclusion, however, that the House will follow the Committee in this legislation, even if the latter should report such a bill favorably.

Much of the time during the hearing is being consumed in consideration of the equities involved in the award made to the Chestatee Pyrites & Chemical Corporation, of Chestatee, Ga. The attorney for that concern told the Committee that the War Minerals Relief Commission, in making award in the Chestatee case, "had an entire misconception of the law as passed by Congress for the relief of these gentlemen who were induced by Governmental agencies to stimulate production."

The Committee apparently looks upon the Chestatee claim as typical of most of those that have been filed. The members have accepted as proven the Government's liability in the case. The question now involved is entirely that of the measure of damage suffered by the Chestatee company.

The claimants insist that there were clearly proven errors in the reports of the engineers and that there were many mistakes on the part of the auditor. In this connection N. P. Pratt, one of the owners of the Chestatee operation, said: "Senator Shaffroth seemed inclined to let us point out where the errors were made against us. Commissioner Moore objected. Our counselor asked for five minutes to show the Commission where errors had been made against us amounting to about \$500,000, but Commissioner Moore declined."

Senator Shaffroth, who is chairman of the War Minerals Relief Commission, in testifying before the Committee, admitted that the law is much in need of amendment. Some members of the

Committee on Mines and Mining are in favor of having the Chestatee case handled as regular war claims are usually handled.

Philip N. Moore, member of the Commission, appeared on Jan. 19 before the Committee to reply to these attacks by the Chestatee company. He explained that the basis upon which an award was made in the Chestatee case was by comparing the plant as finally constructed with a plant of a size which the claimants' testimony showed was contemplated (before the Government's appeal for increased production). The Commission assumed that certain other items of investment were increased proportionately. In this award the Commission took the actual hourly capacity of the mill as operated for eight months as the measure of its capacity. In this calculation it was even assumed that the mill would operate 100 per cent of the time. No award was made for a railroad. The Commission holds that the evidence clearly showed this had been contemplated in the original plan and no documentary evidence has been exhibited to controvert this statement. The claim for financing consisted chiefly of a commission of \$1.25 per ton to be paid upon sales of the ore, of which but a small fraction has been shipped. The Commission therefore takes the position that this is not an accrued indebtedness.

McFadden Silver Bill Amends Pittman Act

Cuts Subsidiary Coinage Standard From 90 to 80 Per Cent and Allows Melting of All Silver Dollars

Hearings have been begun by the House Committee on Banking and Currency on the McFadden Bill which proposes to amend the Pittman Silver Act of Apr. 23, 1918, and to reduce the standard of subsidiary silver coin from 90 to 80 per cent. The new measure amends the Pittman Act so as to require that all standard silver dollars be broken up and sold as bullion. The Pittman Act required the repurchase of a like amount of silver at \$1 per ounce. The McFadden bill repeals the repurchase clause. In commenting on his bill Representative McFadden said:

"The phenomenal rise in the price of silver from 48½c. an ounce in 1915 to \$1.37½c. in 1919 has caused our standard silver dollar, worth only 37c. in 1915, to be worth \$1.06¼ in gold in 1919, and the silver dollar being worth more as bullion than as coin has driven itself out of circulation by the operation of the inexorable law announced by Sir Thomas Gresham, the financial advisor of Queen Elizabeth. Gresham announced that 'money of less value drives out money of more value.' This law applies to the bi-metallic or so-called double standard of value as well as to worn coins. As our gold dollar at the coinage ratio of 1 to 16 of silver, is now less valuable than the standard silver dollar, the cheaper gold dollar has driven the more valuable silver dollar out of circulation. Here is twentieth-century proof of the fallacy of bi-metallism.

"We had the very same experience in 1852, following the discovery of gold in California, when all our silver change money was melted up and the public had to use postage stamps for change. At that time our subsidiary silver coins were the alloquial part of the standard silver dollar. Congress relieved that situation by enacting on Feb. 21, 1853, our present subsidiary silver coinage law, which reduced their weight by 7 per cent and sustained their parity with gold by Government credit. When silver is worth \$1.29 an ounce it is profitable to silversmiths and silver exporters to melt full weight standard silver dollars. When silver is worth \$1.38 an ounce it is profitable for them to melt our full weight subsidiary coins of which we have more than \$200,000,000 out. To prevent the inconvenience experienced in 1852, when we lost all our change money, I have had my bill provide that all future

coinage of subsidiary silver pieces is to be on an 80 instead of a 90 per cent basis. The Holland government has already proposed a bill to recoin its silver on an 80 per cent basis, and Canada contemplates similar action.

"In the debate in the Senate on the Pittman Bill it was shown that silver, under ordinary labor conditions, could be produced at a profit at 50c. an oz. Yet the Pittman Act requires the Government to repurchase a like amount of silver at \$1 an oz. It is my purpose to repeal this vicious clause of the Pittman Act."

Fordney Bill Would Put Tariff on Graphite

A tariff schedule for graphite is contained in a bill introduced by Representative Fordney, Chairman of the Committee on Ways and Means of the House of Representatives. The Fordney schedule provides for a duty of 1c. per lb. for crude crystalline graphite ores containing 50 per cent or less of graphitic carbon and 2c. per lb. for ores containing over 50 per cent of graphite. Lump and chip graphite are to be dutiable at 3c. per lb. of graphite. Flake graphite, crude concentrates and refined flakes are to be dutiable at 6c. per lb. of graphite. All other manufactured materials and compounds containing graphite are to pay 5c. per lb. in addition to the rates of duty prescribed above.

Census to List Strike Losses

Blanks now being mailed by the Bureau of the Census to manufacturers request, among other things, information with regard to losses sustained on account of strikes. This is the first time that a comprehensive effort has been made to arrive at a fairly accurate idea of the economic loss which follows interruptions of production by industrial disputes. Not only are direct losses to be tabulated, but indirect losses as well, where, for example, a plant is closed for lack of fuel brought about by a coal strike.

Southern Pacific Decision Attacked by Pinchot

Gifford Pinchot, as president of the National Conservation Association, has entered a protest in an open letter to Attorney General A. Mitchell Palmer, against what he styles the "abandonment of 160,000 acres of oil lands in California to the Southern Pacific Railway Co., without carrying the case to the U. S. Supreme Court." Mr. Pinchot in his letter urges the Attorney General to take an appeal in the two months still remaining.

Government Rapidly Losing Technical Employees

Higher Salaries Paid by Private Companies Drawing Men Away from Bureau Work

During the six months ended Dec. 31 there was a turnover of 34.6 per cent among the technical employees of the U. S. Bureau of Mines, 48.6 per cent among the clerical employees, and 117.8 per cent among the non-clerical employees. The situation has become so serious that in the Bureau of Mines and in other Government bureaus drastic steps are being considered to lessen the number of resignations from the Government service.

The inability to secure competent technical men and the difficulty experienced in retaining them in the service at present salaries is leading in many bureaus to a re-adjustment of work which will make it possible to pay such employees more money. In some cases entire lines of work are being dropped so that funds may be found to pay the salaries necessary to attract or keep competent men. Efforts also are being made to exact promises from incoming technical men to complete problems to which they are assigned before leaving the Bureau's service.

Mineral Land Purchase Price Refunded

A bill authorizing the payment of \$4,200 to the Buffalo River Zinc Mining Co., of St. Louis, Mo., has been passed by the House, after being approved by the Senate. The money is to cover the purchase price of certain zinc lands in Arkansas, the patents to which were cancelled. The bill contains the proviso, however, that the Secretary of the Interior must be satisfied as to the adjustments of the claim before it is paid.

New Bill Denies Aliens' Right to Take up Mining Claims

Representative Hayden of Arizona has introduced a bill proposing to amend the revised statutes of the United States so as to vest only in American citizens the right to take up mining claims. Under the law as it reads at present, mining claims may be acquired by those who have declared their intention of becoming citizens. Mr. Hayden has a record of activities on the part of Austrians and Germans and other aliens in acquiring mining claims, during and since the war. The bill has been referred to the Committee on Public Lands, which in turn has sent Mr. Hayden's proposal to the Secretary of the Interior in order that his report may be obtained.

NEWS BY MINING DISTRICTS

ALASKA

ALASKA GASTINEAU MAKES NEW CRUSHING RECORD

Juneau—Improvement in the labor situation recently enabled the Alaska Gastineau Mining Co. to make a new record when 359,024 tons of rock was crushed for the mill during November. This gave an average of 8,434 tons of rock crushed each day.

Treadwell—The Port Chatham chrome mines, situated at the tip of Kenai Peninsula in southwestern Alaska, recently shipped 100 tons of chrome ore to the mill of the Alaska Treadwell company, where experimental tests will be conducted.

ALABAMA

The Sloss-Sheffield Steel & Iron Co. has blown in its Hattie furnace at Sheffield, Ala., this making the fourth stack this company now has in operation. Work of repairing and thoroughly overhauling a fifth stack at North Birmingham is being pushed and with improvements such as a skip hoist, new cast shed and an overhead crane is expected to be ready for operation in March.

The U. S. Bureau of Mines station in Birmingham is actively engaged in training both coal and ore miners in first aid and mine rescue work. This is a continuation of the policy pursued during the last year to extend this work in the district.

ARIZONA

TWO NEW STRIKES NEAR KINGMAN—RAY CONSOLIDATED CUTS WAGES—C. & A. MAKES SHAFT CONNECTION

Kingman—Two strikes were made lately near Kingman. George B. Davis found a 9-ft. porphyry dyke* in the Wallapai Mountains of gold-silver ore of milling grade, with a 30-inch paystreak. The vein, which is prominent for 1,500 ft., is in the mountain top, in ground apparently never before prospected, though just below it is the old Cedar Valley trail. The second strike, that in the Chimehuevis Valley, near Topoc station on the Sante Fe, is in malpais, old lava, passed over for fifty years as apparently worthless. Free gold has been found in almost every sample taken. The ground has been staked off for fifteen miles. Eighty autos were in the first rush to the ground.

Ray—Arizona Hercules has resumed operations, after a shutdown of five days, with probability that there will be employment of the full force of 300 miners. Most of the underground work-

men are Mexican. Wages have been reduced by 60c. a day from the former bonus scale of \$1.70 above the basic wage. Announcement was made that the reduction was necessary, as the company latterly had been losing money in operation under the high costs of labor and material.

Warren—At a depth of 575 ft. the Campbell shaft of the Calumet & Arizona Mining Co. has been connected with a 789-ft. upraise from the 1,400 level. The connection was exact. The shaft was started Aug. 15 of last year and the work has been prosecuted with two shifts ever since. The shaft is 3,300 ft. from the Briggs and 2,700 ft. from the Junction, connected with both on the 1,300 and 1,400 levels, respectively. The necessary surveys were through these shafts and were under the charge of W. H. Holcomb and J. B. Fox, with A. J. Balmworth in charge of surface triangulation.

The production of the Shattuck Arizona Copper Co. in December was 260,284 lb. copper, 778,195 lb. lead, 3,085 oz. silver, and 42.15 oz. gold. The production for the year was 2,113,922 lb. copper, 4,381,736 lb. lead, 89,724 oz. silver and 299.83 oz. gold.

