

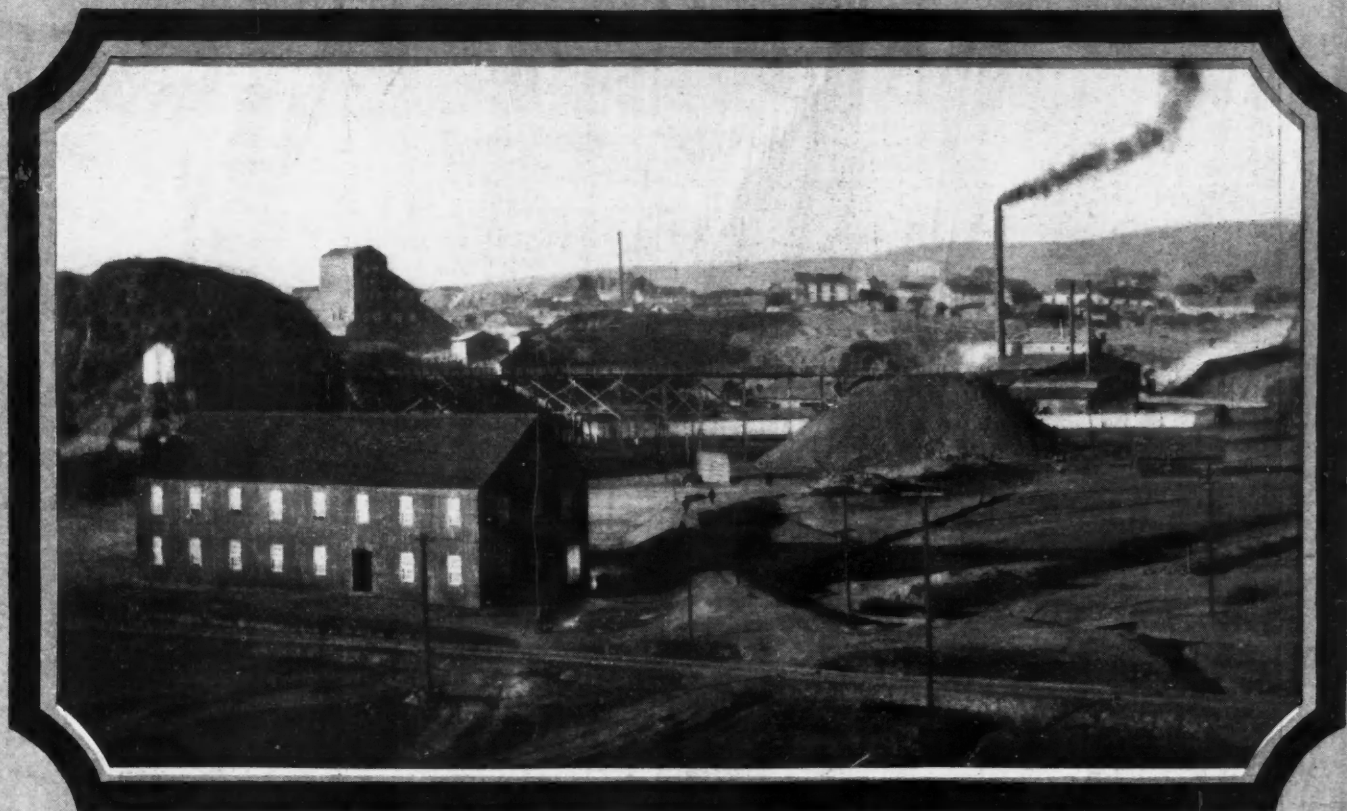
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ENGINEERING AND MINING JOURNAL

A Weekly Journal of the Mining and Mineral Industries

January 31, 1920

Largest Circulation of Any Mining and Metal Journal in the World



Mining Center at Cerro de Pasco, Peru

Mining in the Asiatic Near East

By LEON DOMINIAN

Author of "The Frontiers of Language and Nationality in Europe"

Mining at Cerro de Pasco, Peru

By M. R. WALKER

Formerly Chief Engineer, Cerro de Pasco Copper Corporation

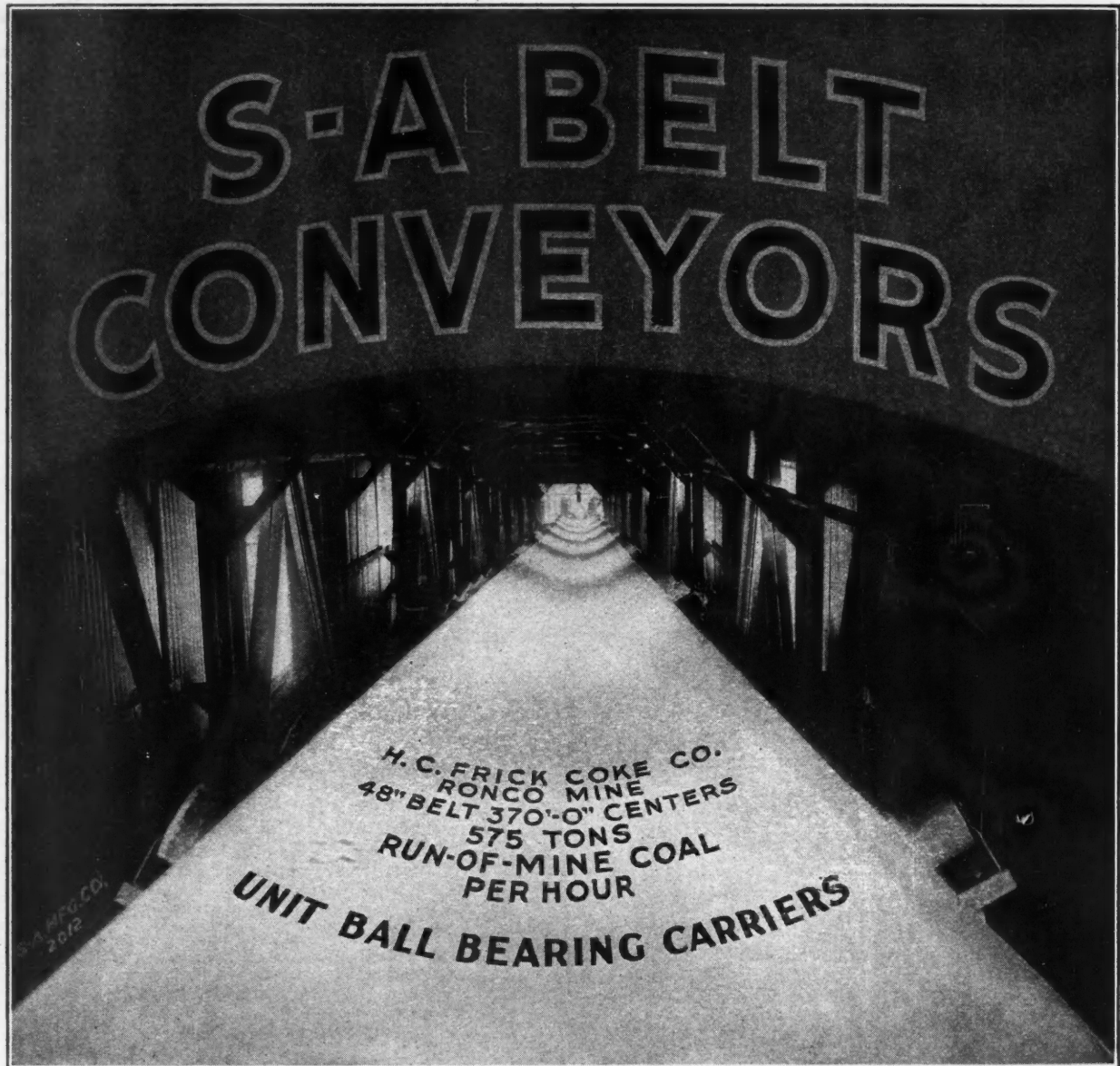
Loading Machines for Use Underground

By A. M. GOW

Oliver Iron Mining Company

Editorial

The High Cost of Mining



FOR THE TRULY BIG ONES
THEY BUY

S-A EQUIPMENT

In all parts of the world the S-A Belt Conveyor has stood the test under the most difficult conditions of service, and has therefore gained great prestige in its particular field of service.

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Number 5

The Panacea

The world outlook for 1920 is like that over a tossing and tempest-ridden sea. All the vicissitudes and evils that mankind suffer under threaten us—various forms of unrest, revolution, war and famine. "The world is out of joint," as Hamlet said.

What is the deep-lying root of the present and recent evils which scourge mankind? What is the remedy? Many can point to the disease in its various forms—who can cure it?

Many thinkers say the remedy is religion. That is getting close, but religion is a broad conception. Some religions help; others hinder.

The Golden Rule has often been submitted as a panacea. It is excellent; but it requires a greater power of self-analysis and judgment than most men possess. It is a rule that has to be evolved anew for every act; and we have not time.

Here are two plain rules which are simple to remember and apply:

1. Give more work or service than you receive compensation for. By earning more than you are paid for, the employer becomes your moral debtor, and you are put in a superior position.
2. Lend a hand to those just beneath you in opportunity or station.

No matter how high you are, there are some above you, and to whom you are responsible.

No matter how low you are, there are some lower. Make those above you your debtors by giving them more than they exact; make those below your debtors by your uplifting hand.

Both can repay or be grateful, or not, as they please. That is not your business.

The application of these two rules, according to our prescription, is warranted to be a panacea for the sick world.

The Economist and the Gold-Mining Problem

IN FORMER EDITORIALS on the gold-mining problem we pointed out that any basic commodity, such as wheat, could be yoked with gold to give a larger volume of real standard exchange commodities as a substantial basis for currency and business, but suggested silver for this role in preference to any other commodity. We called attention to the fact that the amount of gold in proportion to the amount of currency and credits had become so small that it had been lost sight of, with the result that gold was demonetized, and no substitute provided. In a subsequent editorial on the silver problem we pointed out that the pegging of the minimum price of wheat at \$2.25 made wheat a standard

commodity of exchange which determined the minimum prices; and control by the gold standard had been lost.

Since we wrote these editorials Dr. Harvey W. Wiley has advocated the use of wheat as a legalized standard of exchange. In an article in "The Analyst" of Dec. 15, also, Dr. R. Estcourt made the same suggestion. As a preliminary, the writer takes occasion to point out that gold has been demonetized. "It is not yet generally realized," he observes, "that a gold standard has become a figure of speech to indicate value." "A yard of French silk," he says, "prior to the war, would buy two bushels of wheat. Today, in terms of money, we call wheat at three times its pre-war price, and silk at one-third of its former

valuation. The result is the ridiculous position of asking the French people to sell us five yards of silk for a bushel of wheat. A yard of silk today is worth at least a bushel of wheat in terms of produce exchange, but trade is at a standstill—except for what can be secured by lending money to our customers—because they persist in translating goods into money values that have no relations to commodities, but result from over-issues of paper currency."

He then proceeds to suggest the use of wheat as a standard, with a dollar-wheat currency based on this commodity, of which the fixed price would be a dollar a bushel. Speaking particularly of Russia, he observes: "Tomorrow ten rubles may be demanded for goods that today were procurable with five, but a dollar-wheat note would be exchangeable for a bushel of wheat today or any day, and a bushel of wheat can be consumed or exchanged with certainty for full value of commodities."

Doubtless the putting of wheat on a standard exchange commodity basis with gold, and fixing its price at a dollar a bushel, would deflate the world's currency very rapidly, and would, moreover, bring down the cost of living to one-half of its present figure in a short time.

One factor, however, Dr. Wiley and Dr. Escourt must not overlook—the inveterate dishonesty of governments and government-protected bankers. Specifically, we mean this: if for each wheat dollar there existed a bushel of wheat, sound business would be speedily established; but as paper dollars would for convenience be needed in actual currency, it would not be long before the governments and bankers would issue two paper wheat dollars for each bushel of wheat, and so on, until the wheat currency would be debased, and economists soaked in the theory of finance would argue that, after all, wheat was only a symbol, as a basis for the currency, and that, with elevators filled with wheat in various sections of the country, currency representing twenty times the actual stored quantity of wheat in the "wheat reserve" could be issued; and the bankers would, as usual, decamp with the larger part of the goods, leaving the public, as at present, to the mercy of a runaway paper-currency system.

As for ourselves, we are conservative, and prefer silver to wheat. At least, let us try a safe but progressive remedy before attempting a more experimental one.

The fact is that the gold standard would have kept the world on an even keel if the governments and bankers had not hocus-pocused it. If the currency dollars of every kind had simply represented an equal number of gold dollars held in reserve in Washington, for the sake of economy as to wear and convenience in handling, and a large part of the gold dollars had remained in circulation, we should not have our present trouble with gold mining, high costs, or industrial unrest. As the exchangeable wealth increased, prices would tend to drop, so that the existing gold supply would still remain adequate. Now, however, that the divergence between the quantity of the real dollar and that of the bogus

dollar has become so great, a larger supply of real dollars would help greatly in the cure, and for that reason the monetization of silver would assist greatly, provided no further financial tricks were attempted.

Mankind are simple; they are fooled with words for centuries—they accept stones for bread. The word dollar is a corruption of the German thaler, or Joachimsthaler, originally applied to a silver coin minted "in the valley," or in that of Joachim, in Bohemia. It was real money. We have long ago forgotten what real money was, and we trust the governments and the banks, which have hypnotized us into the belief that a scrap of paper or a lump of silver, any size, was a dollar. A dollar in countries with a gold standard means only one thing and nothing else: one-twentieth of an ounce of gold. It will clarify our thinking and make sane our actions in the future if we think ounces and say ounces instead of dollars, if we are to be on a gold or a gold-silver standard; and if the suggestions of our economists should be adopted, and we should go on a wheat standard, let us say, and let us think, bushels instead of dollars. Dollar is a discredited word which has been so demeaned that it should be consigned to the scrap heap.

The High Cost of Mining

NO SUBJECT is of more fundamental interest to the mining industry than high costs. High prices for food, clothing, and supplies make labor high; and high labor and other prices make mining expensive. With the fixed value for gold, the rising tide of costs has well nigh engulfed the gold-mining industry; and in copper mining, with costs risen from 8c. or 9c. to 16c. or 17c., and copper metal very little higher, many mines cannot operate, and those that do have no profit. High and rising costs are at the bottom of most of the "industrial unrest" in this country, and are the cause of constant strikes, wage adjustments, and new inequalities in our social organization. Most important it is, then, to ascertain the cause, for without knowledge of it there will be no remedy.

The complaint regarding high costs, which previously had been confined to popular discontent, was brought into the higher atmosphere of the Government notice in August by the railway workers, who insisted on reduction of living costs or increased wages. A vigorous campaign was then made by the Administration, acting in accordance with a message from the President. This campaign was based on the assumption that high costs were due to "the trusts"—especially the Armour meat combination—and prosecutions of the Armour company and other food-handling enterprises followed. Great quantities of Army provisions were ordered to be distributed to the public, at less than current prices.

For days after the opening of this campaign the newspapers enthusiastically followed it, watching for prices to descend to pre-war levels under the Administration's attack; but as it became evident

that the hurled pebble of the valiant Attorney General had no effect upon the high-tide sea of prices, popular enthusiasm waned.

It would be unfair to the Administration to believe that it was actually so ignorant as to the real cause of high prices as it pretended; and the most charitable view is that the hurrah that it made in attacking the packers and other food dealers, and in distributing food to the populace (as rulers have done from time immemorial to create better humor), was calculated as a popular political move. The law of supply and demand, the decreased production, the world-wide shortage of food, resulting in universal high prices, were not mentioned. These obvious facts, however, were patent to everybody else, and were preached until they became popularly understood; increased production became a popular slogan; and in his latest message the President, though still calling for a renewed war on "the profiteers" as a cure for high prices, mentions also the necessity of production.

As a matter of fact, the campaign of the Government is piffling, and cannot help high prices; it only illustrates how far behind the popular intelligence our Governmental intelligence frequently is, and the necessity of non-political expert advisers to the Government—of engineering advice, in short.

There are, as we see it, five chief causes for high prices: (1), world under-protection; (2), world inflation of currency; (3), the pegging of wheat; (4), increasing proportion of non-producers; (5), unchecked middlemen's profits.

For the first cause we need offer little explanation. It is commonly understood—outside of Washington. When for several years producers are drawn from the productive industries, and devoted to non-productive and destructive military pursuits, a great world shortage results, and such a shortage is now upon us. It matters not that our own supplies are bounteous; it is the demand of the world for food and clothing that bids up the price of American meats, potatoes, sugar, cotton, and wool.

As to the second cause, we have treated of that in our editorials on the gold and silver problems. It is an obvious fact, which is just lately coming to be generally recognized, that our currency is inflated, even though not so much so as the inflated currencies of Europe, which show all stages up to bankruptcy; and that prices rise in proportion to the inflation.

Third, the pegging of wheat at a minimum of \$2.25 per bushel. At this artificial level wheat buoys up all other prices; they cannot possibly come down, for this cause alone. It is artificially high—Argentina and Australia can and do sell wheat for less. It was so pegged by Hoover to insure a maximum supply of wheat against a threatened world shortage; but when other prices rise to near the same level, as they have done and inevitably do, the situation is artificial and mischievous, and the props should come out from under.

Fourth, the increasing proportion of non-producers. This change in life in this country, especially,

had been going on for years before the war. The farmers were drifting into the city, and the farms were run down, rented, or abandoned. By the law of demand and supply, prices advanced proportionately for the fundamental farm-raised necessities of life—food and clothing—and these controlled all other prices and wages.

Fifth, the middlemen's profits. These we have always had with us, and the same is true in every country. We find small foundation of remedy in the popular and political outcries to make the great business combinations the "goat." It is our impression that these combinations usually lower prices instead of raising them. The small dealer is your true pirate; your mammoth combination is so well organized that it can get all the profits it has the face or dares to take, on a much smaller margin. The Standard Oil Company reduced greatly the price of oil to the consumer; since the dissolution of Standard Oil, gasoline has advanced markedly under competition. Before the formation of the great smelting combinations, the smelters' levy on the miner's ore was in general much larger. As for the packers' combination, we are inclined to accept their advertising propaganda showing a very small margin of profit per pound; nor have we observed that the Government has made any point against them except the immensity of their business control. Judging from other analogous cases, the American business man now expects the price of meat to rise. We are perplexed, anyhow, at the point as to who or what is a "profiteer." To buy low and sell high is a time-honored principle of business; no one of our thousands of opulent citizens who throng the hotels of New York but has done it. Their name is legion. If they have done wrong—and they have not dreamed of it, and nobody has told them—it is a national condition, against which the Attorney General, with his individual prosecutions, cuts but a foolish figure.

Are there remedies? There are:

1. For world under-production. The remedy is what is now being preached—increased production. For this we must first assure world peace; second, we ourselves must lead, instead of preaching to the other fellow; third, we must find an incentive for each case. The development of this theme is obvious.

2. For world inflation of currency—as rapid a return to real money as possible. The banking system, of which bankers are so proud, and which has lost sight of a real standard commodity of exchange, is really to blame for most of our industrial unrest, for fluctuating costs, strikes, and general vertigo. Our suggestion has been the creation of a larger supply of standard exchange medium—as there is not enough gold—adding to it silver. We suggested wheat as a possibility, but preferred silver. Since the expression of this conviction, we note that Dr. Harvey W. Wiley, in a speech, advocates wheat as a medium of exchange, as also a writer in "The Analyst." Wheat could do the trick—or anything else real. Miners of gold, silver, and other metals

can best help to bring about solid conditions by pressing home to the Government their desire to have a real and readily exchangeable commodity behind their paper, and to get rid of as much of the paper as may be, as soon as possible.

3. The pegging of wheat—the remedy is the removal of the artificial price level.

4. The increasing proportion of non-producers. This is the most difficult problem; but it could be attacked through special graded taxes on those engaged in non-productive occupations.

5. The unchecked middlemen's profits. The Government should work out a system of distribution between the producer and the consumer. At present there is no system, but an ever-increasing swarm of middlemen squeeze the last penny out of the farmer and the consumer alike. There is no safety in small commission men and stores—their expenses are higher, their methods inefficient, and their associations more tyrannical than outright business combinations. The political rings of cities often stand in with them, and the system is complete. There are plenty of business men who could work out an efficient method to systematize distribution from the producer to the consumer and reduce the cost—which is a large part of the first cost—to a minimum. That any government, municipal, state, or Federal, does not touch this problem is an evidence of the lack of real efficiency and helpfulness.

In most of these things the miner and the smelter are guiltless—and helpless; except as they can point out and insist on the remedy.

A Safe Position for Air Receivers

A RECENT compressed-air receiver explosion which occurred at the repair plant of the Yuba Consolidated Goldfields Co., at Hammonton, Cal., on Nov. 17, makes pertinent the questions of what is a safe position for the receiver and, in existing installations, has precaution been taken to isolate the receiver in such a position as to cause minimum risk both to person and property. The explosion in question resulted fatally to two workmen in the vicinity, seriously injured two others, and was responsible for large damage to the plant. The cause of the explosion has not as yet been ascertained, although the presumption is that internal combustion was responsible. A careful examination, we are told, failed to find evidence of internal combustion. Whatever the cause, the accident should bring to plant superintendents and engineers the need of careful inspection of existing installations. A receiver explosion is rare. It does sometimes occur. At the bottom is some defect in installation or oversight in operation.

In inspecting receivers, assuming that they have been subjected to proper strength tests, the adequacy of the safety valve area and the position of these valves are the first consideration. The next is the mechanical condition of the valves and the readiness with which they respond to an increase in pressure over the allowable working pressure maintained in the system. Finally, all operating details should be rigidly inspected.

At Hammonton, the two receivers which exploded were placed between two wings in an area formed by a shop building which connected the wings. The receiver heads were blown into the buildings, the receivers being thrown outward beyond the space between the two wings. Ordinarily, receivers are placed in positions close to the compressor, as was done in this instance. There are the advantage of compactness of installation and short pipe runs. We raise the question as to whether it would not be an excellent practice to place the receiver at a much greater distance and in such a position as to be away from buildings and from places where workmen pass or congregate. We know of one instance where the receiver at a mine is placed close to the shaft collar, and are confident that there are many similar installations. We feel that there would be an additional element of safety were such installations changed and new installations designed so as to be safe in any contingency, rare though it might be.

Keeping Our Reputations Clean

WE HAVE just been obliged to refuse a manuscript tendered us because we were unable to confirm some of the statements made, and the reputation of the author was such that we did not care to publish the article without confirmation. Possibly in no other industry is a man's reputation more considered than in mining engineering. Our younger mining engineers—most of the older ones have already learned the lesson—should remember this, and be extremely careful to ascertain the true status of any company with which they may consider associating themselves.

Mining men are quick to recognize promotions designed merely to make the lot of some wily stockbroker more comfortable. They mentally blacklist the names of the men associated with such enterprises. The public is learning that a new company may be better judged by the men behind it than by a statement of the ore reserves or data regarding expected mining and treatment costs and profits. If the names of men whose characters are above reproach are found on the list of officers or on the directorate, the inference is that the property has merit. Conversely, the remark is often made "The mine is a good one, but the president is a rascal; so I think I will keep out."

The Journal Returns to New York

WITH the issue of Feb. 7, we will resume the publication of the "Journal" in New York. Our readers will appreciate the practical difficulties which have been successfully overcome three thousand miles away from the home office of the Journal. We have spared neither expense nor effort in maintaining our standards. The experience we have gained will, however, contribute to our ability to more thoroughly and efficiently serve the mining industry. We leave our friends in San Francisco with the feeling that our short association has built up a closer bond between the West and the East.

WHAT OTHERS THINK

The Peon and the Politician

Though much has been said and written regarding Mexico, and emissaries have been sent to ascertain the real cause of the dissension in that country it seems as if through the lack of knowledge of the people as a class, their environment, and their customs, and the inability of our emissaries to come in contact with the people who cannot, or at least do not, wine, dine, and entertain them, the real crux of the situation has become so muddled that the prime factor no longer appears.

Up to the time of the opening of the Mexican Central R. R., about 1882, the country was largely agricultural. The owners of large landed estates, or "haciendados," who were the principal employers of labor, practically held their "peones," or laborers, in slavery. Under an old law or custom, an employee in debt to his employer could not leave until this indebtedness was settled. There were always ways and means of acquiring these debts, as a birth, baptism, or death requiring the expenditure of even such a trifling sum as five pesos incurred an almost impossible debt to the peon who earned a few centavos and a measure of corn per day and had the usual complement of a wife and numerous children to support; and there were therefore few laborers who were free agents.

Indebtedness of the small landowner, always to the larger, was held equivalent to a mortgage, and the failure to settle even small accounts was sufficient cause for seizure of property worth many times the amount defaulted, but with the large land owner in control of stores, banks, and all other business, it was absolutely impossible to borrow the amount required without passing the obligation from Peter to Paul. By these two methods, the wealthy and influential land owner acquired enormous tracts of land and an abundance of labor, and frequently with the acquisition of land went the full corps of employees. The efficiency of this cheap labor was "encouraged" by force.

Under the perhaps unwritten but nevertheless effective law of the appointing of petty officials at the request of the haciendado, these officials, as a matter of courtesy and business, aided and abetted their employers in enforcing these customs, leaving the working class without recourse and absolutely at the mercy of the rich and frequently unscrupulous land owner.

Mining operations, not so extensive then as now, were conducted on approximately the same lines as the haciendas. The owners, mostly Spaniards, enforced their desires as only the Spaniard can.

These were the primary causes of the unrest of the peon class, who were never able to throw off the yoke of slavery established by Spain.

With the advent of the railways, labor became more in demand, and what is known as the "renganche," or securing of contract labor, was resorted to. The "renganchero," or labor agent, furnished transportation for men and their families to the point of road construction and also furnished the cash necessary to free them from indebtedness to their former employers. To stop this, it was decreed by some of the state governors, all large land owners themselves, that it was illegal to move laborers from one state to another, although no complaint was made if the movement was made into their own state and not out of it.

Mines, smelters, and manufactures operated by foreigners now began to multiply, and competition for labor was keen. Miners being paid 25 centavos per day in one district were offered 50 centavos, a peso, two pesos, three pesos per day in other districts. Farm laborers were secured by renganche at many times their former wages, their debts paid and their families moved free of cost to them. Any inducement was offered to get labor as long as the result justified the means. Distance to be moved made no difference, and the losses occasioned by the failure of a few to complete the trip to the new field of labor were of small importance, the demand for labor having become so great.

Foreigners purchased ranches. They, too, added to the demand for labor and increased the wages, and this started the dissension or antagonism against them as foreigners, as the haciendado, governor, banker, and politician, all large land owners, had to keep up with the raise or lose the labor.

Efficiency was unknown to the Mexican. A sharp stick for a plow and 25 centavo labor could not compete with modern methods. Profits to the land kings began to fall, and, of course, the foreigner was to blame.

These things caused antagonism on the part of the wealthy class toward all outsiders.

By nature the peon is agrarian. The mines, under rigorous management, have too many "major domos," or "bosses," who keep the men at work and also object strenuously to the old custom of four days' "fiesta" and three days' work; to the ignorance of the children, to the drunkenness of the men, to the fanatical religious ceremonies, the barbarous pageants of bygone ages carried on under the auspices of the Church, contrary to the laws of the country, but continued in order to hold the spell of superstition and ignorance over them, and which, by invocation of the law, were reduced to a minimum. Who but the foreigner was to blame?

Ninety per cent of the working class of Mexico will go to work if opportunity affords. Of this 90 per cent perhaps one-half are barely making the

expenses of the poorest kind of a living. Should our government decide to attempt the pacification of the country, perhaps 50 per cent of the total working force could be mustered against us. Under no conditions would it be expected that a force of over 250,000 men could be armed and sent into the field.

Nothing is more insulting to the peon than to tell him that he has Spanish blood in his veins, and nothing indicates his Aztec ancestry more than that when persecuted he is a fiend incarnate, but he can be led or reasoned with like a child. Play fair with him and he will play even fairer with you, but his more aristocratic and partly Spanish politician brother has no such characteristics, and the sooner he is removed from his power, the sooner Mexico will become a quiet and orderly country.

George A. Laird.

Bowling Green, Ky., Jan. 8, 1920.

In Reference to Spelling Reform

I have received a communication from the Secretary of the American Institute of Mining and Metallurgical Engineers, presenting arguments prepared by one of the members, Mr. H. W. Shockley, in favor of certain so-called reforms in spelling, and also presenting the brief and sane reply of the president and board of directors against such reforms. My ballot has been forwarded, voting against the proposals.

Mr. Shockley and the spelling reformers mean well. Their avowed object is to "make our spelling conform better to the pronunciation;" meaning, one must assume, to the present pronunciation of our words. In this attempt they are committing a fundamental mistake, for pronunciation would prove an unstable foundation should it be made the base of a reform in the spelling of our grand language.

1. Present pronunciation is not uniform. At the present time, words are not pronounced alike in different sections of the United States, nor in different countries of Great Britain (to say nothing of Ireland): not the same in Canada as in Australia. For example: "Been" is pronounced "been" in England and "bin" in the United States. "Can't," "again," "fast," "last," "half-past," "top," "worry," "squirrel," are further illustrations.

2. Pronunciation is unstable. As Mr. Shockley and other reformers state, the pronunciation of our words has changed in the past, and to my knowledge it is continuing to change at the present time. In New York for example, words such as "church," "skirt," "bird," "hurt," and "Ernest" are usually pronounced "choich," "boid" ("boweed" might be better), "sko-eet," "ho-eet," "Oee-nist," by most New Yorkers. Their usual pronunciation was formerly current in that city during my twenty years' residence there. Contrast these with the sounds of the same words as pronounced in Scotland!

It is untrue to assert that "the spoken and not the written word constitutes the language." Both constitute it, excepting among savage and ignorant races where writing and printing are unused. Latin, for example, is practically dead as a spoken language, excepting in the Catholic Church; but it still

exists in the form of innumerable books, documents, and inscriptions. The sounds of spoken words have an existence measurable in fractions of a second, and, unless recorded (as by the phonograph), they cease to exist outside our memories. "Per contra," written words have at least a visible and permanent existence.

Mr. Shockley rather praises our English language in saying that it is the widest spoken of all. He advocates a "scientific spelling" to increase the spread of the language among foreign nations. It might accomplish that result; but the present limited spelling-reform proposals are the reverse of scientific, proposing that we castrate only a score or so of our words, as a beginning. Scientific reform of spelling would entail changes of a far-reaching and drastic character. For a scientific phonetic spelling we would first have to agree upon an accepted pronunciation for all our words—a difficulty indeed. The final result would be a language largely new; perhaps with forty letters in its alphabet? The vast collections of books in our public and family libraries would grow obsolete and unread excepting by those also educated in the present English language.

Even now the attention is somewhat distracted when an American reads an average British publication, and vice versa; for the spelling reformers have already begun to confuse our common language. Let us beware of multiplied spelling creeping into further use under the alias of simplified spelling. If changes come, let them come by natural growth; the slower the better. The doubtful advantages offered by the small but noisy soviet of the spelling reformers were well expressed to me a dozen years ago, by Mr. T. M. Hamilton, then superintendent of the Braden Copper mine. He remarked: "I like this simplified spelling: you can spell any — way you please."

Let us pray that our friends Shockley and Skeat will start to boom Esperanto, and let our language alone.

Harold Abbot Titcomb.

Farmington, Me., Jan. 5, 1920.

The Gold Mining Problem

I have read with interest your leading article "The Gold Mining Problem" in your Nov. 8-15 issue. I would like to know where you get your authority for the statement that the gold miner cannot get gold dollars for his bullion or that anyone cannot get gold dollars for Federal Reserve notes.

I am one of those unfortunate people in the present condition of industry and finance who is dependent on a fixed income, and, as such, have necessarily given considerable thought to the increasing cost of living and the reasons for the same. Long ago I came to the conclusion that, if every one carried gold instead of paper money, prices would be much lower, and, acting on that conclusion and desiring to do my share in reducing prices, I, at every time I went to the bank for money during the war, asked if I could get gold. I was always refused, and then I took paper, but the next time I asked for gold.

After the armistice I met with the same refusal. I then wrote to the bank, as follows, as near as I can recollect: "Enclosed find my check for \$200. This check is good at your bank for \$200 in Federal Reserve notes. What will you charge to have these Federal Reserve notes redeemed in gold at the U. S. Treasury in Washington and pay to me the gold at your bank?" In response to this the bank said that they would pay the gold without charge, and ever since then they have cashed all my checks in gold. Nowadays I always carry gold in my pocket, and meet my expenses therewith.

I presume you have many readers in that long-suffering class which depends on fixed incomes. If they can not get gold at the bank, suppose you advise them to try my plan.

C. T. Carnahan.

New York, Dec. 26, 1919.

The Silver Problem

In your No. 22 of Vol. 108, page 887, in the editorial headed "The Silver Problem" you state:

"Silver is now quoted in New York at \$1.33 per ounce—and at this figure the silver coin is worth considerably more as metal than its exchange value as currency."

This statement is only correct in so far as it refers to the silver dollar. The price of silver would have to advance much higher in order to make the statement true as regards half and quarter dollars and dimes.

Erroneous statements as to the bullion values of coins tend to foster hoarding of such coins and to diminish the circulating medium.

Sidney J. Jennings,

New York, Jan. 10, 1920.

Improvement in Northern Mexico

Conditions in northern Mexico have greatly improved during the last two months, but those familiar with the country are inclined to look upon it as the calm before the storm. Instead of the bolshevik cars, there is a Pullman operating to the City of Mexico. The roadbed is not considered safe for night travel; consequently, the sleeper is held over night in Chihuahua and Torreon. Villa has lost his leaders and his most intelligent co-worker Angeles; still he has been down before, several times.

Some of the large mining companies, particularly the Guggenheim interests, are starting their larger mines and metallurgical equipments. Those who are interested in properties a day or more journey from the railroad are still afraid that when they have accumulated a stock of supplies it will be taken away from them. Parral and vicinity is a particularly attractive field now. The great veins there, labor 75c. U. S., and abundant water power electrically transmitted from the Concho River, and a fine climate, make a combination that is not found in many places.

A man who came across the Sierra Madre from Sonora reports an extraordinary condition there. The American plants and mines are idle, the small

native mines and the gambucinos exceedingly prosperous; high silver and low labor making an unusual combination. That section is as safe as during the time of Porfirio Diaz. Supplies from the outside: coffee, sugar, clothing, and other necessaries are high, but eggs are only 10 centavos a dozen and meat 25 centavos a kilo. The best grazing land lies immediately east of the Sierra. This section has been raided back and forth many times by Villa, and is devoid of stock. Some stock was sent into the Sierra for safety, and it has thrived there. Horses and pack animals are said to be more abundant than before the trouble set in.

A curious development is the Defensa Social; "socialistas," they are called. Each community has formed a local guard that is now being recognized and armed by the state governments. They do not like to be called upon to defend other settlements than their own.

The various towns and farming districts have suffered so much in the last few years that they are very desirous for peaceful and settled conditions. "Trabajo y Pan" ("work and bread") is the idea. They do not care much about what constitution they are operating under or who is governor. In fact, much of the banditry and outlawry is due to the fact that commerce and industry have nearly ceased in some sections and many thousands have starved in the last few years. There was nothing else for many to do but take to the road. A ragged native or an unpaid soldier will rob or exchange clothing with a well-dressed foreigner when he gets a chance.

H. H. Taft.

El Paso, Tex., Jan. 9, 1920.

Gasoline Locomotives Underground

Your editorial of Dec. 6 brings to mind one attempt of a mine crew to absorb carbon monoxide, fortunately with no fatal results. When the gasoline engine was new in Mexico, about eighteen years ago, a hoist of approximately 25 hp. was installed in the underground workings of Dolores mine, at Matehuala, S. L. P. Tubing ordered for the exhaust, 900 ft. of it more or less, had only partly arrived when the hoist was ready for operation. About 500 ft. of concrete conduit was laid along the floor of what was usually an "outcast" tunnel, this being connected, through such pipe as was available, to the hoist.

The engine worked beautifully. As rope guides were used, the cage, a locally made contrivance, was run up and down the shaft a number of times to see that all was in working order. Whether this changed the air current or not is unknown, but something did, and monoxide settled all through the mine. Those in the upper workings got it first.

It being Monday, the first effects to the men were considered as the "crudo" or "hang-over" which usually followed a Sunday after pay day. It was finally evident that something more than this was wrong, and it was realized that it was gas from the exhaust. An examination of the conduit showed it to be leaking like a sieve. Men were sent through

the mine to call all hands out, and about the drunk-est appearing lot of men ever coming out of a mine was the result.

About half a dozen were in really bad condition. Two or three were carried out unconscious, perhaps fifty were deathly sick, and two hundred more had headache or slight attacks of nausea.

No doctor was available, so we gave each man a smell of strong ammonia. If it knocked him down, and he got up again, he was cured; if it didn't, we repeated the dose until his objections were sufficient to indicate that he was well alive. It is funny now (but was not so funny then) to recall the effects. Some men sang, and some merely staggered around as if drunk; some acted like "two days out" in a rough sea, and some were in the semi-stupor preceding the down and out "Sotol" jag.

The chronic drunks seemed to be the worst affected; the "zorras," or torch bearers, lads twelve to fourteen years of age, were troubled little.

The experiment was never tried again, so the question as to whether men could become accustomed to carbon monoxide is as undecided as ever, but they did not, in this case, start off well.

George A. Laird.

Bowling Green, Ky., Jan. 11, 1920.

Unimetalists, Bimetalists, and Sinemetalists

After reading the editorial entitled "The Silver Problem" in your issue of Dec. 13-20, I reach the conclusion that your solution of the threatened disappearance of our silver coins would be to "peg" silver, just as gold and wheat are now pegged. The effect of such a procedure would naturally be that if anyone else wanted some of the metal he would have to pay at least as much as if not more than the pegged price. But would this stabilize its market value and save our stock of small coins? Hardly.

Gold today happens to be a drug in the market. No one will pay even \$20.67 per fine ounce for it, and the only reason it commands approximately that price as a commodity is because it can be taken to a mint and there exchanged for gold coin or legal tender currency to nearly that value which any bank will credit on deposit at par.

On the other hand, wheat, pegged at \$2.25 per bushel, commands \$2.65 f.o.b. steamer at the seaboard, and will undoubtedly advance to a higher figure if there is a short world's crop this year, or if Europe can arrange in some way to buy it in larger quantities than it is now buying. The same will occur in the case of silver at this time if that metal is pegged at \$1.2929 per fine ounce. The law of supply and demand is a hard one to beat.

When I came to the West in 1871, and embarked in mining in Colorado, the silver in the ore I produced brought me all the way from \$1.32 to \$1.40 per ounce. The metal was pegged then by being one of the two metals admitted to free coinage, the coinage value of silver being \$1.2929 per ounce. But hardly any of that produced in the West in those days ever went to the mint. Practically all of it was sold to bullion brokers in New York, who shipped it

to correspondents in the same line of business in London, who, in turn, sent it, either direct or through government channels, to India and China, where it was employed in paying the everlasting debt of Europe to Asia. As surely as the sparks fly upward, that is just what will happen now under similar treatment and conditions. As long as the demand in the Orient continues strong enough to absorb a little more than the new silver being produced in the world, and the price mounts to \$1.33 or better, silver coins will slowly flow to the melting pot. Nothing can prevent this but a marked increase in the output of the metal, which of course will soon occur.

The present situation, considered in connection with the history of precious-metal mining during the last seventy-five to one hundred years, confounds equally the theories of both the mono and the bimetalists, and brings us a step nearer to the time when the forward nations of the world will use for their own media of exchange purely asset money, of no intrinsic value, and will turn over all their gold and silver coins to the backward nations to play with until, in the fullness of time, they also learn financial wisdom. Metal coins are merely hand tools, convenient for small transactions, inconvenient for large ones, and of necessity of fluctuating value directly in proportion to the number in circulation and the demand for the metal of which they are made for other purposes.

The only other kind of money that will ever possess comparatively stable purchasing power will be one that has no intrinsic value, has nothing behind it but the taxable wealth of the people whose government issues it, is legal tender for all debts, both public and private, within that political entity, is regulated in volume by the ebb and flow of taxable wealth there, and bears in total face value a regular proportion to it—probably somewhere between 2 and 5 per cent. We are perhaps close to the time when such a form of currency will begin openly to be considered by international financiers. For several years they have been privately in favor of it.

Theo. F. Van Wagenen.

[We should have stated in our editorial of Dec. 13 and 20 that though the parity point for the silver dollar is \$1.29, for subsidiary silver coinage it is about \$1.38 per ounce. For worn coins, of course, the figure is still higher.—Editor.]

Prospectors Need Encouragement

After reading the interesting article by Mr. Loveman in your issue of Dec. 6, on "Exploration in Southeastern Asia," it impresses me as a most excellent argument—though possibly quite unconsciously so on the part of the writer—in favor of free prospecting, and a definite reward for finders of new mineral deposits in the way of a fee simple title thereto, easily obtainable and held, and as easily transferable.