Patagonia—The Patagonia-Superior (Magma) company is installing an Ingersoll-Rand compressor and a 100-hp. motor driven by current from Nogales. Drilling is to be started at once, both in the mine and at several surface points. Underground work is being driven on the 400 and 600 levels. A. A. Wren is in charge, assisted by J. S. Classon, late of Butte. The Flux management is starting on a six-months development plan expecting to open enough ore for a 100-ton furnace.

The Hardshell is sinking under contract a 500-ft. shaft, now 430 ft. deep, from which a 1,000-ft. crosscut will be run to the main vein, already proven by a 300-ft. incline shaft. Sinking has been delayed by water and new pumps have been ordered. H. K. Welsh is manager. Ore from the old workings is being shipped by lessees. The El Paso shaft of the Consolidated Arizona Copper Co. is down 270 ft. and will be sunk to 1,000 ft. before crosscutting is begun. W. J. Mitchell is manager. The Old Glory Co. has been formed to take over ground adjoining the Blue Nose, in the Harshaw section. The Hosey has completed its 300-ft. shaft and will start crosscutting. The mine has been bonded in Duluth.

CALIFORNIA

MOTHER LODE OPERATIONS—GRUSS MINE LETS CONTRACT FOR DEVELOPMENT WORK

Sutter Creek—The Central Eureka has thirty stamps dropping and 100 men employed. Excellent ore is going to the mill from the 3,300, 3,500, and 3,700 levels. Old Eureka is vigorously continuing the work of sinking its shaft. The management expects to strike good ore about 300 ft. below present workings.

Grass Valley—The Idaho-Maryland mine has been unwatered to the 500-ft. point. Eighty men are employed. Work on driving the east and west drift at the Allison Ranch mine will be discontinued, as no orebodies have been found in this direction. The drift has been run 857 ft. at a cost of \$10 per ft. Driftings in a westerly direction will probably be undertaken. New buildings are under construction at the Central Consolidated and preparations are being made to erect a hoisting and pumping plant. The State Highway mine has ceased work for the winter, owing to the lack of suitable buildings.

Angels Camp—The new shaft at the Waterman mine is down 40 ft. The company has erected several buildings. At the Angels Deep mine development of a large body of low-grade milling ore is progressing on the 200 level. Work on the 20-stamp mill is being rushed, and the company expects to have it in operation by March.

Genesee—The Gruss Mining Co. has let contracts for the first 1,000 ft. of development work on the 400 level. This will include continuation of a north and south drift and completion of a crosscut. The high-pressure water system has been put in working condition and will be utilized among other purposes for working an eight-drill compressor.

Independence—All the equipment at the Reward mine is being disposed of, and its operation will probably never be undertaken again.

Keeler—The Estelle Mining Co. has completed the construction of an aerial tramway to the Morning Star workings and ore is now coming over it steadily for shipment to the smelter. The ore, which is an especially fine smelting product, carries gold, silver, lead and some copper, there being 2,000 tons either broken or on the dump at present. The company's property adjoins that of the Cerro Gordo Mining Co. In development the Estelle com-

pany has driven what is known as the Troeger tunnel a distance of 7,000 ft. and several veins assaying well have already been cut.

Trona—The Slate Range Minerals Co., operating near Trona, has recently completed a new concentrator and reports a substantial tonnage of ore blocked out which will insure continuous operation during 1920. For some time the company has been shipping three or four cars of crude ore weekly. The ore carries gold, silver and lead, with a small percentage of copper, the silver content being about half of the total.

Alleghany—Drifting from the lower tunnel of the Tightner mine has uncovered the Red Star vein which is being followed. The El Dorado, Mariposa and Sixteen-to-One have resumed production.

Shasta County—The Bully Hill Copper Co., at Winthrop, will soon begin work on its projected zinc smelter. The same process as employed by the Mammoth Copper Co. will be used. At Keswick, the Mountain Copper Co. is opening up new territory in the Iron Mountain and Hornet mines. Steady shipments of rich ore have been maintained to its plant at Martinez.

COLORADO

WELLINGTON MINES NEARING FULL CAPACITY—CONTINENTAL MINE LEASED

Apex—While extending the Barrick tunnel to cut the ore shoot originally discovered and opened up by a shaft, a well mineralized vein was found. Samples were recently assayed running \$30 a ton in gold, silver and lead. The tunnel is being driven by the Saco De Oro Mining & Milling Co.

Breckenridge—The Wellington Mines Co. has been increasing its force steadily and expects to be working full capacity soon. The mills were closed down last March on account of the low price of zinc.

Cripple Creek—In three weeks in December twenty-eight cars of high-grade ore were shipped to the Eagle Ore Co. The ore is being mined by Anderson and Benhelman who hold a lease on three acres of the mine.

Pitkin—At the Volunteer mine lessees in the upper workings are shipping to the Leadville smelter at the rate of a car a week. Lessees in the lower workings have ore of good grade and expect to make a shipment soon. At Durmont, the Drummond Mining & Milling Co. is preparing to start operations. Tom Webb will be superintendent.

Idaho Springs—A small streak of high-grade ore has been opened on the Bluebird mine by Moscript and Rolner. The new owners of the Lincoln group intend to do considerable prospecting on their ground before developing.

Georgetown—A lease and bond on the Continental mine has been given to Los Angeles interests. Talmadge Kyner has been engaged as consulting engineer for the syndicate. The Stewart-Mitchell Mining Co. has begun work at the Smuggler mine with John Rant as superintendent. The fifth level winze is to be deepened 30 ft. and a new level started.

Gunnison—The Wicks Mining Co., former owner of the Doctor mine, has taken back the property. D. A. Shumock, of Aspen, has been placed in charge. Rich zinc carbonates have been shipped for the last five years.

IDAHO

Kellogg—The north mill of the Bunker Hill & Sullivan Mining & Concentrating Co., at Kellogg, which was being used for experimental purposes, was destroyed by fire recently, entailing a loss of \$50,000. The mill was formerly used to treat tailings, but was later converted into an experimental station. A large amount of valuable equipment was also destroyed. The fire is believed to have started in the boiler room. The loss of the mill, it is stated, will in no way interfere with the operation of the mine.

The Bunker Hill company has had itself bonded in order to enter the market for Canadian ores. The smelter, which has a capacity of 1,500 tons of ore per day, can handle as much as 1,000 tons of custom ore, it was stated in the company's San Francisco office. The securing of suitable railroad rates is necessary before the custom field can be effectively entered. It was for this purpose that an office was recently opened in Spokane in charge of Frank W. Smith. The company will also be better able through this office to keep in close touch with the shippers from whom it is expected to draw. The complex composition of some British Columbia ores will necessitate careful attention at the smelter.

MICHIGAN

CHAMPION AND BALTIC MINES LED IN COPPER YIELD IN 1919

The Champion mine, owned jointly by the Copper Range Co. and the St. Mary's Mineral Land Co., made the best record in 1919 of all mines operating in Michigan as to copper content of ore hoisted. Its average return was 42 lb. of refined copper per ton of ore sent to the surface, or better than 2 per cent. The average for the Michigan district for the year was less than 1 per cent. The ore produced by this mine now is running 40 lb. The December production of ore was 10 per cent higher than in November and the output of copper was 1,840,000 lb., an increase of 400,000

lb. over November and 200,000 lb. over October.

The Baltic mine, owned outright by the Copper Range Co., took second place as to copper content of ore. It is maintaining its refined output at 35 lb. to the ton, an average kept up for the last three years, due largely to careful rock selection. The December ore output was 14,000 tons or less by 3,400 tons than in November. This was due to a bad cave-in underground, causing considerable interference with the output of one shaft. The refined output for December therefore showed 490,000 lb., compared with 626,400 in November and 697,000 in October. Most of the damage done by the cave-in has been cleared away and the company likely will show a normal output in January.

Trimountain, the third operating company of the Copper Range group and for a long period referred to as the "weak sister" of this combination, bettered Baltic in rock output in December. Trimountain ore averages 30 lb. to the ton, or 1½ per cent.

The Mohawk mine made a good record in December, as it did in 1919. The tonnage was increased to 48,600 in December which will bring the output of refined copper to 1,215,000 lb. compared with 1,033,322 in November and 1,062,279 in October. Mohawk suffered less than any mine in the district from the exodus of working men in the spring. This property did not participate in the curtailment of output as did most of the mines during the year.

Wolverine is a property that has "come back" through good management. This mine is now working in pillars for half of its product, but the other half is coming from territory that once was looked upon as played out. In December, 1919, the Wolverine produced 21,770 tons of ore that is running 16.5 lb. per ton.

MONTANA

Butte—The production of the Anaconda Copper Mining Co. for 1919 was in excess of 150,000,000 lb. of copper, approximately 6,000,000 oz. of silver, 37,500 oz. of gold and 50,000,000 lb. of refined zinc, according to year-end estimates of the company's metallurgical department. Copper production in 1918 was 293,603,726 lb., silver 10,967,905 oz., and gold 64,318 oz. The silver output is calculated on the basis of 80 oz. per ton of copper and the gold on the basis of one-half oz. per ton of copper.

Anaconda expects to get under way with the manufacture of phosphate about the first or middle of next April. The old Bradley plant at the works is being overhauled. This will be the first

venture of the company into the fertilizer field. The initial capacity of the plant will be 50 tons of rock from which will be produced 35 tons of double-acid phosphate, containing 48 per cent of phosphoric acid.

NEVADA

LOUISIANA CON.'S NEW PLANT NEARING COMPLETION—B. & G. R.R. RUMORED SOLD

Mt. Montgomery—The Louisiana Consolidated Mining Co. expects that its new sintering plant and 125-ton lead stack will be in operation in a couple of months, by which time the addition of Jones-Belmont flotation cells to the concentrator will also be finished. This will give a mill capacity of 125 tons per day. A thirty-five-mile power line to the lines of the Nevada-California Power Co. is also being built.

Goldfield—The Goldfield Development Co. has leased the Riley area of the Florence mine for five years and is blocking out \$12 to \$20 ore. Preparations are being made to place a section of the mill in operation. A large tonnage of Cracker Jack ore will also be handled at this mill.

Tonopah—A condensed statement of operations of the Tonopah Belmont Development Co. for the quarter ended Sept. 30, 1919, shows net earnings of \$44,511 for that period. Details were as follows: Received and receivable for ore, \$210,143; mining, milling and administration expenses, \$165,631; expense for September shutdown, \$9,286; miscellaneous income, \$4,717; dividend from the Belmont Surf Inlet Mines, Ltd., of which Tonopah Belmont owns 80 per cent, \$67,483. As a result of cleanup of mill for last half of December the Belmont shipped bullion valued at \$100,296, also a carload of concentrates estimated to be worth \$30,000. For the same period in December the West End Consolidated shipped bullion worth \$57,540, and the Tonopah Extension shipped bullion valued at \$62,000. The old McKane shaft is being retimbered by the Tonopah Extension, a small hoist has been installed and a new headframe is being built. The Tonopah Mining Co. has opened up a new orebody in driving a crosscut on the 400 level of the Mizpah shaft. The crosscut was driven to get around some caved ground in making a connection with the drift on the footwall of the Mizpah vein. The new vein is 30 ft. wide in the crosscut and the ore is of good milling grade.

Divide—At a depth of 130 ft. in the old Hearst shaft on the Belcher a crosscut has picked up the vein from which high-grade was shipped years ago, but which was cut off by a slip at the 100-ft. point. The vein dips towards the old Belcher shaft and it is intended

to run a crosscut from the 200 level of the latter which is expected to open up the Hearst vein at a depth of 400 ft. Sinking has been resumed in the new Belcher Extension shaft and it is now down 110 ft. The drift on the 100 level is out 40 ft. and is all in ore. The crosscut on the 300 level of the shaft sunk on the line of the Belcher and Belcher Extension is progressing steadily, but has not yet reached the Belcher Extension vein, its objective.

Mason—The Mason Valley Mines Co. has discontinued development on the Northern Light mine, which it has under lease and option, but shipments of ore previously developed continue at the rate of 20 tons per day.

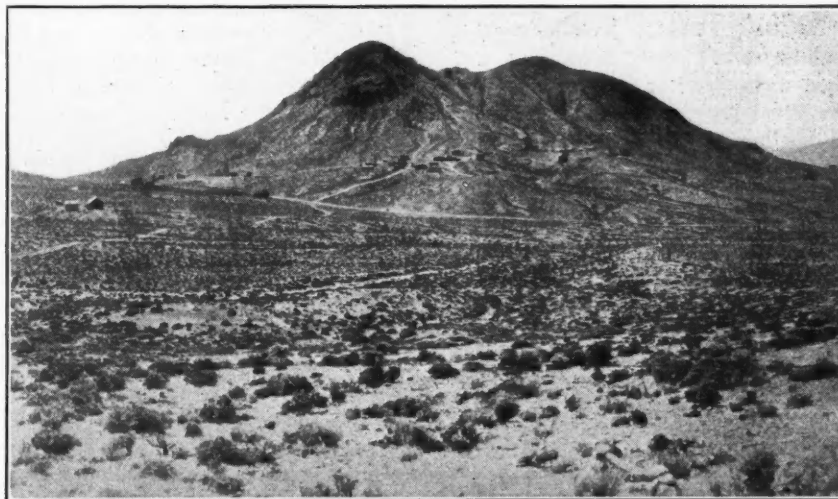
Goldfield—Much apprehension is manifested in Goldfield and other southern Nevada camps over the rumor that the Bullfrog & Goldfield R. R. has been sold by the Senator Clark inter-

NEW MEXICO

NEW INTERESTS IN CO-OPERATIVE CO. CALUMET—NEW MEXICO MILL READY FOR OPERATION

Lordsburg—Michigan bankers have purchased 20,000 shares of stock in the Co-operative Mining Co., paying therefor \$40,000. Their interests will be represented by Charles A. Ball, formerly of the Dime Savings Bank of Detroit, who has been elected secretary and treasurer. E. H. Gould has been appointed mining engineer. An extensive plan of development work will be inaugurated at once. The property has a good showing of high-grade lead-silver ore, there being 11 ft. exposed upon the 150 level. A 60-ton mill is 80 per cent completed. H. C. Walters will be mill superintendent. E. H. Tabor is president and D. W. Taylor, assistant secretary.

Weston and Kern, of Colorado, have



THE DIVIDE DISTRICT, NEVADA, WITH GOLD MOUNTAIN IN BACKGROUND

ests. According to F. M. Jenifer, of the Tonopah & Tidewater R. R., the rumor has not been confirmed nor future plans announced. The Clarks have few, if any, other interests in Nevada, according to the best information.

Unionville—J. A. Spiker, manager of the Unionville Mining Co., has announced that the mill on that property will be soon in operation. Samuel Newhouse and others of Salt Lake City are reported to hold an interest in the company.

Bruner—Within a few days the Kansas City-Nevada Consolidated Mining Co. expects to start the new 50-ton modern cyanide plant which was erected last year. During 1919, besides erecting the mill, the company put in a pipe line eleven miles long and did considerable development work in the way of opening up new ore. The company employs approximately thirty-five men.

taken a lease upon the Caesar Brock property in the Burros. An old concentrating mill, built about 20 years ago, will be rebuilt and used in treating material now on the dump. At Tres Hermanas, Roy W. Moore recently examined the Waterloo property for Los Angeles interests.

The Pyramid Mining & Milling Co. is figuring upon a 2,300-volt transmission line from the Eighty-five Mining Co.'s property to the Last Chance mine, which will mean complete electrical equipment for mill and mine, about 150 kw. being required. Basil Prescott is manager. The Misers Chest mine, which adjoins the Bonney upon the west, is taking out \$70 ore from the main Bonney vein upon which sinking is in progress from the 350 level.

Silver City—The initial test of the new 50-ton mill of the Grant County Copper Co., whose property adjoins that of the Chino Copper Co., is said to have

been successful. It is estimated there are 500 tons of milling ore on the dumps and about 20,000 tons blocked out. B. T. Link, Las Cruces, N. M., is president. The Calumet-New Mexico Mining Co., of Pinos Altos, expects to have its new mill in operation soon. The old Bremen property in Chloride Flat is reported sold; it includes the Bremen, Seventy Six and the Baltic. A company known as the Silver Spot Mines Co. has joined R. I. Kirchman and will develop the Boston Hill property. A double compartment shaft has been started on Spot No. 1 claim, which will be carried to the 300 level, where a crosscut will be run. Mr. Kirchman is president and Frank Light, secretary and treasurer.

OREGON

OPERATIONS IN SOUTHWEST OREGON

Sixes River—The Inman company recently completed a 35 by 135 ft. retaining dam across Sixes River, and is operating three hydraulic giants on the placer diggings below. The dam will impound 6,000,000 cu. ft. of water. A 34-in. wood-stave pipe line supplies the giants. The Sixes River district is situated in the northern part of Curry County and occupies the area drained by the Sixes River.

Gold Hill—The Sylvanite group of gold-quartz claims situated two miles northeast of Gold Hill, owned by the Gold Hill Mines Co., has been taken over by F. H. Van Horn, of Denver, Col., representing Victor W. Brown and associates of Pittsburgh, Pa., under a lease and option to purchase. Mr. Van Horn is on the ground and as soon as the equipment can be repaired, work will be resumed. This property was also known as the Ray & Haff group.

Waldo—The Esterly hydraulic placer mine near Waldo in the southwest part of Josephine County is operating with a new tail race, recently completed which required a 700-ft. tunnel through a serpentine dyke, which cost nearly \$50,000. The new system of operating has done away with the need of a hydraulic elevator for disposing the tailings, which required a lift of 73 ft., and has released for actual mining a volume of water several times that which was formerly used to handle 1,000 cu. yd. daily at a cost of about 6c. per yard, and reduced the cost of mining to ½c. per yard.

SOUTH DAKOTA

HOMESTAKE RUNNING AT HALF CAPACITY—NATIONAL TIN'S MILL READY

Lead—The Homestake company's Amicus mill of 240 stamps was placed in commission on Jan. 17. This, with two other mills in operation, makes 540 stamps dropping out of a total of 1,020. The water has been lowered below 800

level in the mine and ore is being broken on this level.

Hill City—The National Tin Corporation has sent three carloads of ore from the Mohawk mine to the mill bins. No date has been set for placing the concentrator in commission. A boiler, compressor and hoisting engine are being installed at Tin Boom, where a two-compartment incline shaft has been sunk to a depth of 60 ft. Work is to be resumed at the Cowboy mine.

UTAH

KNIGHTS CONTROL TINTIC CENTRAL—JUDGE ZINC PLANT TO RESUME—MOSCOW COALITION ORGANIZED

Eureka—The Lehi Tintic, in the northern part of the Tintic district, is developing its property by means of a tunnel, which is being advanced at the rate of 10 ft. daily. The Tintic Paymaster, also in this section, is drifting under contract. A telephone line recently completed to this property will benefit it and adjoining properties. The East Tintic Coalition at its recent annual meeting reported that during 1919 an electric hoist was installed, a pipe line built, and the shaft sunk 100 ft. The Tintic Standard, also in East Tintic, shipped 124 cars of ore during December. The new seven-mile railroad to the mine is expected to be complete in about three weeks and, with hauling by truck entirely done away with, operating expenses will be reduced by several thousand dollars monthly. The new or south shaft, which is being sunk under contract, is down 1,200 ft.

The Chief Consolidated, the largest producer in the Eureka section of the Tintic district, has installed a second 8-in. water column reaching, as does the first, from the 1,800 level to the surface. The water is raised in three lifts, there being pumping units on the 1,800, 1,200, and 600 levels. At present the pumps are lifting 900 gal. per min. The new equipment will more than double the present capacity of 1,200 gal. Some of the best ore now being produced comes from below water level. The Centennial-Eureka is opening its workings above the 700 level to lessees. This mine is opened to 2,200 or 2,300 ft. The Knight interests have acquired control of the Tintic Central in the Silver City section of the district, adjoining the Iron Blossom. The Tintic Central is being developed through the Iron Blossom's 1,700 level. It has a shaft down a little over 1,000 ft.

The Centennial-Eureka, which is opening its upper levels down to the 700 level, is asking royalties ranging from 15 to 50 per cent, according to the grade of ore. The Diamond Queen in south Tintic is preparing to deepen its shaft, which at present is down

about 125 ft. The Independence Mining Co., east of the Copper Leaf in east Tintic, has begun shaft sinking. Machinery is being installed and arrangements have been completed by the Utah Power & Light Co. for building a 1780-ft. electric power line to the property.

Alta—The Columbus Rexall at Alta has shipped eight cars of silver ore since resuming shipments on Dec. 29. Twenty-one men are being worked. Development is being done in a number of places.

Milford—Work will be resumed this month at the Moscow mine, an old producer and dividend payer near Milford. A new company has been formed which will be known as the Moscow Coalition, taking in the old Moscow and the adjoining Combination and Red Warrior properties, the three together comprising an area of about 640 acres. The Moscow has been opened to 1,400 ft., the Combination to 400, and the Red Warrior to 500. The new company is capitalized at 3,000,000 shares, par value \$1.

Park City—The electrolytic zinc plant of the Judge Mining & Smelting Co. which was closed down at the time of the Park City strike, is to resume operations. The Iowa Copper is mining ore from the raise from the tunnel level, and on the tunnel level itself is drifting for the downward extension of the limestone bedding. The Keystone is resuming work, litigation with the Silver King Coalition over apex rights having been settled out of court and right of way granted through the Hauer tunnel of the Silver King Coalition. The Silver King Coalition has developed new ore in two or more places, and is doing extensive development. Abandoned stopes in upper workings are also being reopened. A number of new leases have been given on the old upper levels.

WASHINGTON

GOLD STRIKE NEAR QUEETS RIVER REPORTED—LOON LAKE COPPER MAY RESUME

Seattle—Prospectors returning with reports of rich placer-gold finds in the beach sands along the Pacific, near the mouth of the Queets River, have started an appreciable stampede to that area. Wintering in Seattle are many placer miners from Alaska, several of whom contributed to the fame of Gold Beach at Nome. Many of these men have shouldered their packs and are now actively investigating the reports of the "new bonanza." The existence of placer-gold in certain localities along these beaches has been known for some time, but the sands were generally considered too low grade and the gold too fine to be profitably recovered.