There is a constantly growing demand for all minerals, and particularly the metals; and a decided dearth in discoveries of new deposits. History tells

us that practically all the producers of the past have become known through the efforts of the lowly prospector, either as such, or as a fisherman, a hunter, or a mere wanderer in the wilds for the love of the open life.

Yet not only do the mining laws of most countries penalize the activities of such individuals by demanding a license from them, but, outside of our Western States and Alaska, they can never own what they may find. Can anyone explain how, under such circumstances, new mineral deposits are going to be brought to light?

Theo. F. Van Wagenen.

Denver, Col., Jan. 6, 1920.

Conservatism

Most persons have a vein of conservatism when it comes to changes and innovations, and this is specially true of the English, who do not normally favor push or rapid decisions. The word English is used advisedly, because the above statement would be far less correct if the word British were employed.

When one considers metallurgy, or any section of it, during the ten years or more preceding the war, progress certainly has been considerable, and so, in many respects, the time occupied in making that progress has also been considerable. Without indulging in even traces of pessimism, at times it is quite evident that there is a lack of generous interchange of information, which could safely be made public, between different sections of the engineering profession. Books and published papers, though written so as to read well, do not record those vitally necessary practical details and those failures (which do not read so well), which are essential if information is to be handed round in a useful form.

Think of some of the changes that have come about and see how long it took to effect them. Tube mills were used for grinding cement clinker for some time previous to their introduction into the metallurgical scheme in West Australia in 1899. They were introduced into South Africa about 1905.

The pot-making machine used on the Continent of Europe for several years before the war for making the pots or retorts used in zinc manufacture, is now getting into Great Britain and displacing the hand-made pots or retorts which have hitherto been used for distillation.

The spiral sand pump, well known to mining men, of extreme utility within its limits, and quite fool-proof, is practically unknown in other spheres where it would seem to be wanted.

Similarly, a large number of civil and mechanical engineers are quite unaware of the range of utility of the modern centrifugal pump, with its easy replacement of all wearing parts and other improvements which have long ago been introduced as a result of knowledge gained in mining and reduction work.

To wade through a long paper that has been read before some society or that has been published takes a long time, but it is often necessary in order to dis-

cover the kernel of the whole matter. Most interesting and useful are those communications which, in those cases where it is possible, conclude with a terse synopsis and clean-cut conclusions.

Certain books on metallurgical and milling machinery are not much more than extracts and illustrations from various makers' catalogs, and giving only the vendors' opinions, which are sometimes vastly different from those of the users.

In one large mining center the combined various interests arranged matters so that no innovation could be adopted except under conditions which left any possible advantage solely with the mining interests. It was a one-sided arrangement, and obviously could not last long, and it did not last. The classic work of Bessemer met with every possible opposition, and had Bessemer been a weaker man the iron master of England would have stopped him altogether.

During some recent labor troubles the lack of progress in standardization was forcibly brought home to me. Having occasion to act as fireman on locomotives, I observed that so great is the difference between locomotives of the same class that a driver cannot and does not take over and immediately run another locomotive of the same class as the one to which he has been accustomed. A considerable difference is, on sight, noticed in the several and various controls which are operated from the footplank, and it is because of this operating difference between locomotives of the same class that a fresh driver is always under a disadvantage at first.

In general it seems fairly evident, wherever one looks, that information circulates slowly and possibly that much knowledge gained is periodically forgotten and later rediscovered.

H. T. D.,

Mining Club, London, Nov. 3, 1919.

Mexico and U. S. A.

Allow me to call to your attention the following quotations from "Punch" (London, Dec. 3, 1919, page 461), and from "The New York Times" (Jan. 8, 1920, page 1). Note particularly the two dates.

AMERICAN KILLED BY CARRANZA OFFICER; THIRD SLAIN IN MEXICO IN TWO DAYS

Special to The New York Times

Washington, Jan. 7.—The State Department today made the following announcement:

"The Department of State has been advised by the American Consul at Tampico . . . that Gabriel Porter, an American citizen in the employ of the Penn-Mex Co., was shot and killed by a Mexican federal army officer at Tuxpam on Dec. 21, 1919. The consul has been directed to report further information, and, if warranted by the circumstances, to urge the local authorities in the Tampico district to arrest and punish the guilty person. . . .

"This makes the third case of the killing of Americans reported to the State Department inside of two days. . . . The Mexican Embassy at Mexico City has been instructed to bring these cases strongly to the attention of the Carranza government."—N. Y. Times, Jan. 8, 1919.

"The United States Government has once again warned Mexico against lynching American subjects. Unless the offence is immediately stopped it is possible that America may have to warn them again."—Punch, Dec. 3, 1919.

I guess that "Punch" has us Americans sized up all right all right. American.

Farmington, Me., Jan. 10, 1920.

BY THE WAY

Cousin Jack Philosophy

"This 'ere cauld weather we've been 'avin', m'son," said Cap'n Dick, "do make a man feel h'old, an' tha h'older 'e do feel tha less 'e takes to workin'. But, on tha other 'and, a man's sense o' well-bein' may be figgered h'out by w'ot 'e thinks. This moornin' I wuz walkin' to shaf' with Jan Trebilcock, and sez I to 'e, 'Pretty cauld is'nt un? Jus see by tha thermometer at tha dry 'house she were ten below.' 'Ten below,' sez Jan, 'W'y dam-me, if I bean't caulder than I thought I were.' Which also shows, m'son, that sometimes a 'eap o' knowledge is a bad thing too."

Either Rip or Ananias

Reports were published in British Columbia recently of the discovery of a wonderful mine in the north country. The bonanza was pictured as being of such a character as to make Cobalt's palmiest days seem poor. As the article continued, however, the reader was gradually permitted to learn that the new discovery was a mine known as the Dolly Varden. Thus it becomes apparent that Rip Van Winkle is up and about again. It was true that a quantity of high-grade ore was being sacked at the mine at Alice Arm for shipment. Its value was placed at \$22,000.

Nature's Preservative

Discovery has been made, according to a press report, in the Holman iron mine, near Taconite, Itasca County, Minn., not far from the source of the Mississippi River, of the trunk and branches of a prehistoric pine tree in an excellent state of preservation and with pine cones about it. The tree is not petrified. The wood is as sound in the main as though it had been felled only a few years ago and the pine cones are still pliable. The wood with exposure to air has not softened or crumbled, and the find is the first of its kind on record so far as geologists of the iron ranges can learn.

Diamonds in Matto Grosso

In his report on the "Exploration of the Valley of the Amazon" (Senate Executive Document 36, 1853), Lieut. Herndon gives some interesting data on the diamond industry of Brazil. Quoting M. Castelnau, the diamond yield of the province of Matto Grosso, from about 1746 until 1849, is estimated as worth \$10,000,000; the baubles costing to Brazil alone the lives of more than 100,000 human beings. He concluded that diamond hunting, as a business, is unprofitable; but, like all mining operations, he deemed it a lottery. A man in the diamond region

might stumble upon a fortune at an instant of time, and without a dollar of outlay; but the chances are fearfully against him. Continuing, he wrote "Should Brazil have the magnanimity to throw open the diamond region to all comers, and encourage them to come by promises of protection and privileges, I imagine that this would be one of the richest places in the world, and that Brazil would reap enormous advantages from such a measure."

A Swindler's Mistake

After doing a rousing business of \$35,000,000 in 1917 and 1918, George Graham Rice comes a cropper just for helping himself to \$721 and a \$100 Liberty bond belonging to a lawyer somewhere in the Middle West. Poor George! He should have known better than to mix up with lawyers where money is concerned. The young man starting out in life will do well to ponder a moment over the mistakes that Rice has made and seriously seek to avoid the pitfalls that beset his path. Rice's career can, however, be pointed to with a steadier finger after the sentence pronounced is heard. Advice to the young had better be reserved until another day.

Jury Trial in an Early Camp

"Exactly why horse stealing should have been so early recognized as such a heinous sin is not easy to discover," says Clarence King in his book "Mountaineering in the Sierra Nevadas." "However that might be, murderers continued to notch the number of their victims on neatly kept hilts of pistols or knives, in comparative security, long after the horse thief began to meet his hempen fate. Early in the fifties, on a still, hot summer's afternoon, a certain man in a camp of the northern mines, which shall be nameless, having tracked his two donkeys and one horse a half-mile, and discovering that a man's track with spur-marks followed them, came back to town and told 'the boys,' who loitered about a popular saloon, that the animals had been stolen."

After describing how the first suspected person was caught, bound hand and foot, and laid upon his back in the bar-room, Mr. King continues:

"A jury was quickly gathered in the street, and, despite refusals to serve, the crowd hurried them in behind the bar. A brief statement of the case was made and they shoved the jury into a commodious poker room. The noise outside the bar-room by and by died away into complete silence, but from afar down the canyon came confused sounds as of disorderly cheering. They came nearer, and again the light hearted noise of human laughter mingled with clinking glasses around the bar. A low knock at the jury door; the lock burst in, and a dozen smiling fellows asked the verdict. A foreman promptly answered, 'Not guilty.' With volleyed oaths and ominous laying of hands on pistol hilts, the boys slammed the door with, 'You'll have to do better than that!' In half an hour the advocate gently opened the door again. 'Your opinion, gentlemen?'—'Guilty!'—'Correct! you can come out. We hung him an hour ago.'"

Mining in the Asiatic Near East

Mineral Deposits of Great Economic Importance, the Existence of Which Has Long Been Known, Await Development by Modern Enterprise and Methods—Status of Present Political Control—Prospect and Retrospect

BY LEON DOMINIAN

Author of "The Frontiers of Language" and "Nationality in Europe"
Written exclusively for *The Journal*

THE Asiatic section of the region known as the Near East comprises the lands which formed part of the Turkish Empire in 1914, the Caucasian section of the former Russian Empire and Persia. It is part of the Old World whose political importance has always been paramount, and, to appreciate this, one need only realize that, for Europe, this region is the land-gate to Asia, and that, inversely, it plays the same role for Asia with regard

Europe. Here was the great forward stride made in civilization which marked the passing of the Stone Age into the period of bronze. The development of social organization among the early dwellers of former Turkish lands was accomplished by the recognition of the economic value of metals. Hence the search for ores and the art of working them are industries of high antiquity throughout the Asiatic Near East.

An Intensely Mineralized Area

Nature lent itself admirably to this development. Between the land-dotted waters of the Ægean and the mountainous bulwark which separated Turkey from Persia, great chains of lofty peaks extend and culminate in the snow-capped volcanic mountains of Armenia. The elevated and semi-arid plateau of Asia Minor, supported by three arcs of major folding, is bordered by a succession of ancient and modern mine workings which reveal the intense work of mineralizing agencies. For the same area, no other region of the world is known to be as extensively mineralized, except Mexico.

The feature of interest in the Near Eastern field is found, however, in the realization that it is virgin soil to the miner. At present this interest is perhaps greater than ever, in view of settlements about to take place. Granted that these settlements will provide the land with orderly administration, one may reasonably surmise that mining operations will quickly follow. In this connection a knowledge of the ancient sites of exploitation is far from being devoid of value, for to the modern prospector these sites may be regarded as positive indications of the existence of ore deposits, the surface of which has alone been mined, owing to the imperfect knowledge of early miners.

The ancient miners primarily sought gold, and historical descriptions of gold mining in the Asiatic Near East are more abundant than records for any other metal. The classic literature of Hellas is full of allusions. Many are the legends which owe their origin to the clean-ups made by enterprising Lydian prospectors in washing the gravels of the Hermos and its tributary, the Pactolus. The valley of these rivers has its source in the northern slope of Mount Tmolus, in the Smyrna region, which acquired newspaper prominence since its occupation by Greek forces in the spring of 1919. The origin of the placer gold in this region is even discussed by ancient philosophers. Some attributed the gold to the fact that Midas, the mythical founder of the Phrygian kingdom, had bathed in the Pactolus, upon the advice of Bacchus, in order to be deprived of the faculty of turning everything he



LEON DOMINIAN

to Europe. And as long as intercourse between these two continents shall continue, the Near East is bound to loom prominently in the relations between East and West.

Whatever be the angle from which this region is viewed, its interest remains always fresh. As far back as one desires to delve into historical retrospect, there is plenty to attract the geologist's or miner's interest. From Asia Minor and Armenia, the archæologist and ethnologist aver that the first metal-using ancestors of the human race invaded

touched into gold—a predicament which prevented him from eating. Others entertain sounder views. Thus we find Philostrates, who was a contemporary of Nero and Vespasian, advancing the hypothesis of the primary derivation of the nuggets from the gold in the rocks of Mount Tmolus. But this was no novel hypothesis, for Herodotus likewise had attributed the origin of the valley gold to the same mountain.

The passing of centuries in this region is marked by a decline of gold production. Byzantine writers of the eleventh century allude to the ancient productivity of the valleys, without, however, comment on contemporary recovery. It seems probable that, during the last two thousand years, gold washing in the Smyrna region has been limited to the meager operations which any present-day traveler may have observed among the peasants of the Boz Dagh lowland, who eke a scanty livelihood by washing the gravels brought down by small streams. But the exhaustion of the placer fields, by no means a certainty in itself, need not imply that the mountain source of the nuggets won by ancients is depleted.

Historic Evidence Confirmed by Geologically Demonstrated Conclusions

The fact that the northwestern portion of Asia Minor was gold-bearing may be regarded as certain. The abundance of gold jewelry excavated on the site of the several cities of Troy is evidence of ample local production. Troy was, two thousand years ago, a very ancient town. Commercial intercourse during the period of its growth was insignificant. Moreover, the city was founded near Astyra, an ancient locality which was famed for its gold mines, according to the testimony of no less an explorer than Strabo. This historical evidence is supported by modern geological knowledge. The locality is of interest because here Tertiary igneous rocks have been detected in which the presence and succession of rhyolites, andesites, and basalts are remarkably similar to the sequence of flows observable in certain gold-bearing districts of the Great Basin region, such as the southwestern portion of Nevada, which has been studied in detail by the eminent editor of the "Engineering and Mining Journal." Farther north, the precious metal has also been found at Serjiler, south of the Dardanelles region.

Proceeding eastward, the name Cape Jason on a map of the southern Black Sea coast evokes visions of hardy pioneers whose exploits are similar in many respects to the more familiar enterprises of our forty-niners. Were the reader to resort to Strabo's copious documentation, he would find that throughout this Black Sea coast it was the custom of the natives to recover gold by first straining the auriferous muds through screens and subsequently spreading the undersize over sheepskins specially selected on account of their long fleece, the shreds of which served to entangle the precious metal. Here, beyond doubt, was the original land of the Golden Fleece. Pliny, one of the best known among ancient naturalists, is in accordance with Strabo on this point.

Still farther east, the Pontic area contains the valley of Izpir, known to its ancient dwellers as the Province of Syspiritides. This site is famous through the detail of Menon, a Macedonian general sent by Alexander the Great, for the purpose of securing possession of the gold lands. Such at least is Strabo's version of this expedition. We are now in Armenian land, and here runs the valley of the Tchorkusu, which has been identified by Bible students with the Pison, mentioned in the second chapter of Genesis with the statement that the locality was gold bearing. In this region, also, somewhat south of Trebizond, were located the gold workings which supplied the mint at Constantinople during the reign of Justinian, and possession of which was contended by King Chrosoes of Persia.

This rapid sketch suffices to show that Asia Minor and Armenia were no mean producers of gold in antiquity. Modern exploration will probably throw more light on these ancient operations and will also help the mining geologist in the conduct of his researches. In our time very little gold has been obtained from this area. In the southern section the deposits of argentiferous lead of Bulgar Dagh in the Taurus uplift have yielded small quantities of the yellow metal. It is not unlikely that the output will be increased with the introduction of modern machinery and methods in the region.

Copper Deposit on Upper Tigris Worked Since 1096 A. D.

Copper appears to be abundant throughout Asia Minor and Armenia. The best known deposit is undoubtedly that of Arghana Maden, in the upper valley of the Upper Tigris. This deposit, which covers an area of about eight square miles, is known to have been worked since 1096 A. D. At the beginning of the present century the Turkish government, by which it was owned, had converted it into small leases which were granted to native operators. The ore was converted locally into matte containing about 30 per cent copper and shipped in this form to Alexandretta, whence it was conveyed to European smelters. A promising region for copper production appears to be the coastal lowland extending east of Fatissa Bay beyond Trebizond to the former Turko-Russian frontier. Desultory work of the last thirty years throughout this region serves to indicate the presence of extensive copper beds. It was impossible to undertake operations while the Turkish regime lasted, owing to incessant requests for "backshish" from officials high and low.

Within the plateau of Asia Minor a variety of economically workable mineral deposits are found. At Sultanchair, in the province of Brussa, borax in the form of extensive beds of pandermite, a variety of colemanite or borate of lime, occurs in Tertiary sedimentaries lying in a basin surrounded by steep hills of granite and crystalline schist. The plains near Eskishehir constitute one of the most important localities in the world from which meerschaum is mined. The producing district extends from Eskishehir eastward to Angora. The mineral-bearing plains form a valley filled with drift from the

surrounding mountains. In this drift, the sepiolite, or meerschaum, is found in rounded nodular masses rarely exceeding 10 cm. in diameter. The product is graded according to color and purity into five or six qualities, and, before the war, the bulk of the output was controlled by Austrian companies. Other minerals, such as arsenical pyrite near Odemish and lithographic stone north of Mihailich, have also been profitably extracted.

Manganese, Emery, Chrome, Antimony, and Quick-silver Mined in Plateau Region

In general, however, the mountainous rim of the plateau deserves greater attention on the part of the mining operator than the gently sloping tableland of the interior. On the west, manganese has been mined in the Phlinika and Zengan districts. The production of Turkish emery came entirely from this section of Asia Minor and the adjacent islands. Inland, the emery mines lie in a belt extending south and southeast of Smyrna. The ore occurs in lumps up to 15 cm. in diameter, embedded in a red-brown clay and associated with calcite. Chrome ore, rich in chromic oxide and with low silica content, has also been mined in this region. The production, however, has fallen off in recent years.

Two important centers of antimony production, at Odemish and Jinlikaya, in the same Smyrna district, deserve mention. High-grade ore, often carrying as high as 65 per cent antimony, is found in both places mentioned. Mercury has likewise been obtained at Karaburna, near Smyrna, from cinnabar deposits in the vicinity of basaltic flows and metamorphic siliceous schists. Mining was carried on in open cuts on ores containing as little as 0.25 per cent Hg, which were sorted and screened into concentrates assaying from 0.75 per cent to 2.0 per cent Hg. Double Spirek tower furnaces for broken ore and Cermak-Spirek for fine were installed about ten years ago, the production then amounting to approximately 3,000 flasks. At Konia, also, cinnabar has been found associated occasionally with stibnite.

The southern portion of the rim is noted chiefly for its iron. It is not unlikely that the region east of Adalia Bay, now under Italian control, may become a site of iron exploitation. This important mineral is also found at Anamur directly facing the island of Cyprus. To the east the flanks of the powerful Taurus uplift are known to have yielded gold, silver, copper, and lead.

Lignite Deposits Extensive

Neither is the region devoid of fuel. Lignite occurs extensively in Asia Minor, Armenia, and Syria. The beds containing this variety of coal are generally met in tertiary lacustrine deposits, and appear to belong to a zone of transition between the Miocene and the Pliocene. The deposit worked at Manjilik is typical, and its product was formerly used as fuel for an electric power station feeding the smelters and workings of the Balia silver-lead mines. Throughout the Troad and the Dardanelles region seams of lignite are also found. The beds extend, in fact, through Demirtash, near Brusa, to Chai, near Afioukarahissar, where the thickness of the

coal attains 2 m. In the province of Smyrna likewise, at Sokia and Nazili, lignite has been produced for local use. Its occurrence, however, does not appear to be confined to these two districts.

In Armenia, lignite has been derived from seams imbedded in the Upper Eocene, occurring in the province of Erzerum. The annual production for 1911 amounted to 1,000 tons, and has not been exceeded since then. As one nears the old Russian frontier, the lignite beds are met again. They are well developed at Khenek, near Migri, in the upper valley of the Arax, as well as at Cheraker and Sivan, near the Lake of Van. A hard variety of coal, resembling anthracite, has been discovered near Erook, in the province of Biblis. A similar grade has also been met in the environs of Palu.

The exploitation of coal in Mesopotamia dates back to the middle of the nineteenth century, when the fuel was won on a small scale for local consumption at Harpot, east of Jezvich. It was used later on the river boats plying on the navigable stretches of the Tigris. In the low hills lying east of Kifri, near Bagdad, coal has been obtained from shallow workings chiefly for the use of the fluvial transportation industry.

In Syria two deposits of lignite are worked in the province of Beirut. The Anmiade mine, near the village of Kermael, yields about 1,000 tons annually, and one-half of this amount is obtained at Haitoura, near Jezzini. In the Lebanon, many districts in which lignite occurs are known. At Falooga, the lignite was mined to supply the silk factories of the neighborhood with fuel. Elsewhere in Syria coal has been discovered in the Beka's mountains and at Huleh, near Damascus. Explorers have also mentioned the presence of coal near Aleppo. In Palestine the only locality in which coal is known appears to be the Ajiloon district.

Syria is noted chiefly for its bitumen, which is recognized as being exceptionally pure and rich in the native state. The product is used locally in the manufacture of black varnish for furniture, leather, and the like. The chief producing localities are the Dead Sea shores and Hasbeya. In the latter locality the pits are now in the abandoned state in which they were a few years prior to the war. An excellent quality of bitumen is also found near Latakiah, in northern Syria.

The most important and best-developed coal field in Turkey occurs in the vicinity of Constantinople, at Heraklea, on the Black Sea coast. The coal beds are not known to extend far inland, but their easterly extension beyond Amasra is surmised. The coal belongs to the bituminous variety and is slightly higher in ash than the corresponding average types from European basins. It may be classified, on the basis of paleontological and lithological data, into three stages, corresponding to the Culm, Westphalian, and Stephanian stages of the European carboniferous. Locally, these stages are known, respectively, as the Aladjaghzy, the Cozloo, and the Caradon. The first two are economically the most important, but the best coal is derived from the middle

stage. The Caradon stage provides excellent material for coking purposes; the Aladjaghzy is used chiefly in the manufacture of illuminating gas and for steam generation.

The most important mines in this coal field are owned by a French company. Many native operators, however, have obtained leases from the government, and work independently on a small scale. The annual production increased from 137,000 tons in 1890 to over 750,000 in the years immediately before the war. It is believed that this tonnage is susceptible of further increase when conditions become normal in the region. Prior to 1914, the coal consumption of Asiatic Turkey and the Levant was estimated at 5,000,000 tons.

The Asiatic Near East contains a very rich petroleum field in its southeastern section along the frontier between Turkey and Persia. All the way between Mosul and Bagdad the Arabs are in the habit of collecting for lighting purposes the oil oozing above the soil. This Mesopotamian oil field has reached a stage of profitable development on the Persian side of the frontier, where British companies operate. The British government is a co-owner in these fields, as declared by the Chancellor of the Exchequer before the House of Commons on Dec. 3, 1919, with the statement that the British government had purchased two million one-pound shares from the Anglo-Persian Oil Co.

It is interesting to note that manifestations of oil are continuous throughout a long belt which begins at the oil fields of Burma and extends westward to Mesopotamia, whence it strikes northward through Armenia and ends in the Caucasian oil fields. Everywhere in this belt the liquid fuel has been found, and though its importance has only been recognized at Baku, Ahwaz, and in Burma, many of the intervening localities where the black liquid oozes constantly, such as the butte of Van, undoubtedly deserve to be explored.

Georgia Most Important Source of Manganese

In Caucasian territory, the best mineralized section appears to occur in Georgia. This region is noted for its manganese mines. It is estimated that half of the world's output of this mineral comes from the Kutais mines. In this section of Georgia, the Schalken Grueben and Huetenverein of Gelsenkirchen was the most important operating firm before the war. This German property was confiscated after the war by the Russian government and negotiations were carried on for some time with British capitalists for its acquisition. Subsequent Russian reverses prevented a deal from being consummated.

Copper is also found extensively from the Black Sea to the Caspian, but the deposits, although considerable, are handicapped by lack of roads and fuel. One of the best-known deposits is that of Zanghezur, in Armenia, which has been developed in a small way. Coal is practically unknown in the Caucasus. The scarcity of this fuel, however, is compensated by the existence of oil.

In this period of world reconstruction, the point of greatest interest in regard to mining in these

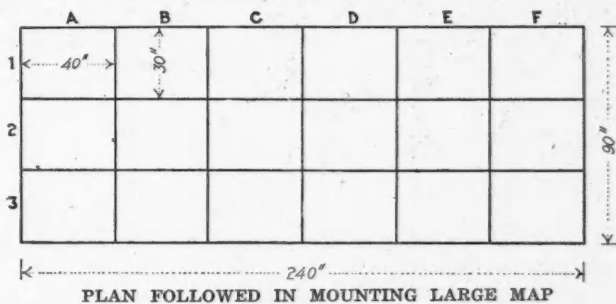
regions lies in the possibility of resuming exploitation, which has remained at a standstill for about two thousand years. The exhaustion of rich surface ores need not imply depletion of the deposits. In fact, everywhere in the Asiatic Near East the knowledge and craft of modern methods are awaited. Strabo, to whom I shall once more pay tribute, had written of the Rio Tinto Mines as gold producing in the same glowing terms which he applied to mines in Asia Minor.

A mining geologist trained to ore variation at depth would be little surprised to find extensive copper beds where gold was mined twenty centuries ago. Detailed investigations in Asia Minor and Armenia, as well as in Syria and Mesopotamia, will probably lead to interesting developments. But little can be achieved before these regions are properly administered, and this at present is their most urgent need.

Mounting a Large Map

Methods used in mounting several large prints in order to form one large map may be of interest to readers who occasionally have similar work to do. The completed map was 90 x 240 in. Eighteen prints, size 30 x 40 in., were used and placed together as shown in the accompanying sketch.

A floor of sufficient area to accommodate all of the prints was chosen and then planed to a fairly smooth surface. Twenty-two feet of ten-quarter sheeting was tacked to the floor, stretched widthwise to obtain a margin over the width required, and fastened



securely by tacking small wooden strips around the edges. A thin paste of cornstarch, with a little flour and glue added, was made and then boiled for a half-hour or more until good thick paste was obtained. This was applied to the back of the prints with a wide paper-hanger's brush, care being taken to spread it evenly and not too thickly. The print was then put in place on the sheet, and the work done rapidly in order to prevent patches drying before they were properly stuck.

Prints were placed in the short rows first, that is, the three prints in A, then those in B, and so on. This makes it easier to match the prints. If a row lengthwise were laid first, the first print laid would be dry and partly shrunk before the next row could be started. It was also found best to lay the No. 2 print of each row first.

Two men working together can get better results. Half round mounting sticks placed at top and bottom complete the map.

Mining at Cerro de Pasco, Peru

Mineralized Area in the Andean Mountains, at an Altitude of 14,300 Ft.—Shrinkage, Square-Set, and Cut-and-Fill Methods Employed—Leaching of Stockpiles by Meteoric and Mine Waters.

BY MYRON R. WALKER*

Written exclusively for *The Journal*

CERRO DE PASCO, Peru, is a town of about 12,000 population lying in latitude 11 degrees south, and 110 miles from the Pacific Ocean. It is 14,300 ft. above sea level, on a slope which drains west to the Junin plateau. About a mile north of Cerro is a watershed, to the immediate south and west of which the drainage is by the rivers Mantaro, Apurimac, and Ucayali for about 960 miles to the Amazon; and to the immediate north and west of the watershed the drainage is by the rivers Huallaga and Marañon for about 610 miles to the Amazon. The two waterways are roughly parallel and run north about ninety miles apart. Cerro, therefore, like nearly all of inland Peru, may be said to lie

north and south and varying from half a mile wide at the north end to a mile wide at the south end.

Much of the ground is swampy, and the mines are wet. A drainage tunnel (from Lake Quiulacocha, at the southwest), supposed to have been completed about 1830, taps the mines at the 300-ft. level, but is now of little use, being caved in many sections. Formerly it was of recognized utility, both for drainage and ventilation purposes, and scores of the old workings which were gouged down from surface connect to it. A more modern tunnel was started by Meiggs in the '80s, under a government concession allowing a royalty on ore extraction from drained mines. The concession has passed through



THE TOWN OF CERRO DE PASCO

at the headwaters of the Amazon. The town is fifteen hours by rail from the principal Peruvian port of Callao, the journey being nearly east for 140 miles of track and across the continental divide, and thence nearly north for 83 miles of track. Daily freight service is maintained, but passenger trains make only three round trips per week. The railroads are standard gage.

Topography and Drainage

The mines lie in a basin bounded by hills which rise about 300 feet above it. The basin is an eastern branch of the Junin plateau. The ground of known mineral value covers an area roughly a mile long

other hands until finally it is controlled by the Cerro de Pasco Copper Corporation. This adit, known as the Rumiallana tunnel, is two miles long, taps the mines at about the 400-ft. level, handles 2,000 gal. of water per minute, and drains to the north. Any future drainage tunnel at greater depth will probably be five or more miles long, and, like the Rumiallana, will debouch north or northeast. The known valuable claims at Cerro cover an area of about 430 acres. Most of these are owned by the Cerro de Pasco Copper Corporation and allied interests.

The Andean Mountains are sedimentary rock. The Cerro formation has been called lower Cretaceous. East of the mineralization occurs limestone; to the south is limestone and shale, and to the west is an

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intrusive locally called rhyolite. In places the rhyolite, instead of being solid, occurs as breccia, locally called conglomerate. The sedimentary contacts dip under the intrusive. Between the rhyolite and the limestone, and extending north and south, is a body of pyrite variously estimated as containing up to 300,000,000 tons considering its extent as only 500 ft. below surface. At its southern end the pyrite turns along the shale toward the west.

The worked orebodies lie either in the pyrite or close to it on the side of the sedimentaries. The limonite capping of the pyrite is what was generally worked before 1890. It is called "paco," and is worked chiefly for its silver. The rhyolite is fairly covered by swampy ground, and its limits therefore have not been well marked. West of the rhyolite limestone again occurs, the contact dipping under the intrusive.

The pacos are generally siliceous from surface down to 300 ft., the silica content being 70 to 80 per cent. In one place paco has been found at a depth of nearly 400 ft., and a vertical fault displacement is suspected here. Siliceous pacos carrying silver to the amount of eight or more ounces per ton are used for converter lining.

At depth the solid pyrite is joined on the east not by pacos but by a banded sedimentary impregnated with very fine-grained pyrite, with excess iron near the pyrite and excess silica at a distance. This zone is characterized by chimneys enriched in silver or copper or in both. Some of these chimneys were worked down to 300 ft. in former days, and others have been discovered only by recent depth development. Two such chimneys carry lead and zinc instead of copper.

The eastern or calcareous sedimentaries were exceptionally impregnable, probably due to a major north-and-south fracture, and large deposits of copper ore were formed therein, enriched by leaching of the superimposed cupriferous limonite. The southern or clay sedimentaries were not so easily pierced; hence, instead of a stockwork, narrow veins were formed along fractures roughly parallel to the rhyolite contact. The copper occurs usually as arseno-antimonial sulphide, but oxides, carbonates, and even native copper are found.

The Workings

The large copper deposits forming the eastern and southeastern parts of the mineralization have been well prospected by workings to below 400 ft. The southern portion has been similarly opened to 700 ft. The northern end is zincy in depth, and development operations were stopped at the 400-ft. level. The western side, comprising both paco and pyrite, has not been sufficiently developed and is now being explored by churn drilling.

Numerous faults cut both the stockwork and the narrow vein sections. Those in the stockwork are of small throw and are more noticeable from a study of horizontal sections than from rock appearance on the ground. Those affecting the narrow veins are of greater throw and have often required considerable study.

Neglecting the old native workings, the mines have been opened by several vertical shafts, of which five are at present working shafts. Excelsior, the deepest shaft, is below the 800-ft. level (May, 1919). Main working levels are the 300, 400, 500, 600, 700, and 800. The Rumiallana drainage tunnel in places constitutes a working level; at the south end of the property it is 30 ft. above the 400, and at the north end 30 ft. below the 400-ft. level.

In the stockwork section, main drifts run about north and south, usually along the west side of the



SMALL HYDRO-ELECTRIC PLANT NEAR CERRO DE PASCO

orebody, and crosscuts are placed at intervals varying from 50 to 200 ft. Raises are situated at points of enrichment and driven to the level above. Square setting is started from the raises and carried two sets wide to certain limits. These limits may be older workings, walls of the orebody, fire zones, lean ore, or simply tramming distance. Practice has determined the limiting width of two sets, as wider cuts bring trouble both by cost of extra timbering

to support the weight and by incipient adjacent crushing, causing fire zones. Stopes are usually run not over seven floors high for a single cut. Waste siliceous filling is brought through the raises from upper levels and packed into the open sets, when possible removing the timber while retreating. Only a small percentage of the timber is saved. Adjacent to fire zones the filling is packed in wet.

Above the stockwork section mined by square sets the siliceous capping, low in copper but with good silver values, was mined until recently by the glory-hole method. This capping runs easily when broken, and was pulled to chutes on the 300-ft. level. It has been found cheaper to mine the ground directly into railroad cars on the surface.

The narrow veins were first mined by the stull-and-pillar method. Inherent in the method as here practised was an element of uncertainty, because the stopes "wouldn't stay open and wouldn't come

readiness with which the copper enters into solution and precipitates on iron has led to an experimental adaption of the method underground. A shrinkage stope is being prepared in the low-copper pyrite, and the intention is to leach both the broken ore in the stope and the drawn ore in the surface stockpile. The results of this experiment will be interesting.

In 1917 the total production was about 300,000 tons, of which about 40 per cent was from the shrinkage stopes, 30 per cent from square-set stopes, and 30 per cent from silica caving. In 1918 the production was about 260,000 tons, of which about 52 per cent was from shrinkage and cut-and-fill stopes, 29 per cent from square-set stopes, 17 per cent from silica caving and stripping, and 2 per cent from leaching stopes. The proportion mined by each method during various periods is dependent not at all on availability of ores in different parts of the mines, and not to any great extent on the cost of



MAIN OFFICE AT CERRO DE PASCO

together." At the Rumiallana level the shrinkage method was adopted. Shrinkage works well in the veins which stand nearly vertical and are comparatively narrow, say ten feet wide. In the flatter and wider veins the hanging wall dilated the broken ore and tended to dislodge in slabs, which blocked the flow to the chutes. In the wider veins a cut-and-fill method has therefore been adopted; but instead of carrying cribbed ore passes up the stopes, foot-wall raises are driven parallel to the vein, and from these are driven horizontal or inclined crosscuts to the stope. The relative cost of this cut-and-fill method, as compared with shrinkage, has not been determined. A division of costs by tonnage is not a criterion when costs are rapidly changing. The proper comparison can be made only by dividing quantity (not cost) of labor and material by tonnage, and this has not yet been done.

Leaching of stockpiles by meteoric and mine waters has been practised at Cerro since 1913. The

method, but largely on the requirements of the smeltery, which treats both custom and company ores. The variation in copper, silver, iron, and silica content of the Cerro ores, according to various sections of the mines, makes these ores very attractive to a smelterman.

The classification of reserves is largely on the basis of equivalent value of copper content, considering a certain number of ounces of silver as equivalent to 1 per cent of copper, but this basis is not adhered to strictly. Ores of $3\frac{1}{2}$ per cent copper are called "high grade." Ores of less than $3\frac{1}{2}$ per cent copper and not less than $2\frac{1}{2}$ per cent copper equivalent are called "low grade." Ores of $1\frac{1}{2}$ to $2\frac{1}{2}$ per cent copper equivalent are called "concentrating." In addition to these classes is that of lead-zinc ore, which, to be considered, must not fall in the above classes, and must have at least ten per cent zinc.

In making an estimate of ore reserves at any given time, the calculation of copper equivalent is

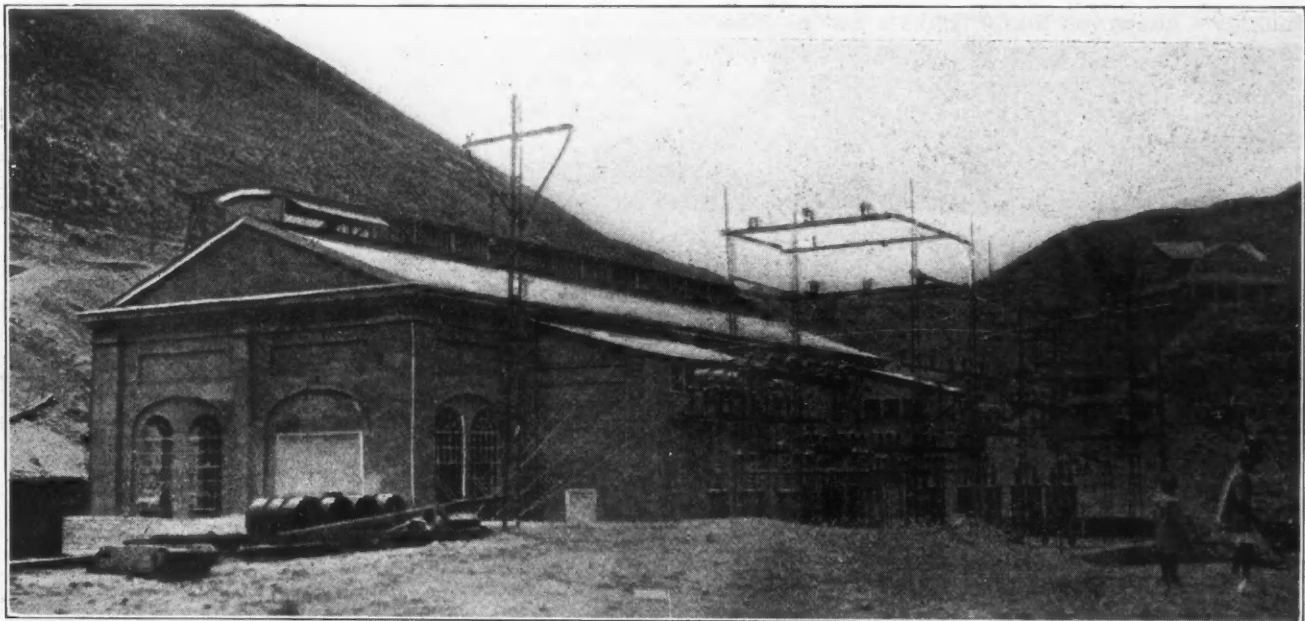
based on the relative ruling prices for copper and silver, and it would thus seem that the classification of any given ore might vary from time to time. In following this classification it is found (1) that "high-grade" ore has almost invariably more than 4 per cent copper equivalent; (2) that "low-grade" ore includes material of low-copper high-iron content copper and 2 oz. silver, and material running, say, no copper and 20 oz. silver; (3) that "concentrating" ore includes material of low-copper high-iron content which possibly cannot be economically concentrated but doubtless can be leached at a profit.

Ore blocked on at least three sides is classed "in sight." Ore blocked on two sides only is classed "probable." No other classes are considered, but the given classification is extended to include ground ten feet beyond development workings in ore, and

portion of the compressor equipment is connected for either steam or rope drive. When driven by steam, the rope drive runs the motors as generators to furnish power for the electric pumps. The electric pumps are geared triplex, and 3- and 6-stage centrifugals. Air pumps also are installed, but except for certain purposes are seldom used.

The standard-gage railroad receives ore from the surface bins into wood and steel gondolas of 18 to 35 ton capacity. The railroad is owned by the mining interests and serves the metal mines, coal mines, lime quarry, smeltery, and one hydro-electric station.

With the exception of timber and some food, practically all supplies come from the United States. Within the last two years native eucalyptus has been used for stulls, lagging, and short plank. All other mine timbers are Oregon pine. The present prin-



MAIN HYDRO-ELECTRIC GENERATOR STATION AT OROYA

these ten feet are classed with the block adjoining on the opposite side of the working.

At the end of 1917 there was sufficient ore "in sight" and "probable" to last twenty years at normal production, with a content of more than 5 per cent equivalent copper. During 1918 development work was curtailed, but at the end of 1918 the expectations of life were extended rather than reduced.

Power for all purposes is available from the company's two hydro-electric stations. The mines use about 1,600 hp. The first large hoisting engines were designed to run either by steam or compressed air, and were usually run by air. Recently all shaft hoists have been electrified. Air is still available to the principal hoist for emergency use. In case the electric power lines are down, a battery of coal-fired steam boilers is immediately thrown in to run the compressors. A further battery of oil-fired steam boilers, which are usually acting as air receivers, is unlimbered for power use and is ready in an hour if the electric shutdown promises to be protracted. A

principal shaft is the Esperanza, with five compartments and steel headframe. It is in the foot wall of the stockwork section and reaches the 700-ft. level. The four-compartment Excelsior shaft is in the foot wall of the narrow vein section, reaches the 800-ft. level, and is being equipped with steel headframe. Other shafts have wood headframes.