Northport—The Electric Point mine, 20 miles east of Northport, and the Gladstone Mountain property adjoining have resumed shipments.

About 225 men are employed at the Northport smelter, which is running one furnace, chiefly on ore from the Hercules and the Tamarack & Custer mines in the Coeur d'Alenes.

In the Deer Trail district of Stevens County, C. S. Turner has bid \$100,000 for the Silver Queen and Snowstorm properties which are in the hands of a receiver. Mr. Turner expects to secure the property and sink 100 ft. deeper and then drift. The property is well

ered by the receiver. The plan is for development, rather than for present production. Bondholders will be asked to wait six months for their interest and stockholders will be asked to donate part of their holdings to raise money. It is proposed to sink 200 ft. deeper to the 700 level in order to develop the orebody, which is better at the present lowest level, 500 ft., than it is at levels above. Twenty to twenty-five per cent of the stock in the company is said to be held in Boston.

Newport—The Bead Lake Gold-Copper Mining Co. has purchased the adjoining property of the Kootenai-

which are expected to provide a steady flow of ore for the 150-ton concentrator built at Alamo, B. C., last July. This mill is situated on the Kaslo-Nakusp railway. It was designed and built by the General Engineering Co., of Salt Lake City. Waterpower is derived from the north fork of Carpenter Creek and the distance from the intake to the mill is approximately two miles. The water is conveyed to the mill under 210-ft. head by a 22-in. steel pipe line. A 225-hp. Pelton wheel furnishes all motive power for the mill. A 45-hp. Pelton wheel is provided as a spare and in case of a shut down would be used for operating the lighting plant



ALAMO CONCENTRATOR, THREE FORKS, B. C., COMPLETED IN 1919 BY CLARENCE CUNNINGHAM

equipped and is opened by a 200-ft. shaft and 2,000 ft. of drifts and cross-cuts. The ore is silver-lead, silver predominating. It produced \$200,000 in the past.

Chewelah—The United Silver-Copper Mining Co., at Chewelah, is milling 225 tons of ore daily, an increase over recent tonnage. The ore is coming chiefly from above the 600 level, but work is proceeding on the 1,000, 1,100 and 1,200 levels. Conrad Wolfe, president, has again resumed personal charge and is now making his home at Chewelah, near the mine.

Loon Lake—Boston and Spokane stockholders are working out a plan for the resumption of operations at the Loon Lake Copper Co.'s property at Loon Lake, in Stevens County, which is in the hands of a receiver. These plans are said to be favorably consid-

ered by the receiver. A contract has been let for several hundred feet of work on the Comstock vein. It is planned to build a 100-ton mill in the spring. The milling machinery is all ready on the ground.

CANADA

British Columbia

EQUIPMENT OF ALAMO CONCENTRATOR—LORNE MINE BONDED

Sandon—At the Noble Five mine, Sandon, B. C., during the last few months ore has been developed 3,000 ft. below the apex of the vein. Recent showings at the Silversmith mine are on the 1,000-ft. level, this being the lowest horizon in the Sandon camp at which ore has been hitherto developed.

The Queen Bess, Idaho-Alamo, Wonderful, and Sovereign mines are among the properties in the Sandon district

and the Dorr tanks. Jigs have been eliminated and the fine grinding is done entirely by Hardinge mills. The sizing and classifying is done by three Callow traveling-belt screens and one duplex Dorr classifier. The zinc and lead flotation product is separated on Wilfley tables, selective flotation not being attempted. About 75 per cent of the total lead is recovered by water concentration. The zinc contents of the ore are recovered by Callow pneumatic flotation-cells.

Lillooet—The Lorne and another of the operating properties of Cadwallader Creek have been bonded by the Mining Corporation of Canada, according to reliable report. This corporation recently acquired the Pioneer mine on the same creek.

Stewart—The first winter shipment of ore from the Premier mine, Salmon

River District, northern British Columbia, consisted of 300 tons and it is expected that between 3,000 and 4,000 tons will be shipped over the snow. Tractor haulage was tested but found unsatisfactory. Horses are now in use. Some labor trouble has been reported from the Premier, the complaint being against the food. The Alaskan town of Hyder, the American gateway to the Salmon River district, is to have new docks and other facilities for handling freight and general business. The Hyder Dock Co. has been organized to construct a \$30,000 pier. At present most of the freight billed for Hyder is handled on barges over the tide flats.

The Alice Arm Development Co. has been organized to provide a new town-site at the gateway to the Alice Arm mineral district. At present most of the buildings are on tide flats. The change will place the town on the hillside, close to the railway terminal, and with water and other facilities readily obtainable.

The work of installing a concentrator at the Victor mine, Maus Creek, near Fort Steele, B. C., is reported to be almost complete. This property has long been under development. The ore is complex, carrying argentiferous galena and zinc blende associated with iron pyrites in a quartz gangue.

Ontario

Porcupine—The Dome is increasing its working force as opportunity offers. At present there are 350 men and the mill is treating about 950 tons a day, as compared with its capacity of 1,500 tons. The Dome is said to be asking for an extension of the Dome Extension option, which expires in March, the shortage of labor being given as the reason. The Dome Lake mill is shortly to resume the treatment of ore and the prospects for reopening the Porcupine Crown are brighter. It is expected that this company will amalgamate with the Moneta, and engineers representing both companies are now making an examination to decide on the basis. Operations are being carried on upon a number of small properties, one of the most interesting being the Clifton, which has a small rich vein, smelter shipments from which ran about \$120 a ton. The McIntyre is pulling its pumps from the Plenaurum and it is presumed that the option on this property will not be exercised.

MEXICO

Sinaloa

El Fuerte Mining & Smelting Co., operating near Choix, Sinaloa, has taken over the smelter equipment belonging to the Choix Consolidated Mining Co. and has leased part of that company's mines. The plant includes

one blast furnace having an annual capacity of 36,500 tons. This will be put in operation during 1920. J. R. Thomas, 514-16 Grant Building, Los Angeles, is treasurer of El Fuerte company.

Northern Sonora

A 60-ton concentration and flotation mill has been installed by James Lord for the Louise Mining Co., a West Virginia corporation, at its Buena Vista mine, situated in the southern part of the Moctezuma mining district. H. J. Wendler is manager. The mill is not in operation at present because of lack of water for continuous operation. A well is being sunk, however, and the mine is expected to produce considerable water. A one-furnace smelter has also been built under Mr. Lord's supervision. According to the same source, the Lampazas mines near Buena Vista, owned by the Bank of Sonora, probably will begin operations soon. J. Barney is superintendent of this property which consists of several hundred pertenencias of mineral lands. Aside from minor holdings, the property is composed of three principal mines, Las Tajos, Mina Grande and Mina de la Arroya. A large tonnage.

Canario Copper—The Canario Copper Co. has made one of the biggest strikes of copper ore in the recent history of northern Sonora. Importance is added to the discovery because it indicates a five-mile westward extension of the low-grade orebodies occurring at Pilares de Nacozari. The new strike is on the 300 level of the Lily Segundo group and is reported by J. P. Harvey, president and managing director of the Canario, to be chalcocite.

Cananea—Operations of the Cananea Consolidated Copper Co. are following the policy recently announced in that about 60 per cent of the reduction plant is in operation. The December output was about 3,250,000 lb. of copper. The company is employing approximately 3,100 men.—The Democrata property, belonging to the Hoffman interests of Cincinnati, O., C. E. Hoffman, manager, has approximately 600 men employed at the present time and is doing considerable development work. One furnace is in operation in the smelter.—The Calumet & Sonora has 200 employees working in the mine and mill of its silver-lead-zinc property. in order to afford employment to the numerous idle men in the camp as a result of the reduction of forces at the various properties in the district, Presidente Julian Gonzales, of Cananea, has inaugurated street work, several hundred men being thus employed. Three shoe factories have also started up in Cananea to give employment.

A committee has been named by the local miners' union to present demands upon the Cananea Consolidated Copper Co. for redress of alleged grievances. The date of the proposed conference was not made known. The workmen's committee is known as the Junta de Conciliacion Municipal. Pedro M. Reyes was named as spokesman.

The copper production in December of the Greene Cananea Copper Co. was 3,600,000 lb. copper, 124,100 oz. silver and 620 oz. gold.

Zacatecas

Bonanza—The Socavon de Providencia, now the property of the Compania de Minerales y Metales, has been developed quite extensively. Levels have been opened at approximately 50-meter intervals below the old tunnel level to the number of two, and connections made with similarly located levels in the company's Albarradon mine. It has been found that practically the entire distance from the western extremity of the Providencia claim to the eastern one of the San Eligio claim is mineralized, the mineralization being particularly concentrated along those portions of the limestone bedding planes where these have been bent southward by the main intrusive, due probably to the formation of transverse fractures. The Providencia mine has been producing 6,000 to 7,000 tons per month for some time. Its equipment comprises a steam-driven electric power plant located at its lower cable terminal, capable of developing 500 kw. while the electrification of the mine equipment is being completed.

The San Eligio mine of the Mazapil Copper Co. has been keeping up to a production of 7,000 to 9,000 tons per month, and still holds first place among the lead-silver mines of the district. The development has reached a depth of about 490 m. below the shaft collar. It is interesting to note that the permanent water level in this mine is found at some 355 m. below the collar and that from the bottom level (478 m.) as good carbonate ores are being mined as were found 400 m. above.

The properties of the American Smelters Securities Co., which had been idle for several years, have within the last year been developed toward their southeastern portion where the western extension of the San Eligio-Providencia main fracture has been opened up with gratifying results.

Of the rest of the properties of the immediate vicinity, most of them, such as the Nazareno, Salaverna, Ozuna, Catacillas and Alicante are idle; some of them through apparent exhaustion of their ores, while others for reasons not apparent.

PERSONALS

Lindsay Duncan of San Francisco is in Tonopah.

Forest Rutherford recently visited Douglas, Ariz.

Charles Butters and Joe Thorne have left San Francisco for Central America.

F. A. Goodale of Colfax, Cal., has gone to Queensland, Australia, to examine gold and sapphire placers.

T. D. Walsh has been appointed superintendent of the Rural-Buckeye mines of Mohave County, Arizona.

Wallace Lee, oil geologist, is now associated with the Frantz Corporation; address at Friederich Building, Denver, Col.

Frank P. Knight, of Boston, president of the Iron Cap Copper Co., is in Globe, Ariz., where the company's property is situated.

Geo. F. Shurtliff recently inspected Arizona and Sonora mining properties owned by the Cameron-Michel Co. of New York.

H. G. Palsgrove, superintendent of the Avalos unit of the Compania Minerales y Metales at Zacatecas, Mexico, has returned to Denver.

Scott H. Sherman, manager of the Gila Copper Sulphide Co., Christmas, Ariz., has resigned that position and is residing at Phoenix, Ariz.

Ralph A. Watson has left the Consolidated Arizona Smelting Co., to become chief engineer for the Tennessee Copper Co. at Copperhill, Tenn.

E. Maltby Shipp is now associated as staff engineer, with Lawrence Chamberlain & Co., Inc., U. S. Realty Building, 115 Broadway, New York City.

H. F. Strangways, of Canada, has returned to his post with the Cerro de Pasco Copper Co. in Peru. He served in the Royal Engineers during the war.

D. M. Rait has been promoted from chief engineer of the Calumet & Arizona Mining Co. to assistant superintendent. R. H. Dickson has become chief engineer.

J. K. L. Ross, of Montreal, has been elected a director of the Consolidated Mining & Smelting Co. of Canada, to fill the vacancy caused by the death of his father-in-law, W. D. Matthews.

Nelson H. Darton, geologist of the U. S. Geological Survey, will spend two months early in 1920 in the Dominican Republic investigating oil conditions there. A New York oil company is actively interested.

Walter Fitch has resigned as general manager of the Chief Consolidated

Mining Co., Eureka, Utah, but continues as president of that company. His son, Cecil A. Fitch, succeeds him as general manager.

E. Norris Hobart, who has been assistant state engineer for New Mexico, has resigned to resume his work as chief engineer of the Charcas unit of the American Smelting & Refining Co., at San Luis Potosi, Mex.

Arthur W. Jenks has returned to Berkeley, Cal., after four months spent in examination of mining properties in the Northwest for Portland interests. Mr. Jenks was with the Burma Mines, Ltd., as smelter manager at Namtu, Burma, India.

M. H. McLean, for many years manager of the Detroit mines of the Phelps Dodge Corp. at Morenci, Ariz., is superintending diamond-drilling exploration of low-grade copper deposits in the Aspen Grove-Camp Nicola section of British Columbia.

T. O. Bishop, inspecting engineer, Mines Department, New Zealand, is in San Francisco. Mr. Bishop is interested in welfare and mine safety work and is visiting mines in the United States in order to study the work being done along these lines.

W. E. Simpson, who has had nine years experience in West Australia in connection with the mining and treatment of gold telluride ores, is making an investigation into the occurrence of gold tellurides in the Boston Creek area of northern Ontario.

R. L. Alexander has been appointed superintendent of development and extension operations under way by the new Caribou Silver Mines Corp. Mr. Alexander has had considerable experience as manager of properties in Arizona, Colorado, and South America.

A. G. Maddren, formerly with the Alaskan Division of the U. S. Geological Survey, and with the U. S. National Museum, has entered the employ of the Vulcan Oil Co. He will make a detailed study of part of the Ranger oil field, Texas, working under the direction of Dr. Ralph Arnold.

Elmer Harrison Finch, geologist, has been appointed chairman of the Mineral Division, Land Classification Branch, U. S. Geological Survey. Mr. Finch, who succeeds Alfred R. Schultz, resigned, has been an active member of the Land Classification Branch for a number of years.

William Walker has been appointed Chief Inspector of Mines for Great Britain, succeeding Sir Richard Redmayne whose resignation was recently noted. Mr. Walker has acted in this capacity for three years while Sir

Richard was war-time advisor to Controller of Coal Mines.

S. C. Soupcoff, engineer with the American Smelting & Refining Co., left for Tonopah on Jan. 11 and expects to leave for Mexico soon. Mr. Soupcoff has recently returned from South America, where he spent six months investigating the oil possibilities of Venezuela and Colombia.

Cecil H. Desch, professor of metallurgy at Royal Technical College, Glasgow, since 1918, has been appointed professor of metallurgy at Sheffield University succeeding Dr. J. O. Arnold, elected Emeritus Professor. Dr. Desch was born in 1874, educated at Finsbury Technical, the University of Wurzburg, and University of London (D. Sc. about 1907).

A. C. Savage of the Esperanza Mining Co., Ltd., Mexico, was recently at Vera Cruz on his way from El Oro, Mexico, to New York. Charles Hoyle, manager, sends this information by cable in response to a special request made at the instance of Mr. Savage's relatives who have not received any direct information as to his present whereabouts.

Thomas Cowperthwaite is the newly-appointed safety engineer of the Calumet & Arizona Mining Co., Bisbee, Ariz. The recently established department of safety of this company has jurisdiction over their smelter at Douglas, the New Cornelia Copper Co., Ajo, the railroads from Warren to Bisbee and Ajo to Gila. In all, the lives of over 5,000 men are affected by the efficiency of Mr. Cowperthwaite's department.

W. B. Gohring, for fourteen years connected with the Calumet & Arizona Mining Co., most of the time as its mining superintendent, has resigned. Mr. Gohring went to Bisbee in 1905 and found employment in the Irish Mag shaft of the Calumet & Arizona company. He soon was promoted to the engineering department and, later, to the superintendency. He has been succeeded by his former assistant, E. E. Whitely.

W. J. Loring left San Francisco on Jan. 22 for Plymouth, Cal., accompanied by his son, Edward A. Loring, of London, England, who has been visiting in this country for six weeks. While at Plymouth they will inspect the property of the Plymouth Gold Mines, Ltd. E. A. Loring leaves for the East on Jan. 23, while W. J. Loring will make an inspection of the Mother Lode properties in which he is interested, namely, the Carson Hill Gold Mines, Inc., and Pacific Coast Gold Mines, Inc.

OBITUARY

Sir Charles Henry of No. 5 Carlton Gardens, S. W., London, died Dec. 27, 1919, after a year's illness. Sir Charles was formerly connected with the Amalgamated Copper Co., and later became sales manager of the United Metals Selling Co. He served on many important British commissions during the war.

Ebenezer MacKay, of Dalhousie University, Halifax, N. S., died on Jan. 5, following an attack of pneumonia. He was 56 years of age and a distinguished educator. He graduated at Dalhousie in 1886 and studied subsequently at Harvard and Princeton. In 1896 he was appointed to the chair of Chemistry and Mineralogy at Dalhousie University, retaining that position until his death. Prof. MacKay was unmarried.

James McLean, president of the Phelps Dodge Mercantile Corp., and of many other companies, died Jan. 7, 1920, at his home in New York City, after suffering ten months from an attack of pneumonia. Mr. McLean was born in that city Dec. 18, 1845, was almost continuously resident in New York State. He was best known to our readers as an experienced mining promoter, having been a director of the United Globe Mines, of the Greene Cananea Copper Co., and for some years in the metal brokerage firm of White & Haskell. Mr. McLean was also on the directorates of the El Paso & Southwestern and the Lehigh Valley railroads.

INDUSTRIAL NEWS

Brokaw, Dixon, Donnelly, Garner & McKee, geologists and petroleum engineers, announce the removal of their offices to 90 West Street New York City, Room 1207.

O. H. Johnson, recently manager of the Marcy Mill department of the Mine & Smelter Supply Co. of Denver, is no longer connected with that company. His present address is 1339 Clayton St., Denver.

J. L. T. Waltz has been elected president of the Bremer-Waltz Corp., 30 Church St., New York City, importers and dealers in aluminum and other metals. C. P. Berkruzen is vice-president-assistant treasurer, and P. B. Adrian is secretary.

Royal Vindicator Mines Co., 230 Third Avenue, N., Nashville, Tenn., has offered for sale at auction, its entire mining property, machinery, equipment, lands, and other goods.

Mesabi Iron Co., Inc., has recently been formed, with a capitalization of \$3,000,000, in cumulative preferred and 150,000 shares of common stock, to work the low-grade iron ores of the eastern Mesabi range. The chairman is Charles Hayden, and the president is Daniel C. Jackling. Among the directors are John D. Ryan, Percy A. Rockefeller, S. W. Mudd, Horace V. Winchell, and J. Carson Agnew.

Compressed Air Magazine, 11 Broadway, New York City, appears in new size, dress and typography with its issue of January, 1920. Its 16 pages are now $10\frac{1}{2} \times 7\frac{3}{4}$ inches, 3-column style, with pleasing type face and much improved engravings. The text continues as readable as ever, and with considerable new blood on the staff, it should prove a useful journal unique in its field. A former member of the "Journal" staff, Eugene P. McCrorken, recently became managing editor of this monthly.

TRADE CATALOGS

Accuracy. A booklet explaining the purpose and methods of maintaining the highest standards in the making of "Caterpillar" products. Holt manufacturing Co., Stockton, Cal. $4\frac{1}{2} \times 6\frac{1}{2}$; 29 pp., illus.

Goodwin M. Trent, San Francisco, Cal., has issued Bulletin No. 1 describing Universal cyaniding machines, replacers, thickeners, agitators and aerators. A list of users and some operating results are also given.

Nelson Valve Co., Philadelphia, Pa., has issued its new catalog and price list No. 10, an attractive, well illustrated and well bound book of 156 pages covering bronze, iron and steel valves in gate, globe, check and non-return patterns, including types for every class of service and using materials carefully selected for the service to be rendered.

Cutler-Hammer Manufacturing Co., of Milwaukee, Wis., have issued two well-illustrated booklets, reprints of "A" and "S", describing, respectively, motor-operated brakes for alternating current service and their ingenious construction of the magnetic separator pulleys used to remove magnetic content from non-magnetic among bulk material.

NEW PATENTS

U. S. patent specifications may be obtained from the Patent Office, Washington, D. C., at 5c. each.

Alumina—Process of Recovering Alumina. Claude G. Miner, assignor to The Miner Chemical Corporation. (1,324,318; Dec. 9, 1919.)

Briqueting Press. William Schumacher, assignor to General Briqueting Co. (1,322,960; Nov. 25, 1919.)

Bromine—Process of Extracting Bromine from Brine. Herbert H. Dow, assignor to Dow Chemical Co. (1,323,173; Nov. 25, 1919.)

Cast Iron—Refining Cast Iron. Herbert Barnes. (1,322,516; Nov. 25, 1919.)

Cement—Apparatus for the Manufacture of Portland Cement. Robert W. Lesley. (1,323,293; Dec. 2, 1919.)

Cement—Utilization of Low-Grade Carboniferous Material. Robert W. Lesley. (1,323,294; Dec. 2, 1919.)

Concentrating Table. Charles C. Hebbard. (1,324,250; Dec. 9, 1919.)

Cyaniding — Electrolytic Cyaniding Process. William A. Hussey. (1,324,352; Dec. 9, 1919.)

Drill Bit. Wilfred E. Usrey. (1,324,631; Dec. 9, 1919.)

Electric Furnace. William H. Bristol and Manfred J. Johnson, assignors to the Bristol Co. (1,323,576; Dec. 2, 1919.)

Hoisting—Safety Device for Elevator Cars and Mine Cages. John Hofer. (1,324,451; Dec. 9, 1919.)

Iron Sponge, Manufacture of. Gustaf Grondal. (1,322,430; Nov. 18, 1919.)

Magnetic Separator. John E. Greenawalt. (1,324,149; Dec. 9, 1919.)

Manganese—Process of Purifying Manganese Dioxides. Julian S. Gravely, assignor to Winchester Repeating Arms Co. (1,323,690; Dec. 2, 1919.)

Percussive Tool. William A. Smith, assignor to Ingersoll-Rand Co. (1,324,078; Dec. 9, 1919.)

Placer Mining—Art of Placer Mining. John Curtis Patterson. (1,325,263; Dec. 16, 1919.)