On main haulage levels Jeffrey electric locomotives are used in connection with D. C. 250 volt overhead trolley wire. Trains consist of six Hadfield cars holding 22 cu. ft. each. On the new lower levels it is proposed to use 40-cu. ft. Granby cars. Hand tramming in stopes and intermediate levels is by 14-cu. ft. end-dump cars.

Imported skilled and professional laborers are supplied with free quarters. Single men get either suites or single rooms with bath. Family men have modern cottages. Heat, light, and furniture are free. Board is supplied by the company at \$25 per month. A well-equipped hospital, with a capacity of sixty beds, is run by the company at Cerro, and has emergency branches at other camps. A nominal

monthly medical fee is charged to all contract and monthly salaried men. A club organized by the employees and managed by the company maintains bowling alley, billiard room, barber shop, library and reading room, dance hall, and card room.

Common labor gets a minimum of \$0.75 a day. Miners and drillers get up to \$2, skilled mechanics up to \$4, and shift bosses up to \$5. Salaries of professional men are about the same as in the United States.

Costs

Underground costs per ton, including wages, material, and power, in 1918 were, for cut-and-fill mining, \$2.08; square-set mining, \$3.97; stripping, \$0.29; pumping, \$0.30; haulage, \$0.35; hoisting, \$0.35; sorting, \$0.06; loading, \$0.09; total operating, \$3.48. Engineering cost was \$0.07; laboratory,

the mine tonnage in 1918 was 13 per cent below that of 1917, the smeltery output was about the same for the two years. This may be explained by any or all of the following factors: Varying grade of Cerro shipments; varying grade and quantity of Morococha shipments; effect of custom ores; smeltery efficiency.

Capacity of Equipment

The present mine equipment at Cerro can easily handle 420,000 tons per year, and on the basis of present prices should mine this quantity at an underground cost of less than \$3 per ton. With the completion of the new smeltery at Oroya, the addition of rolling stock to the railroad, the completion of the new concentrator at Cerro, the normalization of the tonnage from Morococha, and the elimination of war restrictions on getting supplies, there should



OLD ARASTRAS NEAR CERRO DE PASCO

\$0.04; accounting, superintendence, and miscellaneous, \$0.28.

Each operating item of labor and material used is charged to either the individual working place or to a general subdivision, such as pumping, tramming, or other operation. Each account or shop order is assigned a number. Classification of all labor and material slips is made daily, and the amounts are posted daily on an individual sheet for each account number. These sheets are supervised by the engineering department to eliminate errors of classification. Power costs are distributed by the accounting department on the basis of engineers' estimate of power used for various purposes, and estimates are revised periodically to meet changing conditions.

General

Production is uniform and probably will not be increased during 1919 and 1920, nor until completion of the new smeltery now building. Although

be no difficulty in maintaining a smeltery production of 70,000,000 lb. of copper per year.

A Recent Copper Leaching Patent

A new process for leaching ores containing copper sulphate, either natural or produced by roasting, was patented on Dec. 30, 1919, by John J. Nelson, of Los Angeles. The leaching is done by a solution of bisulphate of soda and common salt. The gangue is then filtered off, and the clear solution passed into a tank, where the copper is precipitated with finely divided iron. Sodium chloride is also added in the precipitating tank.

Power Alcohol may possibly be obtained as one of the by-products of coal distillation, according to an article in the "Times Trade Supplement." The gases produced from gas retorts and coke ovens contain about one-half of 1 per cent, by weight, of ethylene, and a process is being devised for collecting this ethylene and converting it into alcohol.

Loading Machines for Underground Use

Their Efficiency in Reducing Mucking Charges—Underground Loader Must Dig as Well as Load—
Experience Indicates Preference for Compressed Air as Motive Power
in Underground Mechanical Loading

BY A. M. GOW

Written exclusively for *The Journal*

THE desirability has long been recognized of some machine that will reduce the arduous labor or "mucking," or shoveling ore or coal into tram cars underground. Many attempts have been made to produce such machines. Machinery has been introduced into almost all other operations of mining to increase the tons per man and reduce operating cost. Even the books are kept and the bills made out by machine; but the No. 2 shovel still holds its own. It will have to give way, however, for the insistent demand for an underground loader, and the efforts that are being made to produce it cannot fail to bring about a certain degree of success.

It is not to be expected that one design of machine will meet all requirements, because the underground conditions as to head-room, tonnage, and character of material vary between extremely wide limits. A machine admirably adapted for work in one mine might prove utterly useless in another. The conditions in one mine might warrant an investment wholly prohibitive elsewhere. A machine designed to handle a large tonnage in a low coal seam would in all probability prove inoperative in an iron ore mine on the Mesabi Range. Compressed air may be the most suitable source of power in one district and electricity in another. Consequently, there is room for machines of several types differing from each other not only in detail of design but in their fundamental principles of operation. These fundamental principles have already been pretty well disclosed and incorporated in many machines, many of which have been of a more or less experimental nature.

No One Machine Meets All Conditions

The ambitious inventor would do well to examine the files of the Patent Office and familiarize himself with the state of the art and also learn as much as he can from the successes and failures of other inventors. It is usually a good plan to begin where the other fellow has left off. Possibly some genius may appear with some new and revolutionary idea, but that seems hardly probable. Success is to be looked for in the proper mechanical design and proportion of parts and adaptation to a given set of conditions. No one machine will meet them all.

It is useless to attempt to draw a general specification for an underground loader or to make an accurate statement as to the requirements it shall fill, except in the most general terms. Of course, it should be low in first cost, but at the present time it is almost impossible to hazard a guess as to what is the maximum price an operator can afford to pay. "Low first cost" in one place might be ruinously high in another. Simplicity of mechanism and few-

ness of parts are of course desirable, particularly in ore mines where the stuff handled is fine and as abrasive as emery. Inasmuch as the operators have little mechanical skill and training, the machine should be as near "fool proof" as possible. When the machine fails the whole mining program is liable to derangement; there is no place to put the machine and facilities for repairing it are poor. But such considerations should not be given undue emphasis. Machines on the surface break down and wear out, but operators do not go without them on that account. Furthermore, operators must not expect too much at this time. After the designer has done all he can, the machine must be really developed underground. And here the manufacturer and the user should co-operate to their mutual advantage.

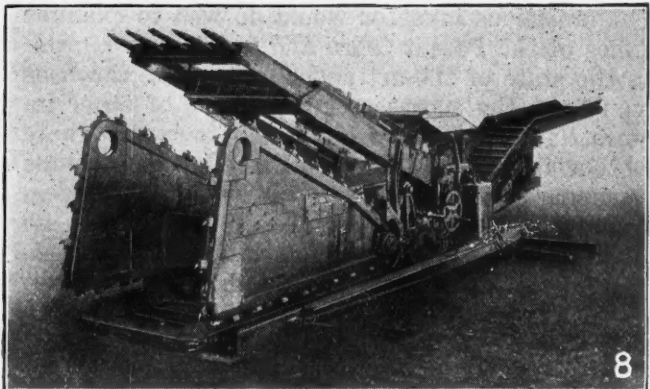
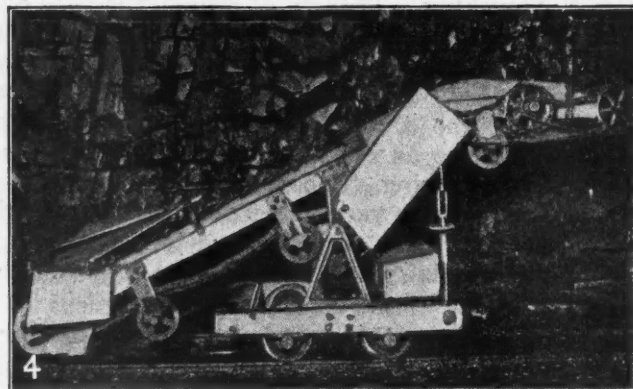
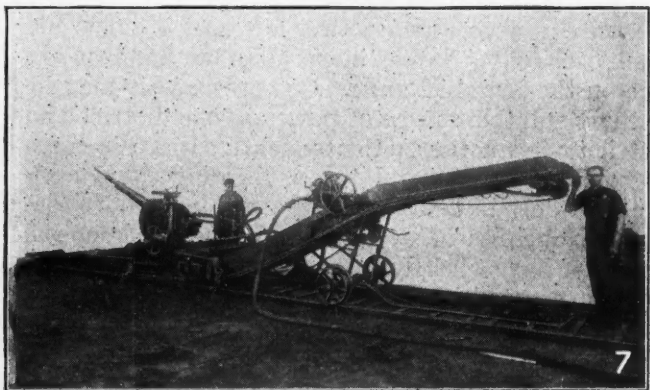
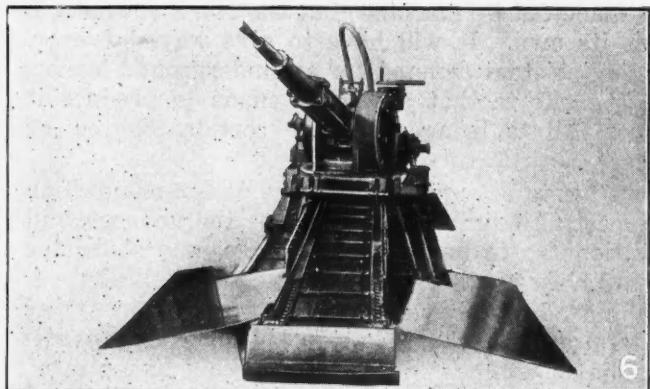
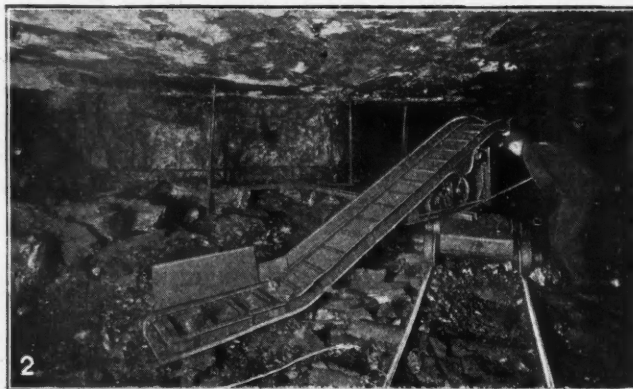
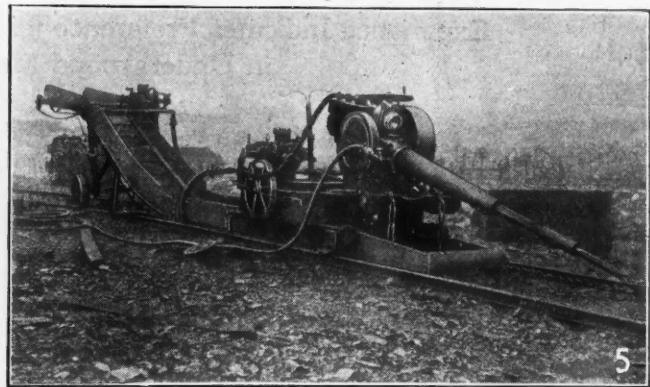
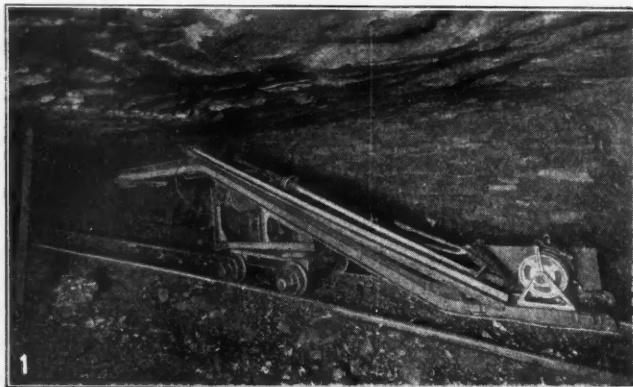
There is no doubt about the demand for such machines, and the increasing wage scale and the scarcity of men able and willing to "muck" make the demand more acute. Some operators hold that, even if machines should not reduce the cost of production, there would be other gains not shown upon the cost sheet that would make the use of machines well worth while. If, in addition to doing the work, machines will reduce the cost of production, taking into consideration investment, maintenance, and depreciation, so much the better.

Time Consumed in Mucking

Time studies made underground in mines when a number of operations constitute a cycle and result in the production of a certain tonnage usually show that the most promising field for saving labor is upon that item where labor is most largely expended, namely "mucking." Though, of course, the time consumed in the different operations varies greatly in different mines, take it by and large in metal mines, it appears that "mucking" consumes 35 to 40 per cent of the time, the remainder being distributed over such items as blasting, blowing out smoke, tramming, trimming, timbering, drilling, track laying, and so forth, in varying percentages. Evidently the place to increase efficiency and tons per man is upon the shoveling of the dirt after it has been broken down.

It would appear that greater activity has been shown in the coal-mining industry to produce such machines than has been shown in that of metal mining. The tonnage and the character of the material are probably more favorable in coal than in metal mines. But each has its own difficulties. In no place does the problem seem an easy one.

Shoveling into tram cars really comprises two operations: digging the loose material and elevating



FIGS. 1, 2, AND 3. JEFFREY PIT CAR LOADER.—FIG. 4. CLEVELAND-CLIFFS IRON CO.'S LOADER.—FIGS. 5, 6, AND 7. INGERSOLL-RAND ENTRY CUTTER AND LOADER.—FIG. 8. JEFFREY-MORGAN MINING AND LOADING MACHINE



FIG. 9. JEFFREY-MORGAN MINING AND LOADING MACHINE

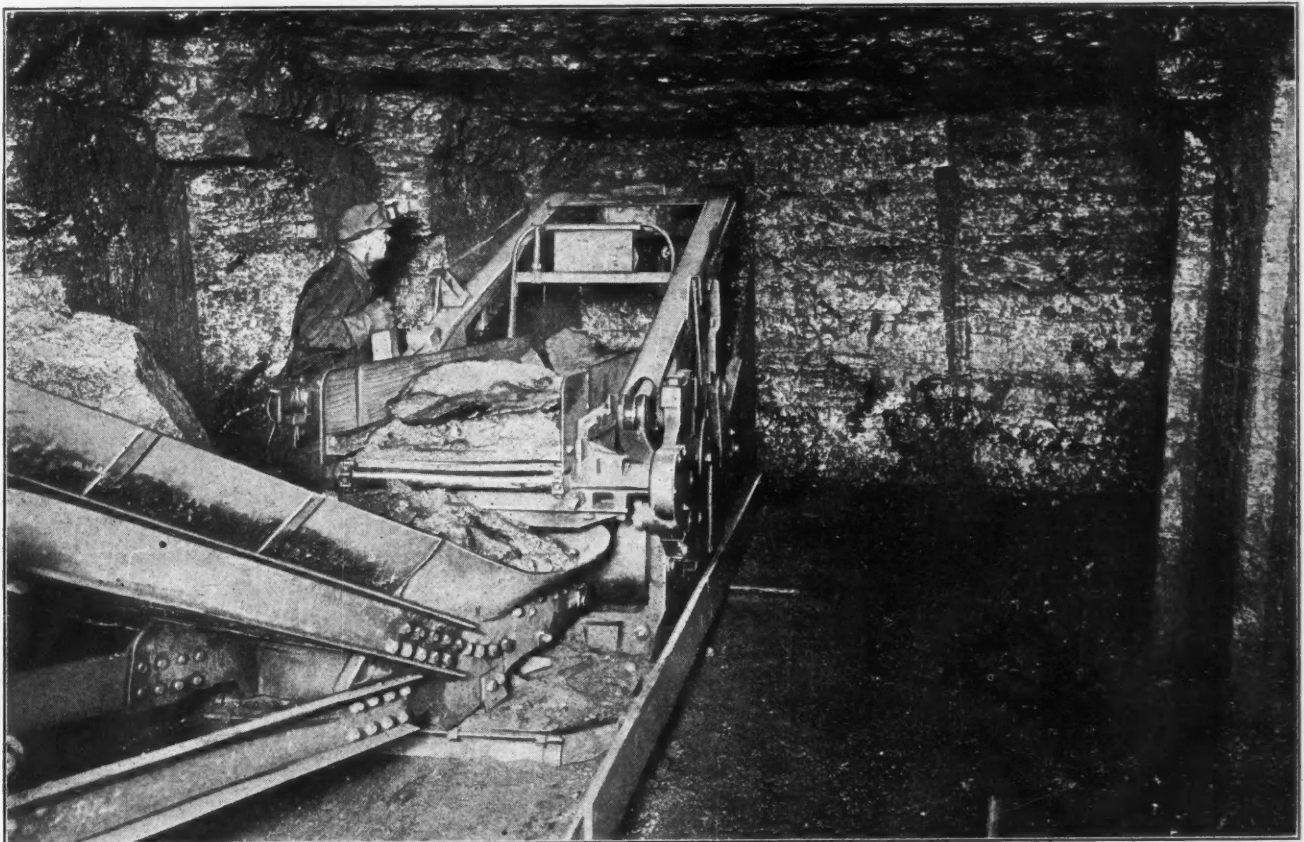


FIG. 10. JEFFREY-MORGAN MINING AND LOADING MACHINE

it into the cars. Inventors and mechanics working along different lines have produced distinct types of machines, varying between wide limits in cost and weight and ranging in all degrees from extreme simplicity to great complexity. An attempt is here made to group these various machines according to their fundamental principles. Such grouping or classification is necessarily inexact, because the types overlap each other and some machines might reasonably appear in two groups. The purpose, however, is to show what has been tried from the mechanical standpoint. The economical results and effects upon the cost sheet will not be treated here.

eter as practicable. The ore or coal is shoveled by hand upon the conveyor at its lower end, and elevated into the tram car. This machine is not upon its own wheels, but is moved through the drifts on a timber truck and set in any position desired. Several years ago the Cleveland-Cliffs Iron Co. at Ishpeming, Mich., built such an elevator and mounted it upon wheels. It is shown in Fig. 4.

Inasmuch as a surface wagon loader along similar lines is in very general use, it would seem that there might be a field for this type of machine if properly designed to meet underground conditions. But apparently the feeling among mining men is that if the

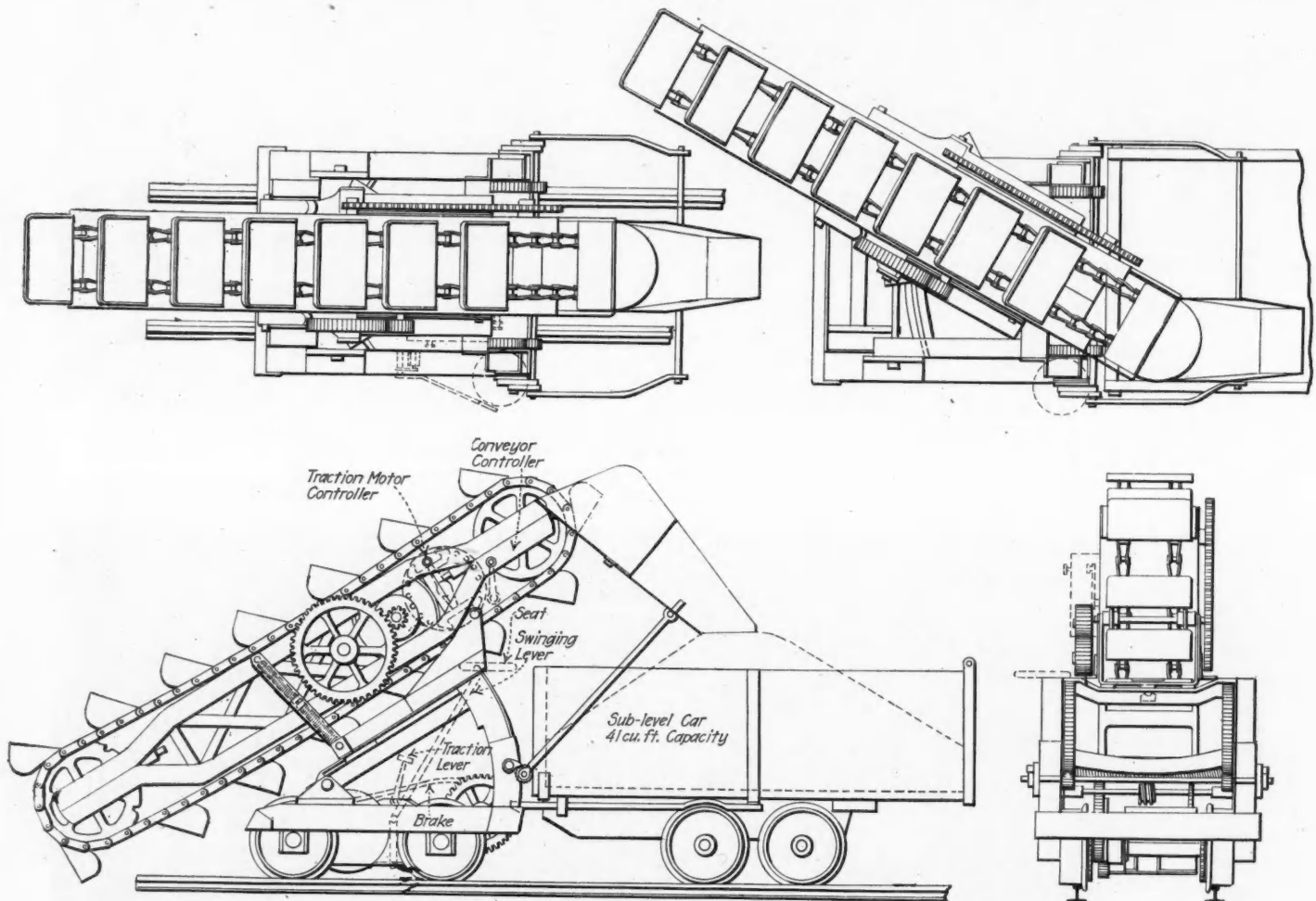


FIG. 11. McQUEEN LOADER, BUILT BY OLIVER IRON MINING CO.

Such statements are liable to be very misleading, and results obtained with the same machine may differ greatly at different mines.

It has occurred to many persons that the problem could be at least partially solved by a machine that would simply be a loader and not a digger, the idea being that the heavy labor comes in in raising the loaded shovel to the top of the tram car. Probably the simplest form in which the idea appears is in the Jeffrey Pit Car Loader, as made by the Jeffrey Manufacturing Co., Columbus, Ohio. It is shown in Figs. 1, 2 and 3. The machine here shown consists of a motor-driven belt conveyor set upon an incline, passing over head and tail pulleys as small in diam-

eter as practicable. The ore or coal is shoveled by hand upon the conveyor at its lower end, and elevated into the tram car. This machine is not upon its own wheels, but is moved through the drifts on a timber truck and set in any position desired. Several years ago the Cleveland-Cliffs Iron Co. at Ishpeming, Mich., built such an elevator and mounted it upon wheels. It is shown in Fig. 4.

Inasmuch as a surface wagon loader along similar lines is in very general use, it would seem that there might be a field for this type of machine if properly designed to meet underground conditions. But apparently the feeling among mining men is that if the material has to be shoveled anyhow it might just as well be shoveled into the car and be done with it, and to fill the bill an underground loader must dig as well as load.

It has been suggested time and again that a modification of the idea almost universally used on concrete mixers could be used for underground loading. Sand, cement, and aggregate are deposited upon a pan, and then, by power means, the pan is elevated to discharge into the drum. If a similar pan were adopted to discharge into a tram car, the shoveling onto the pan would be mostly on the level, large chunks would not have to be lifted by hand, and a fair proportion of the dirt could be picked off the pile



FIG. 12. THE JACKSON SHOVEL WHICH EMBODIES THE BUCKET-ELEVATOR IDEA

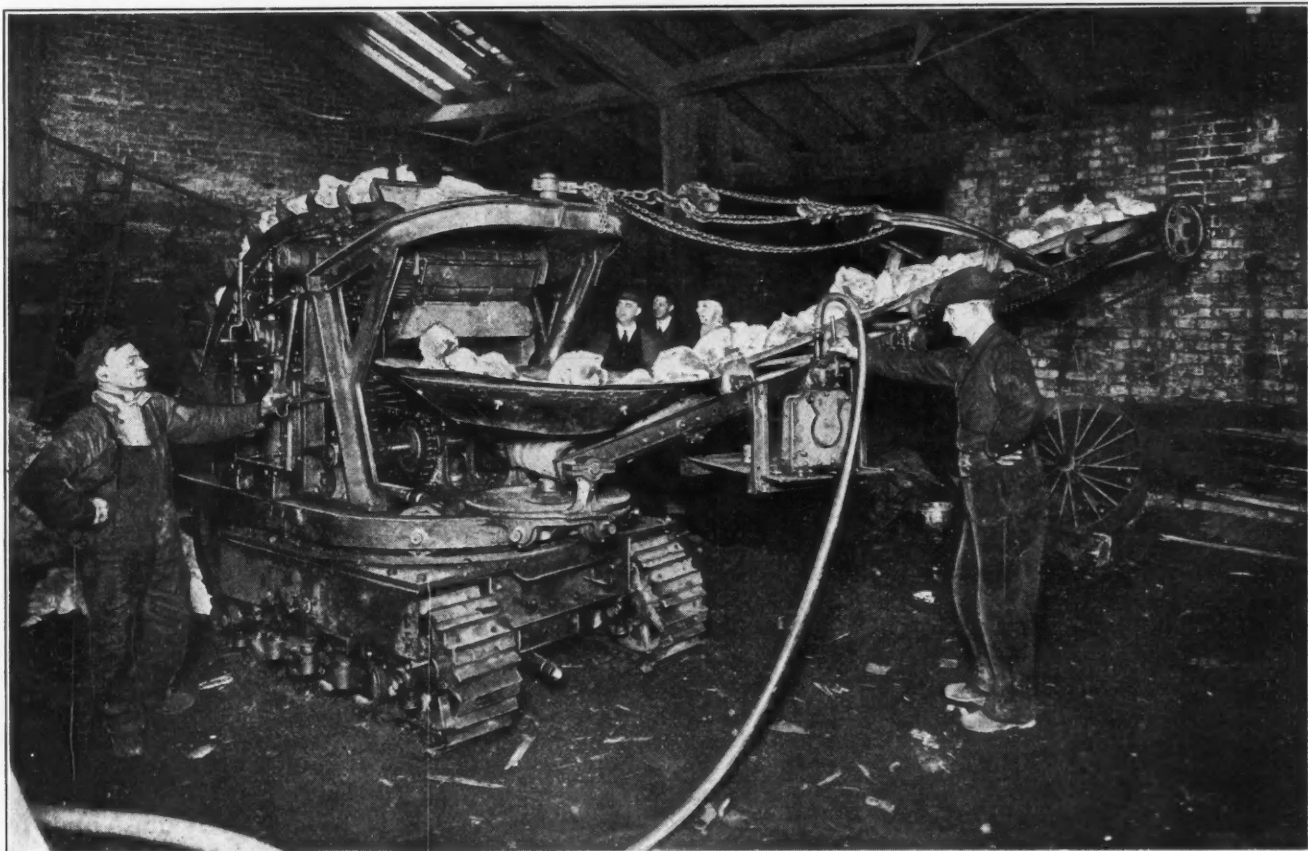


FIG. 13. REAR VIEW OF THE JACKSON SHOVEL

right onto the pan. By means of a wire rope and a small winding drum, the pan could be elevated through simple guides of structural steel so bent at the top as to dump the pan into the car. In the absence of power, the drum could be turned by hand like a winch. So far as I know, this idea, although sketched in several forms, has not been reduced to practice. This proposal meets with the same objection. The machine does not dig. It only elevates. It does but half the work. If the capacity of the machine to load is limited by the shoveling capacity of the men, it is not worth while. Whether or not this position is well taken, the fact remains that although proposed and tried out some years ago,

fully in certain coal mines, it has not come into general use. In iron mines it, of course, is out of the question.

The same fundamental idea of breaking the coal down so as to fall onto an elevator was worked out in a very elaborate manner by the Jeffrey Manufacturing Co. It was brought out in 1913 and is called the Jeffrey-Morgan Mining and Loading Machine. It is designed for thick coal seams. It is shown in Figs 8, 9 and 10. The undercutting and vertical shearing are done by cutting chains, and a series of heavy reciprocating picks break down the coal onto the conveyor underneath, which discharges onto a second conveyor, which in turn, delivers into the car.

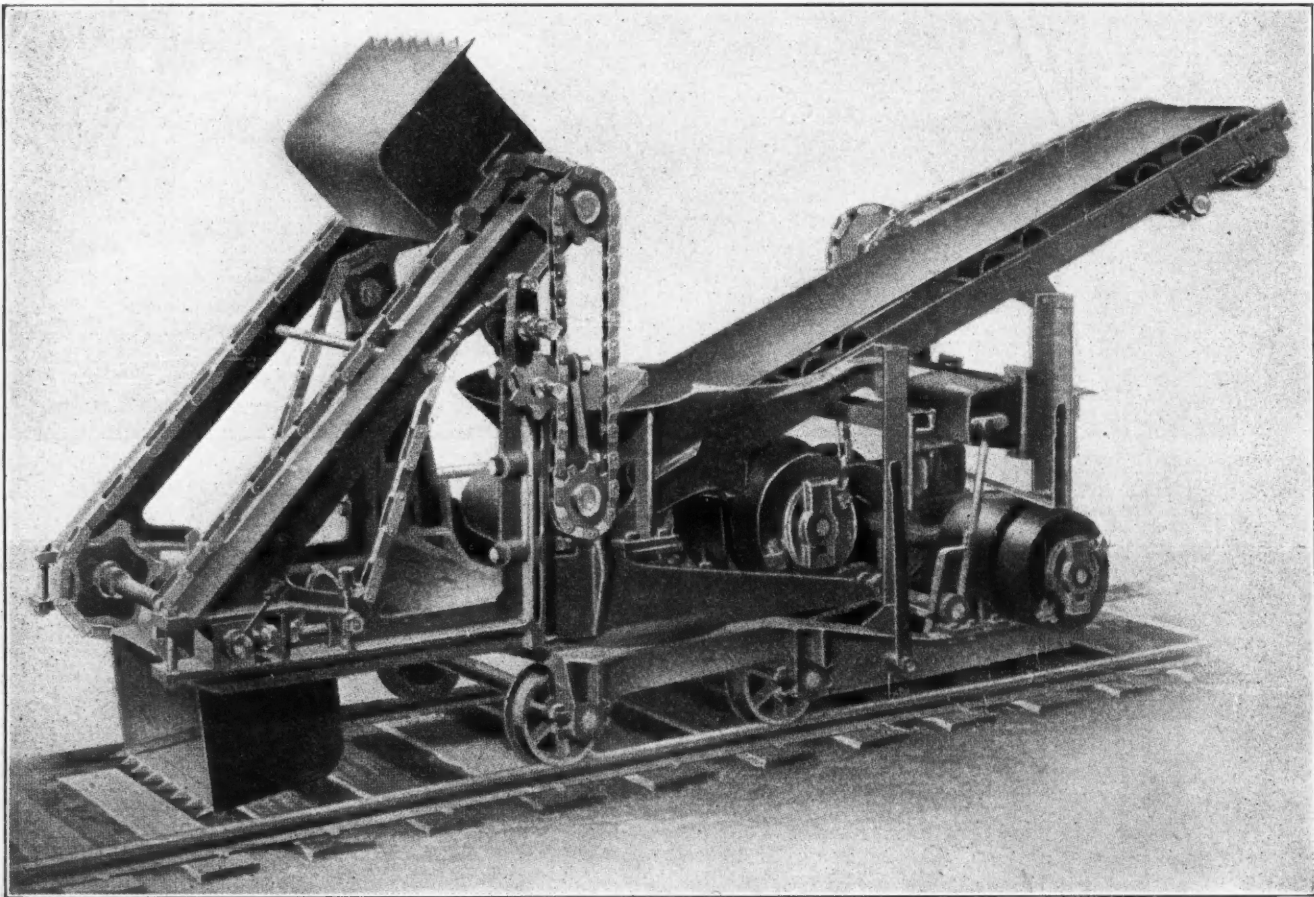


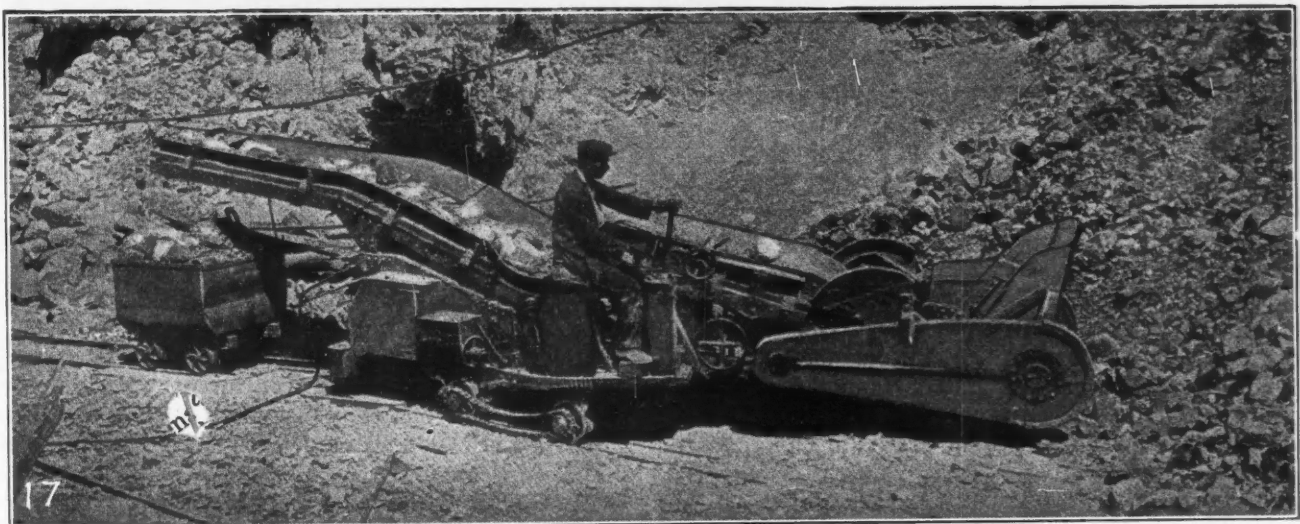
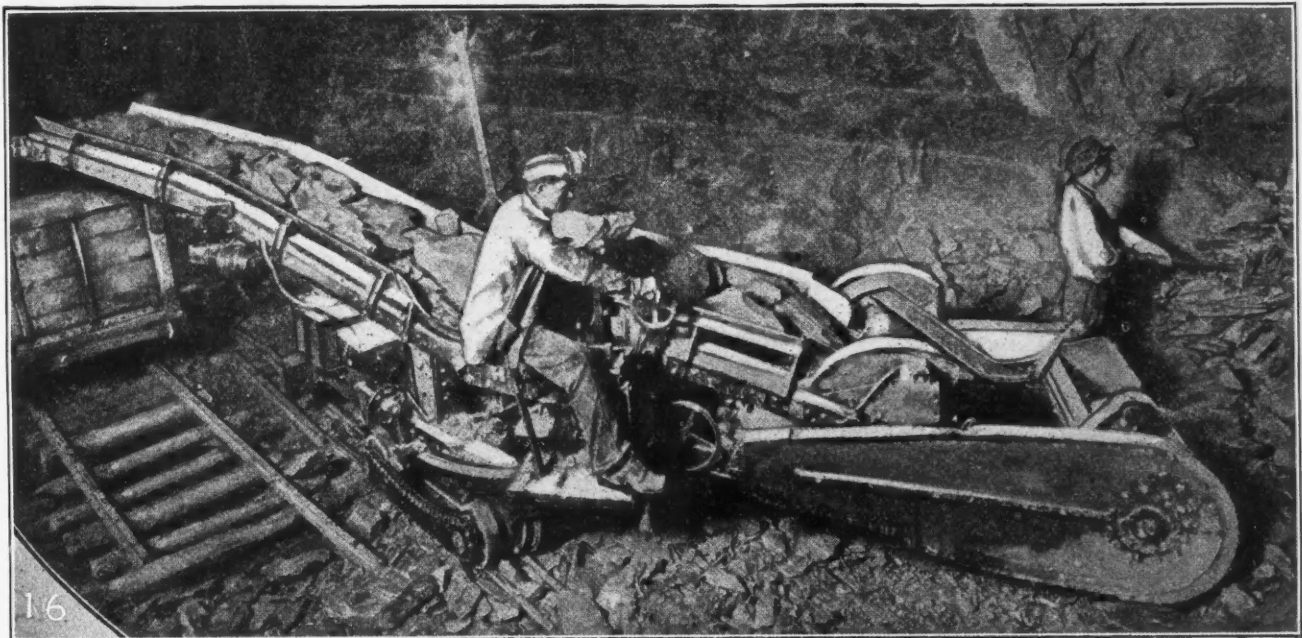
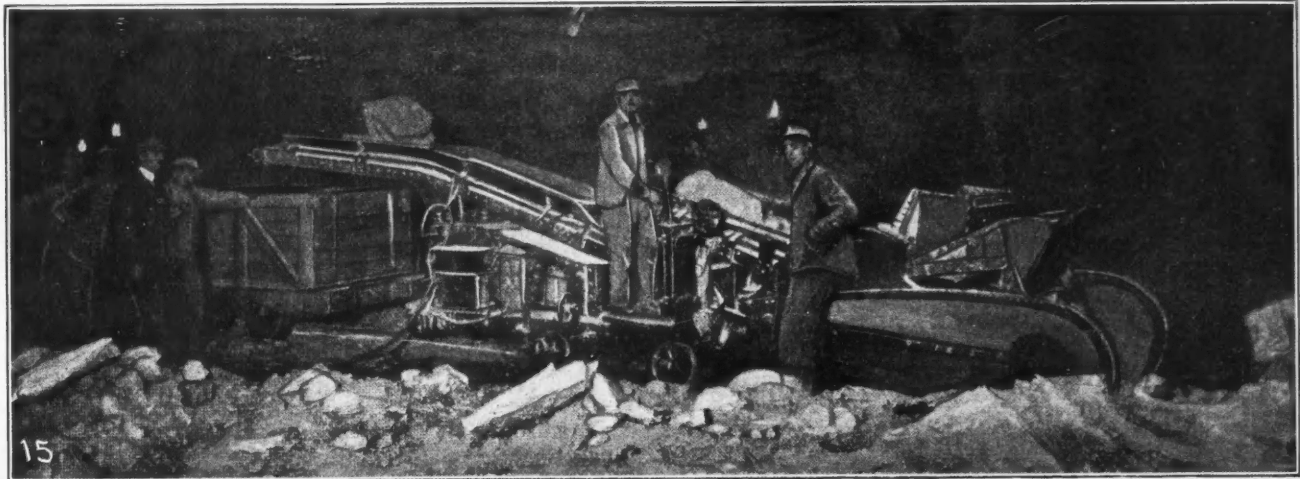
FIG. 14. McDERMOTT CONTINUOUS TWIN SCOOP LOADER

machines that simply elevate and do not dig have not come into extensive use in mining operations.

To avoid shoveling onto the conveyor the Ingersoll-Rand Co. about ten years ago developed a combination of coal puncher and elevator shown in Figs. 5, 6, and 7. A powerful puncher is situated on a carriage over the low end of a flat conveyor. The puncher is capable of vertical and lateral movement. The first operation is to undercut the seam, then move the low end of the conveyor as far forward as possible and break the coal down upon the conveyor. Obviously, such a machine could be used only in material like coal, soft enough to be mined without blasting. In fact, one strong claim for the machine was that it dispensed with explosives. Though it has been used success-

This machine, though tried out thoroughly, has not proved popular. The number of movable parts, its complexity, and high cost seem to be against its general adoption, even in mines working seams of sufficient depth to permit of its operation. Like the Ingersoll-Rand machine, it can operate only in material so soft that blasting is not required.

As was to be expected, the idea of a bucket elevator has appealed to a number of ambitious inventors. On the surface, bucket elevators dig from a boot, elevate, and discharge. Why not do the same underground? Such a machine must be able to hold itself against the pile of dirt in order to make the bucket fill. Under its own power it must have forward and backward motion, and, in addition, a certain amount of radical motion to cover the width of



FIGS. 15, 16 AND 17. MYERS-WHALEY SHOVELS IN OPERATION

the breast. Twenty-odd years ago such a machine was built at the shops of the Minnesota Iron Co., Tower, Minn., intended for use at the Fayal mine. It was a heavy, clumsy affair, and did not prove at all satisfactory. No photographs or drawings are available.

A machine along similar lines, though much more carefully designed, was built about five years ago in the Hibbing shops of the Oliver Iron Mining Co. It was designed by H. R. McQueen. Fig. 11, reduced from the general drawing, shows the arrangement. It gave good results so far as it was tried, but was not in service long enough to really determine its limitations. Unfortunately it was destroyed in a

tising literature the following description is taken: "The material is taken up by scoops or buckets on an endless chain, elevated and dropped into a hopper, which feeds to a conveyor belt, which, in turn, loads into a car. The scooping mechanism is so pivoted that it can dig as well to the side as to the front of the machine. The ore, however, being delivered to the conveyor through the hopper, reaches the car behind the loader no matter at what angle the scoop is loading. The dimensions are: Length, 15 ft. 9 in.; height, 6 ft. 7½ in.; width, 4 ft. 0 in.; weight, 8,000 lb." The average loading capacity is given as 45 tons per hour. It is reported as giving excellent results in at least one iron mine in Michigan.

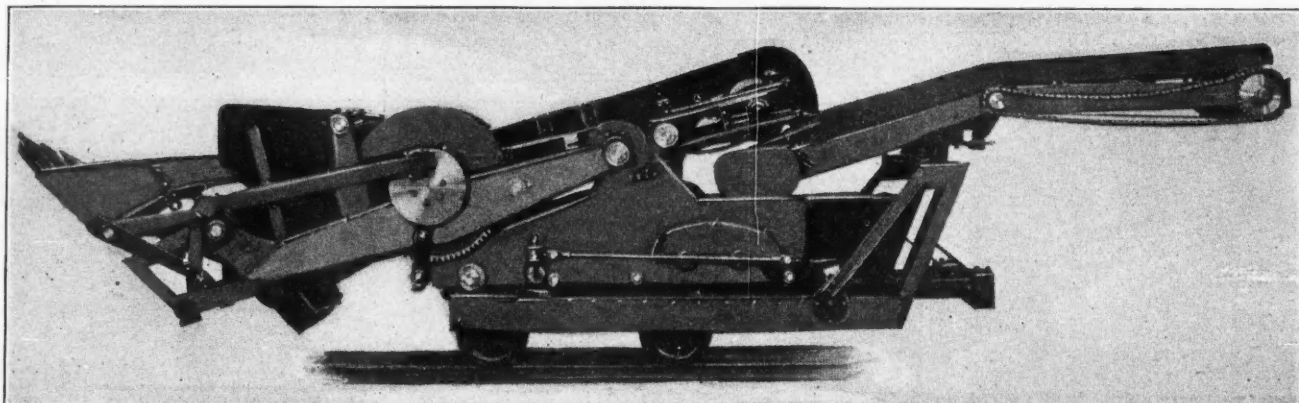


FIG. 18. HALBY SHOVELING MACHINE

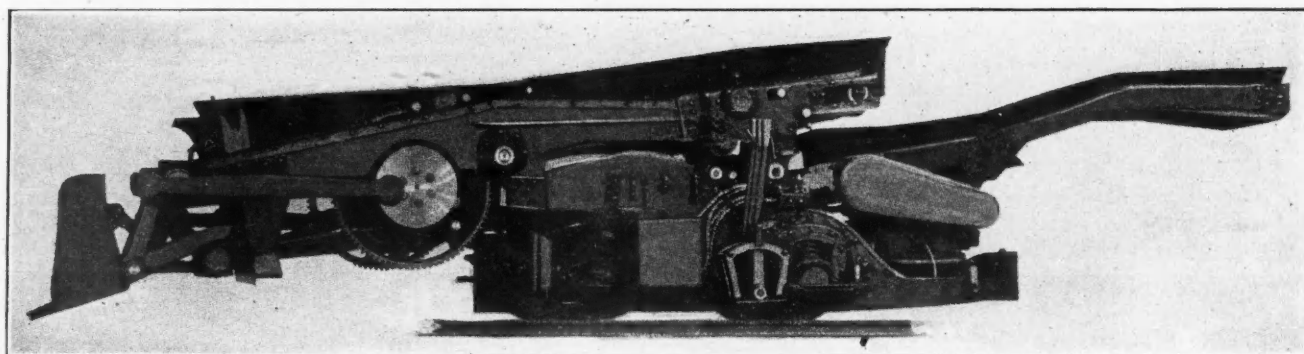


FIG. 19. HALBY SHOVELING MACHINE

fire without having had a fair chance to show what it could do.

A very ambitious attempt along the bucket-elevator line is shown in Figs. 12 and 13. This machine, known as the Jackson shovel, has been built in five sizes. Obviously, the machine here shown was not designed to meet the underground conditions of the average mine. A much smaller model, only 5 ft. 6 in. high, was designed for mining use. I am not informed as to what is the status of this machine today, or whether it was ever given a thorough try-out underground.

The latest aspirant for public favor of the bucket-elevator type is known as the McDermott Continuous Twin Scoop Loader and is put on the market by the Wellman-Seaver-Morgan Co., Cleveland, Ohio. Fig. 14 gives a clear conception of it. From the adver-

From the mechanical standpoint, machines of this type are subject to the criticism that, inasmuch as iron ore is very gritty, the many movable parts, links, pins, and other members, incident to the use of a chain belt will be subject to excessive wear. How serious this objection is remains to be seen. It undoubtedly has less weight applied to machines for use in coal mines than in iron mines. Machines will wear out, and repairs and maintenance are an offset to the advantage and economies effected by any kind of machine loader.

Another type of machine comprises a reciprocating digging element at the front that discharges the material onto a conveyor that delivers it into a tram car in the rear. Two machines, the Myers-Whaley, built by the Myers-Whaley Co., Knoxville, Tenn., and the Halby, built by the Lake Shore Engine Works,

Marquette, Mich., incorporate the idea. These are beyond the experimental stage, having gone through several years of experience and trial and the strengthening of weak places. They show careful design, and under certain conditions of operation have proved entirely successful. The Halby has been pretty thoroughly tried out in the iron mines of Michigan, and, though it proved entirely operative so far as digging and loading was concerned, it has not met with favor sufficient to warrant its general introduction as a substitute for hand mucking. The size, weight, first cost, and mechanism of these machines, in the opinion of the operators of iron mines, leave them out of the running in competition with hand labor. The Myers-Whaley machine is shown in Figs. 15, 16 and 17, and the Halby machine in Figs.

Another machine which properly belongs in this group, but differs radically in mechanical construction, was built by Messrs. Billings & Middlemiss and tried out at the Morton mine, in the Mesabi Range. It is shown in Fig. 20. The digging element in this case is a large, powerful hoe, having a forward and backward motion, adapted to hoe the ore onto an apron. From the apron the ore is discharged onto a belt conveyor and thence into the tram car. The belt conveyor was operated by an air engine, and the movement of the hoe, the swinging motion to enable the hoe to cover the width of the breast and the tilting motion of the conveyor, was obtained from direct-acting air cylinders. Underground at the Morton mine the machine was reported to be digging and loading successfully, but apparently it never got

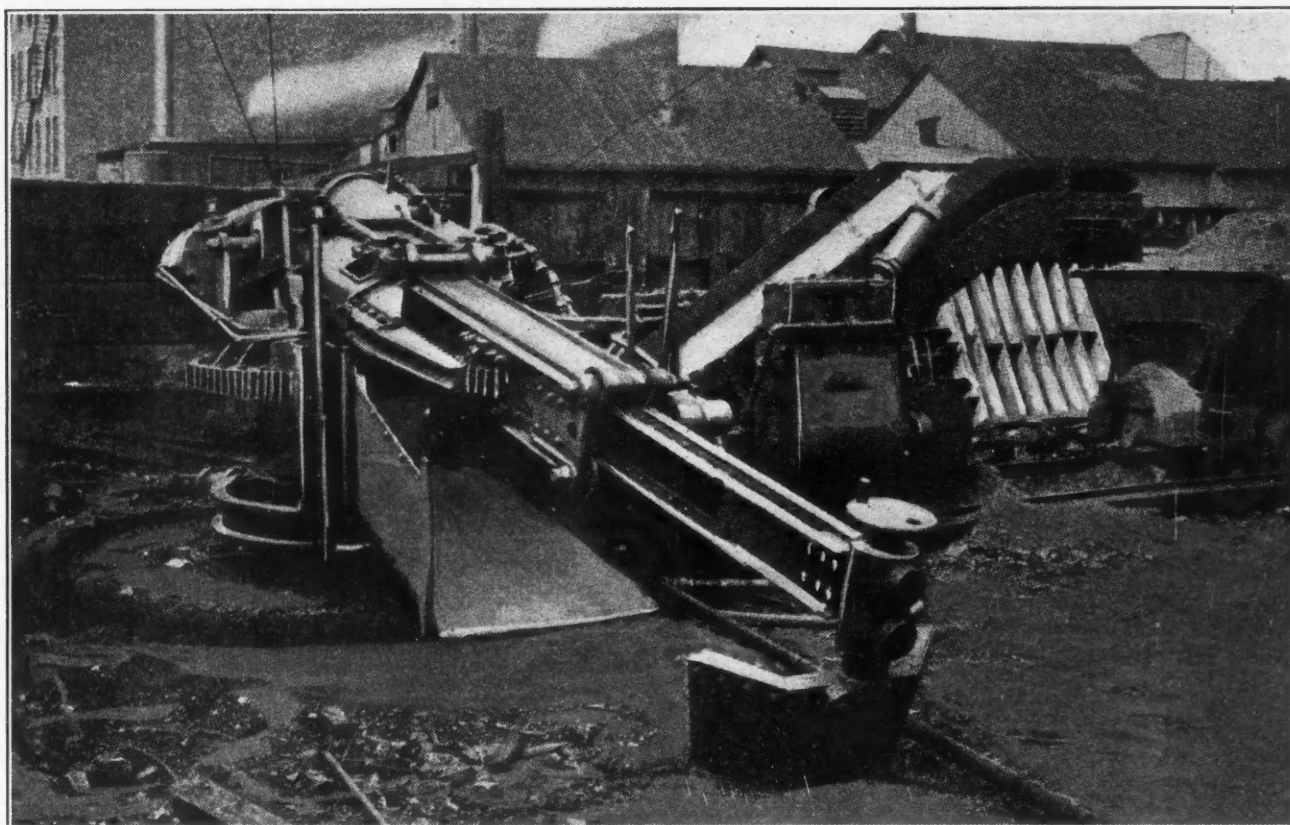


FIG. 20. BILLINGS & MIDDLEMISS MACHINE

18 and 19. Both machines are built in different sizes. The dimensions of the No. 4 Myers-Whaley are given as length, 26 ft. 0 in.; height, 4 ft. 6 in.; weight, 18,000 lb. The No. 2 model has a length of 21 ft. 0 in.; height, 3 ft. 10 in.; weight, 9,000 lb. The latest model of the Halby, T-700, is 23 ft. 4 in. over all, 4 ft. 6 in. high, and 4 ft. 8½ in. wide.

In the Pennsylvania coal regions the Halby has been installed in several mines and is reported as giving most excellent results. A capacity of one ton a minute is easily obtained. In fact the tonnage is limited far more by the difficulty of getting cars than by the capacity of the machine to dig and load. In this respect the loading machine is ahead of the management, and if it is the intention to use machines the mine should be laid out accordingly.

beyond the developmental stage, and so far as I can learn it is not being exploited today.

Where stopes are high enough and tonnage is large enough, there is no reason why revolving, motor-driven machines of the steam-shovel type should not be operated underground. It would seem that a small revolving shovel would go a long way to solve the problem in many mines, and, as would be expected, the idea has been mechanized along several lines. The fundamental conception is that of a shovel or dipper filled by forcing it into the pile, then raised, revolved 180 degrees, the dipper door tripped, and the load dropped into the car.

The Thew Automatic Shovel Co., of Lorain, Ohio, build a small, motor-driven shovel especially designed for underground work. Though it is a small

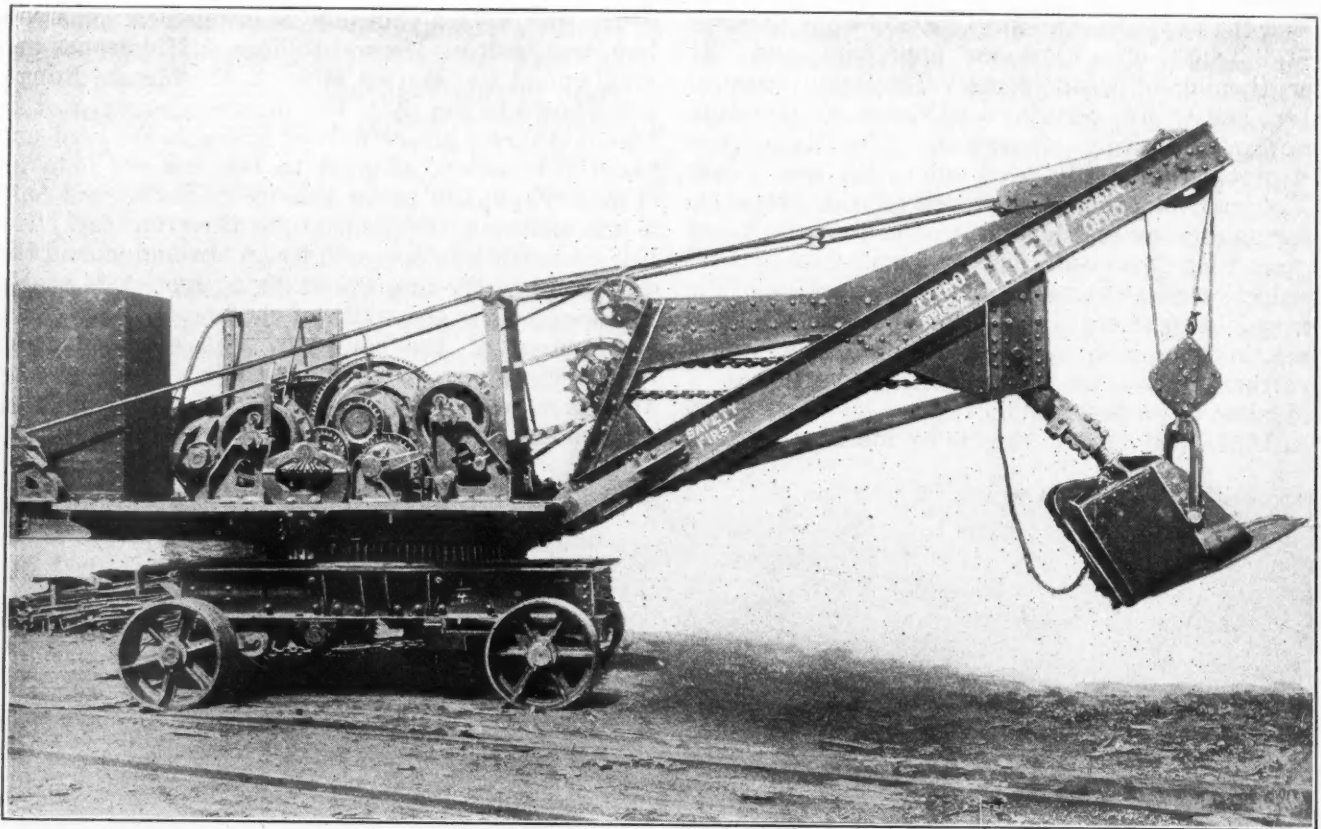


FIG. 21. THEW MOTOR-DRIVEN UNDERGROUND SHOVEL

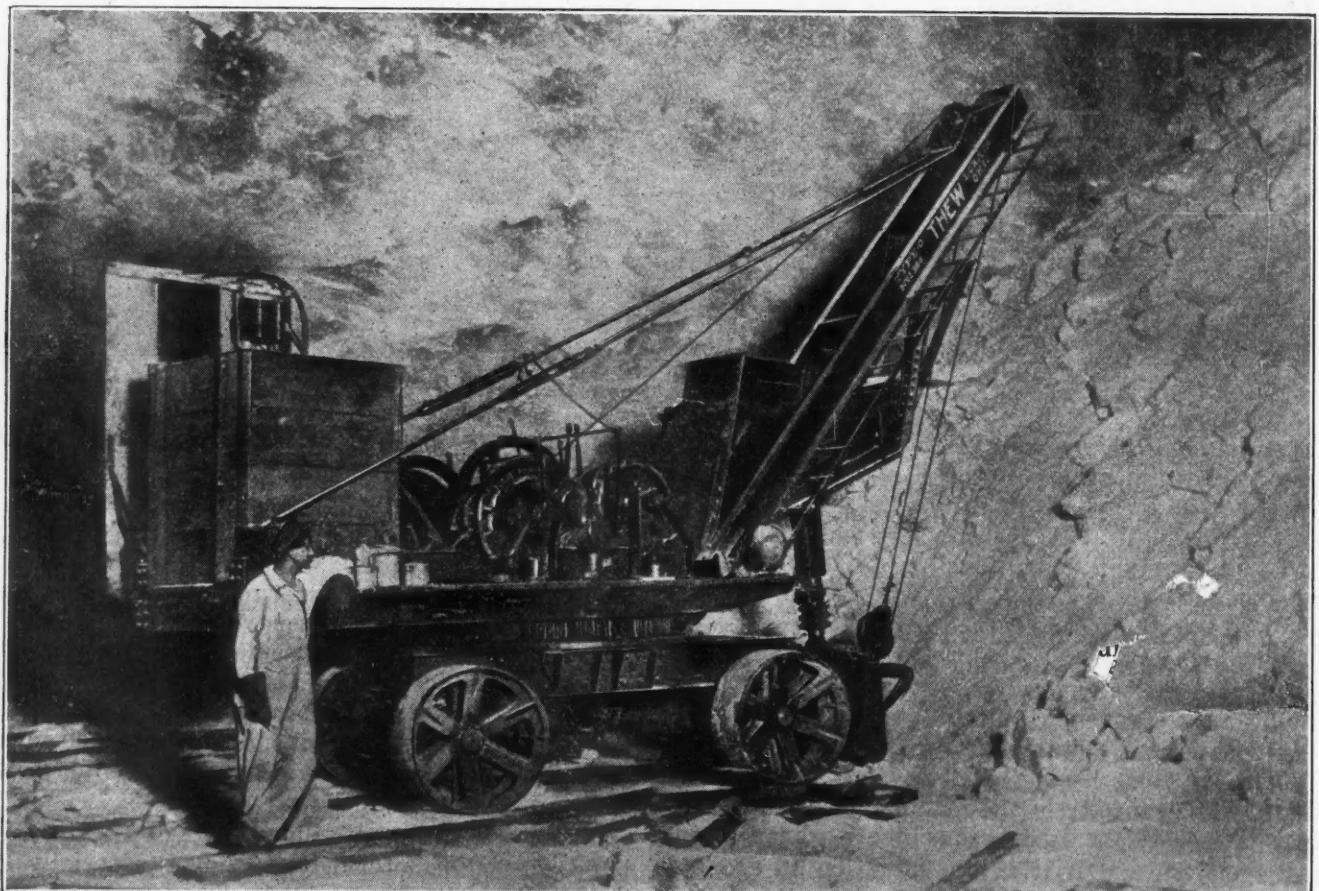


FIG. 22. THEW SHOVEL INSTALLED UNDERGROUND

machine as steam shovels go, it is quite large as an underground loader. It is shown in Figs. 21, 22 and 23. The dimensions given are over-all height, 9 ft. 0 in. to 12 ft. 0 in., over-all length about 25 ft. 0 in. One twenty-horsepower motor by means of friction clutches furnishes power for the operations of hoisting, crowding, swinging, and propelling. Where head-room will permit and tonnage warrant, there can be little question as to the operativeness of this machine.

A large builder of mining machinery is now engaged upon the development of a machine of this general type designed to work in low coal seams. A

For several years Captain Samuel Hoar, a mining man of Virginia, Minn., has worked to produce a revolving shovel small enough and strong enough, sufficiently simple and "fool proof," to meet the demand upon the iron ranges of Minnesota and Michigan. The results of his efforts are embodied in the Hoar Loader, as manufactured by the National Iron Works, Duluth, Minn. It is shown in Figs. 24, 25, 26 and 27. Upon a truck is mounted a turntable, carrying the "power unit." This "unit" consists of three reversible air engines, each controlling one motion of the machine. The dipper first moves forward horizontally by the action of one engine. It is then

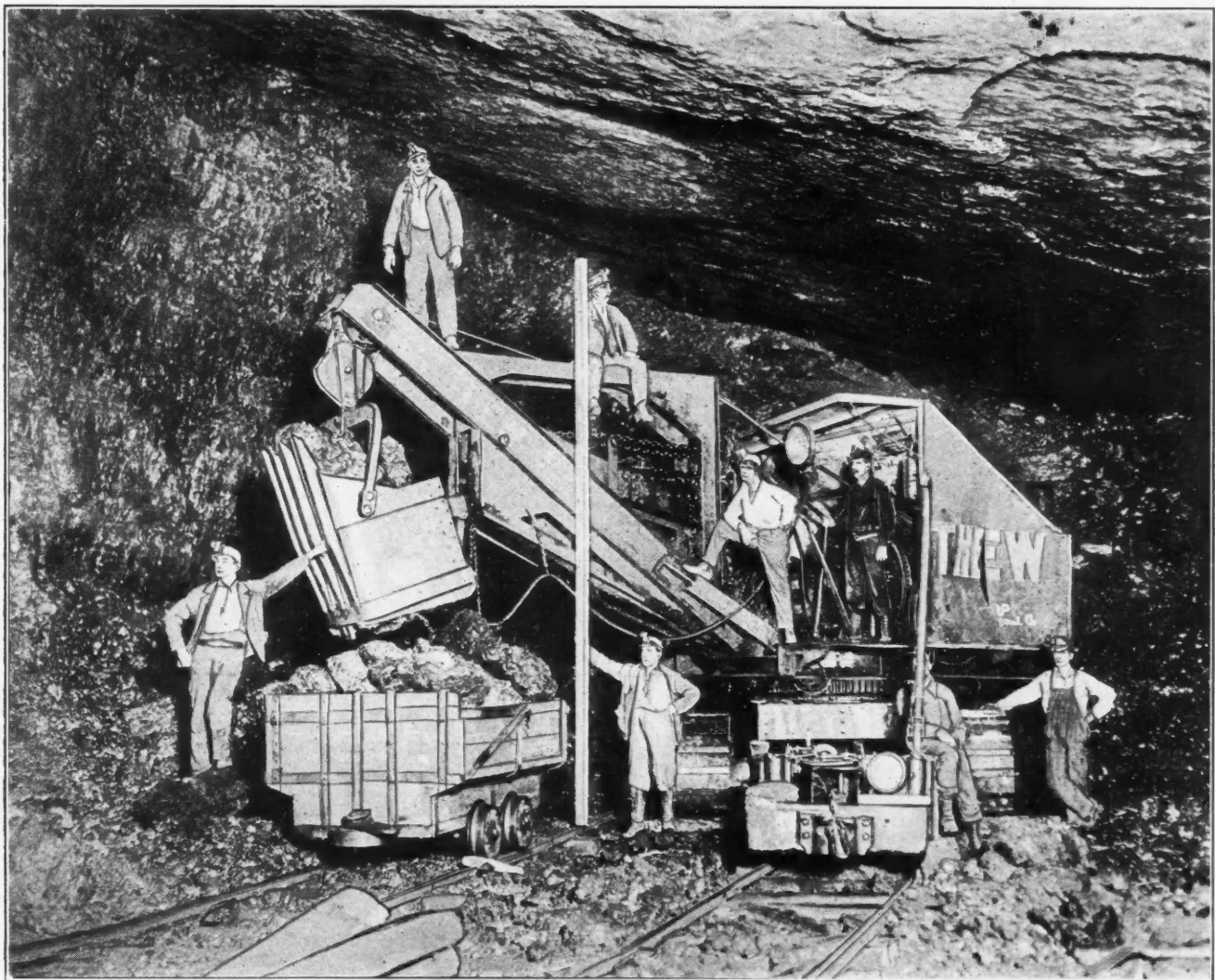
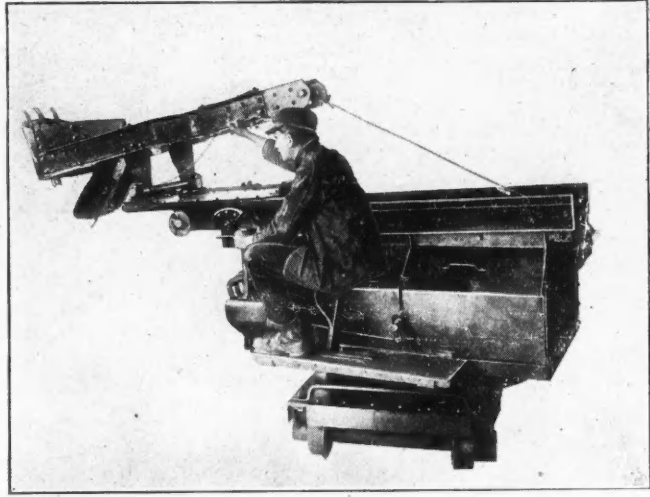
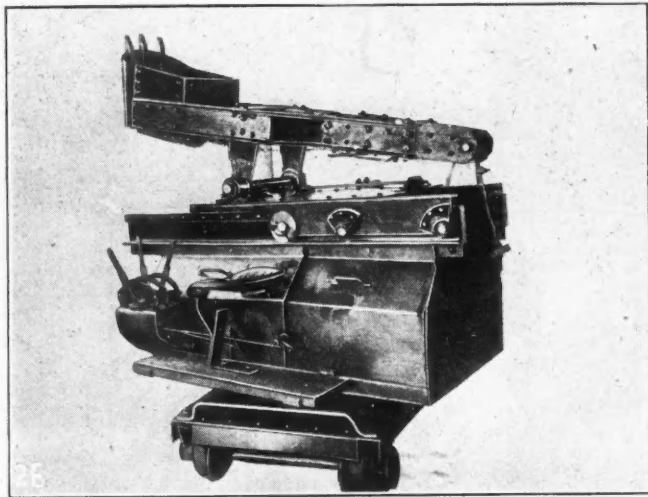
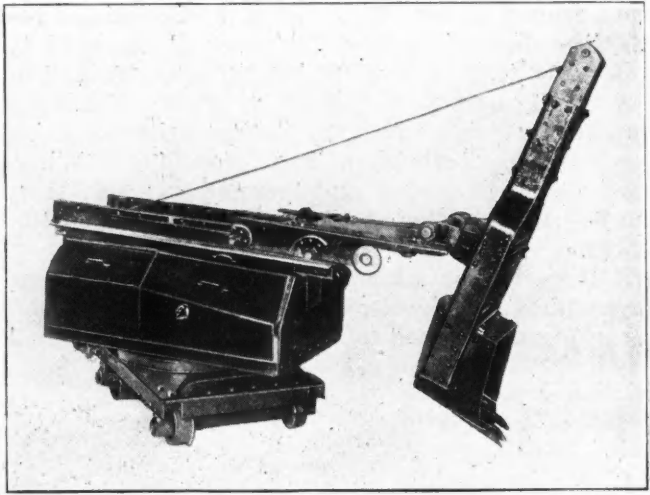
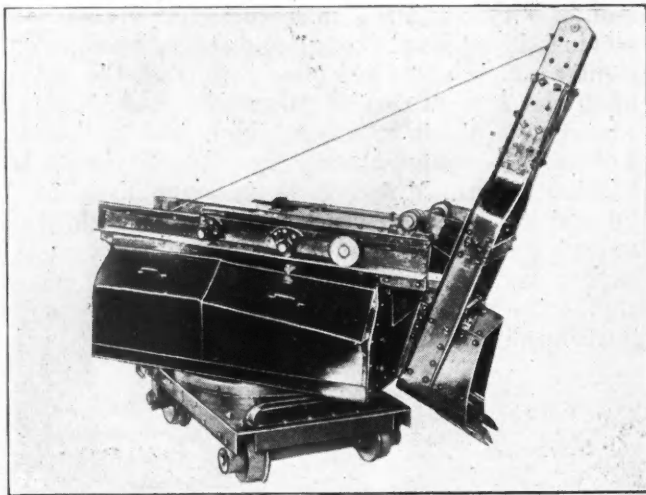


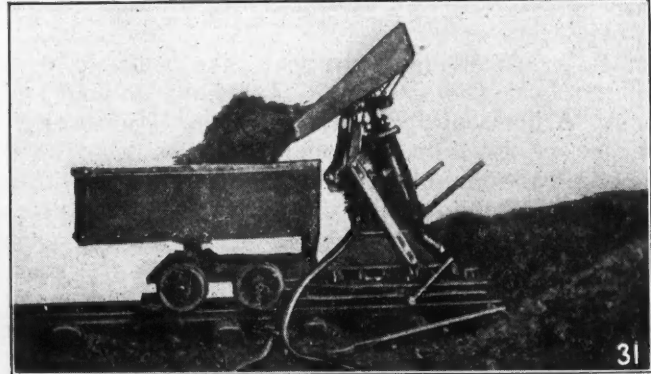
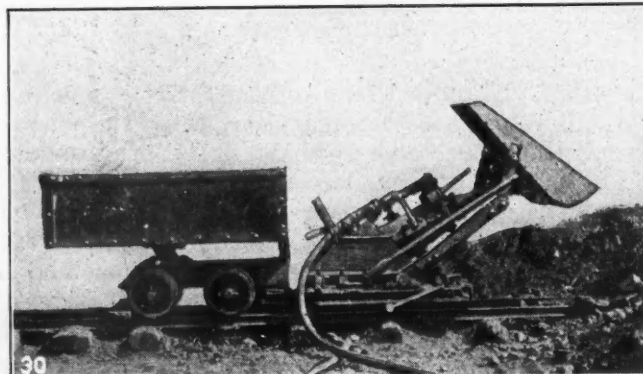
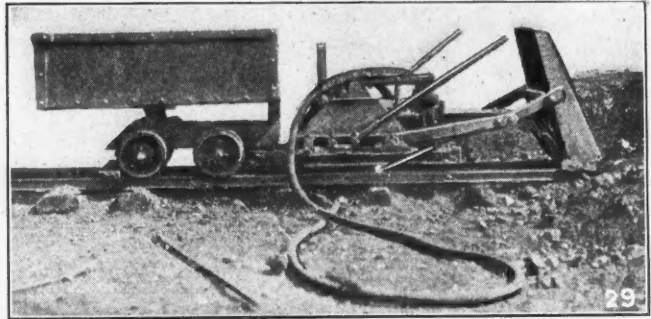
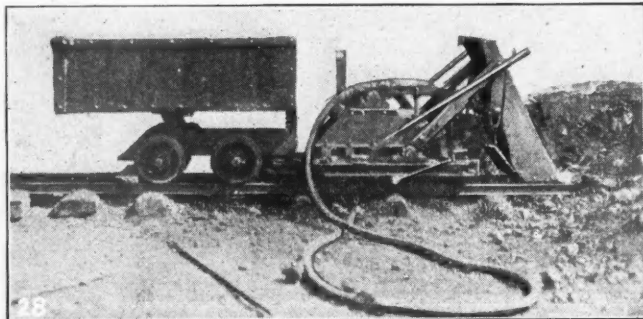
FIG. 23. THEW ELECTRICALLY-DRIVEN SHOVEL UNDERGROUND

centrally located hydraulic jack, like a large drill column, holds the machine in place between floor and roof. A horizontally operating dipper stick, carrying a very flat dipper, is adapted to revolve around the central column. The dipper having been filled by forcing it horizontally under the pile, is raised, swung around over the car, and discharged by means of a pusher. Where the roof is low and the room is large the machine would seem to present many possibilities. It is not yet beyond the developmental stage, and the builders request that no photographs be published at present.

swung into the horizontal position by the action of another. The third then rotates the turntable, until the dipper is over the tram car, when the operator trips the dipper door by hand. The operator rides the machine and handles three levers, one to each engine, in the forward or backward position. Obviously, the machine can be equipped with motors instead of air engines if desired. The machine can work in a drift 6 ft. 6 in. high by 9 ft. 0 in. wide. The movable parts are well covered and protected from dirt and water. This machine seems to be growing in favor. Entirely successful operations from the



FIGS. 24, 25 26, AND 27.. HOAR LOADER

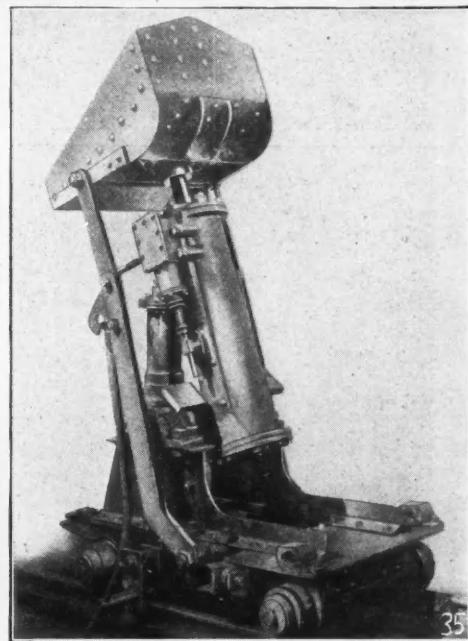
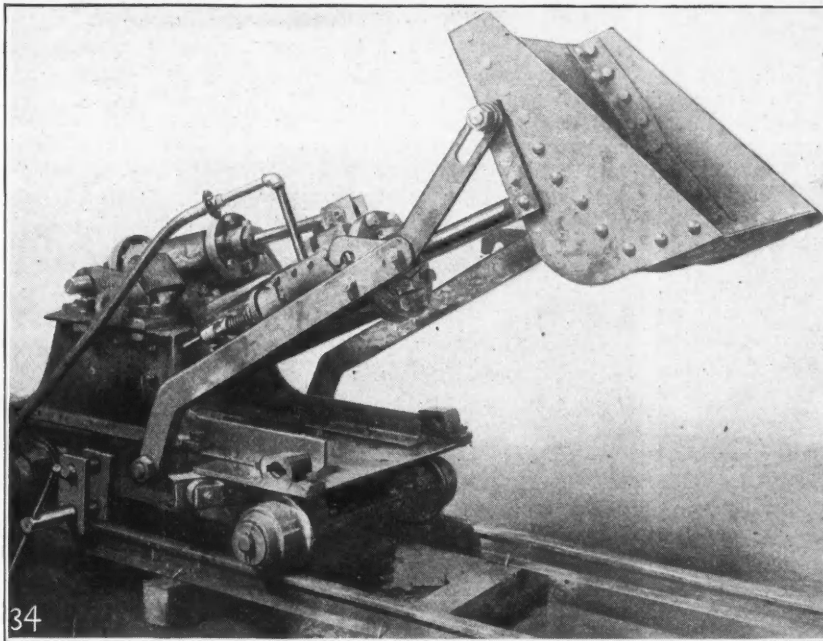
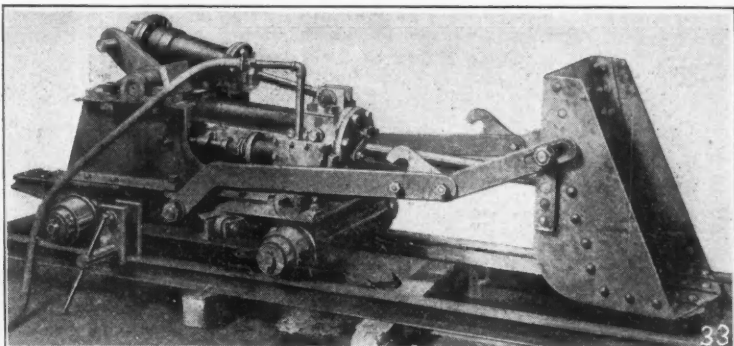
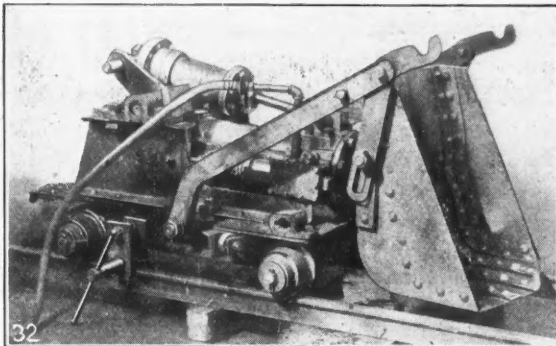


FIGS. 28, 29, 30 AND 31. MIDDLEMISS LOADER

cost sheet side are reported from a number of iron mines. Though, no doubt, the machine will be improved as experience dictates, nevertheless it is past the experimental stage. Particularly good reports are heard from its operation in rock drifts where mucking is specially laborious.

All the machines thus far described are open to the criticism that they comprise constantly moving parts, such as motors, chains, elevators, and so forth, involving more or less complexity and wear. As said before, just how much weight should be given to this criticism is problematical. But there is an entirely different type of machine to which it is not

through a drift by hand and that self-propulsion involves mechanism not worth while. The radial movement, too, is accomplished by hand, but the other movements are controlled by direct-acting air cylinders. For a given amount of power expenditure there is no question that electricity is cheaper than air. But it is argued that air is always present to operate power drills, and not in use for that purpose when loading is being done. Therefore, air is the logical power to drive the machine. The argument would seem to have considerable weight, especially in levels and in places where it is not desirable to put in electricity for haulage. Two machines of this



FIGS. 32, 33, 34 AND 35. MIDDLEMISS LOADER

applicable at all, for the movements are intermittent and obtained by means of direct-acting air cylinders. A dipper is loaded by being pushed directly into the pile. It is then swung directly upward, over and backward to a dumping position, and discharges into a tram car without the intervention of any conveying mechanism.

The machine is capable of sufficient radial movement to enable it to cover a breast nine or ten feet wide or four and a half to five feet each side of the center line. The machine is not self-propelled, as it is argued that the idea lends itself to so light a mechanical construction that it can be readily pushed

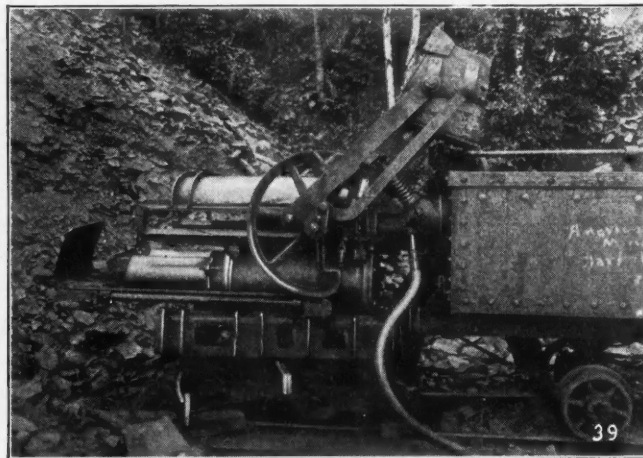
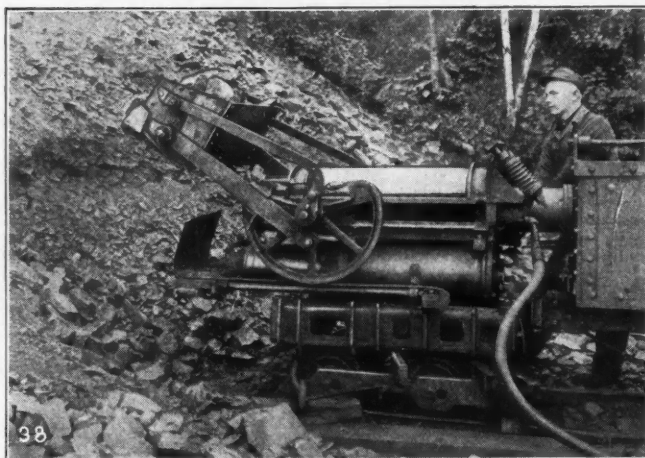
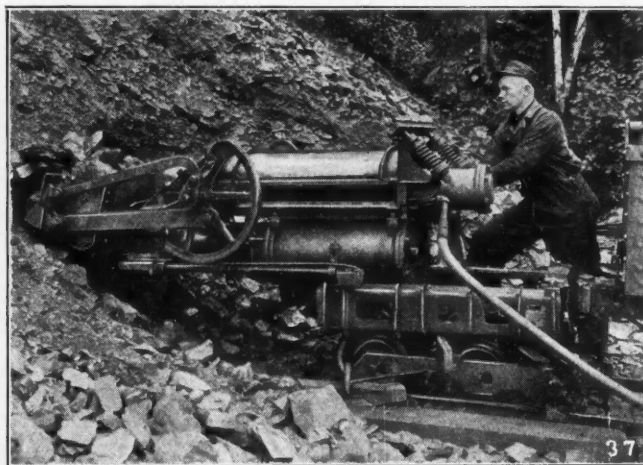
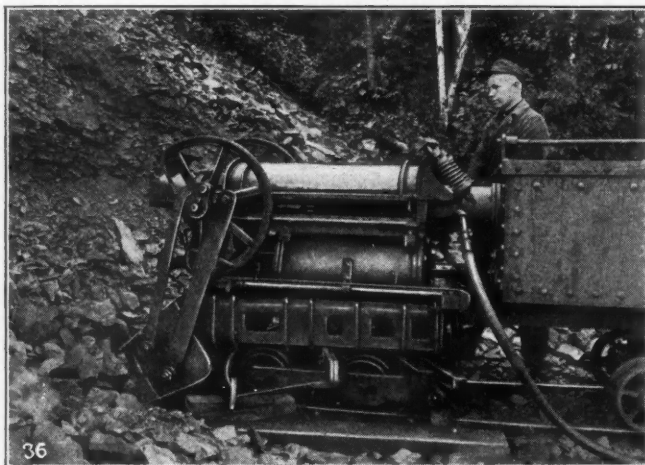
type have been designed, the Middlemiss and the Armstrong. Though several Middlemiss machines have been built and operated underground, it is still in the developmental stage and has not reached commercial form. Figs. 28, 29, 30 and 31 show one model in four different positions while loading a car, and Figs. 32, 33, 34 and 35 illustrate a similar shovel at closer range.