Refractory Composition (Zirconium Oxide, Magnesite and Alumina). Enoch T. Ferngren. (1,324,546; Dec. 9, 1919.)

Separation—Apparatus for the Separation of Substances of Different Specific Gravities, Such as Fine Coal or Ores and the Like. John Marriott Draper. (1,323,174; Nov. 25, 1919.)

Steel or Ferro Alloys, Manufacture of. William Lawrence Turner. (1,325,455; Dec. 16, 1919.)

Welding—Means to be Employed in the Electric Welding of Iron or Steel or Alloys Thereof. Augustus Charles Hyde. (1,323,768; Dec. 2, 1919.)

THE MARKET REPORT

Daily and Weekly Metal and Mineral Prices,
Metal Market Conditions, Average
Monthly Prices, Stock Quotations

Silver and Sterling Exchange

Jan.	Sterling Exchange	Silver		Jan.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
15	371¼	130¾	79	19	368½	131¾	79
16	369	128½	77	20	367	132½	79½
17	368½	129½	77¼	21	363	132¼	79½

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.

Daily Prices of Metals in New York

Jan.	Copper		Tin	Lead		Zinc
	Electrolytic		Spot	N. Y.	St. L.	St. L.
15	18.85	@19.10	61¼@63¾	8.45@8.75	8.30@8.50	9.15@9.30
16	18.85	@19.10	61¼@63¼	8.50@8.60	8.30@8.50	9.15@9.25
17	18.85	@19.10	61¼@63¼	8.50@8.60	8.20@8.50	9.15@9.20
19	18.72½	@19.10	62 @63	8.50@8.60	8.30@8.45	9.15@9.20
20	18.72½	@19.10	61½@62½	8.50@8.60	8.30@8.50	9.10@9.15
21	18.72½	@19.10	61 @62½	8.50@8.60	8.30@8.40	9.05@9.15

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 the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

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

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

London

Jan.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3 M.	Spot	3 M.	Spot	3 M.
	Spot	3 M.							
15	119¾	122	124	371½	372½	47¼	47½	58¼	60¼
16	117¾	120	123	376½	377¾	47¾	47¾	58¾	60½
17									
19	117¾	119¾	122	384½	386¼	47½	47½	59	60¾
20	116¼	118¼	122	384	386	47¼	47¾	58	60
21	115½	117½	121½	384	385¼	46½	46¾	58	59¾

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

METAL MARKETS New York, Jan. 21, 1920

During the past week the noteworthy features of the metal market have been the quiet and easy market for zinc, the steady demand for lead, and the strong but quiet absorption of copper by large consumers.

Transatlantic freights remain easy and show no change over those of last week. Transpacific freights continued unchanged at \$12 from San Francisco to Hongkong and Kobe.

Copper

The market has not been very active during the past week but a considerable amount of copper has been sold from the large producers direct to a few small consumers for domestic use. Larger part of this copper goes to the wire drawers. The wire mills of the United

States are very active, on account of the large export business due to the shortage of labor abroad. There was not much range in price during the week, the prices remaining between 19 and 19¼c. delivered, for the major market. In the latter part of the week the market receded somewhat, due to resales of large amounts of copper to speculative dealers, these sales being forced from the original buyers of large orders which mature in January. This brought the price down to as low as 18¾c. Some lots changed hands at 18¾c., but not in sufficient quantities to affect the general market, and these are therefore not quoted in our table. Some of the large producers have sold out for the first quarter and are selling mostly for second quarter delivery, so that although the market was quiet there is a healthy demand.

The export market is poor in copper as in all other metals. On account of the low exchange rates, Europe is not in a position to buy from us at the present time.

The heavy sale of copper in recent weeks is asserted to have cut into the surplus of crude and refined copper, which is slated to have been around 1,000,000,000 lb. from the spring of 1919 to November, but is now estimated as 700,000,000 lb. The normal surplus is stated as around 400,000,000 to 500,000,000 lb. Production figures of four porphyry coppers, Utah Copper, Chino, Ray, and Nevada Consolidated, showed an aggregate increase of production of 665,230 lb. in December over November.

Copper Sheets—No change in nominal price of 29½c. per lb. set early in the month. Domestic demand picking up somewhat. Wire 22¼c. per lb.

Tin

On Jan. 15 and 16 London market was erratic due to speculative influences, and the price fluctuated widely, although American demand was almost lacking. On Jan. 16, 65-ton lot arrived from Australia and on Jan. 19, 1,090 tons arrived from Singapore. Total imports for the month up to Jan. 19 amounted to 1,865 tons at Atlantic and 415 tons at Pacific ports. After a decline of £11 sterling, Singapore, price was £381 sterling, c.i.f. London. On Jan. 19 there was another sharp advance in the London market, standard grades going up £8 for spot and £17 17s. 6d. for futures.

Our quotations are for 99 per cent pure tin, a custom which was established during the war, when the pure brands were not available for import. With the termination of the war, however, more of these brands than of the 99 per cent tin are imported. During 1918 out of about 58,000 tons of tin which was imported into the United States, about 45,000 tons was Straits, Banca, and Billiton tin, these being the so-called statistical brands leaving only 13,000 tons of 99 per cent tin. We shall therefore soon resume in our tables the quotations of Straits tins as well as 99 per cent.

Lead

There has been a steady demand for lead, one of the principal producers reporting sales amounting to several thousand tons. Prices ranged in the main

from 8.50@8.60c. New York basis, but in the early part of the week the price was as high as 8½c. The largest producers, the American Smelting & Refining Co., advanced its official price on Jan. 15 from 8¼ to 8½c. New York and from 8 to 8¼c St. Louis. There was reported to be a good demand at 8½c. for future delivery in March and April. Small lots for nearby delivery are reported sold as high as 9c. but these were not sufficient in volume to affect the general average on which we quote, and which is based on tonnages. The low differentials between St. Louis and New York evidenced in our quotations was due to the fact that several of the St. Louis sellers are bullish and are holding lead, so that in some cases the metal has actually been sold at the same figure in St. Louis and New York. Metal is reported very scarce and most of the available supply is concentrated around St. Louis.

In our market report of Dec. 3, issued Dec. 6, on page 885, the London quotation for lead on Dec. 3 was reported as £37½ sterling, which was in error. The correct quotation was £39½ sterling for both spot and three months.

In our market report of Jan. 7, issued Jan. 10, page 103, the London quotations for lead on Jan. 6 were reported as £47½ for spot, and £48¼ for three months, which were in error. The correct quotations were £47½ for spot and £48½ for three months.

Zinc

The zinc market has been very easy and inclined to sag, and there has been hardly any business. Zinc at East St. Louis has been freely offered at 9.15c. and did not go higher in large lots than 9.30c. Toward the latter part of the week it sagged with the London market, and all business was done at 9.15c. and on the Jan. 21 sales as low as 9c. were reported. The market was variable, sales being made at the highest prices quoted and at the lowest prices quoted on the same day, due to the influence of the speculative decline in the metal, which in turn is largely due to the fall in foreign exchange. On this account also the sales for future deliveries are weak, one sale reported having been made at 9.15c. for second quarter. The better grades can be had at almost the same price as Prime Western, which we quote. Some business in high grade zinc was reported done around 9½ and 9¾c. St. Louis.

Zinc Sheets—On Jan. 15, the price changed from \$12 to \$12.50 per hundred pounds, less 8 per cent on carload lots. Slightly higher prices for export.

Gold

On Jan. 15, the price of bar gold in London was 110s. 8d., and on Jan. 16

the price was 111s. and 3d. per fine oz., as compared with 106s. early in December. As the British standard for coinage is 77s. 10½d., recent prices represent a premium of over 40 per cent.

Silver—Market has shown an advancing tendency. Buyers from various quarters have taken up such bullion as has been offered. Though the inquiry has not been broad, London market has advanced to meet the fall of sterling quotation on this side, sterling having declined about eight points during the last week.

Spot supplies of silver are scarce in New York. Recent high prices have stimulated production but current output is below the average for the last ten years. Recently silver sold in San Francisco as high as \$1.40 per oz. Buying for Chinese consumption continues. It is reported that a large short interest which has been built up in London for heavy speculation in the metal has developed.

Mexican dollars at New York: Jan. 15, 99%; Jan. 16, 99%; Jan. 17, 99½%; Jan. 19 and 20, 100%; Jan. 21, 100½%.

Palladium—Demand very quiet at about \$130 per oz.

Aluminum—No change has occurred in the aluminum market. Demand is only fair and price 32½@33c. per lb.

Antimony—Spot antimony of ordinary grades is bringing 10%@10½c. per lb., with special grades up to 11c. Futures are shaded about ½c. Demand continues strong and supply scarce. Last week's quotation of 9¼ to 9½c. was in error and should have read 10¼ to 10½c.

Bismuth—Price has declined 15c. per lb. for 500-lb. lots to \$2.50. Demand still good, however.

Nickel—Ingot, 43c.; spot, 43c.; electrolytic, 45c., unchanged.

Quicksilver—\$93 per flask of 75 lb., up to \$95 for very small lots. Most of the small sales of less than 50 flasks. San Francisco telegraphs \$90 steady.

Chrome Ore—Lack of boats is holding up possible foreign shipments. Ore from India running about 50 per cent is offered at 75c. per unit.

Tungsten Ore—Some small amounts of Chinese wolframite being sold as low as \$6 per ton, but nominal price held at \$6.50; no high grade ores being sold.

Nitrate—Demand very strong and supply scarce, due to shortage of ships. Quoted at \$3.50 to \$4.35 per cwt. for carload lots.

Platinum, Iridium, Cadmium, Molybdenum Ore, Pyrites, Sulphur, Feldspar, Fluorspar, Graphite—Unchanged; see our market report, pp. 107.

Zinc and Lead Ore Market

Joplin, Mo., Jan. 17.—Zinc blende, per ton, high, \$61.50; basis 60 per cent zinc, premium, \$61; Prime Western, \$60@ \$57.50; fines and slimes, \$55@50; calamine, basis 40 per cent zinc, \$35. Average settling prices: blende, \$52.79; calamine, \$36.25; all zinc ores, \$52.12. Lead, high, \$97.60; basis 80 per cent lead, \$95@98; average settling price all grades of lead, \$93.91 per ton.

Shipments the week: Blende, 11,166; calamine, 80; lead, 1,445 tons. Value all ores the week, \$728,100.

The \$60 basis was paid by four or more purchasing agents; others circulated an impression that this was an early week price and the market had dropped to \$57.50 at the week end. Only a small tonnage, if any, was purchased on the latter figure in Prime Western grades. Several buyers besides those representing sheet metal producers were in the market for premium ore and they paid the premium price of \$61. The \$57.50 quotation is given only because a claim was made that ore was bought on this basis.

Unconfirmed rumor gave a \$100 basis for lead. It is possible this was paid but it could not be verified.

Platteville, Wis., Jan. 17.—Blende, basis 60 per cent zinc, \$60 base for Prime Western grade. No sales of premium grade reported. Lead ore, basis 80 per cent lead, \$99@100 per ton. Shipments for the week are 1,738 tons blende, 90 tons calamine, and 292 tons lead ore. For three weeks of year the totals are: Blende, 5,021; calamine, 360; lead, 537 tons. During the week 2,520 tons blende were shipped to separating plants.