The dipper is secured to the end of a piston rod and driven into the pile by a direct-acting air cylinder. Upon reaching the end of the stroke, the air is reversed, and the backward movement of the piston in the cylinder rotates both cylinder and dipper to

the dumping position. The velocity of the dipper at the end of its backward strokes determines how far the dirt will be thrown, and this velocity is controlled by a cataract cylinder. The dipper then returns to its first position by gravity, ready to repeat the cycle. Many troubles were experienced with the one machine with which I am familiar, but they did not appear to be insurmountable and I am advised that an improved design will be tried out soon, in which it is hoped that the troubles will be overcome.

The Armstrong Loader is the result of several years hard and persistent work of Frank Armstrong, mechanical engineer of the Penn Mining Co., Vulcan, Mich., and manufactured by the Lake Superior Load-

chine is unclamped from the rail, moved forward by hand and clamped again to the rail in the new position. In order to dig across the face of a breast eleven feet wide, the machine is supported on two circular tracks, the center of which is in the rear of the machine, so that the dipper in the dumping position is always directly over the tram car. It will operate within a head-room of seven feet, and the weight is about 4,000 lb. It negotiates with perfect ease any track or curve upon which tram cars can be operated. Comparatively light in weight, simple in mechanism, with no continuously moving parts, it appears to be an extremely promising machine, especially for metal mines. In wet sticky ore, how-



ARMSTRONG SHOVEL. FIG. 36. STARTING.—FIG. 37. DIGGING.—FIG. 38. LIFTING.—FIG. 39. LOADING

er Corporation, Duluth, Minn. It is shown in Figs. 36, 37, 38, and 39. It differs widely in mechanical detail from the Middlemiss, and has little in common with it except the fundamental idea of the use of air cylinders and the movement of the dipper in a vertical plane from the digging position, over and back of the machine to the dumping position. It has one peculiar feature upon which its promoters place great stress, and that is its ability to do what they call "selective digging."

In case the dipper meets an obstacle that it cannot overcome, it does not stall but automatically raises and slides over it, continuing its full stroke. When all the dirt within reach has been shoveled, the ma-

chine is unclamped from the rail, moved forward by hand and clamped again to the rail in the new position. In order to dig across the face of a breast eleven feet wide, the machine is supported on two circular tracks, the center of which is in the rear of the machine, so that the dipper in the dumping position is always directly over the tram car. It will operate within a head-room of seven feet, and the weight is about 4,000 lb. It negotiates with perfect ease any track or curve upon which tram cars can be operated. Comparatively light in weight, simple in mechanism, with no continuously moving parts, it appears to be an extremely promising machine, especially for metal mines. In wet sticky ore, how-

ever, trouble may be expected from the dipper refusing to discharge. The velocity of the upward and backward movement of the dipper is capable of adjustment and control by means of the cataract cylinder. The machine is clearly beyond the experimental stage, and on a manufacturing basis, built to jigs and templets to secure exact duplication of parts. Just what its limitations are remains to be seen, for in its present form it has been upon the market only a comparatively short time, but is giving very satisfactory results in at least half a dozen metal mines.

In the December, 1918, number of "Coal Industry" there appeared an interesting and complete article entitled "Underground Coal-Loading Machin-

ery," by E. N. Zern, in which is described the Hamilton Loader, built as long ago as 1905. It might be likened to a bucket elevator turned flatwise; and is spoken of as a "flat flight" machine. Fig. 40 conveys a pretty clear idea of how an endless chain carrying scraper arms or "flights" deliver the coal onto a conveyor that in turn discharges it onto a car. The article referred to goes on to say: "The Hamilton machine in its original and improved forms was experimented with for two or three years in various coal fields. It did load coal at the rate of a ton a minute. It picked up the coal and left the floor practically clean. It would load extra large lumps, was easily handled, and fairly free from breakdowns. To all appearances a machine had been produced which apparently had every requirement and was

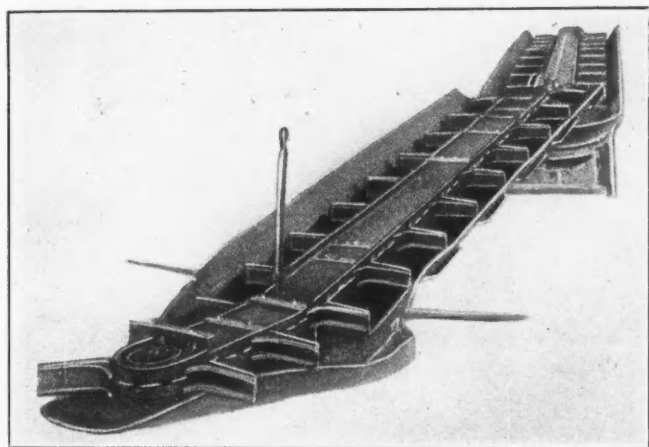


FIG. 40. IMPROVED HAMILTON LOADER

capable of loading at the rate of 2,000 lb. per min., or the equivalent of the work of ten men. But in spite of its good features it did not prove to be a success, largely due to the fact that existing conditions in coal mines rendered it impossible to keep the machine in continuous operation. In some localities it was not permissible to shoot the coal down to the floor, as it would break too much. This necessitated the employment of extra men to pull down the coal, and they were unable to do this in such a manner as to keep the machine busy. This, together with the delays universally encountered in coal mines, left but little time for the actual loading of the coal. Further unavoidable features of the machine were its size and weight and failure to adapt itself to pillar work." The above quotation should be read carefully by too hopeful inventors, for it well illustrates the disappointments they must meet.

For the handling of dirt on the surface the road scraper or "slusher" is a very old arrangement. So, also, underground various modifications of the scraper idea have been used for many years. For a simple scraper system underground in metal mines the first requisite is a small, powerful, portable, reversible, reasonably cheap hoist that can be set up anywhere on a post or drill column and operated by anybody under any conditions. The Ingersoll-Rand Co. make the "Little Tugger" hoist which seems to fill this specification. The use of it in connection with an

ordinary road scraper or "slusher" is gaining in favor in the ore mines of Minnesota and Michigan. Its use would seem to warrant the laying out of metal mines with special reference to this method of handling the ore. Figs. 41 and 42 were taken in a mine on the Mesabi Range and Fig. 43 in a mine at Joplin, Mo. It will be observed that in the Joplin picture two "Little Tuggers" are mounted on one column, so that the scraper can be hauled back by a tail rope. So far as I know, in the iron mines of the Lake Superior district no tail rope is used, the scraper being hauled back by hand. It is a question whether the use of the tail rope is a real advantage if the haul is less than fifty feet. What appeals strongly in the scheme is its extreme simplicity. In case a straight pull from the breast to the raise in

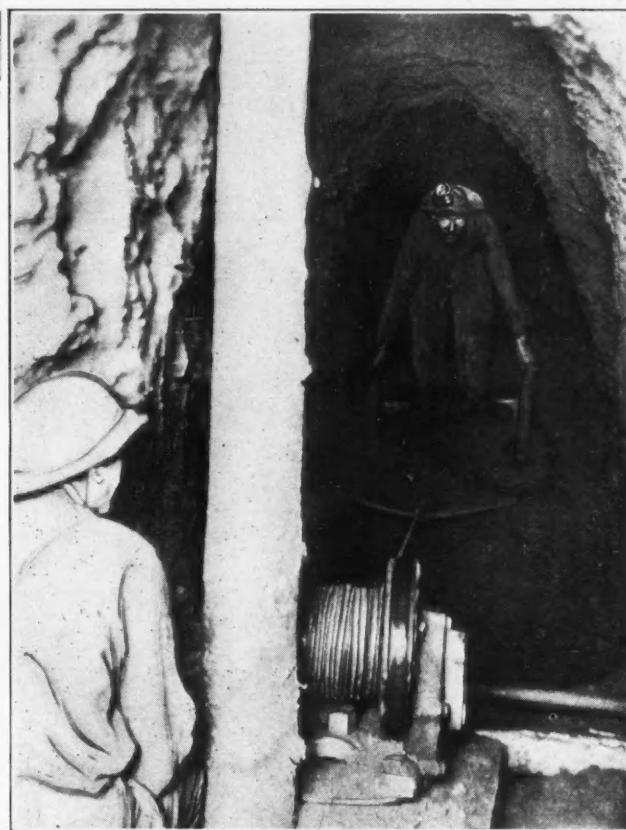


FIG. 41. SLUSHING WITH LITTLE TUGGER HOIST

which the ore is dumped or to the car to be loaded cannot be secured, a snatch block can be used to make the turn, but the snatch block is a source of grief and trouble, and should be avoided if possible. Consequently, the mine should be laid out in advance, so that the location of slices and raises is such that the haul shall not be greater than fifty feet—twenty-five is preferable—and the pull on the rope shall be straight. In chunky ore it may be difficult to hold the handles of the scraper, especially when its nose gets under a piece embedded so tight that it cannot be moved.

In one mine where the ore was very wet the scraper was made of slats or bars, and really acted more like a rake than a scraper. It is, of course, a simple matter to make the scraper of a size and con-

struction best adapted for the character of the material. Getting the scraper to dig into a pile and get a full load appears to be the most difficult part of the job. As a rule the two men, one on the hoist and the other on the scraper, change off. Obviously, this scheme is workable in places where it is impracticable to place a loading machine. On the sub-levels it can dispense with track laying entirely if the raises are placed properly with reference to the slices. The results attained at certain mines warrant the belief that this rejuvenation of an old idea has come to stay.

Following certain suggestions of F. E. Keese, general superintendent of the Oliver Iron Mining Co., at Ishpeming, Mich., there was tried underground an arrangement for handling a scraper which

was not sticky, the arrangement could probably be worked to advantage.

What is probably the most complete and elaborate development of the scraper idea is that known as the Evans System, the invention of Cadwalader Evans, of Pittsburgh, Pa. The Goodman Manufacturing Co., of Chicago, Ill., handles the invention and makes the installations. The only real novelties the system seems to possess are the thoroughness with which the details have been worked out and the peculiar "V"-shaped bottomless scraper.

Figs. 46 and 47 show the system diagrammatically in elevation and plan. It is customary to install the layout so that it may load out a block of four rooms. A double drum hoist operates a main rope and tail rope, and by means of properly located sheaves the

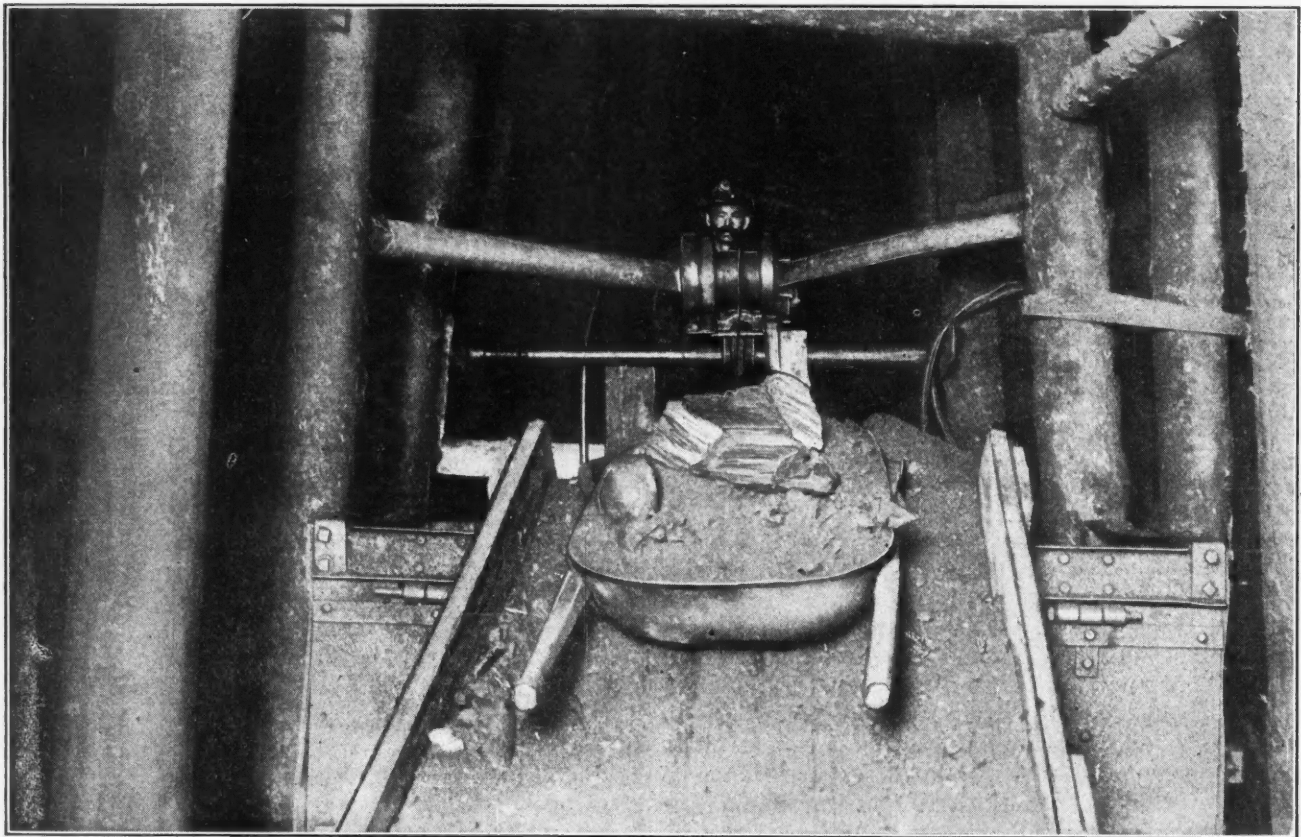


FIG. 42. SLUSHING UNDERGROUND ON MESABI RANGE

appeared to have in it possibilities, but which has not yet been worked out to a satisfactory conclusion. No photographs are available, but the Figs. 44 and 45 will suffice to explain the idea. By either legs or drill columns a light channel iron is supported near the top of the drift. It carries a sheave on its front end, a "Little Tugger" on its rear end, and a trolley between. Winding up the rope by the hoist serves to drag the scraper into and up the pile of dirt, and when filled it is run backward to a point over the tram car and dumped. It is drawn back by hand to the digging position. It was found that in case the nose of the scraper gets under an immovable chunk, the man on the handles was likely to go over the top and head into the breast. In dirt that would break without chunks, and, that at the same time,

scraper travels the length of the room, making its own path or roadway and discharges its load into the tram car in the entry. Fig. 48 gives a comprehensive idea of the scraper and of how it transports the coal; Fig. 49 shows the loading of the tram car. In both the anthracite and bituminous coal fields it appears to be gaining in favor. A fairly full description of the arrangement will be found in the "Coal Age" for December, 1918, where the advantages of the system are given as follows:

1. It requires no track in the working place after the first crosscut is made.
2. It uses no complicated mechanism.
3. Delays are few and repairs light.
4. It simplifies the problem of replacing loaded cars with empties.

5. It can be worked in seams of any height, although more attractive to low-seam operations than high.
6. It is not affected by seams of moderate inclination.
7. In case of falls of roof, little or no injury can result, as the hoist is away from the room.
8. It is flexible and can be adapted to the drawing of pillars.



FIG. 43. SLUSHING UNDERGROUND USING TAIL ROPE, JOPLIN DISTRICT

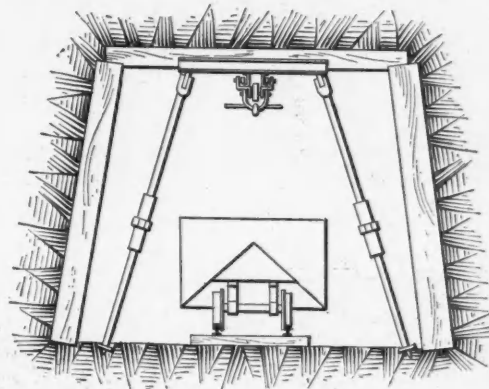
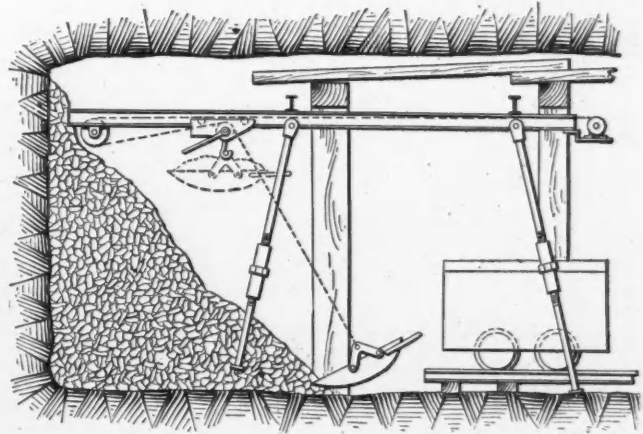
Its disadvantages would seem to be:

1. The capacity of the system is low.
2. The abrasion of the coal in the scoop as it passes over the bottom, along with the churning of the particles, causes degradation of the product.
3. The power consumption in dragging the scoop over the floor is large.

Though undoubtedly the system has been a success in coal mines, it is questionable whether in metal mines it would prove preferable to the very simple scheme described above in the operation of

which a "Little Tugger" hoist, a rope, and a road scraper are all the equipment required.

This article does not pretend to have covered the whole field. No doubt there are many machines that may have been built and tried and proved disappointments and have not come to my attention. There are



FIGS. 44 AND 45. OLIVER IRON MINING CO.'S SCRAPER

also a number of machines that are in process of design. No consideration has been given here to a certain type of conveyors specially designed for use in thin coal seams, which in some cases is made to 300 ft. long. In "Coal Industry" for December,

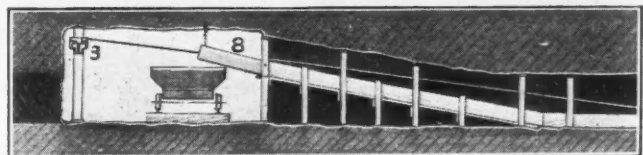
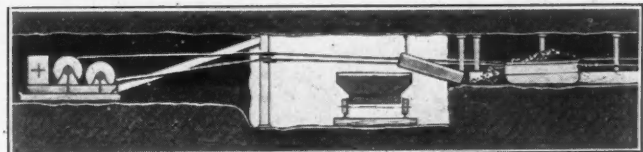


FIG. 46. DIAGRAM SHOWING EVANS SYSTEM IN ELEVATION

1918, will be found a reference to such machines as well as to certain loaders not discussed here.

From all the foregoing it would appear that development is to be looked for along three general types of machines as follows: Straight air operated



FIG. 48. EVANS SCRAPER IN USE IN A COAL MINE



FIG. 49. LOADING TRAM CAR WITH EVANS SCRAPER LOADER

shovels that throw over in a vertical plane. The Armstrong is an example of an operative machine of this type. Small revolving power shovels, operated by air engines or electric motors. The Hoar and Thew are typical. Machines with a digging element in front, delivering onto a conveyor that discharges into a car. These are represented by the Myers-Whaley, the Halby, and the McDermott.

It is still a question whether or not the machine should be self-propelled. That would seem to depend

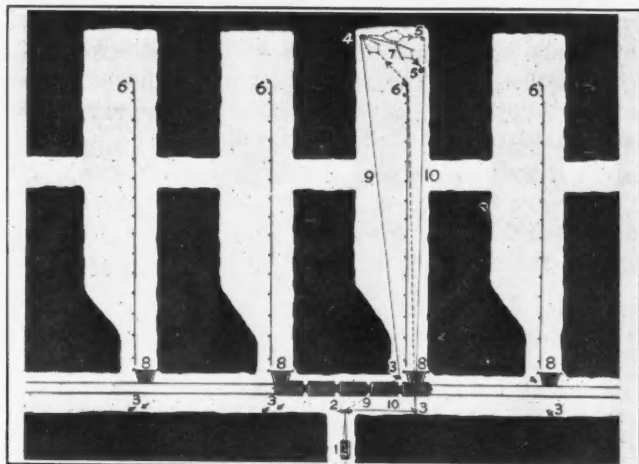


FIG. 47. EVANS HAULAGE SYSTEM PLAN FOR FOUR ROOMS

upon the weight of the machine and whether electric motors are available for moving the machine from place to place. Self-propulsion necessarily involves a complexity of mechanism to be avoided if possible.

Continuously moving parts and continuously moving motors would seem to be conducive to wear and loss of power. A machine of the revolving shovel type operated by direct-acting air cylinders would appear to offer possibilities, but at the same time present many mechanical difficulties. But the field is big enough, the conditions are so variable, and the demand is so insistent that there is little doubt that several types of machine will be developed, giving the mine owner a reasonably wide latitude from which to pick and choose, and reducing the labor of underground loading, with what effect upon the cost sheet remains to be seen.

Making a Wooden Pulley for Crushing Rolls

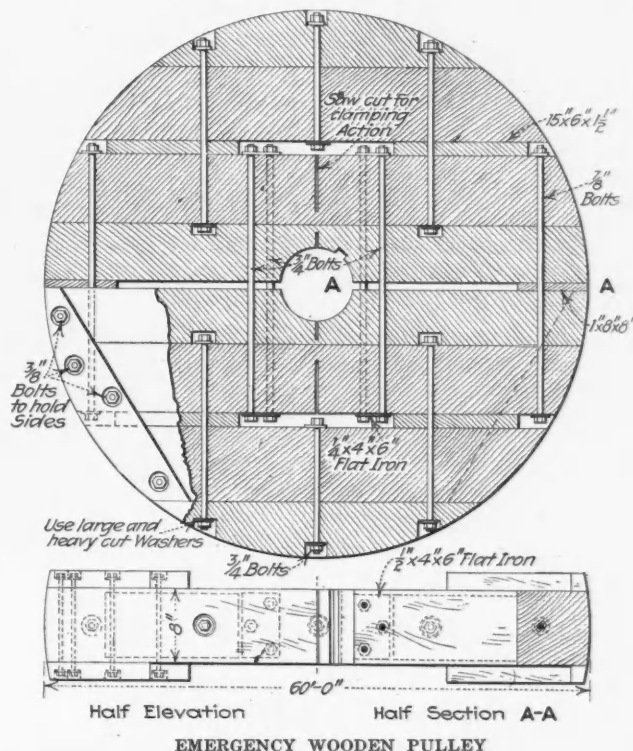
BY CHARLES LABBE

Few, if any, crushing rolls are equipped with wooden pulleys, but in one mill, at least, it was necessary to install one in an emergency, and it is still operating successfully. A large rock had fallen between the casing of the rolls and the 5-ft. cast-iron pulley, breaking the latter beyond repair. The rolls were necessary for the operation of the mill, and delivery of a new pulley could not be obtained sooner than four to six weeks. An emergency pulley was therefore made of 6 x 8-in. lumber, as shown in the sketch.

The clamping action on the shaft was obtained by the six 3/4-in. bolts near the hub, and the saw cuts. Two 7/8-in. bolts were used near the rim and

six 3/4-in. bolts to hold the outer members. The rim was counterbored with an extension bit, to make room for a hexagonal nut and socket wrench. The face of the pulley was made up to the required 12-in. width by 2 x 6-in. boards bolted on to both sides.

The outline was sawed as well as could be done with a hand saw, and the finishing done on a 14-in.



lathe. The headstock had to be turned end for end, the 24-in. face plate coming where the gears driving the feed screw were. The pulley wheel was bolted on to the face plate, and the compound rest, with tool holder, fastened on a temporary timber frame. The face was then trued up to size and crowned, and the center was bored to fit the shaft. The pulley was balanced by boring inch holes in the sides, leaving them open in the heavy side and putting inch bolts in the light side.

A Plastic Dressing for Wounds and Burns

The Ambrine treatment of burns, scalds, and all surface wounds proved very successful for casualties incurred in the Great War, and its use is now being extended to industrial plants. The dressing is a compound of wax and resins, and is solid when cold. It is heated to about 150 deg. F. and applied by means of a special atomizer, or it can be gently daubed on with a soft brush. A plastic dressing, impervious to air, is thus formed, which does not adhere to the wound and which promotes the healing process without appreciable contraction. Disfigurement and scars are prevented to a greater extent than was possible under the old methods.

The outfits can be purchased in two sizes at \$17.50 and \$47.50 each, and will no doubt be found valuable in first-aid dressing in metallurgical plants, particularly for burns.

The Desert Prospector's Guide

Sage Counsel Regarding Trips Into Arid Territory—Assuring an Adequate Water Supply—
The Mangement of Burros—A Substitute for the Traditional
Cure for Snake-Bite

BY LEROY A. PALMER

Written exclusively for *The Journal*

IN THE late winter and spring of 1919 I made a reconnaissance of certain lands in the east end of the Mohave Desert in California. The information secured on this trip brought a realization, stronger than ever, of the possibilities of systematic prospecting in the little-explored desert regions, and I am setting down some of the results of my experiences in the hope that they may offer some helpful suggestions to others who may go into this country to explore or develop its mineral resources.

The country covered is in the very heart of the desert, lying in a U shape on both sides of the main

By an elimination process I got down to a pack train of burros as the most practical means of transportation, and proceeded to Goffs to prepare for the trip. It did not take me long to find out that burro outfits are by no means as plentiful as they were a few years ago, but I finally had my choice of three at varying prices. I chose the highest priced, and subsequent events justified the choice.

In selecting an outfit it would be hard to say which is the more important, a good string of burros or a good "puncher." I certainly got a puncher de luxe. He is a young man, desert born but city bred, who



ON THE TRAIL

line of the Santa Fe R. R. in the Pah-Ute, Little Pah-Ute and Old Woman mountains on the south side of the railroad and the Hackberry, Providence, and Clipper ranges on the north. Goffs, at the junction of the main line and the Searchlight branch, is the principal station. It is thirty-five miles from Needles on the California-Arizona line.

The work was done in two trips. I was accompanied by one man, who looked after the camp and the outfit but took no part in the field work. On the first trip we were quite isolated, seeing no one and not sending or receiving any mail for weeks at a time. On the second trip we were in more or less frequent touch with small mines and cattle ranches.

has made a success in the business world far beyond his years. I found him on a small ranch resting up after two very strenuous years, and he jumped at the chance to make the trip. A boyhood knowledge of burros and the same energy and attention to detail that had made him a successful business man stood him in good stead, and he soon had the "hotel and transportation service" working so smoothly that I forgot everything but my field work.

As we were going into a country in which water holes were few and far between, we were obliged to plan on packing water, in some cases considerable distances. Here entered a slight complication, as we were obliged to figure part of our burros for this

use alone, and, of course, the more burros we had the more water we had to pack, and the more water we packed the more burros we needed. We finally decided that five would be the proper number of pack animals.

In making up an outfit of this kind one should not slight the things which tend to physical comfort, but should draw the line at any unnecessary weight. Plenty of bedding is essential, especially in winter or early in spring. A light mattress adds much to one's comfort, as it is often hard to smooth out the inequalities of the ground so that they will not be painfully noticeable without one. One of the canvases used in covering the packs should be spread on the ground and the bed laid on that.

If one is making a summer trip he can get along fairly well without a tent, but it is better to have



THE AUTHOR

one, especially if it is necessary to do any writing in camp or if one wishes to read or work after sundown.

Clothing should be serviceable, of course, and one should take as many changes as he can conveniently carry, as there is slight opportunity for laundry work on such a trip. Boots should have heavy soles and large hobnails. Never in years of field work under all manner of conditions have I found rougher, rockier, or steeper country than in the desert, and especially in this part of it.

In the cooking outfit there should be one Dutch oven, or preferably two Dutch ovens. The Dutch ovens serve not only for baking, but also, because of their ability to hold heat, are very useful for stewing and as all around cooking dishes.

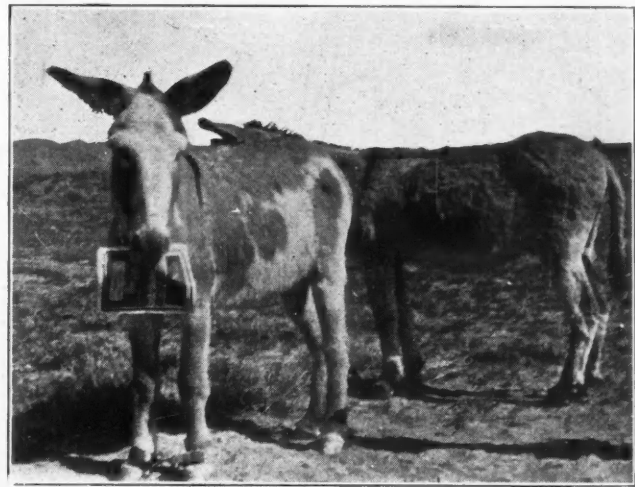
At one of our camps where we stayed several days, Zack rigged up a very ingenious oven by digging a

hole, in which he placed some rocks and on them set a square five-gallon oil can. A piece of sheet iron was then arched over the top of the hole, so that the heat surrounded the can on all sides, and with a little experimenting our oven did excellent work.

The Grub Question

As to the all-important item of grub. The staples on such a trip are such things as "the two B's"—bacon and beans; coffee, potatoes, flour, rice, dried fruits, with sugar, salt and milk—foods that will afford a maximum of nourishment with a minimum of weight and space.

If one is going on a very long trip away from all sources of supply, the most rigid economy is necessary. In such a case a very nutritious food is pemmican, made by thoroughly drying or "jerking" thin strips of beef and then grinding or grating them to



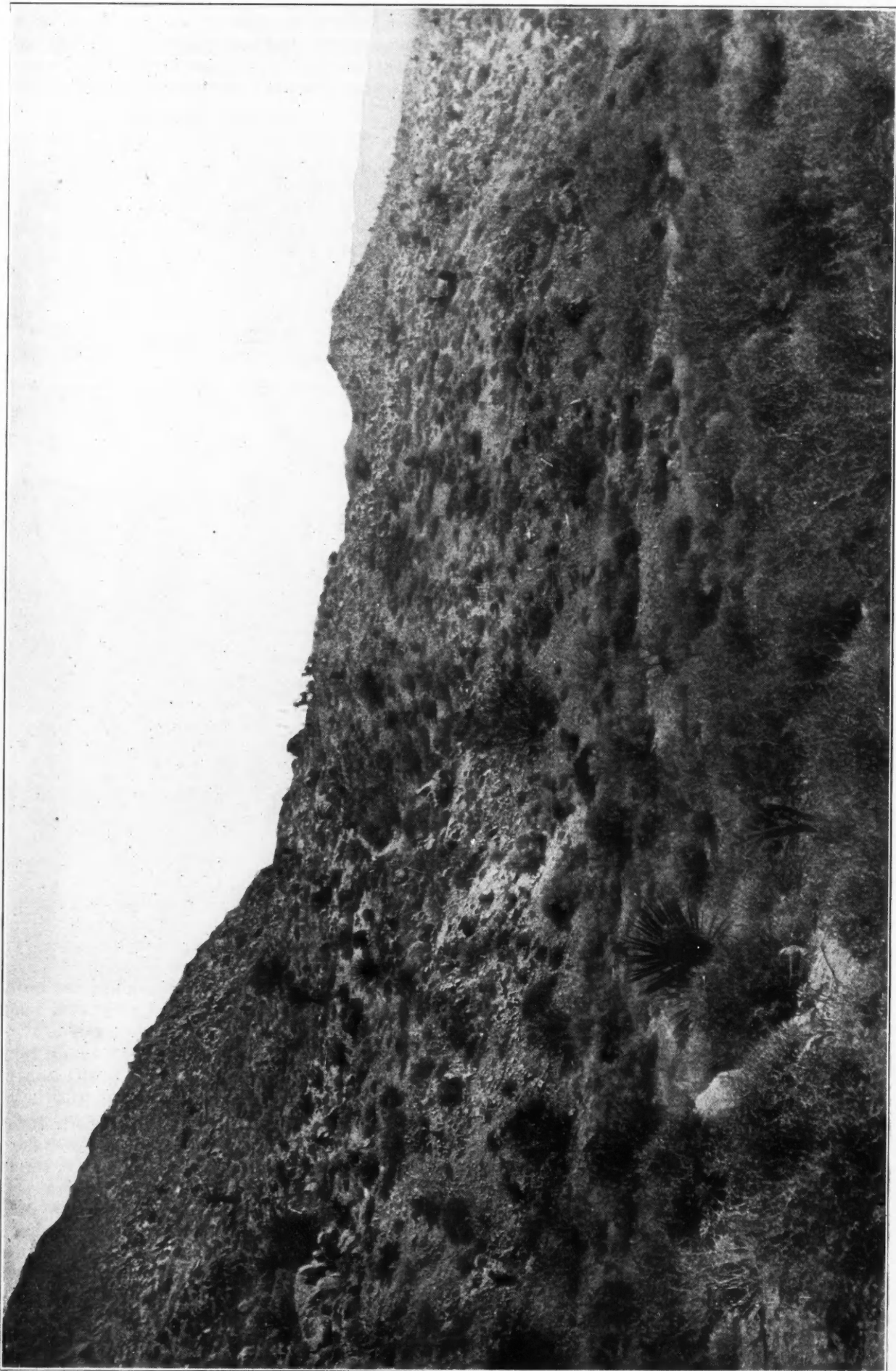
THE DESERT OF THE DESERT BURRO

a powder. Powdered milk should be carried, as it is lighter and less bulky than evaporated milk. The prunes should be pitted before starting. Evaporated instead of fresh potatoes should be taken, and in many other ways the weight of the provisions can be brought close to the irreducible minimum. Of course, it is not feasible to carry fresh meat, but we did not suffer on that account. Young jack-rabbit, cottontail, and quail were abundant, and we had many a fry and stew that would have been the envy of the city dweller. No attempt was made to carry butter or eggs.

The Gentle Burro

The burro is a classic example of the great law of compensation. He possesses qualities such as sturdiness, endurance, and ability to rustle feed and exist on a small supply of water which make him peculiarly useful for work of this kind. On the other hand he has many traits, including a general "ornerness," which offset some of his good points and try the soul.

On the first trip, from February to April, when the weather was cool, the feed green, and we had occasional rains, the burros got along on very little water, in fact, there were days when they were not working when they drank none at all; and their aver-



THE DESERT. CAN YOU MAKE OUT THE MOUNTAIN SHEEP ON THE SKYLINE?

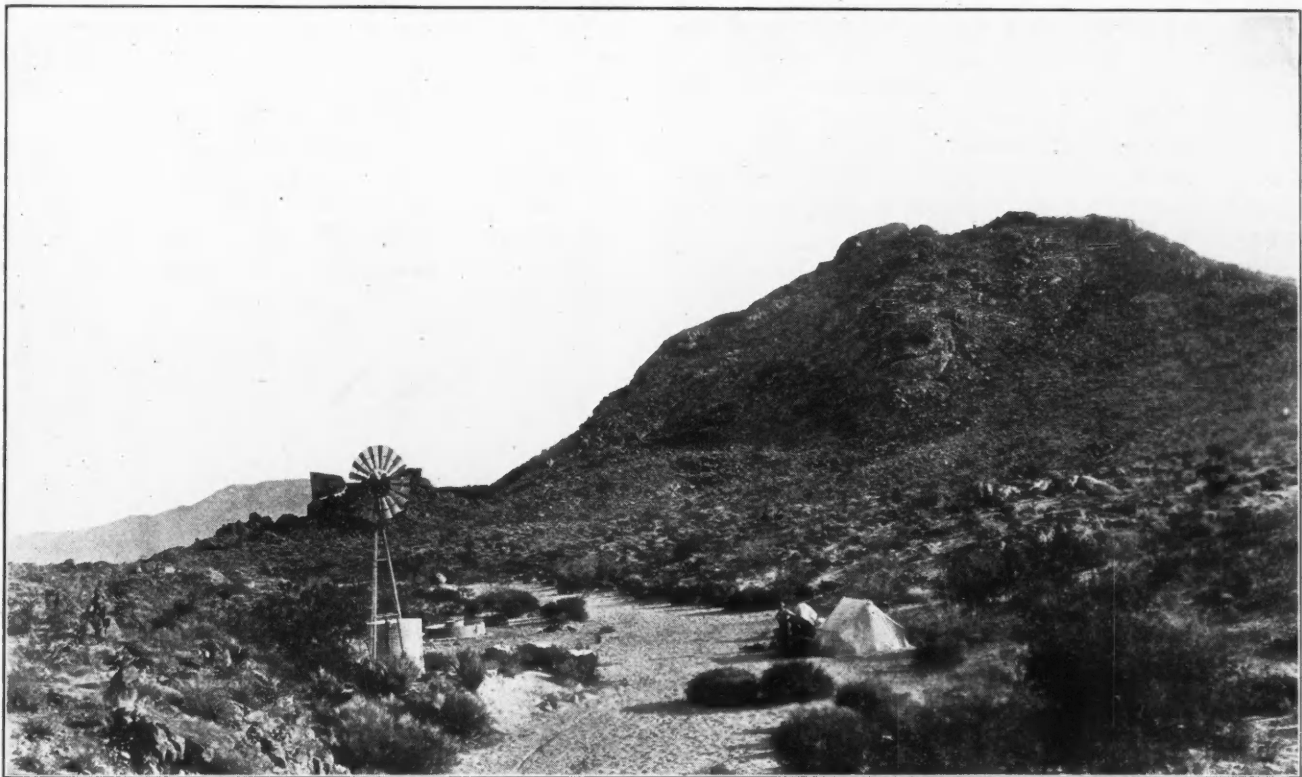
age under those conditions probably was not in excess of a gallon and a half a day each. On the second trip the weather was warmer and the feed drier, so that the average was nearer twice the above amount.

While in camp do not fail to keep in touch with your burros. They should be turned loose, hobbled and belled, but they are such travelers that they should be rounded up or at least located every day. In hot weather they can be depended on to come into camp for water, but when the weather is cool and the feed green, they get along very well without it, and if they are allowed to roam there is no telling where they will be when needed.

It is generally estimated that the average burro will pack 150 lb. and travel fifteen miles a day regularly. It is reasonable to say that burros will travel

fully as a riding saddle. After fitting, each should be labeled for its burro, and when it is taken off its blanket should be kept with it.

Each pack, except the water pack, should be covered with a canvas, and all packs, water included, should be securely lashed. For this the old reliable diamond hitch is the best. It is easy to throw, easy to release, and holds better than any other. When it comes to packing it is best to have one man stand guard over the burros after they are packed, as they will lie down if they get a chance. Once down, they are hard to get up, and are very apt to shift their packs in doing so. In packing, be sure everything is solid and lashed tight before you start, as, once on the trail, it is highly desirable to keep going every minute. Delays cause confusion, and if you



THE OASIS

on an average as far as a man cares to when he takes into consideration the additional work of packing, unpacking, and making camp. Under those conditions fifteen miles makes a big day's work, although there were occasions when we made more than twenty.

Throwing the Diamond

Packing was done with kyaxes, made by attaching rope slings to ten-gallon coal-oil boxes. For water we had twenty-two five-gallon oil cans, so that when the outfit made a special trip for water it could carry full capacity and leave two cans in camp for my use until its return. In moving camp part of the kyaxes were filled with provisions, bedding, and other necessaries, and the empty water cans that went with them were tied to the packs.

An important item in the efficient working of the outfit is that the packs should fit properly and hang evenly. A pack saddle should be fitted just as care-

fully as a riding saddle. After fitting, each should be labeled for its burro, and when it is taken off its blanket should be kept with it.

Unfortunately, much of the desert region is not adequately mapped, and many of the maps that are to be had are inaccurate. In California, maps published by private corporations are available for the different counties, but these are not dependable, as they are based on old Government surveys, some of which were made as long ago as 1855. In those days surveying in the Mohave Desert was a man's-size job, and the surveyors frequently were more concerned over how they were going to keep their scalps than they were over an accurate mapping of the topography.

As a result, the early plats contain almost no information. But in recent years much of this country has been resurveyed, and new plats are being published. These are not contoured, but give excellent information as to topography, springs, roads,

and such features. They are made up by townships, and a photolithograph of a township can be obtained from the General Land Office, Washington, D. C., for 25c.

The Drink Question

The most vital consideration on a desert trip is the water. In working in such a country one should secure all of the local information that he can. Knowledge of tanks, springs, trails, and such things frequently stands one in good stead. On a reconnaissance trip, such as ours, one must depend on the supplies that are already developed, and frequently must pack water considerable distances. At one camp our water pack was over twenty miles.

When we moved camp, our usual plan was to pack two burros with water. This gave us forty gallons, a sufficient supply to allow at least a day's rest at the new camp before starting on a water pack and to leave plenty in camp for me while a full load was coming up. Our daily consumption for burros, cooking, and personal use was less than ten gallons on some days, when conditions were particularly favorable and the burros drank little or none, and rarely exceeded twenty gallons, even on the hot days of the latter part of the trip.

Always Be Assured of Sufficient Water Supply

Always be sure about your water supply. Do not cut loose from one source until you have established your next. Leaving booze out of consideration, practically all deaths from thirst in the desert are due to either ignorance or foolhardiness. One is frequently tempted to take a chance, but it does not pay, as the spring or the tank may not be where you thought it was, or it may be dried up. Remember that if you make a day's journey to where you hope to find water, you not only use a day's supply in making the trip, but also, if you are disappointed in finding it, you are a day farther off from your known supply. So if there is any doubt, one should always scout ahead and fix the next source of supply definitely.

These directions apply to reconnaissance work. If one expects to camp any length of time at one place, he can arrange regular water packs from some spring or tank, or build what road may be necessary and bring in a team and wagon with water barrels. Sometimes it may be advantageous to develop a supply for camp use. All through this trip I found evidence of the existence of water not far from the surface. Almost any of the larger washes would yield a reasonable supply from a shallow well if it were properly placed, although frequently the sand and gravel are so loose that the excavation would require timbering. The windmill shown in the illustration is over a well excavated to a depth of ten feet on a fracture zone in granite, with a drift eight feet long from the bottom of the well. The supply is sufficient for the watering of several hundred head of cattle.

In Camp

It is advisable to bank the tent well, even in quiet weather. There is usually a breeze stirring in the evening, and if one is trying to read or write in a tent that is not banked, it gets in and causes annoy-

ance by flickering the light and blowing the papers about. In winter or spring, a high wind may come up at any time. Twice when we made camp late and tired, and took chances on not banking, we were caught in sandstorms and had to turn out in deshabille to make the tent fast.

Fuel is abundant. Occasionally in the higher parts of the mountains we got cedar wood, but our standard fuel was greasewood. Once get a fire started, and green greasewood makes an excellent fuel.

Dodging the Rattlesnake

When the weather got warm, each of us carried a "snake kit," consisting of a small package of powdered permanganate of potash, a ligature, and a bandage. In case one is so unfortunate as to be struck by a rattler, he should slash the wound crosswise with a sharp knife or gather the affected part in his fingers and cut it out. The permanganate should be rubbed into the wound, the ligature applied between it and the heart, and the bandage wrapped tightly about.

If one keeps his eyes open there is little danger of being struck. High boots are a protection, and one should not go poking around rock piles, such as mining-claim monuments, without careful examination for snakes. If struck above all things keep your nerve. Rattlesnake venom acts directly on the heart, and fright aggravates its evil effects by slowing up the heart action. It is probably true that of the few people who have died from rattlesnake bite nine-tenths literally have been scared to death.

The Saturday Night Sand Bath

The chief drawback of the trip was the enforced economy of water for personal use. When one packs water over twenty miles, some uses that we usually consider necessities go into the luxury class, as witnessed by the "after taking" picture of one of the party. A fair substitute for a bath can be found in a sand rub. Choose the bottom of some gully where the sand is fine and clean, and the operation will be found to be surprisingly refreshing and cleansing.

This is not the place to go into the pleasant, even delightful, phase of the trip, which were many. I confess that I had looked forward to it with some misgiving, expecting many inconveniences and some hardships. As it turned out, none of the latter and few of the former materialized. This was due principally to the fact that whatever problems, however small, confronted us were handled in a common-sense and systematic manner, instead of by taking a chance that they would work themselves out satisfactorily. In this connection I cannot give too much credit to my companion for the part that he played in making the trip the success that it was.

Both the Asbestos and Corundum Industries in South Africa are capable of very great expansion, according to the "South African Journal of Industries." No other country in the world can compete with the Union as regards varieties and fibres of asbestos. In actual extent, the crocidolite belt of the Cape Province is probably the largest known asbestos area, and the eastern Transvaal areas are developing in a remarkable manner.

Copper in Southern Oregon

Production Stimulated by Demand During War—Future of Region Depends on Amenability of Ore to Modern Concentration Methods

BY A. E. KELLOGG

IN 1860 copper was discovered at Waldo, in Josephine County, Ore., and several deposits were soon after developed. But the properties gave poor returns, on account of high cost of transportation and supplies. Copper ore also occurs in small quantities associated with gold ores in the Greenback, Grant's Pass, Lower Applegate, and Ashland districts, and in quantities sufficient to form the object of mining operations, primarily for copper, in the

drifts on five different levels, supplemented by a 500-ft. vertical shaft. The deposit is opened for about 1,000 ft. horizontally and 800 ft. vertically.

At the Blue Ledge mine, in the Upper Applegate district, the ore consists of nearly solid pyrite and chalcopyrite, with a little pyrrhotite and, rarely, spalerite or galena. This deposit is opened by a series of adits driven in the face of a cliff at different elevations. With winzes and raises the ore is exposed vertically for about 800 ft. and horizontally for about 2,000 ft. The elevation of the Blue Ledge is about 4,000 ft.

For several years the state and Federal bureaus of mines have been working on the problem of concentrating the copper ores of this region in an attempt to remove the pyrrhotite. Magnetic separa-



THE BLUE LEDGE MINE

Gold Hill, Galice, Upper Applegate, and Waldo districts. This region, including Jackson and Josephine Counties, is situated in a mountainous and heavily forested country, containing one major and several minor valleys. The chief valley of the area is that of Rogue River, which crosses the region from east to west in an irregular course. The minor valleys are those of Bear Creek, of Applegate River, and of Illinois River. Elevation above sea level in this region ranges from 700 ft. near Galice to about 7,500 ft. on Mount Ashland or Siskiyou Peak. In general, the valleys are from 1,000 ft. to 1,500 ft. high, and the mountains reach 5,000 to 7,000 ft. Josephine County is wholly within the Siskiyou Mountain region; Jackson County extends from the western flank of the Cascade Range into the Siskiyou.

The orebody of the Alameda mine, in the Galice district, has been opened up more extensively than that of any other copper mine in the region. This is due in part to the fact that the property is well situated for systematic development, being in the narrow but traversable canyon of the Rogue River, which cuts across the lode to a depth of at least 500 ft. The development consists of over 6,000 ft. of



ALAMEDA COPPER MINE

tion was soon discarded as impracticable. Flotation has so far given good results.

Little copper ore was shipped from southern Oregon before the war. Shipments increased during the war, running over 12 per cent copper. These shipments were limited by the number of teams and auto trucks available for hauling the ore from mine to shipping point. Since the armistice, the Puget Sound smelters, which were the chief buyers of these ores during the war, have found them useful in fluxing Alaskan ores, and are still in the market. The Blue Ledge mine and the Queen of Bronze mine, the latter being in the Waldo district, are each operating with about forty miners to supply this demand.

Tungsten Mining in China

Large-Scale Production Practically Ceased With the Signing of the Armistice in 1918—Operatives Recover Bismuth as a Byproduct—Supplies Fully Equal to Present or Prospective Demand

BY ROBERT SLESSOR
Mining Engineer, Hongkong
Written exclusively for *The Journal*

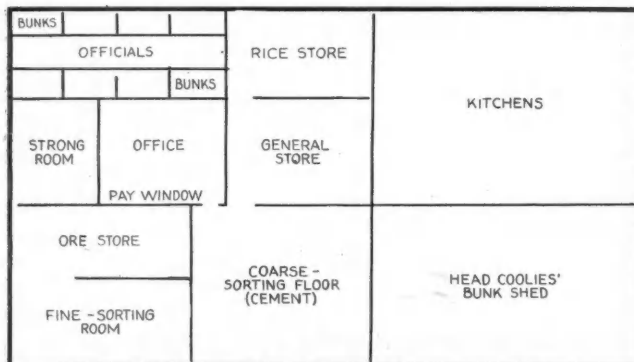
TUNGSTEN mining in China dates from about 1916. It is said that some coolies back from working in the Burmese tungsten mines noticed similar ground in the hills round their villages, and after some difficulty convinced the local merchants that the ore was valuable. Most of the 12,000 tons of tungsten ore that came from China was found in the mountains separating the Kwantung watersheds from the Yangtze River system. The boundaries of the provinces follow these divides, so that the bulk of the Chinese tungsten ores were mined either just within Kwantung or within the provinces of Hunan or Kiangsi, or Kwangsi.

The ore found its way by the easiest routes, i.e. carried on waterways in the native sampans, to

ican market practically closed on account of the impending import duty, and they found the English market weighted by the large government stocks that were only slowly being sold. In consequence, the most of the mines visited were nearly idle.

Description of "Mines"

The so-called "mines" consist of open workings in the detrital matter around the flanks and foot of the mountain that is called the "mine." The mountains are usually from 2,000 to 3,000 ft. above the surrounding hills, and, though not the highest of the range, are fully 4,000 to 6,000 ft. above sea level. Originally the tungsten occurred in quartz lodes, with slates and schists close to the granite. Denudation was very great, and the gravels on the sides of



HAND-SORTING SHED AT LITTLE COW TUNGSTEN MINE
(Built of bamboo and mats)

the ports of Nanning, Wuchow, Canton, Waichow, or Swatow, and a small proportion also to Changsha, and thence to Shanghai. The first-named ports all centered on Hongkong, whence the bulk of the ore went to America—for a good reason. For 1916-17-18 the British government commandeered all the British Empire produce of tungsten at a fixed price of 60s. per unit, and the price in America went to 90s. and over at one time. With the advent of the armistice in 1918, the position was reversed: the price fell in America to below the English price of 60s., which subsisted for some time after November, 1918, and there was an inducement to smuggle tungsten ore into the British territory near Hongkong, in order to obtain the better English price. However, not many tons were successfully got through, as the British authorities knew just where any tungsten would come from in the new territory.

When the British government price fell to 30s. per unit, there was no inducement to mine, and until the embargo was raised recently no tungsten was exported from China to England, and very little to America. The Chinese ore dealers were stocked up with ore bought at high prices; they saw the Amer-



SKETCH OF ROUTES TO TUNGSTEN MINES
Scale about fifty miles to the inch—July 9, Sept. 9, 1919

these hills and the creeks at the bottoms all yielded quantities of easily won tungsten.

The local farmers set to work with their ordinary hoes that they used for their paddy fields and scraped and washed the hillsides for the tungsten contents. At the Tong Kok and Shek Chong mines only two small quartz lodes could be seen at the top of the hill, both bearing a little tungsten, though the ground all around had been well turned over and washed. At the Little Cow mine the "miners" were still working some of the detrital tungsten and also one or two quartz lodes, and at the last three (see map) the quartz lodes were plainly visible and had been tunneled in numerous places.

At the Quee Mee mine, especially, about fifteen quartz lodes were counted on the top of a hill approximately 3,000 ft. high, all of which had been tunneled and burrowed. This last mine was, according to local people, the most recently opened, and,

judging by the work in the eight months it had actually been working, there must have been fully 20,000 workers there. At the time of visiting, however, only about fifty men were at work. The main body of workers left when the price fell, soon after the armistice.

Methods of Concentration

The manner of working and concentrating the ore was much the same at each mine, and a description of one will be typical. The Little Cow mine is worked by a company which holds the "concession" for the ground from the people of Yung Yuen. It is situated about one day's climb in the hills above this village. The company provides food (rice) for the workers on condition they sell all the ore won to the company. The ore is washed from the soil by leading a stream of water to it, the arrangement being similar to that employed in the recovery of tin. A small wooden sluice box is used in which the gravel is "forked" or worked by a shovel to a rough concentration. The product is then hand-picked on the spot and carried in baskets to the central mat shed, where the offices are. There it is again hand-picked on a cement floor (see sketch), but it is not broken or crushed. When the basketful is judged clean it is weighed by the company official and paid for at once at a fixed rate, usually from 10 to 15c. per catty of 1.333 lb. for the tungsten and a higher rate for any bismuth that may be recovered, for this ore carries about 10 per cent of bismuth, which is easily picked out, on account of its whitish color, which contrasts sharply with the dark brown and black of the tungsten.

Ore is Shipped in Bags

After sale to the company the ore is again hand-picked to separate the bismuth, and it is then roughly bagged in about 50 lb. lots, so as to make a load of about one picul (133.3 lb.) for the coolies to carry down the hills to the village. At Yung Yuen the finer material is again picked over by women using pointed slats of bamboo, after which it is re-bagged for transport by coolie to Ying Tak, on the railway line, or by boat on the North River.

On arrival at Canton, the ore is again hand-picked at the company's godown, and all is hand-crushed to about 16 to the inch. Finally it is sieved into fines and coarse (the coarse being 16 to the inch), and bagged for export. The export bagging consists of one calico bag, inside a gunny bag. The whole is then wrapped in Chinese bamboo matting and bound with rattan, so as to go about twenty to the long ton. The hand-sorting is very well done, and the ores average 71 to 72 per cent WO_3 , the bismuth assaying over 60 per cent.

The dealers estimate their costs at: cost runners at mine, 12c. per catty; three hand-sortings, 3c.; military tax and likin, $2\frac{1}{2}$ c.; transport by road and river, 12c.; export tax $1\frac{1}{2}$ c.; packing and other costs, $\frac{1}{2}$ c., a total cost f.o.b. Canton of $31\frac{1}{2}$ c. per catty. This corresponds to about \$7.30 per net ton per unit.

The rather high cost is offset, however, by the 10 per cent of bismuth which the operators recover without expense, which enables them to sell their

tungsten at less than above unitage. The procedure at the other mines is much the same as to hand-sorting, but the arrangements are more primitive, as few go to the cost of building a complete shed. The Little Cow mine is managed by a Chinese who spent some years in the Federated Malay States.

Clean Concentrate Produced, but Process Slow and Costly

The present Chinese methods produce a clean concentrate, but they are slow and costly. When the hard quartz is worked, it is hand knapped and washed in close woven baskets. Even so, much ore must be lost which could be recovered in a modern mill using rolls, jigs, and tables. Though this is true generally there is no one "mine" where the development is enough to justify a mill, even if Chinese capitalists could be found willing to venture the money. When the miners find that the easily won detrital ore begins to be worked out, they look for another hill, and generally find one not far distant. Thus the supply of tungsten ore always equals the demand.

Further in the interior of China, tungsten has been found in many places, but on account of the cost of carriage, by land or water, these mines cannot be worked on present unitage prices for tungsten.

Had the Great War lasted another year there is no doubt that many more deposits would have been opened. The geological features of the ore occurrences I have not discussed, as that subject has been covered elsewhere.

Stone's Report to Zinc Institute Indicates Many European Opportunities

The opportunities for export trade in zinc are described in a recent report prepared by George C. Stone for the American Zinc Institute. Mr. Stone has a wide acquaintance among the men in the zinc industry, both here and abroad, and in the trip which he made to Europe was able to pick up a great deal of valuable information regarding possible markets.

Considering zinc ore, Mr. Stone believes that the principal market lies in Belgium, with little opportunity of selling to England or France. Holland and Germany, he thinks, will also import high-grade ore, which could be supplied to advantage by this country.

The high quality of American slab zinc is emphasized, and for several years, at least, the United States seems to be the only country in a position to supply the European demand for this material. Sheet zinc is also in demand, and a great deal is used in building construction.

In any inquiry into export conditions nowadays considerable attention must be given to the question of transportation cost and of foreign exchange, for these two items have changed the course of a great deal of tonnage. Mr. Stone has discussed these topics fully. Belgium will no doubt smelt the Australian ore, on account of several favorable conditions. Considerable inquiry was made into the smelting costs of that country.

NEW PUBLICATIONS AND BOOK REVIEWS

Geology and the Deposits of the Tintic Mining District, Utah.

By Waldemar Lindgren and G. F. Loughlin. Professional Paper 107, U. S. Geological Survey, 282 pp. Washington, D. C.

This is another addition to the noteworthy series of studies of mining districts which have been issued by the Geological Survey. The first part, by G. F. Loughlin, is devoted to general geography and geology; the second part, by Waldemar Lindgren, to the ore deposits.

In Mr. Loughlin's general discussion we find a little too much of the attitude of the well-read student, with his mind full of the previous literature, and the views of previous authors. His first sentence, indeed, is "The East Tintic Mountains as a whole are rather complex and form parts of the extensive but now partly buried system of block mountains known as the Basin ranges." This is good text-book stuff, but, so far as we know, the text books have not an adequate basis of fact for the tradition; nor is adequate evidence, as to the East Tintic range owing its elevation and relief to recent faulting, offered in the paper. The map and cross sections show nothing of the kind, but show the range as a synclinal range of erosion. Similarly, concerning the valleys (p. 17) the author states, without offering any evidence, "These valleys represent the down-faulted portions of the Great Basin," a statement not even in accord with the unsubstantiated but well-fixed theory that he has in mind.

Similarly, in the case of the igneous rocks, the phenomena are evidently examined with a mind surcharged with current theories like those of Daly (following La Croix and others), on assimilation of wall rocks and magma intrusion by "stoping," and the method is to examine how far the geologic features of the district do or do not harmonize with these particular theories. Thus (p. 75):

"The early rhyolite east of the Iron Blossom mine, represented by the next eruption may be a differentiate from the latite or andesite, due to gravitative separation of the constituents originally in the andesite; but possible effects of abyssal assimilation cannot be denied.

"The production of the Packard and Swansea rhyolites through the assimilation of siliceous rocks by monzonitic magmas some miles below the surface was also possible, but quite beyond the realm of proof."

All this is conjecture, and even the ideas conjecturally stated are not derived from examination of the phenomena of the district, but from general and in part conjectural literature.

Nor does the presence of inclusions of intruded rocks in an intrusive monzonite mass necessarily indicate "stoping" as a method of intrusion (p. 87).

The safe and time- and paper-saving method of geological investigation is to reason direct from local phenomena to cause; and it is this method alone which yields solid results.

Nevertheless, there is a great deal of valuable information and careful research in this paper. The sedimentary beds are Paleozoic; the igneous rocks Tertiary. The succession of these lavas is established as essentially 1, andesite; 2, rhyolite; 3, latite (monzonite); 4, basalt. As in most other districts, faulting occurred at various periods. Of special interest (p. 95) is the abundance of spinel as a contact-metamorphic mineral.

The most striking thing about Mr. Lindgren's investigation of the ore deposits is the splendid mineralogical study made by himself and assistants. Ground-water studies showing the deep-water level in this arid range are interesting, both in this and in Mr. Loughlin's part of the work. The ores

are of silver, lead, copper, gold, and zinc (and bismuth, antimony, and arsenic); and are connected with the monzonite intrusion. Gold and copper occur on the whole near the monzonite; lead, zinc and silver further away. In individual mines, a similar but not so definite change is noted with depth. This corresponds with the theory, first worked out by Spurr, of successive precipitations of different metals from the same solutions in successive zones with falling temperature, with the copper zone below the lead-zinc zone; this has been abundantly verified by others in Butte and elsewhere, and in Utah by Butler, who first pointed out that similar zones occur laterally from an intrusive body. Here at Tintic it is stated that the ore deposits were formed only a few thousand feet below the surface. The dolomites and limestones have been the most favorable for ore deposition. Barite is the most conspicuous gangue mineral; the adjoining limestone and dolomites are silicified to jasperoid. The galena carries its silver in the form of argentite. An interesting thing is the inhospitality to ores of the rhyolite: veins do not occur in it, although it is pre-mineral. Similar examples of barren pre-mineral formations exist in Tonopah. The paragenesis of minerals as studied in this section shows in general (p. 184) copper (arsenic and antimony) earlier than lead and zinc.

As in all of Lindgren's work, there is a great deal here that will repay close and repeated study.

Such a work as this would be improved by a summary, to be placed at the beginning of the volume. J. E. S.

Asbestos in the Union of South Africa. By A. L. Hall, Union of South Africa, Department of Mines and Industries, Geological Survey, Memoir No. 12, 1918, 6 x 9½ in.; 155 pp., 15 plates, 16 text figures, 1 infold map.

This publication is a combined geologic and economic report. The deposits described are of special interest, owing to the remarkable fiber length and high percentage of spinning asbestos obtained, and also because of the diversity of asbestos types represented, all the principal commercial varieties being mined in South Africa. Asbestos, particularly that of spinning grade, is finding wider uses year by year; in fact, the demand at present greatly exceeds the supply. The appearance of a volume devoted entirely to the asbestos deposits in South Africa is, therefore, timely, and affords information of particular interest to all manufacturers of asbestos products.

The opening chapter deals with the varieties and properties of asbestos, with special reference to the South African products. The occurrence, chemical composition, and physical characters of chrysotile, crocidolite, amosite, and tremolite are briefly described. In Chapter II, relating to asbestos deposits in the Cape Province, a detailed description of the asbestos belt is followed by an account of the varieties of crocidolite or blue asbestos, and a description of the occurrences, nature of fiber veins, mine workings, method of preparation, grading, and disposal of the product. Chapters III and IV are devoted to the asbestos deposits of the Transvaal. These consist of chrysotile or white asbestos of the Canadian type, crocidolite or blue asbestos, and amosite, a recently discovered variety of ash-gray, pale brown, or nearly white asbestos, found in cross-fiber veins in the Lydenburg and Pietersburg districts. In Chapter V, the chrysotile and tremolite deposits of Natal are described.

Chapter VI deals with the genetic problem. The discussion is comprehensive, reference being made to the works of various geologists who have made careful studies of the subject. It is pointed out that the chrysotile veins of South

Africa do not occur in massive serpentine as in Canada, but are interbedded in dolomite, and are associated with basic sills. Magnesian silicates were formed presumably by contact metamorphism, and were altered later to serpentine, which crystallized in prismatic form in fractures. As the serpentinization is evidently a result of the action of meteoric waters, the author concludes that the deposits are relatively superficial as compared with those of Canada. Crocidolite and amosite, the monoclinic amphibole varieties, occur only in banded ironstones. Although the mode of formation is complex, and not yet clearly understood, the amphiboles were evidently formed from constituents present in the associated sediments, and assumed their asbestiform character through a process of prismatic recrystallization. Deposits of these types probably persist to considerable depth.

Chapter VII, "industrial aspects and uses," contains a discussion of the peculiar properties of asbestos that render it commercially valuable, and the degree to which these properties are developed in the various types of fiber. The chapter concludes with an account of the uses of asbestos, and the present status of asbestos manufacturing industries in South Africa. Chapter VIII gives statistics of production, and this is followed by a concise summary of the entire subject, an appendix presenting some analyses, and a bibliography of literature on South African asbestos. An infold sketch map shows the distribution of asbestos deposits in South Africa.

To users of asbestos, the most important part of the report is the detailed description of the new iron amphibole asbestos, which the author has named "amosite." The most remarkable feature of this mineral is its great fiber length, which reaches a maximum of about 11 in., the entire output from one important mine averaging 6 in. The fiber is said to be superior to crocidolite as regards incombustibility, and is at least equal to it in tensile strength, flexibility, and in seawater and acid-resisting properties. It can be readily spun into yarn and woven into cloth, though, on account of its unusual fiber length, some modification in spinning machinery is necessary. The description of these deposits which are extensive will arouse wide interest among users of asbestos in all parts of the world.

It is to be regretted that no list of producing companies, with their addresses, is given, for, on account of the present shortage of spinning fiber, many consumers will desire to obtain supplies from this field, and such a list would greatly simplify communication.

The text is well written, logically arranged, and is in every respect a creditable publication that will take an important place in the literature of this most interesting and useful mineral.

O. B.

Asbestos from Mine to Finished Product. 9½ x 11 in., 194 pages (including blanks), 60 plates; prepared and published by the Asbestos and Mineral Corporation, 17 Battery Place, New York City, 1919. Edition limited to 1,000 copies.

In this publication the story of asbestos is largely pictorial, as the text consists only of a foreword (one page and a quarter) and a descriptive title for each of the sixty plates. The titles, however, contain sufficient information to constitute, together with the illustrations, a fairly connected story. The first twenty-seven plates are illustrative of the quarries and mills at or near Thetford Mines, Quebec, Canada.

In arrangement of the subject matter, and in artistic quality of plates and binding, the book merits commendation, though additional descriptive text would have made the story much clearer to those unacquainted with the subject. For a company actively engaged in the asbestos industry, with book writing merely a side issue, the authors are to be congratulated on preparing such an instructive and artistic publication.

O. B.

Oil Engines Details and Operation. By Lacey H. Morrison. 6 x 9; 459 pp.; 357 illus., 19 tables. McGraw-Hill Book Co., New York, 1919.

The book is divided into three parts, dealing with the full Diesel, the semi-Diesel, and the low-compression engines in turn. The author is to be congratulated in that he has spared the reader a long historical discussion. The absence of formulas is another departure from most of the books on the subject, and they may well be dispensed with in a work of this nature.

The first section deserves the greatest credit, and shows the author to be well conversant with the various standard types of Diesels. This part is exceedingly well illustrated. The author begins with a short historical chapter, following it with a brief, fairly well illustrated discussion of the best-known American Diesels, both stationary and marine. Chapter III gives a general description of installation methods which should stand the isolated purchaser in good stead. The next eight chapters deal with engine parts.

The scheme followed in each of these chapters is first to give a general discussion of the part under consideration, followed by a detailed description with illustrations of the principal makes. A discussion of engine troubles and practical operating information is also included. The chapter on valves is exceptionally good and shows timing diagrams for the various engines.

The next chapters deal with air compression systems, cooling water, lubrication, fuel oils, and the first part closes with a chapter on fuel consumption, giving test curves, actual field data, and cost figures comparing the Diesel with natural-gas engines, producer-gas engines and steam turbines. The chapter on lubrication is short, and, for such an important subject, is weak in description. In connection with fuel oils the author devotes a little space to the theory of combustion, with a classification and description of the various American oils. There is also a list of specifications.

In the second part, under the head of semi-Diesels, the following engines are briefly considered: Hoid, Lyons Atlas or Midwest, Nordberg, De la Vergne "F. H.," and a description of the Price principle which has been receiving attention of late. Only twenty-six pages are devoted to engines of this type.

In the section devoted to what the author terms "low-compression engines" a marked decrease in the number of photographs is noticed and the general arrangement is not as pleasing as in the first part. Various details are considered in connection with the following engines: Muncie, Frimm, Chicago Pneumatic, Fairbanks-Morse, Buckeye-Barrett, Bessemer, De la Vergne, Bolinder and Meitz, and Weiss. The discussions are more general, and a larger amount of space is given to repair work than in the other sections. The chapters on governors, fuel pumps, and fuel nozzles are good, and this is fortunate, as these are vital parts, and a clear understanding of them is essential.

The last three chapters take up, in turn, exhaust pits and water cooling systems, air starting systems and operating troubles, and fuel consumption, giving curves for various engines and cost figures.

Owing to the rapid strides in the semi-Diesel and low-compression types, the author has unwittingly described some obsolete features as being up to date. Cases in point are the Hoid ignition device and the Fairbanks-Morse engines. The latter now employ a compression pressure of 250 lb. per sq. in., thus bringing them out of the author's "low-compression" class.

Altogether, the book is satisfactory and will prove valuable to anyone interested in the subject of oil engines, whether from a manufacturing or an operating standpoint.

T. M. R.

Oil Shales of DeBeque, Col.

Present Status of Development and Future Possibilities—Description of Properties and Geology of Deposits—Retorting and Refining Problems to be Solved
Importance of Byproducts

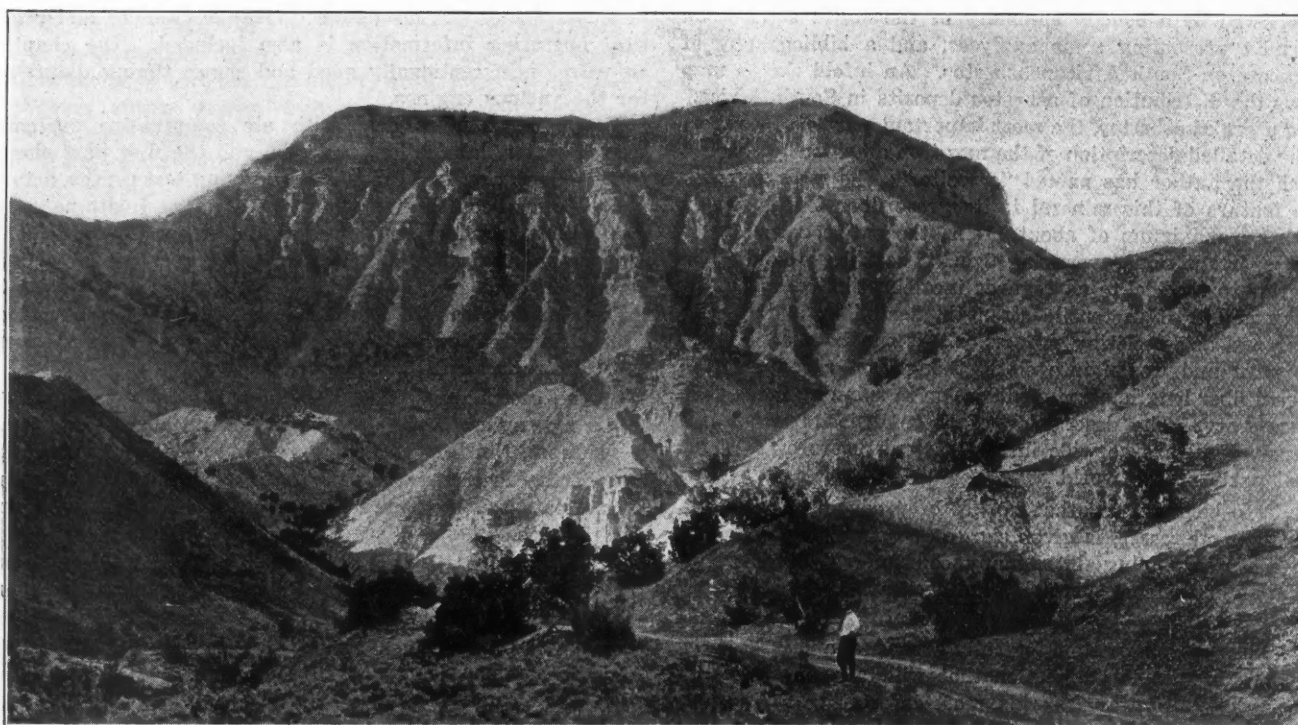
BY G. ROBERT DEBEQUE

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Written exclusively for *The Journal*

GOVERNMENT statistics indicate that the supply of petroleum in the United States will probably be exhausted in considerably less than twenty-five years. Acknowledged authorities state that, despite the greatest drilling activity in the history of the industry, the increase in production is not keeping pace with the increase in demand. The United States now imports about four million barrels of oil per month from Mexico. Statements of George Otis Smith, Director of the U. S. Geological Survey, show that of crude oil there was in

the United States affords reasonable assurance that general trend of oil prices will be upward. This, in conjunction with the fact that the production of oil shales has been a successful business in Scotland since 1850, where the shales are much poorer, less extensive in area and thickness of strata, and more difficult to mine than the Colorado shales, justifies the belief that the immediate development of the industry in Colorado offers profitable opportunity for the investment of capital.

Oil-bearing shales are found in the United States



MT. LOGAN, FOUR MILES FROM DEBEQUE. A MOUNTAIN OF OIL SHALE.

storage on Dec. 31 of the years 1915 to 1918, inclusive, the following:

	Barrels
1915	194,185,000
1916	179,371,000
1917	156,168,000
1918	132,800,000

and that during the same period there was marketed

During	Barrels
1915	281,104,104
1916	300,767,158
1917	335,315,000
1918	345,896,000

In view of these facts, the importance of the oil-shale deposits of Colorado and Utah is apparent, for in them probably lies the future oil supply of the United States. Whether or not the development of this new industry would be a commercial success at this time can be definitely proved only by actual practice. The history of the petroleum industry in

in formations ranging from Ordovician to late Eocene age, but the older shales, except those related to cannel coal, are not rich in oil. The richest shales belong to the Green River (Eocene), and are found in northwestern Colorado, northeastern Utah, and, to some extent, in Wyoming and Nevada. The oil-shales of Colorado and Utah are of the greatest commercial importance. The Colorado and Utah area consists of 2,500 square miles, underlaid with oil shales, much of which is remote from transportation. A great portion of the area in Utah is overlaid with more recent formations.

DeBeque and Grand Valley in Colorado are the centers of oil-shale development, and it is doubtful that the more remote districts will receive attention for several years. The towns named are situated on

the main line of the Denver & Rio Grande R. R., about midway between Denver and Salt Lake City, and they are on the southern edge of the oil-shale area. Grand River and its tributaries have cut through the Green River formation at these places, thereby exposing the oil-shale outcroppings 1,000 to 2,500 ft. above the valley floors. The strata composing the Green River formation are horizontal or nearly so. Faults are rare, and when found are of the normal type. The richest shales occur in the middle member of the formation, and are from a few inches to 80 ft. thick. They have an aggregate thickness of 100 to 500 ft., and are remarkable for their regularity. The upper and lower members of the formation also contain oil shale, and though some of the beds are fairly rich, they vary greatly as to thickness and continuity, and are not dependable. In many places the upper member of the formation has been eroded, and the rich shales of the middle member are then exposed at the tops of the mountains.

"Massive" shale is the local name given to that variety that is richest in oil. It is fine-grained, curly in structure, and resists erosion. The weathered outcrops appear as benches, which are grayish blue in color. When broken, it is dark brown or black, and when very rich it has a vitreous appearance. "Papery" shale derives its name from the fact that this variety shows the stratification more clearly, and when weathered it presents an appearance of leaves which are very flexible. "Papery" shale is sometimes black, but is usually dark brown. It is not as rich as massive shale, and weathering affects it more than 20 ft. from the outcrop, whereas the "massive" shale is affected only a few inches.

On Roan, Dry Fork, Conn, Kimball, Clear, and Brush creeks, tributary to Grand River at DeBeque, there are 175 miles of continuous outcrops of oil shale, and at Grand Valley the outcrops are 69 miles in length. There are strata from 4 to 80 ft. thick of "massive" shale which yields 40 to 100 gal. of oil per ton. In many places there is an aggregate thickness of 100 to 300 ft. of leaner shales yielding 20 to 30 gal. per ton, and there are numerous strata of "papery" shale from 6 to 50 ft. thick which yield an average of 42 gal. of oil per ton of material.

Twelve oil-shale companies are operating in the DeBeque district. None is producing oil, although some are now constructing retorting plants. Others are confining their operations to mining and general development of the shale deposits. The Colorado Carbon Co. owns 5,920 acres of shale land on Kimball Creek, twenty-seven miles from DeBeque. The main stratum of shale is 60 ft. thick and yields an average of 100 gal. of oil per ton. The property is equipped with a tramway one-half mile long, and the company owns a retorting and chemical plant in Kansas City. The raw shale will be shipped to that place, where it will be treated for the recovery of chemicals and other byproducts. The work on the property is confined to the construction of roads and development of the various shale beds.

The Oil Shale Mining Co. has 960 acres on Dry Fork, twenty miles from the railroad. It has six

retorts of the Henderson (Scotch) type, each being of six tons daily capacity. It has been demonstrated by preliminary experimentation that the Henderson retort is not, under the conditions to be met, so far applicable to the treatment of the rich "massive" shales in the DeBeque district. The management has conducted tests with the Young (continuous-feed) process, and has ordered one unit of six tons' daily capacity, to be constructed on the property, for the purpose of making more extensive experiments. The company owns an aerial tramway 2,000 ft. long. The main bed of shale is 10 to 20 ft. thick and averages 75 gal. of oil to the ton.

The Mount Logan Oil Shale Mining & Refining Co. has 1,180 acres on Mount Logan, four miles from DeBeque. The property is equipped with an aerial tramway one mile long and three twenty-ton Galoupe retorts have been erected. It is reported that the plant will be in operation soon. The main shale stratum on this property is 12 ft. thick, and yields an average of 100 gal. of oil per ton.

The American Shale Refining Co. owns 12,000 acres on Conn Creek, twelve miles from the town. A Wingett retort of 150 tons' daily capacity was ordered for the property and shipped to DeBeque, but has not been erected. Material for a 3,000-ft. tramway is on the ground. The shale cliffs of this property rise to a height of 2,500 ft. and expose the outcrops of five large shale beds. Only the richest two will be developed. They are 60 and 75 ft. thick and yield an average of 60 to 50 gal. of oil, respectively.

The Mount Blaine Oil Shale Co. has 3,000 acres of land between Clear and Roan creeks, fourteen miles from town, and the company has purchased a Galoupe retorting plant of thirty tons' daily capacity. The main bed of shale is 12 ft. thick and will yield about 100 gal. of oil per ton.

The U. S. Consolidated Oil Shale & Refining Co. has 5,000 acres of land on Kimball Creek, twenty-five miles from DeBeque. It has shale beds yielding 70 to 125 gal. of oil per ton. It is reported that the company will begin the development of the shale beds at once.

The DeBeque Shale Oil Co. owns land on Brush Creek; the Velvet Shale Oil Refining Co. has property on Clear Creek; the Lackawanna Oil Shale Products Co. has 1,280 acres on Conn Creek, and the Shale Oil Syndicate owns oil-shale deposits on Clear Creek. It is expected that some of these companies will soon begin the erection of plants for treatment of the shales. It is also reported that plans are being made for the construction of a shale-oil refinery to be situated in DeBeque.

Companies operating in the district (with one exception) are concerned only with the production of crude shale oil. The recovery of ammonium sulphate and other byproducts will probably receive no attention until a satisfactory process has been developed for the recovery of oil.

The Oil Shale

The Green River formation consists principally of shales which were deposited in fresh water. Shale

which yields oil is dark brown to black and has a specific gravity of 1.60. It is fine-grained; is impervious to water and oil, and when it is rich and thin-bedded is very flexible. In distillation or burning it loses from 10 to 40 per cent of its weight, according to the amount of volatile matter that it contains. Complete combustion leaves a residue of clay, lime, and sand.

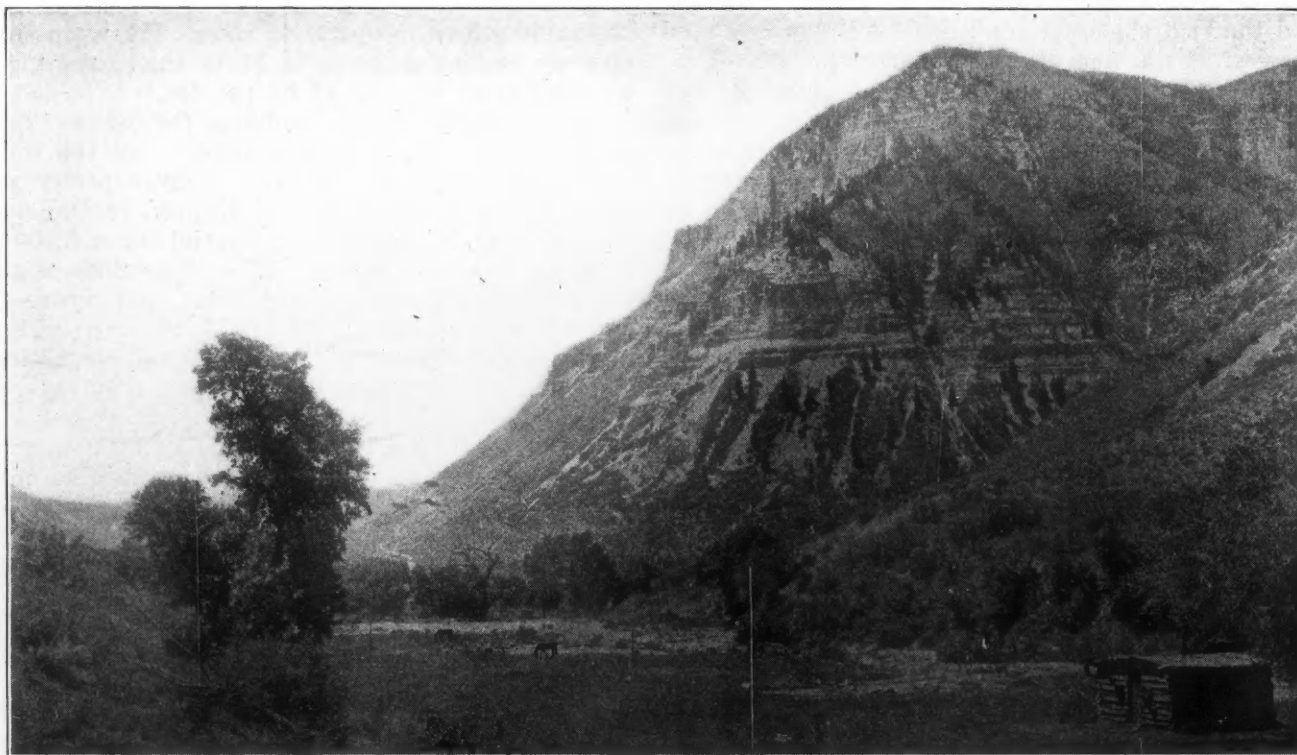
Oil shale does not contain material soluble in the common solvents of bitumen. Shale oil is derived from lower plant and animal matter which has been altered to more or less extent by bacteria and other agents. The material which yields the oil is known as "kerogen."