Iron Trade Review

Pittsburgh, Jan. 20, 1920

Fig Iron—Bessemer, \$37@38; basic, \$36; foundry, \$38@40; f.o.b. Valley furnaces, freight to Pittsburgh being \$1.40.

Steel—Billets, \$38.50@45; slabs, \$41@45; sheet bars, \$42@55; rods, \$52@66.

Coke—Connellsville furnace, \$6; foundry, \$7 per net ton at ovens.

Ferromanganese—Domestic producers appear to be fairly well sold up for first half and there is occasional second half business being done, quotations ranging from \$140 to \$150 delivered; 76 to 80 per cent English is quoted at about \$140 c.i.f. Speigleisen remains quoted at \$45 furnace for spot and up to \$50 for futures.

Ferrosilicon—Electrolytic is quiet at about \$80 delivered Pittsburgh, Valleys, and Cleveland for 50 per cent, and \$140 for 75 per cent. Bessemer ferrosilicon is \$59.50 for 10 per cent, \$62.80 for 11 per cent and \$66.10 for 12 per cent f.o.b. Jackson, Ohio.

Current Prices—Materials and Supplies

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse also the base quotations from mill:

	Large Mill Lots	St. Louis	Chicago	San Francisco	New York	Chicago
Blue Annealed	Pittsburgh	Louis	ago	cisco	Cur-	Year Ago
No. 10.....	3.55-4.00	4.64	4.82	5.80	\$5.07-6.00	5.52
No. 12.....	3.60	4.69	4.7	5.75	5.17	5.57
No. 14.....	3.75-4.20	4.74	4.72	5.90	5.27	5.595
Black:						
Nos. 18 and 20....	4.15	5.24	5.80	6.75	6.80-7.80	6.295
Nos. 22 and 24....	4.20-4.71	5.29	5.85	6.80	6.85-7.85	6.347
No. 26.....	4.25-4.75	5.34	5.90	6.95	6.90-7.90	6.395
No. 28.....	4.35-4.85	5.67	6.00	7.05	7.00-8.00	6.52
Galvanized:						
No. 10.....	4.70	5.79	5.97		6.50	6.87
No. 12.....	4.80	5.89	6.07	7.30	6.55	6.92
No. 14.....	4.80	5.89	6.07	7.30	6.60	6.97
Nos. 18 and 20....	5.10	6.19	6.37	7.60	6.90	7.27
Nos. 22 and 24....	5.25-5.75	6.34	6.52	7.75	7.30	7.32
No. 26.....	5.40-5.90	6.49	6.95	7.90	7.45	7.47
No. 28.....	5.70-6.20	7.04	7.25	8.20	7.75-9.00	7.77

STEEL RAILS—The following quotations are per gross ton f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh		Chicago	
	Current	One Year Ago	Current	One Year Ago
Standard bessemer rails.....	\$45.00	\$55.00	\$45.00	\$65.00
Standard openhearth rails.....	47.00	57.00	47.00	67.00
Light rails, 8 to 10 lb.....	2.58½*	3.13½*	2.585*	3.13½*
Light rails, 12 to 14 lb.....	2.54*	3.09*	2.54*	3.09*
Light rails, 25 to 45 lb.....	2.45*	3.00*	2.45*	3.00*

*Per 100 lb.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh		Chicago	St. Louis	San Francisco
	Current	One Year Ago			
Standard railroad spikes, ½ in. and larger.....	\$3.35	\$3.70	\$4.27	\$4.44	\$5.65
Track bolts.....	4.35	4.90	5.17	Premium	6.65
Standard section angle bars	2.75	3.25	2.75	Premium	4.60

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Mill Pittsburgh	New York Current	New York One Year Ago	St. Louis	Chicago
Beams, 3 to 15 in.....	\$2.45	\$3.47	\$4.27	\$3.54	\$3.47
Channels, 3 to 15 in.....	2.45	3.47	4.27	3.54	3.47
Angles, 3 to 6 in., ½ in. thick.....	2.45	3.47	4.27	3.54	3.47
Tees, 3 in. and larger.....	2.45	3.47	4.27	3.54	3.47
Plates.....	2.65	3.67	4.52	3.54	3.67

STEEL SHEET PILING—The following price is base per 100 lb. f.o.b. Pittsburgh, with a comparison of a month and a year ago:

	Current	One Month Ago	One Year Ago
	\$2.65	\$2.55	\$4-5

RIVETS—The following quotations are per 100 lb.:

	STRUCTURAL						
	Mill Pittsburgh	New York Current	New York One Year Ago	Chicago	St. Louis	San Francisco	Dallas
½ in. and larger.....	\$4.20	\$5.00	\$5.675	\$4.72	\$4.99	\$6.15	\$7.50

CONE HEAD BOILER							
	Mill Pittsburgh	New York Current	New York One Year Ago	Chicago	St. Louis	San Francisco	Dallas
½ in. and larger.....	4.30	5.10	5.75	4.82	5.09	6.25	7.50
¾ in. and 1 in.	4.45	5.25	5.90	4.97	5.24	6.40	7.50
1 in. and 1 ¼ in.	4.70	5.60	6.25	5.32	5.49	6.75	7.75

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Hercules red strand, all constructions.....	20%
Patent flattened strand special and cast steel.....	20%
Patent flattened strand iron rope.....	50%
Plow steel round strand rope.....	35%
Special steel round strand rope.....	30%
Cast steel round strand rope.....	22½%
Iron strand and iron tiller.....	50%
Galvanized iron rigging and guy rope.....	+12%
San Francisco: Galvanized, less 5%, bright, less 25%. Chicago, +5 on galvanized, 30-2½ cff on bright.	

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill Pittsburgh	Cincinnati	Chicago	St. Louis	Denver	Birmingham
Straight.....	\$5.75	\$7.50	\$6.50	\$7.00	\$8.15	\$7.00
Assorted.....	5.85	7.50	6.50-7.00	7.25	8.40	7.25

BAR IRON AND STEEL—Per 100 lb. to large buyers at mill, Pittsburgh: Iron bars..... \$3.00 Steel bars..... \$2.50

COAL BIT STEEL—Warehouse price per pound is as follows:

	New York	Cincinnati	Birmingham	St. Louis	Denver	Chicago
	\$0.12	\$0.16½	\$0.18	\$0.19	\$0.18½	\$0.14½

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham	Denver
Solid.....	14c.	13c.	15c.	15c.
Hollow.....	17c.	.....	.....	22c.

STEEL AND IRON PIPE—The following discounts are for carload lots f.o.b. Pittsburgh, basing cars of National Tube Co. for steel pipe, Cardry A. M. Byer's for iron, both dated Mar. 21, 1919.

BUTT WELD							
Inches	Steel Black	Galvanized	Inches	Iron Black	Galvanized	Per Cent.	Per Cent.
1 to 3.....	57½	44	1 to 1½.....	30	23½		
LAP WELD							
2.....	50½	35	1½.....	24½	9½		
2½ to 6.....	53½	41	2.....	31½	17½		
7 to 12.....	50½	37	2½.....	32½	18½		
13 and 14.....	41	.....	3 to 6.....	34½	21½		
15.....	38½	.....	7 to 12.....	31½	18½		
BUTT WELD, EXTRA STRONG, PLAIN ENDS							
1½ and 1¾.....	46½	29	1½ and 1¾.....	28½	11½		
2 to 3.....	51½	39	2 to 3.....	33½	20½		
4 to 6.....	55½	43	4 to 6.....	39½	24½		
7 to 8.....	56½	44	7 to 8.....	.....	.....
LAP WELD, EXTRA STRONG PLAIN ENDS							
2.....	48½	37	1½.....	25½	10½		
2½ to 4.....	51½	40	2.....	31½	17½		
4 to 6.....	50½	39	2½.....	33½	20½		
7 to 8.....	46½	33	3 to 6.....	35½	23½		
9 to 12.....	41½	28	4 to 6.....	34½	22½		
			7 to 8.....	26½	14½		
			9 to 12.....	21½	9½		

From warehouses at the places named the following discounts hold for steel pipe:

	New York	Black Cleveland	Chicago
1 to 3 in. butt welded.....	47%	43½%	57½%
3 to 6 in. lap welded.....	42%	45½%	53½%
	New York	Galvanized Cleveland	Chicago
1 to 3 in. butt welded.....	31%	34½%	44%
3 to 6 in. lap welded.....	27%	30½%	41%

Malleable fittings, Class B and C, from New York stock sell at list plus 12½%. Cast iron, standard sizes, 10-5%.

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Hot pressed square..... List	\$0.80	\$1.00	\$1.25	\$1.45	\$0.98	\$0.98
Hot pressed hexagon..... List	0.80	1.00	1.05	1.45	0.78	0.78
Cold punched square..... List	2.50	1.00	.75	1.05	1.30	1.30
Cold punched hexagon..... List	2.50	1.00	.75	1.05	1.30	1.30

Semi-finished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York.....	70-5%	50-10%
Chicago.....	50%	50%
Cleveland.....	60-10%	50-10%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller.....	30%	50%	35-50%
Larger and longer up to 1 in. by 30 in.....	20%	40%	25-50%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

	New York	Cleveland	Chicago
For wrought-iron washers:			
New York.....	\$1.50	\$3.75	\$3.00
For cast-iron washers the base price per 100 lb. is as follows:			
New York.....	\$7.00	\$3.75	\$4.25

CONSTRUCTION MATERIALS

ROOFING MATERIALS—Prices per ton f.o.b. New York and Chicago:

	Carload Lots		Less Than Carload Lots	
	N. Y.	Chicago	N. Y.	Chicago
Tar felt (14 lb. per square of 100 sq.ft.).....	\$70.00	\$70.00	\$71.00	\$71.00
Tar pitch (in 400-lb. bbl.).....	21.00	18.00	22.00	19.00
Asphalt pitch (in barrels).....	34.00	34.00	37.50	37.50
Asphalt felt.....	68.00	48.00	72.50	72.50

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York, St. Louis, Chicago and San Francisco:

	1-Ply		2-Ply		3-Ply	
	c.l.	l.c.l.	c.l.	l.c.l.	c.l.	l.c.l.
No. 1 grade.....	\$1.50	\$1.75	\$1.90	\$2.15	\$2.30	\$2.55
No. 2 grade.....	1.35	1.60	1.70	1.95	2.05	2.30

Asbestos asphalt-saturated felt (14 lb. per square) costs \$1.56 per ton. Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs \$2.25 per roll in carload lots and \$2.50 for smaller quantities. Shingles, red and green slate finish, cost \$6.00 per square in carloads, \$6.25 in smaller quantities, in Philadelphia.