Destructive distillation of the shale and subsequent condensation of the gas produces crude shale oil, which has properties common to both petroleum

as is done by assaying for metals in ores. It is also noted that different shale beds yield oils of pronounced characteristics.

From numerous tests made by the U. S. Geological Survey and by private individuals it is estimated that in the DeBeque district the "massive" shales will yield an average of 60 gal., the "papery" shales 42 gal., and the leaner shales 30 gal. of oil per ton of material. It is not probable that the richness of the shale will increase with distance from the outcrop beyond the zone naturally affected by weathering. Two oil wells were drilled in Rio Blanco County in the shales of the Green River formation. One well encountered gas but no oil, and the other developed a small amount of oil near the contact between the Green River and the underlying Wasatch formation.

Mining is of primary consideration in the develop-



OUTCROPPINGS OF OIL SHALE IN THE GREEN RIVER FORMATION

and coal tar. The oil may be fractionated and refined in a manner similar to crude petroleum. Nitrogen may be recovered in the form of ammonia water, which, treated with sulphuric acid, produces ammonium sulphate. The gas remaining after the oil has been recovered amounts to 2,000 to 4,500 cu. ft. per ton of shale. It may yield gasoline by compression and refrigeration, and the waste gas may then be used for heating the shale retorts.

It is known from laboratory experiments that the quality as well as the quantity of oil produced from shale is affected by the method of distillation. Rapid heating to a high temperature breaks up the hydrocarbons and produces non-condensable gases. Steam, pressure, and vacuum have different effects on the quality and quantity of oil produced. For these reasons it is impossible to make an exact determination of the yield of oil in a given sample of shale,

ment of the oil-shale deposits. The industry may be compared with the large low-grade gold and copper mines where, by the use of machinery, large amounts of material are mined at low cost. Until the industry becomes fully developed it is probable that only the richer shales will be mined and treated, but there are large deposits of lean material on the same properties with the rich shales.

Possible Mining Methods

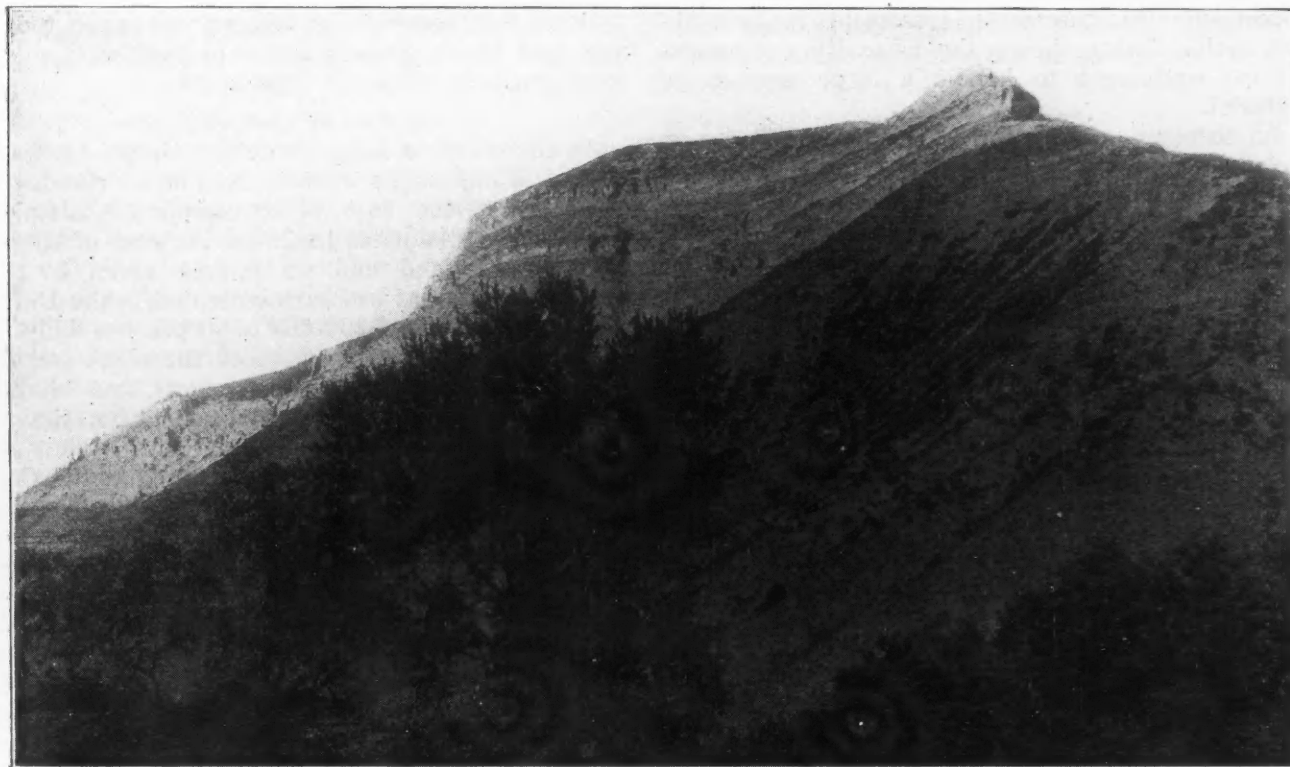
The shales lie in horizontal beds, and where the overburden is thin they may be stripped and mined by steam shovels at an estimated cost of 35 to 50c. per ton. In other places they may be quarried in benches or mined by methods employed in coal mining, at an estimated cost of 75c. to \$1 per ton. As the shale beds outcrop from 1,000 to 2,500 ft. above the floors of the valleys, where the retorting plants

will be situated, the construction of aerial or track tramways must be considered.

Owing to the toughness of the shale, mining methods employed in coal or metal mines may require modification when applied to this particular industry. It is stated that there is a machine on the market which is designed to cut the shale into cubes at the mine face at a cost of 20 to 30c. per ton. The crushing of oil shale also presents some interesting problems. Different retorting processes call for product varying in size from $\frac{1}{4}$ in. to 6 in. It is possible that crushing methods commonly employed in ore treatment may not be applicable to all shales, as some varieties are not friable and do not break readily under impact, though friction causes other shales to become semi-plastic. The estimated cost of mining, crushing, and delivering oil shale to the

ventions have been patented, and though many of them appear to possess merit, others are undoubtedly doomed to failure, either because they will not produce oil or because they will not produce it at sufficiently low cost.

It is hardly to be expected that a process will be discovered that can be universally applied with success to all shales of the district, but it is probable that a process will be evolved the basic principles of which may be applied to the treatment of all oil shales with modifications to fit the peculiarities of each individual problem. The production of oil from oil-shale is comparatively simple, and no unsurmountable difficulties should confront the successful development of the business, but, as in metallurgy, the question requires specialized knowledge and skill, and no company should consider the development of



CAMP ON CONN CREEK, AMERICAN SHALE OIL REFINING CO., NEAR DEBEQUE, COLO.,
ON THE DENVER & RIO GRANDE R.R.

retorts is \$1.25 per ton when the plant is properly equipped with machinery to handle 250 tons per day. When quarrying or steam-shovel mining is possible, this cost should be greatly reduced.

Electric power for the operation of mining machinery may be produced in the DeBeque district by utilizing the water of Grand River. An abundant flow of natural gas has been developed in the drilling of oil wells in the district and it could be used for the same purpose.

Retorting of Shale

The development of the oil-shale industry depends on the discovery of a retorting process which will produce oil economically. The problem has for some time been receiving careful study and experiment by government and individual chemists. Numerous in-

ventions have been patented, and though many of them appear to possess merit, others are undoubtedly doomed to failure, either because they will not produce oil or because they will not produce it at sufficiently low cost.

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shales, is required as a byproduct of the industry. For the recovery of oil only, a lower temperature is probably better. It is obvious that the Scotch method of distillation requires an extensive equipment, especially when it is desired to treat large amounts of shale, as the charging of the retorts, the treatment of the charge, and the unloading require several hours. The endeavors of American inventors are to develop a low-temperature process (700-900 degrees F.) which will allow continuous mechanical feed, so that the retorting of the shale will not be intermittent.

It has been proved in practice tests at DeBeque that the rich "massive" shales cannot be treated successfully in the Scotch retort, as on the application of heat the mass becomes plastic, and when the retort is cooled the shale adheres to the walls and is difficult to remove. The "papery" and lean shales do not offer this difficulty in treatment, the only objectionable feature being the necessity for an extensive equipment to handle a large amount of material.

As no plant is operating in the United States on a commercial scale, the cost of retorting is uncertain, and estimates can be made only by comparison with costs at other places in similar enterprises. In Scotland, the cost of retorting is 40c. per ton of shale treated. By using the same process in Colorado the cost is estimated at 50c., but it is expected that a continuous-feed process will greatly reduce this amount. In refining crude petroleum the cost of "topping," or removal of gasoline, is 10c. per bbl., and the cost for similar treatment of shale oil should be about the same. In a plant treating 250 tons of shale per day, the complete refining of the crude shale oil, with production of gasoline, gas oil, lubricating oil, and paraffin wax, with asphaltic residue, and including cost of piping, storing, barreling, and shipping, is estimated at \$1.25 per ton of shale, or per bbl. of oil, where the shale yields an average of one bbl. per ton of material. With an additional cost of \$1.25 per ton to be accounted for in royalties, interest, amortization, and management, the total cost of producing the refined products would be, for a plant of 250 tons' daily capacity treating shale yielding 1 bbl. (42 gal.) of oil per ton, approximately:

Mining, crushing, and delivery to retorts.....	\$1.25
Retorting the shale.....	.50
<hr/>	
Total cost per bbl. of crude shale oil.....	\$1.75
Refining and preparation of oil for shipment.....	\$1.25
Royalty, interest, amortization, and management..	1.25
<hr/>	
Total refining and overhead cost per bbl. crude oil	2.50
<hr/>	
Total cost per ton of shale or per bbl. crude shale oil to produce finished products ready for market	\$4.25

Crude shale oil of 23.3 gravity was treated by Otto Stalman, of Salt Lake City, by the Stalman process for the refining of crude shale oil, with the following products resulting: Gasoline, 19 per cent,

460 end point; gas oil, 12 per cent, which will yield additional 6 per cent gasoline by "cracking"; lubricating oil, 60 per cent, flash, 395; fire, 475; viscosity, 410 at 100; asphaltic residue, 5 per cent; wax, 2 per cent, 134 degrees melting point.

At current wholesale prices of the above products the shale oil would have a value of \$10.30 per bbl., which, after deducting mining, retorting, and refining costs of \$4.25 per bbl., would leave a profit of \$6.05 per bbl. of crude shale oil or per ton of shale when the material yields 1 bbl. (42 gal.) per ton.

The wax produced from shale oil, representing about 2 per cent of the whole amount, is harder, and being of 134 degrees melting point, in comparison with petroleum wax, which has a melting point of 114 to 124 degrees, is superior to the petroleum product. The asphaltic residue from shale-oil refining, representing about 5 per cent of the total amount, is superior to asphalt or coal tar in toughness and has a greater range in temperature between melting point and brittleness.

Estimates on Cost of Plant

As the oil-shale industry in the United States is new, it is impossible to state, within a close degree of accuracy, the cost of a complete shale-plant equipment. Estimates based on the cost of similar plants in Scotland, and on figures given by the owners of different processes patented in the United States, range from \$250 to \$2,500 per ton daily capacity, depending on the size of the plant and the extent of the refining of the products, and whether or not the plant includes equipment for the recovery of ammonium sulphate.

Some engineers are of the opinion that the Colorado shales can be treated at a profit only by handling at least 1,000 tons daily. This may be true when considering the lean shales which yield about 30 gal. of oil per ton, but for the "papery" shales, which yield an average of 1 bbl. (42 gal.), and the "massive" shales, yielding as much as 100 gal. per ton it appears that a plant of 250 tons' daily capacity, properly equipped with machinery so arranged that the material can be handled at minimum cost, should be a commercial success for the production of oil, without considering the production of ammonium sulphate or the different byproducts to be derived from the asphaltic residue.

It is claimed that at Chiswick, England, the shale plant of the Oil Products Co., Ltd., was taken over by the British government in 1917, and experiments on material from different parts of the British Empire, extending over a period of several months, were conducted under the supervision of Sir Boverton Redwood in using a low-temperature process. As a result of these experiments the British government decided to erect a commercial plant, and accordingly gave a contract for the construction of a plant of 100 tons' daily capacity. It appears from this that the British government considers a 100 ton plant to be of commercial size for the treatment of oil shale, and it is possible that a plant of this capacity would be successful in treating the rich shales of the De Beque district.

In addition to gasoline, lubricating oil, and other byproducts of crude petroleum, oil shales produce ammonium sulphate, which is valuable as fertilizer. Introduction of steam into the retort greatly increases the yield. Theoretically, the average yield of De Beque shale should be about 50 lb. per ton, but in practice it is estimated that a saving of 60 per cent can be made and that the actual yield of ammonium sulphate will be about 30 lb. per ton of shale.

The asphaltic residue from the fractionation of the different oils in the refining process amounts to 2 to 4 gal. per bbl. of crude oil. It is similar in many respects to gilsonite, elaterite, and ozokerite, and, for ordinary purposes where asphalt is used, it is superior to that material. When specially treated it yields byproducts common to coal tar, besides numerous others not found in coal tar. Chemists have succeeded in isolating about fifty valuable byproducts among which are varnishes and enamels that are proof against heat, water, and acid; paints that resist heat and erosion; a variety of hard rubber which can also be used as filler for automobile tires; various coloring materials used in the manufacture of fine glass, pottery, and ornamental tiles; dyestuffs; bases used in the manufacture of explosives; valuable drug products; flotation oils.

The complete development of the oil-shale industry will combine manufacturing with chemistry and mining. As the exploitation of the oil-shale deposits progresses, it is to be expected that a number of manufacturing enterprises will be developed, and it will undoubtedly be found that certain shales will be especially valuable for different purposes. The availability of hydroelectric power and the supply of natural gas at De Beque will aid the development of manufacturing at that place.

After the gas, emanating from the shale during the retorting process, has been conducted to condensers and the crude oil extracted, there remains from 2,000 to 4,500 cu. ft. of waste gas per ton of shale that is comparable with artificial gas. It has a calorific value of about 500 B.t.u. per cu. ft. of gas, or an average of 1,625,000 B.t.u. per ton of shale. The waste gas may be treated for the recovery of sulphur, and additional gasoline may be recovered by compression and refrigeration. The residual gas, still containing efficient calorific properties, may then be used for heating the shale retorts.

Shale Tailing

The shale tailing, amounting to about 60 per cent of the original weight of shale, will undoubtedly be considered as waste until the industry becomes more fully developed, and until that time must be disposed of or stored for future use. It offers possibilities for revenue in the manufacture of pigments, cement, and brick; for the recovery of potash and phosphates, and for road dressing.

Oil shale beds can be sampled and measured, and the oil yield closely estimated. Estimates made by the U. S. Geological Survey place the average production of areas in the United States covered by oil wells at 3,000 to 5,000 bbl. per acre, and the same

authorities estimate the average yield of Colorado oil shales at 50,000 bbl. of oil per acre. Assuming one stratum of oil shale 10 ft. thick which will yield an average of one bbl. (42 gal.) of oil per ton of shale, one acre of ground would then produce 21,780 bbl. of oil. Valued at 10c. per bbl. for "oil in place," an acre of land would have a value of \$2,178. But in the oil-shale areas there are several strata, one above the other, which, in the De Beque district, have an aggregate thickness of 100 to 500 ft.

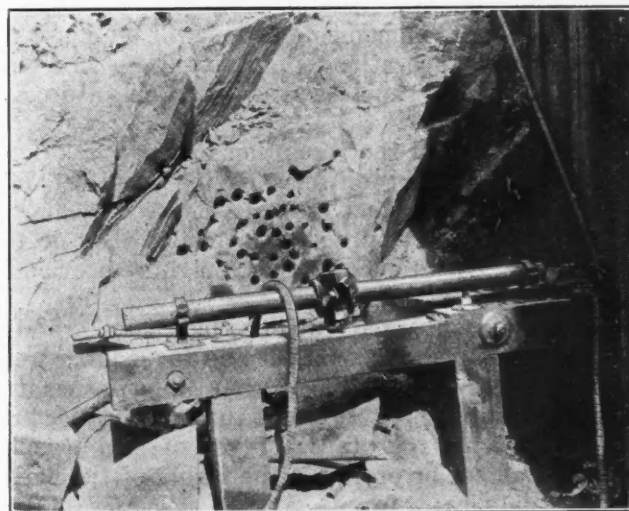
One stratum of shale 10 ft. thick and yielding one barrel of oil per ton, on a strip of land $\frac{1}{2}$ mile in width extending along the 175 miles of outcrops in the De Beque district, would yield 1,183,000,000 bbl. of oil after allowing 25 per cent loss for pillars left in mining. In addition to the oil, there would be 29,575,000 tons of ammonium sulphate, of which about 17,750,000 tons would be recoverable.

The illustrations reproduced herewith have been secured through the courtesy of the Denver & Rio Grande Ry. Co.

Testing Rock Drills

After rock drills have been repaired, some kind of test is necessary before they are sent to the working place. In the absence of a special testing machine, various expedients are resorted to in the shop. These range from the simple method of turning air into the machine and operating it, to the one illustrated in the accompanying cut.

In many cases suitable rock for drilling cannot be obtained as close to the repair shop as may be de-



MECHANISM USED TO TEST ROCK DRILLS

sired, but under such conditions a block of granite can be provided or any other rock of firm texture and sufficient hardness. The picture shown was taken at the Mountain King mine, at Mountain King, Cal. Alongside of the shop where drills were sharpened and repaired a drill stand was erected so as to permit of the drills being tested against the "greenstone," which is a common rock in the neighborhood and which is both hard and tough. The drill is set up and tested by drilling a hole sufficiently deep to prove that it is in good condition.

THE PETROLEUM INDUSTRY

Mexican Oil Business Passing to the British

THAT our Government, by its "Hands off in Mexico" policy, is allowing the profitable Mexican oil business to fall into the hands of British interests is clearly shown in an interesting article by Wilbur Forrest in the N. Y. Tribune of Jan. 19. When the Mexican government passed the now famous Article 27, the British interests, represented by the Mexican Eagle Oil Co., a reorganization of the old Royal Dutch-Shell and the Pearson interests, decided to obey the mandates of the Carranza government. The American companies, on the other hand, realizing the injustice of the new laws, and believing the government to be only temporary, decided

to stand up for its rights, and expected the aid of the Washington officials. This they have not had.

As the American companies are not willing to comply with the provisions of Article 27, they are not allowed to drill new wells. The present production is rapidly going to salt, and the British interests are securing a hold which it will be almost impossible to break. One American company has even been forced to buy oil from Oklahoma in order to fill its contracts for the Mexican product.

The policy of our Government will certainly not give confidence to those of our citizens who are considering the development of resources in foreign countries.

American Oil Companies May Resume Drilling in Mexico

President Carranza Publishes Resolution Which Postpones Enforcement of the Offending Article 27

TEMPORARY relief is offered sufferers under Article 27 of the Mexican Constitution, in a resolution which President Carranza gave to his Secretary of Commerce, Industry and Labor, on Jan. 17. Forty-six oil companies, it is understood, have petitioned against this legislation which virtually nationalizes all oil territory belonging to foreigners. The latest decree postpones the enforcement of Article 27 until the latter is embodied in the law of the land. The companies affected will no doubt resume drilling operations immediately in order to check the recent rapid decrease in Mexican production.

A translation of the resolution follows:

"The petroleum companies having manifested in an express manner that they are disposed to comply with all of legal requirements provided they do not imply the violation of their rights previously acquired;

"Having manifested equally that they are disposed to accept provisional permits for drilling wells valid until the Congress of the Union issues the organic law of the 27th constitutional article, providing that the acceptance of use of said permits does not attack or prejudice the rights of the petroleum companies;

"Having manifested equally that they will not claim from the fact of receiving the said permits to acquire any new right, nor, that the Mexican government by the issuing of said permits abandons any right or principle that it might wish to defend.

"The President of the Republic has seen fit to decide that provisional permits shall be conceded to the oil companies that may petition for the drilling of wells upon the following basis:

"The permits will be valid only until the Congress of the Union issues the organic law of the Constitutional Article 27. The permits that may be granted

in the premises may cover all the wells that have been commenced or drilled since the first of May, 1917; also all the wells that may have been finished, as well as those that now may be in the process of drilling.

"The respective petitions for permits to drill which the petroleum companies may present must contain the statement that the permits will not mean the acquisition of any new right nor the claim that the Mexican government by the fact of issuing said permits abandons any right or legal principle which it may wish to sustain.

"The petitions will also contain an agreement that the permits requested will be valid only until the Congress of the Union enacts the organic law of the Constitutional Article 27 relating to petroleum, when the interested parties must comply with the provisions of said law, or in the contrary case the provisional permits will lapse. It is understood not to have prejudiced in any manner or in any sense the different questions that are now being discussed before the judicial power of the federation the Amparo suits, nor the discussion before the Federal tribunals of general jurisdiction relating to the application of Article 27 and of the different legal decrees on the subject of petroleum issued by the Executive Power. Nor will the discussion of the petroleum law now pending before Congress be prejudiced in any way."

Peace River District of British Columbia Attracts Oil Men

The oil possibilities of territory within the Peace River district and adjoining Dominion lands in the same area are declared by the Hon. T. D. Pattullo, Minister of Lands in British Columbia, to warrant further investigation. Mr. Pattullo's statement is based on the report of Professor J. C. Gwillim, who conducted a party into the country last summer on behalf of the government, an appropriation of \$50,000 having been made for the purpose of investigating the coal, petroleum, and natural-gas resources of the Peace River district. It is likely that a larger

sum will be requested at the forthcoming session of the Legislature to permit of the work being continued. The Standard, the Shell, and the Anglo-Canadian oil companies are showing great interest in the oil fields of both the Peace River district and that around Great Slave Lake. Representatives of the Anglo-Canadian Co. who are in Ottawa look for important developments in the next few years.

The Standard Oil Co. and the Anglo-Canadian Co. are understood to have secured leases covering considerable tracts in the vicinity of Great Slave Lake. The former will send two outfits and the latter one to the ground to make tests. The Shell Oil Co. is understood to have several survey parties at work in possible oil fields situated in the Province of Alberta.

New Booklet on Petroleum Distillation Issued by Bureau of Mines

The Bureau of Mines, Department of the Interior, announces the publication of a bulletin describing the construction and operation of the type of continuous distillation plants commonly known as "topping" or "skimming" plants. Detailed descriptions of methods of constructing and operating a number of representative installations are presented. Data are given for costs of plants, operating expenses, fuel consumption, heat losses, over-all efficiency, laboratory tests on the distillates, temperatures of the liquids passing through the heat exchangers, and analyses of the flue gases.

The plants studied handled about 2,300,000 bbl. of crude oil monthly, and produced approximately 400,000 bbl. of tops, an average yield of 18 per cent. The cost of the plants per barrel daily capacity varied from \$2 to \$28.55; the total fuel consumed under the stills and boilers from 1.07 to 3.69 per cent of the crude treated; and the combined efficiency of furnace and stills ranged from 35 to 66 per cent.

Copies of this bulletin may be obtained by requesting Bulletin 162, "The Removal of the Lighter Hydrocarbons from Petroleum by Continuous Distillation, as Practiced in California," from the Superintendent of Documents, Government Printing Office, Washington, D. C., at a cost of 10c. each.

Hope to Find Oil in Northern Ontario

An expedition fitted out by private enterprise will make exploration for oil in the territory of northern Ontario lying south of James Bay. The party, equipped with a drilling outfit capable of operating to a depth of 900 ft., planned to begin the journey about Jan. 15, leaving the railway at Kapuskasing, about seventy miles west of Cochrane, and following the Kapuskasing River for some distance. Publicity is being avoided as far as possible for the reason that it might lead to the belief that an oil field had been actually discovered.

The Canadian government, in view of the rush to obtain oil leases in northern Alberta, has re-enacted the regulation providing for the payment of a royalty on the output of oil wells. That provision was inserted in all leases issued by the Federal government for many years, but in 1910 was discontinued.

How the Finding of Oil Can Impoverish a County Treasury

One Texas Community Has Its Roads Ruined by Automobile Trucks and All the Income Goes to the Adjoining County

BY ALBERT G. WOLF

THE discovery of oil, and its subsequent production in quantity, should be welcomed in any county of the United States because of the increased revenue such production should bring into its coffers, and thereby lessen the burden of taxation on the general property owners. In Texas, however, where some large oil fields have been developed in recent years, the anomalous condition exists of a county treasury poorer than before oil was discovered. This condition, the County Commissioners declare, is due to the fact that the heavy trucking done by the oil companies tears up the roads, necessitating constant repairs, and yet these same trucks are kept in an adjoining county, where the taxes are paid. Further, the refineries are all in an adjoining county, so that they too escape taxation in the county where the oil is produced.

The argument may be advanced, that the oil land is extremely valuable and should be heavily taxed. But each year the representatives of the oil companies appear before the Commissioners' Court and point out that the land held by the oil companies which has not been drilled is of no more value than farm land, some of it being of less value because no one can say positively that oil will be produced; the land that is producing (the life of top production of Gulf Coast oil wells being short) is just about played out, and is of little more value; and, of course, the land that is worked out, is of no value whatever. Therefore, little, if any, of this oil acreage has a high assessment placed on it.

In view of the foregoing, the increase in receipts by the county from taxation of the oil business is not in proportion to the increased expenditure on the roads necessitated by this same business, and the county is now poorer than it was before the reservoirs of this great "liquid wealth" (to use the favorite phrase of the oil promoters) were tapped.

English Oil Discovery May Prove Valuable

The American consul at Nottingham, England, in an official report states that the recent discovery of oil at Hayton Smeath in the County of Nottinghamshire "appears to justify the possibility of the deposit being worked for commercial purposes." The discovery was made by the Butterly Coal Co. while conducting borings for coal.

United States Steel is not commonly classed as an oil stock and it is not generally known, says the "N. Y. Tribune," that one of its subsidiaries has been engaged in the oil business for years. The Carnegie Natural Gas Co. has extensive oil and gas territory in Pennsylvania and West Virginia, owning, or having under lease, about 190,000 acres. During 1918 a total of 25 billion cu. ft. of natural gas was produced, 134,256 bbl. of crude oil and 585,948 gal. of gasoline.

ITEMS FROM TEXAS AND LOUISIANA OIL FIELDS

Texas Commission's Authority on Conservation Recognized Power of Oil and Gas Division Admitted by Companies Warned to Obey Present Law

Recognition of the power and authority of the oil and gas division of the Texas Railroad Commission to enforce the conservation laws appertaining to oil and gas was shown recently in an exchange of telegrams between the commission and the Gates Oil Co., of Oklahoma. The Gates Oil Co., it seems, has been allowing a gas well in Stephens County, Tex., to run wild for several weeks, wasting millions of feet of gas. A curt telegram to the company by the Commission, stating that the penalty for this is a fine of \$5,000

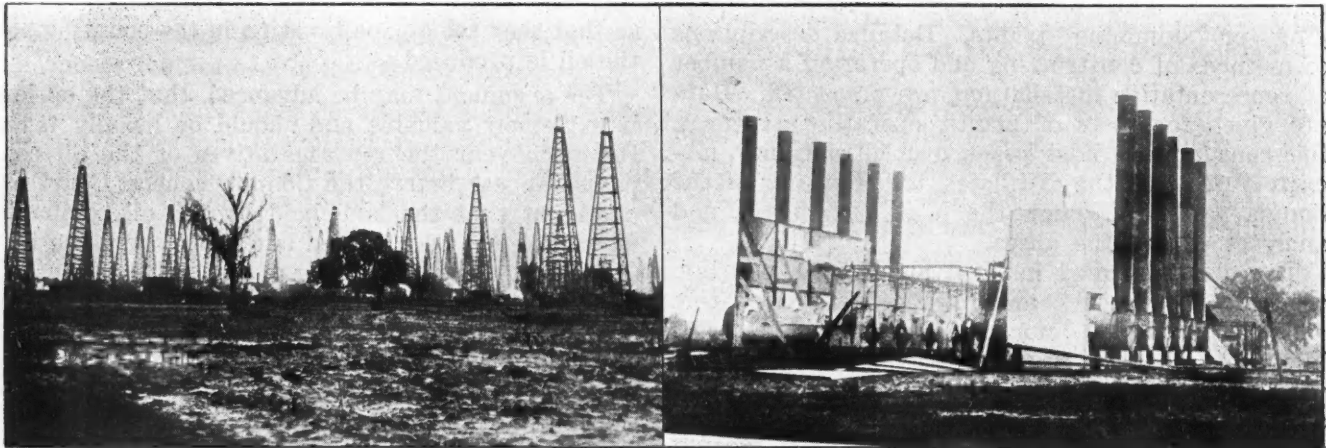
Texas-Oklahoma Boundary Dispute Re-opened at Austin

The Texas-Oklahoma controversy over oil lands in the Red River Valley was opened again recently at Austin when District Judge Calhoun granted an injunction restraining representatives or officers of certain oil companies from entering upon land held by James L. Duffy. This land is held under a permit granted to Sam Sparks by the State of Texas, and transferred to Duffy. It is claimed that Duffy was prevented from drilling by the defendants who threatened and made a showing of physical force. The defendants claim the land under permits granted by Oklahoma, and under placer claims granted by the Federal Government.

Cost of Oil Development High in Northern Louisiana

Work Continues at High Pressure in Spite of Exorbitant Prices and Bad Condition of Roads

The recent wet spell seemed to cool slightly the feverish activity in oil development work in northern Louisiana and northeastern Texas, but it is still continuing despite the terrible condition of the roads and the attendant, almost prohibitive, cost of transportation added to the high wages and high cost of materials and fuel. To haul casing and drill stem a few miles from the railroad to locations, over roads resembling morasses, costs almost as much as the pipe is worth, and the cost of hauling anything else is in proportion. It was



WEST COLUMBIA OIL FIELD, BRAZORI, TEXAS, LOOKING NORTH

BATTERY OF FIELD BOILERS IN WEST COLUMBIA FIELD

a day and refusal of pipe line certificate brought a telegram the next day that the well was shut off. If the well could be shut off that easily, it is stated, there was no excuse for its ever being allowed to blow, and the full penalty of \$5,000 per day should have been exacted.

The powers of this division were also shown when twenty-three small pipe-line companies operating gathering lines were notified recently that their failure to secure permits from the Commission to operate debars them from delivering oil to regular pipe lines. Some of these small companies have already appealed to the Commission for more time in which to make application for permits to do business, according to the rules of the Commission. The penalty practically puts them out of business, and all of them will, no doubt, comply with the regulations.

The Sinclair Oil Co. will build a pipe line from its refinery at Cinco, on the Houston Ship Channel, to the northern Louisiana oil fields and Shreveport.

Small Oil Companies Expanding

Further preparations for extensive development work next spring are indicated by the merging of various oil companies operating in the Texas and Rocky Mountain fields, and the increasing of capitalization of others. On Dec. 29, the stockholders of the Western Oil Fields Corporation instructed their directors to sign a contract of sale to the Producers & Refiners' Corporation. This contract gave the Producers & Refiners' Corporation entire control of the Western Oil Fields Corporation, whose operating properties are in the Homer and Pine Island fields of Louisiana. Stockholders of the latter company were given the option of exchanging their stock in that company for new stock issued by the Producers & Refiners' Corporation.

Another important consolidation was the merging of the Elk Basin Petroleum Co., the Grass Creek Petroleum Co., and the Keoughan-Hurst Drilling Co., into a new corporation capitalized at \$10,000,000.

not uncommon to have to pay \$25 a day for a team and wagon to make a comparatively short trip of inspection.

Activity in the oil business throughout Texas is reflected in the new record for receipts at the State Land Office during December, 1919. Total receipts were \$449,249, chiefly from land sales, leases, permit fees and interest. During the same month 235 patents were granted.

Small Proportion of Dry Completions in Texas

Figures compiled by the Fort Worth Chamber of Commerce show that on Nov. 1 there were 933 rigs and 2,259 drilling wells in the new Texas fields and 169 rigs and 359 drilling wells in the Kansas fields. Between Jan. 1 and Nov. 1, 1919, a total of 2,772 wells were completed in the new Texas fields; 2,217 of these were oil producers, 30 were gas wells, and 516 were dry. Oklahoma reported 7,049 completions during the same period, 3,658 of which were oil producers, a much lower percentage than in Texas fields.

Enlargements and Extensions in Texas Oil Fields

The increasing demand for oil is reflected in the construction of new refineries and the increasing of the capacities of the old ones, and the extension of pipe lines and additions to other transportation and storage facilities for the handling of home production and Mexican crude oil imports. The Gulf Refining Co. is now importing much Mexican crude oil through the ports of Galveston and Port Arthur; the Humble Oil & Refining Co. is making a large expenditure in increasing Texas production, and in a new refinery and in transportation facilities; the Sinclair Consolidated will add a model town to its refinery on the Houston Ship Channel, and will build a pipe line from it to the northern Louisiana oil fields; the Texas Co., it is reported, will enlarge its refinery at Port Arthur; and the White Oil Corporation will build a large-capacity refinery at Texas City, and will extend a pipe line to it from Ranger. The pipe line from Hull to the Houston Ship Channel, planned by the Republic Production Co., has been abandoned by that company, and it will be built by the Humble Pipe Line Co. to the refinery at Baytown, on the channel. The line will run Humble company oil, and that of the Republic and Houston companies. It is stated that a five-year contract has been made with these companies. The Sinclair Consolidated has ordered eight new oil tank steamers, six of 10,600-ton capacity, and two of 7,500-ton capacity. These will be used in transporting Mexican crude oil to the United States, and for foreign export.

Rio Bravo Co. Elects Officers

At the annual meeting of the Rio Bravo Oil Co., a subsidiary of the Southern Pacific R. R., held in Houston, Jan. 12, 1920, the following officers and directors were elected: C. K. Dunlap, president; E. T. Dumble, vice-president; G. B. Herbert, secretary; O. M. Longnecker, treasurer; C. K. Dunlap, E. T. Dumble, G. B. Herbert, R. C. Watkins and E. B. Dailey, directors.

New Oil Field in Louisiana

The recent test of the Paraffin Oil Co. in De Soto Parish indicates the existence of a new oil field. The well, drilled in the northeast corner of Sec. 5-12-13, it is reported, went into oil sand between 2,675 and 2,700 ft. This is one and one-half miles north of Mansfield in new territory; six miles northwest of the Pelican oil field, and four miles north of the Spider field. Arrangements are being made to lay a feeder pipe to one of the main pipe lines of the Gulf or Standard companies close by, if the test is successful.

Coast Gulf Oil News

In Brazoria County the West Columbia oil field produced for the week ended Jan. 10 about 16,500 bbl. per day. This is a decrease of more than 7,000 bbl. a day compared with the preceding week, and indicates the uncertainty of production and short life of the top flow of Gulf Coast oil wells. Most of the output came from Humble Oil & Refining Co., Texas Co., Crown Oil & Refining Co., and the Sun Oil Co. No. 27 Hogg well of the Texas Co. came in flowing several thousand barrels from about 3,000 ft. Unfortunately it rapidly sanded, and an attempt is now being made to clean it out. At Stratton Ridge, the Humble Oil & Refining Co. is down 1,300 ft. in No. 1 Brock well without results, and the Freeport Sulphur Co. is making a second test for oil in its No. 3 well at the northeast end of the mound. The Texas Co., and the Crown and Castell companies jointly, are also drilling.

At Blue Ridge, in Fort Bend County, a number of companies are drilling, but without particularly encouraging results so far. The Gulf Production Co. is setting a screen in its No. 1B well, and it is reported that a thick stratum of oil sand has been penetrated. Results of the test are awaited with interest. Other companies drilling are the Deep Blue Ridge Oil Co., Republic Production Co., Sinclair Gulf Oil Co., Texas Co., and West Gulf Co. The Texas Co. is reported to be below 3,000 ft. with one of its wells.

In Galveston County, some drilling is being done near Friendswood, by the Friendswood Oil & Gas Co., and on High Island by the Sun company.

The Humble and Goose Creek oil fields are the chief centers of oil activity in Harris County, as usual, and considerable drilling is being done in various other places throughout the county, at Sheldon, Greens Bayou, Colby and elsewhere. No authentic reports of oil discoveries have been received from localities outside of proved fields. At Goose Creek, No. 20 Stateland, of the Gulf Production Co., is a pumper; several other wells will be tested soon. At Humble, the Texas Co. brought in two pumpers. In Hardin County, Sour Lake and Saratoga fields are active, and one or two pumping wells have been brought in during the week at each place.

In Liberty County, the Hull field is the chief producer, making about 7,000 bbl. a day. Seven companies produced to make this total, but the major portion was produced by the Gulf and Republic Production companies. Drilling is also being done at Barbers Hill and at Batson in this county.

At Spindle Top, Jefferson County, drilling for several years has been done in an effort to produce oil from sands deeper than the stratum that made the first big production, but without much success. Recently both the Texas Co. and the Crown Oil & Refining Co. got salt water in the deep sand, supposedly, discovered by the Gulf Production Co. sometime ago. These results are not encouraging to any more deeper drilling.

The increase in price of crude oil recently is already felt by the retail customers in the Gulf Coast country, the price of gasoline rising 2c. a gal., and coal oil, 1c. a gal., wholesale.

It is reported that I. R. Bordgaes, acting as agent for the Hardin Oil Co., sold 35,000 bbl. of crude oil in Houston, Jan. 16, for \$2.25 a barrel. This is the highest price ever paid for heavy gulf crude. The market feeling is that further advances in price may take place. One of the chief factors in this price movement is the unsettled condition in Mexico.

In Nacogdoches County, the Carolina Oil Co. brought in Williams No. 8 well near Oil Springs, recently, making about 100 bbl. a day. This is the seventeenth well of this company. Drilling on the eighteenth will begin at once. Land leasing in the vicinity of Nacogdoches continues actively.

In Orange County, the Little Six Oil Co. has pulled its strainer and will drill deeper. The showing of oil in this shallow test, reported to have been made at 1,600 to 1,700 ft., was not sufficient. A new test will be made between 2,250 and 2,500 ft. The Gulf Production Co. is moving its rig to a new location in this district. Altogether six rigs are working.

The Hull field, in Liberty County, continues to make a steady production of about 7,000 bbl. daily. The pipe line planned by the Humble Pipe Line Co. to Baytown will be a great help to this field. The Humble Oil & Refining Co. brought in a well recently making a heavy and threatening gas pressure, but the last report stated that it was under control. The Empire Gas & Fuel Co. is drilling south of Dayton and Liberty. In its No. 2 Jackson well the old screen was shot and a good oil showing obtained, but the new screen rapidly sanded.

At Humble, Harris County, one well of the Lone Star Oil Co. was worked over and a fair production by pumping obtained. Two other companies are testing wells. No other new production is reported. In the Goose Creek field several wells were completed recently. Of these two wells of the Humble Oil & Refining Co. are waiting for rigs.

SOCIETIES AND ADDRESSES

Diversity of Peoples Complicates Mexican Question

An interesting address was given before the members of the San Francisco Engineers' Club on Jan. 22 by John M. Nicol. The subject was "Some Problems in the Mexican Situation." Mr. Nicol discussed intervention in Mexico, raising the question as to how intervention was to be accomplished, when it was to take place, and the right of a large country to intervene in the affairs of a smaller country. He pointed out that a country of one-third the area of the United States, with a large range in climatic conditions, a mountainous topography and a population of over 12,000,000 presented a difficult problem from the view point of intervention. He raised the question as to whether the population of Mexico is going to tamely accept intervention even though such intervention might be for the country's good. With a population consisting of 500,000 of pure European descent, 1,000,000 with some strain of Spanish blood, 1,500,000 to 2,000,000 who might be called Latins and over 8,000,000 Indians, such heterogeneity could hardly result in a homogeneous government. In addition, 8,000,000 cannot read or write. This in itself presents an obstacle to be seriously reckoned with in the establishment of a stable government. If the United States conquers Mexico, Mr. Nicol stated that the problem would still remain unsolved and an additional element of difficulty would have been introduced. The hope of Mexico, in his opinion, lay in the establishment of an Indian civilization and the only form of intervention that would be practicable would be that which would assist the inhabitants in bringing about stable self-government.