HOLLOW TILE—

	4x12x12	8x12x12	12x12x12
St. Paul	\$0.087	\$0.158	\$0.248
Seattle	.09	.175	.30
Los Angeles	.082	.154	.236
New Orleans	.165	.22	.325
Cincinnati	.08705	.1623	.2416
Birmingham	.072	.135	
St. Louis	.08	.15	

LUMBER—Price per M in carload lots:

	8x8-In. x 20-Ft. and Under				12x12-In.	
	P.	Fir	Hemlock	Spruce	P.	Fir
	Boston	\$60.00	\$55.50	\$52.00	\$55.00	\$65.00	$55.00
Kansas City	53.00	51.50	51.50	51.50	64.00	51.50
Seattle		31.00				31.00
New Orleans	45.00				48.00	
St. Paul	61.00	58.00	58.00	58.00	70.00	70.00
Atlanta	62.50	64.50	66.00	76.00	79.50	82.00
Baltimore	48.00				60.00	
Cincinnati	50.00	50.00	47.00		53.00	53.00
Montreal	60.00	65.00	65.00	60.00	73.00	73.00
Los Angeles*	50.00				51.00	
Denver	40.00				40.00	

	1 In. Rough, 10 In. x 16 Ft. and Under			2 In. T. and Gr. 10 In. x 16 Ft.	
	P.	Fir	Hemlock	P.	Fir
	Boston	\$50.00	\$52.00	\$52.00	\$55.00
Kansas City	98.50	89.75	89.75	104.75	92.75
Seattle		33.00			36.00
New Orleans	54.00			55.25	
St. Paul	60.00	54.00	49.00	65.00	63.00
Atlanta	85.00	90.00		77.50	87.50
Baltimore (box)	40-42.00			38-42.00	
Cincinnati	50.00	48.00	47.00	50.00	50.00
Montreal	65.00	65.00	65.00	66.00	66.00
Los Angeles*	49.00				
Denver	43.00				42.00

* Base price, 2x45, is \$45, Los Angeles.
 T. Montreal—Up to 32 ft., over which, \$3 per M. increase up to 36 ft.
 Detroit—2x4x16 Y.P. is \$48. For other sizes, add freight to Chicago quotations.

NAILS—The following quotations are per keg from warehouse:

	St.			Chicago	San Francisco
	Pittsburgh	Louis	Dallas		
Wire	\$4.50	\$3.90	\$6.90	No stock	\$5.50
Cut		5.85	6.40	No stock	6.90

PORTLAND CEMENT—These prices are for barrels in carload lots, without bags.

	Current	One Month Ago	One Year Ago With Bags
New York (delivered)	\$2.80	\$2.80	\$4.00
Jersey City (delivered)	2.47	2.47	3.64
Boston	2.42	2.42	3.67
Chicago	2.00	2.00	3.05
Pittsburgh	2.05	2.05	3.15
Cleveland	2.32	2.32	3.32
Denver	3.12	3.12	3.67

NOTE—Charge for bags is generally 15c. each, 60c. per bbl.

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 200-lb. Barrel	
	Finished	Common	Finished	Common
New York	\$17.50	\$14.50	\$2.90*	\$2.65*
Kansas City	25.50	21.00	2.30	2.30
Chicago	18.00	17.50	1.80	1.10
St. Louis	22.00	18.00	2.70*	2.00
Boston	22.00	18.25	2.75*	3.40*
Dallas	30.00		2.80†	
San Francisco	30.00		1.60	
St. Paul	23.00	20.00	1.80	1.50
New Orleans		17.50		2.20
Atlanta		1.90 (bbl.)		1.95
Denver		26.25		2.50

NOTE—Refund of \$0.10 per barrel.
 * 300-lb. barrels. † 180-lb. barrels.

LINSEED OIL—These prices are per gallon:

	New York		Chicago	
	Current	Year Ago	Current	Year Ago
Raw per barrel (5 bbl. lots)	\$1.80	\$1.59	\$1.98	\$1.90
5-gal. cans	2.00	1.84	2.23	2.00

WHITE AND RED LEADS—500-lb. lots sell as follows in cents per pound:

	White			
	Red		White	
	Current	One Year Ago	Current 1 Yr. Ago	Dry and Dry and
	Dry	In Oil	Dry	In Oil
100-lb. keg	14.50	15.50	14.00	15.50
25- and 50-lb. kegs	14.75	15.75	14.25	15.75
12½-lb. keg	15.00	16.00	14.50	16.00
5-lb. cans	16.00	17.50	16.50	16.00
1-lb. cans	17.00	18.50	17.50	17.00

MINING AND MILLING SUPPLIES

HOSE—	FIRE	50-Ft. Lengths
Underwriters' 2½ in.		\$0.75 per ft.
Common, 2½-in.		.40

	First Grade	Second Grade	Third Grade
¼-in. per ft.	\$0.50	\$0.33	\$0.22

STEAM—DISCOUNTS FROM LIST

First grade	30%	Second grade	40%	Third grade	45%
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LEATHER BELTING—Present discounts from list in the following cities are as follows:

	Medium Grade	Heavy Grade
New York	25%	20%
St. Louis	40%	35%
Chicago	45%	40%
Birmingham	35%	30%
Denver	35-50%	30%
Cincinnati	30-5-2½%	40-2½%

RAWHIDE LACING—30% off for cut; \$0.76 per sq.ft. for side lacing.

MANILA ROPE—For rope smaller than ¾-in. the price is ½ to \$0.02 extra while for quantities amounting to less than 600 ft. there is an extra charge of \$0.01. The number of feet per pound for the various sizes is as follows: ¾-in., 8 ft.; 1-in., 6 ft.; 1¼-in., 4½ ft.; 1½-in., 2 ft.; 2 in., 14 ft.; 2½-in., 2 ft. 4 in. Following is price per pound for ¾ in. and larger, in 1200-ft. coils:

Boston	\$0.275	Denver	\$0.27½
New York	.26	Kansas City	.265
Cincinnati	.275	New Orleans	.25½
Chicago	.26½	Seattle	.25
St. Paul	.26	St. Louis	.26½
San Francisco	.24	Atlanta	.29½

PACKING—Prices per pound:

Rubber and duck for low-pressure steam	\$1.00
Asbestos for high-pressure steam	1.70
Duck and rubber for piston packing	1.00
Flax, regular	1.20
Flax, waterproofed	1.70
Compressed asbestos sheet	.90
Wire insertion asbestos sheet	1.50
Rubber sheet	.50
Rubber sheet, wire insertion	.70
Rubber sheet, duck insertion	.50
Rubber sheet, cloth insertion	.30
Asbestos packing, twisted or braided and graphited, for valve stems and stuffing boxes	1.30
Asbestos wick, ½- and 1-lb. balls	.85

REFRACTORIES—Following prices are f.o.b. works:

Chrome brick	net ton \$90-\$100	at Chester, Penn.
Chrome cement	net ton 45-50	at Chester, Penn.
Clay brick, 1st quality fireclay	1000	36-45 at Clearfield, Penn.
Clay brick, 2nd quality	1000	30-35 at Clearfield, Penn.
Magnesite, dead burned	net ton 32-50	at Chester, Penn.
Magnesite brick, 9x4½x2½ in.	net ton 80-90	at Chester, Penn.
Silica brick	1000	41-45 at Mt. Union, Penn.

Standard size fire brick, 9x4½x2½ in. The second quality is \$4 to \$5 cheaper per 1000.
 St. Louis—Fire clay, \$30 to \$40.
 Birmingham—Fire clay, \$41-\$44; silica, \$46.50-\$54.50; magnesite, \$80-\$85; chrome, \$80 to \$90.
 Chicago—Second quality, \$25 per ton.
 Denver—Silica is \$35 per 1000.

RAILWAY TIES—For fair size orders, the following prices per tie hold:

Material	7 In. x 9 In. by 8 Ft. 6 In.	6 In. x 8 In. by 8 Ft.
Chicago—Plain	\$1.48	\$1.33
San Francisco—Douglas fir, green	1.61	1.14
San Francisco—Douglas fir, creosoted	3.23	2.28

Prices per tie at Missouri mills; St. Louis prices about 25c. higher:

Untreated A Grade White Oak 6x8x8		Untreated A Grade Red Oak 6x8x8	
No. 1	\$0.70	No. 1	\$0.55
No. 2	.80	No. 2	.65
No. 3	.90	No. 3	.75
No. 4	.98	No. 5	.87
7x9x8 white oak	1.05		
7x9x8 red oak, No. 4	.80		

FLOTATION OILS—Prices of oils for flotation, in cents per gal. in bbls.:

	New York	In Bbl.	Chicago Carloads	Denver
Pure steam-distilled pine oil, sp.gr. 0.925-0.94	\$1.10	\$1.05	\$1.00	\$0.85
Pure destructively distilled pine oil	.96	.95	.90	.85
Pine tar oil, sp.gr. 1.02-1.035	.45	.36	.34	.55-.60
Crude turpentine	.85	.68	1.68	.30
Hardwood creosote, sp.gr. 0.96-0.99*	.30			.25-.30

* F. o. b. Cadillac, Mich.

COTTON WASTE—The following prices are in cents per pound:

	New York	Cleveland	Chicago
White	13.00	11.00-13.00	14.00
Colored mixed	9.00 to 12.00	8.50-12.00	11.00
			9.50 to 12.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

Cleveland	13½x13½	\$52.00	\$58.00
Chicago	13½x13½	41.00	43.50

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder:

	Low Freezing 20%	40%	Gelatin 60%	80%	Black Powder
New York		\$0.27	\$0.295		\$2.20
Boston	\$0.2225	.2425	.2675	\$0.3100	2.20
Kansas City	.185	.2275	.2525	.29	2.25
New Orleans	.2375*	.2275	.2475		
Seattle	.1675	.1925	.2125	.2775	2.10
Chicago	.1825	.2075	.25	.2925	2.15
St. Paul	.185	.2275	.2525		2.25
St. Louis	.185	.2275	.2325	.2950	1.80
Denver	.1725	.215	.240	.2825	2.25
Dallas	.189		.288	.342	2.75
Los Angeles	.25	.30	.35		3.00
Atlanta	.22	.245	.265		2.55
Baltimore	.19	.234	.284	.30	2.35
Cincinnati	.1825	.2075	.2275		2.10
Montreal	.28	.31	.34	.38	3.90

* For 50%.

CHEMICALS

SODIUM CYANIDE—New York price is 31c. per lb.; Denver, 37c.; Chicago, 31½c.; St. Louis, 31c.

SODIUM SULPHIDE—New York price per pound is 5c. for concentrated 3c. for crystals. Denver price is 7½c. for crystals. Chicago, 5c. for concentrated 3c. for crystals. Concentrated comes in 500-lb. drums; crystals in 440-lb. bbl.

ZINC DUST—For 350 mesh the New York price is 11c. per lb.; Chicago, 12c.; Denver, 22c.; St. Louis, 15c.

ALUMINUM DUST—Chicago price is \$1.10 per lb.

MINERS' LAMP CARBIDE—Prices net f.o.b. cars at warehouse points:

	Union Cameo 100-Lb. Drums Per Ton	Union Powder 100-Lb. Drums Per Ton	Union Powder 25-Lb. Per Ton
East of the Mississippi, North of Chattanooga	\$106.00	\$101.00	\$1.52
Southeastern portion U. S. A.	115.50	110.50	1.63
Texas (except El Paso)	124.00	119.00	1.74
El Paso, Texas	126.00	121.00	1.77
Denver, Colo.	124.00	119.00	1.74
West Coast	129.00	124.00	1.81