There is need of the United States formulating a fixed policy with respect to Mexico that would assure the Mexicans of the assistance of the United States in working out a stable government in Mexico by the Mexicans.

Iron and Steel Institute, London, holds its annual meeting at London May 6 and 7, next. On that occasion the retiring president, M. Eugene Schneider, will induct the new president-elect, J. E. Stead. By invitation of M. Schneider the fall meeting of 1920 will be held in France. Members are reminded that applications for aid from the Carnegie Fund in aid of research must be made on special forms and submitted before the end of February to the secretary, G. C. Lloyd, 28 Victoria St., London.

Dredge Operators of California Meet at Marigold

On Jan. 14, twenty-five representatives of dredging companies operating in California were the guests of the Marysville Dredging Co. at Marigold, Cal. The meetings of the dredge operators of which this was one have been held at intervals of two months during the last two years. They were first organized in the fall of 1917. At that time a representative body of California dredge operators met in Sacramento, at the invitation of Edwin Higgins, then the engineer for the California Metal and Mineral Producers Association, to discuss the operating problem. It was decided that meetings should be held every two months.

The first meeting was held at Natomas, Cal., in December, 1917. Since then twelve meetings have been held. Dredges in five of the dredging districts have been visited and three visits have been made to steel works which supply castings for the dredges. At the meetings the day is given over to the inspection of dredges and the evening to an informal discussion of dredge problems. A report of the discussion is sent to the engineer of the California Metal and Mineral Producers Association who attends all meetings and from this report an abstract is prepared which is sent to the dredge operators.

The subject of this meeting was "Gold Saving." At other meetings the following have been discussed: Sampling of tailings, design of tumblers, area and design of sluices, design of buckets and bucket lips, speed per minute of buckets, distribution of sands, size of screen perforations, washing of gravel, fire protection, redredging of tailings and loss of quicksilver. One meeting was devoted exclusively to accident and fire prevention, and these two subjects were given particular attention during the inspection of the dredge. Each operator compared the practice of the dredge visited with the practice on his own dredge. The comparative costs of acetylene and electrical welding were discussed at another meeting.

National Conference on Concrete House Construction will be held at the Auditorium Hotel, Chicago, Feb. 17 to 19, inclusive. Among the problems to be discussed at that meeting are those dealing with the present housing shortage, its relation to discontent among all workers, decreased production, rising costs, and general unrest.

MacNaughton Addresses M. C. M. Students

More than the transit, the level or the tape, or any other instrument that can be placed in his hands, the tool that the engineer must know and understand best is the human being with which or over whom he must work. Knowledge of men is the engineer's best asset.

These aphorisms constitute the gist of a short lecture delivered to the Michigan College of Mines student body by James MacNaughton, vice-president and general manager of the Calumet & Hecla Mining Co. and a member of the college board of control, on Jan. 22. It was the first of a proposed series of lectures in a course of human relations that is being developed in the college.

He congratulated the students on their choice of a profession, saying "There is no more dignified nor independent profession; and none that adds so much to the world's worth." He developed the latter clause by explaining the mining engineer takes from the depths of the earth matter that is in itself valueless naturally and by treatment, manipulation, fashioning, turns it into something that has a real value, creates new wealth, adds to the value of the world. He could say this of no other profession, unless he said it of the profession of farming.

"Learn to know and to get along with men. Almost any of them, whether he is a trammer, miner, surface man, railroad man or what not, can tell you a lot of things you could never learn from any other source. And let me impress upon you the fact that the one who gets the work out of the man and still retains his loyalty is the successful engineer. If two men offered themselves for a place as boss and one was known as one who could get along with men, the other known as a wizard at mathematical calculation, there would not be much hesitancy on my part about the choice.

"The man who is to handle men must get into sympathy with men, must share their joys and their sorrows, must realize that they are human with the same longings and desires and problems as himself."

Mr. MacNaughton concluded his remarks with this statement:

"You can only get the supreme joy and satisfaction out of life by knowing and understanding your fellow man and treating him as he should be treated."

THE MINING NEWS

LEADING EVENTS

British America Nickel Corporation Blows in Smelter

Newest Company to Enter Sudbury District of Ontario Makes Successful Start

The new nickel-copper smelter of the British American Nickel Corporation, Ltd., at Nickelton, Ont., in the Sudbury district, was blown in on Jan. 17, while the outside temperature was 35 degrees below zero. Everything went smoothly with the exception of the weighing device on the charge cars which proved to be defective so that the operators had to guess at the proportions of coke, ore and flux fed to

Landslides Common at Juneau, Alaska

The landslide that occurred at Juneau, Alaska, early in January was of small proportions. Although three people were killed and about eleven injured when the debris struck certain buildings in the town itself, no injury whatever was done to the company's equipment. The mountain slopes above the town are exceedingly steep, the ground already resting at the angle of repose. Care is customarily taken lest side hill cuts for construction purposes be the cause of slides. In the accompanying illustration the mountain form-

Postpone Hearing of Arguments in Utah Apex Suit

Hearing of arguments in the apex suit between the Utah Apex and Utah Consolidated companies that was supposed to have opened in Salt Lake City on Jan. 26, was postponed on account of the illness of Judge Gray, counsel for the Utah Consolidated. The date when the hearing will begin is uncertain.

Bureau of Mines for Improved Mining Methods

Efficiency rather than safety will be the major subject of investigation by the United States Bureau of Mines in the Lake Superior district in 1920, ac-



Photo by E. Andrews, Douglas, Alaska

JUNEAU, ALASKA, SHOWING MILL OF ALASKA JUNEAU GOLD MINING CO. AT RIGHT. RECENT LANDSLIDE, WHICH DID NOT INJURE COMPANY'S PROPERTY, OCCURRED AT POINT SEEN IN MIDDLE OF PHOTOGRAPH JUST ABOVE BUILDINGS OF TOWN. THREE LARGE SCARS ON MOUNTAIN SIDE IN BACKGROUND WERE CAUSED BY SLIDES OF LARGE PROPORTIONS IN RECENT YEARS

the furnace. By Jan. 20 the first blast furnace to be fired had attained a daily capacity of 660 tons of charge, and on Jan. 21 the first of the big 13 x 30-ft. Pierce-Smith converters went into commission. Matte containing approximately 10 per cent of combined copper and nickel is being made and it is planned to smelt all the fine ore in the converters and blast furnaces.

About one thousand tons of ore is now being mixed daily at the Murray mine near the smelter site.

The option of the Featherstone interests on a large acreage of iron-ore lands owned by the State of Texas will be closed, according to a report from Austin.

ing the background is seen to be scarred owing to past occurrences of this nature.

California Creates Technical Employment Service

The California State Mining Bureau has inaugurated a technical employment service, without charge, for the benefit of those who are interested in the mineral industry of California. A system has been installed whereby records will be kept of technical men who desire positions and of vacancies existing. According to the State Mineralogist, Fletcher Hamilton, the new bureau has no intention of encroaching upon the field of the various private and public agencies now operating.

ording to an announcement made by B. O. Pickard, district engineer. "In the past the work of the Bureau in the district has largely been concerned with teaching safety methods," said Mr. Pickard. "Now we are going to conduct a series of investigations looking toward improvement of the efficiency of mining methods."

The first investigation is being made by Dr. Cleve Kindall, district surgeon, who has been assigned the problem of "Dry or Change Houses." Mr. Pickard has been assigned problems on mining methods, the one he will first investigate being "The Winning of the Ore in Stopes." Later he will investigate methods of storing explosives underground.

Hecla Answers Complaint Filed by Federal Company
Defendant Makes Specific Denial Alleging Plaintiff's Description of Russell Lode to Be Incorrect

The Hecla Mining Co., through its attorney, John P. Gray, has filed an answer to the suit of the Federal Mining & Smelting Co. in the Russell lode apex case in the United States District Court for northern Idaho. The Hecla contends that the U. S. District Court for northern Idaho is without jurisdiction and that the description of the Russell lode mining claim, as given by the plaintiff, conflicts with areas pat-

given, inasmuch as boundaries are given which on the surface conflict with the Consolidated Extension lode claim. The defendant denies that the plaintiff is now or for more than ten years or at any time for more than three years, has been in possession of ore entitled to the possession of the Russell lode and denies that there is a silver, lead or zinc vein in the Russell lode. It denies categorically that any vein apexes in the Russell lode and that the Hecla has secretly or otherwise penetrated the Russell lode, "or into or upon any vein or orebody therein."

It denies all allegation regarding the removal of ore, the property of the

vein. The answer sets forth that on each claim mentioned a vein of mineral bearing rock was discovered upon the unoccupied domain and located in compliance with the law.

The answer further states that the Consolidated Extension claim was surveyed, advertised and entered for patent without protest by the Russell Lode Mining Co., and that the area in conflict was patented and is part of the Consolidated Extension mining claim, prior in time and mining rights to the Russell lode claim.

The answer prays that the plaintiff take nothing by this action and that the defendant's title to its claims and



Photo by E. Andrews, Douglas, Alaska
 ANOTHER VIEW OF JUNEAU, ALASKA, AND GASTINEAU CHANNEL. ON LEFT IS SILVER BOW FAULT. ALASKA JUNEAU MILL IN MIDDLEGROUND ON SLOPE BEYOND TOWN. ORE FROM MINE IS HAULED FROM PORTAL OF TUNNEL AT LEFT OF FAULT AROUND AND THROUGH SHOULDER OF MOUNTAIN AND THENCE TO MILL

ented by the Consolidated Extension company.

The answer denies that the Court has jurisdiction because this controversy cannot be determined without the presence of the Marsh Mines Consolidated, and in this connection defendant says that the suit therefore does not involve a controversy solely between the plaintiff and the defendant, but between the plaintiff and the Marsh Mines Consolidated on the one side and the defendant on the other, and because the requisite diversity of citizenship does not exist to confer such jurisdiction." (The Marsh is said to be a Washington corporation.)

The answer denies that a correct description of the Russell lode has been

plaintiff, exceeding in value \$6,000,000 or any other sum.

The defendant asserts that it is the owner of all ores beneath the surface of its several mining claims and denies that its claim is a cloud upon the plaintiff's title to the Russell claim or to any vein or lode of the Russell lode mining claim.

The defendant admits that it has no title to the Russell lode, but alleges that it is the sole owner of the Consolidated Extension, Iron Side, Orphan Girl, Muscatine, Muscatine Fraction, Croesus, Burlington, Mascot, June, East Hecla, Croesus Extension, Saturday and Rooster claims, all patented, and that no ore now being mined from the claims is part of the Russell lode or alleged

the veins and ores therein be confirmed and quieted and that defendant recover its costs in the suit.

Travel to Alaska Heavier Than Usual

For more than twenty years the trend of travel from Sept. 15 to Feb. 15 has been from Alaska to the outside, according to a recent issue of the bulletin of the Alaska Bureau of Publicity. This winter the order of travel is reversed, the bulletin states, and there is a heavier passenger traffic from the outside to Alaska than there is the other way. Indications point to the largest movement northward next spring that has been witnessed since the boom days several years ago.

**Minerals Separation Questions
Butte & Superior Statement
Files Bill of Exceptions in Federal
Court—Objections Made on
Nine Points**

Minerals Separation, Ltd., has filed in the Federal Court for the district of Montana a bill of exceptions to a statement in the accounting filed in December last by the Butte & Superior Mining Co., of Butte. The latter company, in this statement, set forth its version of the amount it should be required to pay the Minerals Separation company for infringing on its flotation patents. This sum was placed by Butte & Superior at \$451,000 at the very outside. It will be recalled that this, the defendant company, also contended that "the apparent advantage to the defendant of its infringing acts was the difference in cost of operation." It was contended by the defendant that the cost of grinding was greater in the "free process" than in the infringing process but that the cost of heating in the free process was less than in the infringing process.

The objections made by Minerals Separation to this statement are as follows: "Plaintiff excepts to the document filed by the defendant on Dec. 1, 1919, entitled 'Defendant's Account' for the following reasons:

"1. That it is not an account in debit and credit form of all gains, profits and advantages which defendant has derived, received or made by reason of the infringements found in the Decree after Mandate.

"2. That it is not an account covering the period of the infringements found by the Decree after Mandate from the commencement thereof down to the verification and filing of the said document.

"3. That it sets forth an alleged standard or basis of comparison which is not a proper standard or basis of comparison in determining the gains, profits and advantages attributable to the invention of the patent in suit.

"4. That it sets forth as an alleged standard or basis of comparison that which, as stated, is an infringement of the patent in suit.

"5. That it does not give, for each month throughout the period of infringement, the concentrates obtained and the value thereof, the cost of operation, including the cost of the materials used in the operations, and such other data as are necessary to determine the gains, profits and advantages which the defendant has derived, received or made by reason of the infringing operations.

"6. That it does not give data as to each separate operation in infringement of the patent in suit, of the quan-

ties of oil present in each such operation and such other data as are necessary to determine the gains, profits and advantages which the defendant has derived, received or made by reason of each such operation.

"7. That it is not in accordance with the order of this court, and the summons thereon of this court to the defendant to account.

"8. For the reason that the affidavit and the attached schedules of said document are not in accord.

"9. For the reason that the affidavit forming part of said document contains statements other than those necessary to verify the figures set forth in the attached schedules."

**Calumet & Hecla's Production
in 1919**

The actual production of refined copper by the Calumet & Hecla and subsidiary mining companies for 1919 was 101,913,289 lb., compared with 140,528,613 lb. for 1918. The production of refined copper in 1919 was as follows:

Ahmeek, 17,223,111; Allouez, 3,749,984; Calumet & Hecla 52,859,146; Centennial, 1,365,148; Isle Royale, 13,307,647; La Salle, 340,719; Osceola Con., 10,824,331; Superior, 563,935; and White Pine, 1,979,268.

The production for December was as follows: Ahmeek, 1,495,081; Allouez, 376,100; Calumet & Hecla, 4,699,336; Centennial, 124,311; Isle Royale, 970,600; La Salle, 14,700; Osceola Con., 895,000; Superior, 9,500; and White Pine, 346,939.

Ahmeek production dropped from 24,851,235 in 1918, Allouez was more than cut in two, dropping from 7,071,218. Calumet & Hecla was cut from 67,968,357, Centennial from 2,492,857, La Salle from 1,832,665, Osceola from 15,919,647, Superior from 1,676,446, and White Pine from 3,273,680. Isle Royale was the only one of the group that approached the record for 1918 when its production was 15,442,508.

In addition to the reduced output, costs for 1919 were higher at every property than ever before.

**Vancouver Chamber of Mines
Elects Officers**

At the annual meeting of the Vancouver Chamber of Mines officers were elected for 1920 as follows: Honorary president, William Sloan, Minister of Mines of British Columbia; president, Dr. E. T. Hodge; vice-presidents, J. M. Lay and W. H. Hargrave; treasurer, William Godfrey; executive, C. E. Cartwright, S. J. Crocker, F. J. Crossland, G. S. Dawson, Major Fleck, B. C. Hawkins, Dalby Morkill, Jr., H. P. McCraney, N. Thompson, Prof. J. M. Turnbull, G. S. Pattapiece, and Noble W. Pirrie.

**George Graham Rice Guilty of
Grand Larceny**

**New York Court Convicts Notorious
Swindler Whose Real Name Is
Jacob Simon Herzog**

George Graham Rice has been convicted in New York of grand larceny, the verdict being reached by the Grand Jury after long deliberation and a sensational trial. Other indictments are pending against the promoter.

Rice, who has been notorious as a promoter and swindler and whose real name is Jacob Simon Herzog, was adjudged guilty of grand larceny in the first degree by a trial jury in the Court of General Sessions, in New York City on Friday, Jan. 23, and was remanded to the City Prison for sentence. There are several other indictments against Rice besides the one upon which he was convicted. The maximum penalty for the offense is ten years imprisonment.

Herzog took the name of Rice twenty-five years ago. He is forty-nine years old and has before been convicted of irregularities in financial transactions, having served sentences in Sing Sing Prison and Elmira, in New York State, and in a Federal prison.

Rice was found guilty of misappropriating \$721 in cash and a \$100 Liberty bond sent to him by Rudolph Hartman, an attorney of Mansfield, Ohio, with directions to purchase ten shares of American Car & Foundry Stock. Rice got the money but Hartman did not get the stock. Complaint and indictment followed. The financial operations of the convicted man were conducted on a large scale. Facts were introduced at the trial showing that his company did a business amounting to more than \$35,000,000 in 1917 and 1918. The defendant testified that he never gave his personal attention to orders amounting to less than \$50,000.

Harry Lefkovitz and Russell V. Stewart, formerly associated with Rice in his promotion and stock-selling operations, were convicted early in December of using the mails to defraud in connection with the sale of bogus stock and were sentenced Dec. 23 to two years imprisonment each. They appealed and were released on \$5,000 bail.

Rice testified when giving his pedigree that he did not know whether or not he should be recorded as married. A divorce suit is pending against him.

**B. C. Prospectors' Association
Formed**

At a recent meeting of prospectors of eastern British Columbia a Prospectors' Protective Association was formed, officers being elected as follows: President, J. W. Mulholland; vice-president, C. E. Crossley; secretary, Fred A. Starkey; treasurer, Dr. F. E. Mor-

rison. Its objects are to promote good roads and trails to mining properties, to agitate for an ore testing plant for the Kootenays, to support the re-opening of dormant crown granted mineral claims, to recommend that surface ore samples be made available to the prospector for purposes of instruction, and to appeal to the government to make public the engineer's reports on prospectors' claims.

Isle Royale's Mining Practice Producing Good Results Narrow Mining of Vein, Instead of Picking After Breaking, Responsible for Showing Made

BY HOMER A. GUCK

The supposition that there has been any alteration in the general physical condition of the Isle Royale mine in the Michigan copper country is erroneous. The fact that this mine today is making the most unusual showing both in min-

Isle Royale is not following the mining practice of the mines of the Copper Range company, of selecting its "rock" after it is broken down. "Picking" is part of the mining work at the three Range properties, Baltic, Trimountain and Champion. And it has resulted in increasing the percentage of copper from the ore sent to the mill. There is no ore selection at the Isle Royale, excepting such as is made before the drills are placed. The vein is better mineralized along the foot wall. Occasionally there is value to be found in the hanging but it is rare. Practically the only ore that goes to surface regardless of values is that which comes out of the drifts. The one change in mining practice that has brought about the betterment in the percentage of copper extraction is found in the narrow mining of the vein. At the present time the width of vein that is cut is between

Granby's Title to Vancouver Coal Lands Questioned

Esquimalt & Nanaimo Ry. Co. Sues Estate of Joseph Ganner, Original Owner of Most of Property

BY ROBERT DUNN

Litigation now before the courts of British Columbia again brings up the question of the title of the Granby Consolidated Mining & Smelting Co. to its coal lands on Vancouver Island. The action is that of the Esquimalt & Nanaimo Ry. Co. vs. Charles Wilson and Angus C. McKenzie, the latter being executors under the will of the late Joseph Ganner. It was from this estate that the Granby company acquired much of its coal land, the title being a provincial lease under the terms of the Vancouver Island Settlers' Rights Act, 1904, Amendment Act, 1917. The plaintiff asks that the Crown Grant issued by the Provincial Government be declared



WHARF AT ANYOX, B. C., WHERE GRANBY CONSOLIDATED MINING, SMELTING & POWER CO.'S SMELTERY AND HIDDEN CREEK MINE ARE SITUATED

ing costs and in underground development is not due to any betterment in the copper contents of the ore. It is due to intelligent application of intensive mining economies. There is no better record in the history of resuscitation of apparently worthless copper properties than is shown in the Isle Royale.

At the time the Calumet & Hecla interests took over the Bigelow group there is no question that the Isle Royale was taken along because it happened to be included, not because the Calumet & Hecla wanted it. It was not long before the management became aware of the latent possibilities of the property and realized that Isle Royale had to solve the question of quantity production and an underground mining problem of avoiding the cutting down of poor rock. Both of these problems have been worked out.

Isle Royale is one of the two successful properties that is working its lode close to the eastern sandstone. The other is the Copper Range. But the

ten and twelve feet. Formerly the Isle Royale averaged sixteen feet of vein broken down. There has been a general scrutiny of the vein matter before drilling with the result that much lean matter is left standing for pillars. This is possible in the Isle Royale where the copper tends to run in bunches. It is a general rule of the Isle Royale lode that the values are diminishing in proportion to the distance from the foot wall. The mining problem they have found it necessary to solve is one which calls for good judgment relative to the hanging wall "rock" previous to drilling for blast. Breaking down "rock" which carries three or four pounds of copper is not economical mining. And gradually such mining has been eliminated.

Nitrate cargoes passing through the Panama Canal during the week ended Dec. 13 were destined to Genoa, Lisbon and New York. The three cargoes originated at Iquique, Antofagasta, and Valparaiso respectively.

null and void, insofar as it purports to grant coal, etc. An injunction also is sought restraining the defendants from working or mining for coal, etc., and from registering or applying to register any title to the surface.

The importance of this may be more properly gaged when it is explained that the Granby Consolidated Mining & Smelting Co. has opened up these coal lands and has established collieries at Cassidy's, with accommodation for officials and men of the most modern character, at a cost of approximately \$2,000,000. These mines are now producing about 700 tons of coal a day. The company also has installed at Anyox by-product coking ovens, involving a large expenditure, for converting their Vancouver Island coal into fuel for the copper smelter of Anyox.

A cargo of sulphur from Sabine, Tex., passed through the Panama Canal during the week ended Dec. 13 en route to Melbourne, Australia.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Chestatee Case Continues to Occupy Attention of Committee on Mines and Mining Claimants Endeavor to Convince Members That Money Spent for Railroad Should Be Considered in Making Award— Chrome Men to Be Heard Next

Following the testimony of the members of the War Minerals Relief Commission before the House Committee on Mines and Mining, further consideration of the case of the Chestatee Pyrite & Chemical Corporation has been deferred until February. The Committee continues to look upon the Chestatee case as typical of the other claims despite the evidence presented by the Commissioners that circumstances may differ so in different mining properties as to preclude the following of general rules in the decision of all cases.

Every effort was made by the Chestatee claimants to convince the Committee that expenditures made for railroad construction should have been included in the award. The claimants insisted that the Commission made no allowance for any mode of transportation of the ore from the mine to the market. In that connection, Senator Shafroth, the Chairman of the Commission, said, "Items concerning mining expenditures are matters on which people may differ but it seems to me that all the evidence is that there was an intention to build the railroad and that it is not fair to the Government to put that liability upon the public."

The claimants agree that expenditures contemplated prior to Government stipulations cannot under the law be included in their claim. In support of his convictions, Senator Shafroth introduced the opinion of the Department of the Interior in which it is stated among other things that under the claimants' plan of developing the mine the construction of the railroad clearly was contemplated prior to the Government's appeal.

"While the parties in interest testify that they had abandoned in the latter part of April or the first part of May, 1917, all idea of constructing the railroad and constructed it only because of the Government's stimulation," said Senator Shafroth, "there is no documentary evidence to support their testimony, and I think it is established clearly that it was the settled plan of the claimants to build the railroad long prior to any request by the Government.

In other words, they merely did at an earlier date and as their sole enterprise, that which had been their plan to do from the beginning. I would recommend, therefore, that the railroad item be disallowed."

Pending the completion of further data in the Chestatee case, the Committee will consider the question in connection with the chrome claims. Representative Sinnot of Oregon appeared before the Committee to present his views on the legal applications of the existing law. Representative Raker of California advocated liberalizing the law as well as a more liberal interpretation of the law as it stands.

With regard to the possibilities of the Chestatee property, an extract of a report by C. E. Juhlin, engineer of the U. S. Bureau of Mines, was introduced into the Committee's record, showing that there was 100,000 tons of positive ore in the property, 700,000 tons of probable ore, 500,000 tons of possible ore, and he pointed out that extensions might show several times the amount of ore that was in sight at that time.

Mr. Pratt brought out the fact that Van H. Manning, the Director of the U. S. Bureau of Mines, had advised him that the Chestatee situation was largely responsible for the War Minerals Act. In explaining to the Committee the reasons for the decrease in the price of pyrites, Mr. Pratt made the following statement:

"Not only have imports from Spain been brought in, since the war, at prices somewhat near the pre-war prices, but Mr. Ledoux, who assisted the Government in getting us to stimulate pyrites production, actually has brought in or contracted to bring in since the war over sixty cargoes of Spanish pyrites."

When asked if legislation could be enacted to protect the domestic producers of pyrites from the cheaper imports from Spain, Mr. Pratt called attention to the fact that the Tariff Commission has advised the Ways and Means Committee that the domestic pyrites situation hardly can be helped

by tariff legislation because a large amount of sulphur produced in the country is the real competitor of the domestic pyrites industry. Mr. Pratt expressed his opinion that the position of the Tariff Commission is well taken. He stated that it has been shown conclusively that sulphur can be produced for \$6 or less per ton. He stated that he personally has seen offers within the last two months made by the producers of sulphur to sell their product at \$10 per ton to the trade. In addition he said that he had heard of offers of \$8 per ton.

That the Government's liability in the Chestatee case is as good as proven was accepted by the Committee and it was stated that the question involved is entirely the measure of damages suffered by the Chestatee company and not a question of liability. Mr. Pratt told the Committee that the award of the Commission is based in part upon the report of the engineers which he regards as erroneous in many particulars. In this connection he said:

"The superficiality of the so-called expert reports on this situation is what has counted against us largely in that the Commission got an erroneous view of the situation and by their report to Secretary Lane transmitted that erroneous view to him. Secretary Lane in abiding by the Commission's plan, continued and magnified the error against us."

Continuing, Mr. Pratt said:

"The report stated clearly that the stimulation due to the Government, in considering the railroad, was 56.6 per cent of the completed enterprise, yet when they come to apply the percentage they arbitrarily followed Mr. Holmes' theory of deduction and superficial ideas and brought the valuation down to \$375,000 and gave us 56.6 per cent of that \$375,000, making a clean mathematical error against us of more than \$130,000. We have never been given an opportunity to correct this."

At another point in his testimony, Mr. Pratt stated:

"On the finding of the Commission now we both are absolutely bankrupt. There can be absolutely no remedy for it. I claim it is not due to our action, or bad business methods."

Mr. Pratt pointed out that the liability of the company should be \$204,000, but that the loss above that amount is absolutely and entirely due to the

increased production which was brought about on Government insistence.

Edgar Watkins, formerly counsel for the Chestatee Pyrites & Chemical Corporation, appeared before the Committee as a witness. Among other things he stated that the auditor for the Commission either was incapable or unwilling to understand just how the claim was made out. He went in great detail to show that the work of the auditor was incorrect.

The plan of the Commission, Mr. Watkins stated, appeared to him to be directly contrary to the statute. He quoted the following from their claim:

"Claimants' statement that the smaller plan of development was their real plan would be accepted. Assuming this, it is clear that there is no moral responsibility upon the Government nor is there an authorized basis for the award of any greater portion of this claim and the difference between what would have been the cost under war time conditions of the claimants' original plan as compared with the final actual construction and development. To this determination the attention of the accountants and the engineers of your Commission has been intently directed."

Bids for Supplying Fuel Oil Asked by Shipping Board

The Shipping Board has called for bids for one year's supply of fuel oil for its ships. Its minimum requirements until Mar. 31, 1921, will be 18,900,000 bbl. Its maximum requirements will be 28,000,000 bbl. Each bidder must obligate himself to furnish the maximum requirements in case they are needed. Bids are to be opened Feb. 9. The oil is to be delivered at nineteen of the principal ports, with the larger quantities going to the North Atlantic ports. A special charter rate will be made by the Shipping Board for the transportation of the oil to required destinations.

Zinc Tariff Bill Delayed in Congress

The new zinc tariff schedule which passed the House of Representatives on Sept. 2, and which was published in "The Journal" of Sept. 13, has not yet passed the Senate. It is now being considered by the sub-committee, and no report has as yet been made to the full committee. It would not be surprising if most of the tariff bills now before Congress would be held in abeyance until after the Presidential election in November.

Sales of Sulphur and Metals By Government

Since the signing of the Armistice, the War Department has sold more than 161,000,000 lb. of sulphur. The remaining surplus amounts to 14,872,000 lb. It is available for sale and is located at Jacksonville, Tenn., Little Rock, Ark., and Hopewell, Va.

Non ferrous metals costing the Department originally \$35,052,980.07 had been disposed of, up to the end of 1919, by the Director of Sales for \$21,320,346.77. Ferrous metals originally costing \$34,793,438.95 were sold for \$8,845,590.40.

Acid Plant for Sale

The War Department is offering for sale by negotiation the land, buildings and equipment of the sulphuric acid plant at Mount Union, Penn. The equipment includes four Glen Falls improved rotary burners, two Weller Machine Co. sulphur elevators, four Connorsville Boston-type gas pumps and a 100-ton 50-ft. Howe truck scale. None of this equipment has been installed and is ready for immediate shipment. The land comprises twenty acres and there are a number of brick and frame buildings, a railroad siding, water main, sewers, electric lights and roads.

NEWS BY MINING DISTRICTS

ARIZONA

OPERATIONS AT JEROME—UNITED EASTERN ADOPTS POLICY OF PAYING DIVIDENDS QUARTERLY—OHIO ARIZONA BUILDING TRAM

Jerome—The United Verde Extension company on its 1,500 level has drifted into the orebody previously cut by a winze sunk to the 1,700. The ore thus far sampled averages 6 per cent in copper, much lower grade than above, indicating that possibly the zone of enrichment has been passed and the permanent unaltered ores reached. President Douglas states that the ore in the winze "showed lower values on the 1,500 and 1,700 levels." Some of the ore between the 14th and 15th levels according to David Morgan ran 32 per cent copper. Morgan believes that this rich ore will be found very much deeper than 1,500 feet and attaches little importance to the assays reported.

Gadsden in sinking a winze from the 1200 level is getting near the fault aimed at estimated to be at 145 ft. below the level floor. A new level is to be started on the fault, east and west, as soon as it is reached. Drilling contractors have had much trouble in trying to reach the same fault at greater depth

by an inclined hole from the 1,200 level, a distance of 900 ft. The first hole has caved badly.

A contractor on the Jerome-Superior has been drifting 15 ft. a day on the 700 level in what is described as interesting ground. A cage is to be installed in the shaft.

The Shea company has completed a road to its camp and is installing compressor equipment at the portal of its new tunnel, which is to be 1,200 ft. long. At 675 feet ore has been cut that is thus far developed only by a 320-ft. inclined shaft. The tunnel will drain considerable water. Ore shipments to the Extension smelter, three miles away, are to start next month. It is expected that shipping silver-copper ore will come from the tunnel, which has been started along a cross-vein.

Johnson—Much excitement prevails in the Johnson district over a strike of high-grade copper ore made on the ninth level of the Arizona United Mining Co.'s property. From all indications this is the largest body of high-grade ore ever found in this mine. The company has started work on the Mammoth ground in the northeastern part

of the camp which has produced some good ore in the past.

Two marine boilers and fittings have arrived for the new power plant of the Keystone Copper Co. Machinery for the concentrator is enroute. Erection will begin within ten days.

The sale of the Thunderbolt Copper Mining Co.'s machinery and other property has been postponed twenty days.

Oatman—United Eastern has started upon its policy of quarterly dividends, the first declared being 21c. The monthly output of gold bullion is climbing very close to \$200,000, after a year in which output was kept down materially by a miners' strike. Labor conditions are now good. The mine is said to be in excellent shape, with enough pay ore in sight to run the mill for three years, this aside from an estimated two years' supply in the acquired Big Jim property. The strike stopped operations on the new 1,300 level, which lately was unwatered and through which there will be further exploration. If the results prove encouraging, the shaft is to be sunk to 1,600 ft. The ore reserves are reported to average \$24 a ton.

The Tom Reed company has cut the Bald Eagle ledge on the 600 level under a point where notably rich ore has been found. The ore is said to be of good milling grade.

The United American has been drifting, with good results, on what is believed to be an extension of the Aztec vein of the Tom Reed.

The Highland Chief is drifting along a quartz ledge cut by its lower tunnel.

After two years of idleness, work has been resumed on the Amalgamated, with the shaft nearing 400 ft., where there will be crosscutting in the hope of cutting a continuation of the Gold Roads ledge.

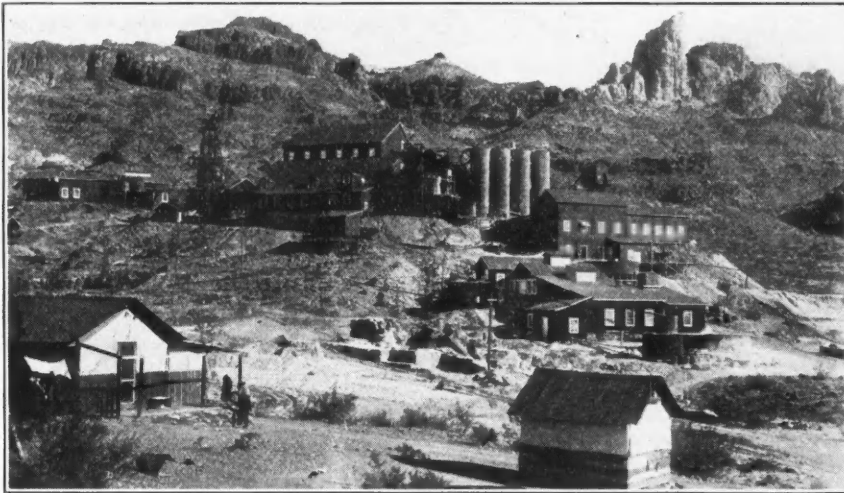
The Arizona Mossback has postponed its annual meeting to Mar. 15, to insure

the dumps contain several thousand tons of milling ore, averaging \$10 value. On the 330 level, the deepest, the ore is a lead-copper sulphide, with some zinc blende.

The Sherwood property, in the Comobabi district, sixty miles southwest of Tucson, is crosscutting at 300 ft. Upper levels ore runs 3½ per cent copper and 10 oz. silver.

J. M. Pemberton, of Tucson, has sold the Bondurant group, 80 miles southwest, to R. J. Monahan and associates, oil men from the Homer and Burkburret fields. In a drift at 90 ft., the vein is said to average \$60 gold across its 3-ft. width.

The Ohio-Arizona Copper Co. is building a tram from its property in



MILL OF TOM REED GOLD MINING CO., OATMAN, ARIZ.

the presence of eastern stockholders. Charles W. Maier has been succeeded as president by Jess W. Spiedel of Wheeling, W. Va., who will move to Los Angeles to be nearer the property. Work is progressing on the 700 level. In March a plan is to be decided upon for a 300-ton mill, for which, it is claimed, 800,000 tons of \$10 ore is available.

Tucson—A very favorable report has been received from a flotation-concentration test in Denver of ore from the Daily-Arizona Con. Copper Co. property in the Catalinas. There was a recovery of 93 per cent of the copper, from ore that ran from 3 to 6 per cent copper, besides gold, silver and zinc. About 70,000 tons of ore carrying 3 per cent copper and \$2 in gold and silver is already developed. It is probable that a mill will be erected soon, following the construction of a road now being built from Oracle to the mine.

The Paymaster Silver-Lead property, in the San Xavier district, has cut in under the old workings, tapping much water and incidentally developing copper ore of good grade. The property has shipped for the last two years and

the Silver Bell mountains to a road below, to facilitate ore shipments.

Hayden—The Gila Development Co. is operating a 30-ton Lane mill on its property in Cane Springs wash, near Troy, northwest of this point. About 20,000 tons of free-milling gold ore is available for treatment, taken from an 8-ft. vein, developed to 200 ft. of depth. There is modern surface equipment for hoisting and for machine drilling. A new highway, now under construction between Troy and Kelvin, will facilitate operations. J. C. Devine is managing director. Ralph W. Bartlett and Charles M. Barney, both of Boston, respectively, are president and secretary.

Copper ore sampling from 15 to 20 per cent is being shipped from the Sombrero Butte property of the Magma Chief company, near Mammoth. A station is being cut at the 320-ft. point, for lateral development of an orebody struck at 220 feet. The main vein is of sulphide ore 12 ft. wide.

Yuma—H. S. Halloway, of New York, has bought the Mandevil property in Silver district, 30 miles north of Yuma. The property was owned locally.

CALIFORNIA

CARSON HILL GOLD PLANS ADDITION TO MILL—PLYMOUTH CONSOLIDATED CUTS ORE SHOOT ON 2,750 LEVEL

Angels—The Waterman mine has contracted with the Angels Iron Works for the installation of a 500-cu. ft. compressor and a hoist for sinking. The latter has a capacity of 1,000 ft., and will be air driven.

The Triple Lode Milling Co. has sunk its shaft 55 ft. on the middle vein. A hoist and a compressor as well as an engine room and blacksmith shop have been added to the surface plant and a head frame has been erected.

Carson Hill—The Carson Hill Gold Mining Co. has plans under way for adding ten stamps to its present 20-stamp mill. The output milled in December was 8,000 tons, the ore being principally from the main shoot of the Morgan mine, though some came from several levels of the Calaveras mine. The Morgan mine produced \$1,040,000 in gold during 1919.

Downieville—The bond on the Mt. Alta gravel mine has been transferred by C. N. Chatfield to A. T. Hathaway, manager of the American Flag property. Mr. Chatfield will continue as manager of the Mt. Alta, with a force engaged in exploring the channel.

Grass Valley—It is planned to start milling soon at the Alcalde mine, formerly known as the Kenosha. Drifting on the ledge has been in progress for the last six months and it is reported that a considerable body of ore has been blocked out.

Mojave—A mining transfer of considerable importance, recorded at Bakersfield, was that of John L. Hannam et al, to John Lawrence Hannam, et al, for the Mug, Old Crow, Widdiss, Full Moon, Saddle Back No. 11, B. W. H. No. E, Colemanite and other parcels in Township 11, Range 8, directly east of Mojave, for \$60,000. Hannam has decided in turn all this property to U. S. Borax Co.

Plymouth—The Plymouth Consolidated Gold Mines, Ltd., has cut the ore shoot on the 2,750 level. The orebody has widened to 6 ft. of high-grade quartz in the first 25 ft. driven. The main shaft will be deepened to the 3,100 level before sinking stops.

Shawmut—At the Eagle-Shawmut mine eighty stamps are dropping on good ore. A crew of 150 men is employed.

IDAHO

NATIONAL COPPER TO RESUME DEVELOPMENT—IDAHO MONTANA ELECTS OFFICERS

Wallace—At a meeting of directors and stockholders of the National Copper Mining Co. on Jan. 20, it was decided to resume development work at

once. August Paulsen, president, occupied the chair. The crosscut on the 1,000 level will be continued for about 300 ft. at which point ore is expected. Here drifting on the vein will begin. Another crosscut will be started to explore virgin ground. The National company stopped work last August after carrying exploration work as deep as the 1,600 level. Stopes were operated on the 1,500 level. When work was stopped the company had \$51,000 in the treasury, which fact caused a strong protest from certain stockholders who thought that a thorough search should continue so long as there were funds. Butte engineers acting in a consulting capacity have advised the expenditure of additional funds in development work. Work will be started as soon as a crew can be assembled.

John A. Sangren, of Spokane, was elected president of the Idaho Montana Mining Co. at the recent annual meeting of stockholders. O. M. Nordquist, Wallace, was elected vice-president, and Walter Keister, of Murray, secretary-treasurer. Power will be installed and development work started in the spring.

Kellogg—Although the recent loss of the Bunker Hill & Sullivan company's experimental station by fire cost the company much valuable data and laboratory equipment, the fire did not in any way interfere with the operations of the mine or mills. The fire was confined to the experimental plant which was in charge of August Woolf, chemist. Mr. Woolf has been engaged for some time on experiments of lead-zinc separation and electrolytic treatment of ores. Valuable charts and deductions from experiments were lost as well as laboratory equipment. New quarters will be fitted out and the work carried on. The U. S. Bureau of Mines has co-operated with the Bunker Hill in much of its work along these lines and the value of such experiments has long been appreciated by the management.

Quartzburg—The Belshazzar vein of the Idawa mine has been cut by the lower tunnel and drifting begun. The crosscut will be extended to the Continental vein. F. C. Brown is superintendent.

The Mt. Chief mine is reported to have been sold recently. Extensive work will be done at the property this summer.

At the Gold Hill mine of the Gold Hill & Iowa Mines Co. a fire recently destroyed the new office building, together with a valuable collection of mine maps, models and records. The fire was caused by a high-tension current coming in contact with telephone wires. The sub-station on the power line was also burned. This company is employing about 125 men and crush-

ing over 150 tons per day. The new cyanide plant is ready to start operations and considerable improvement has been made in the old mill. The company led in gold production in Idaho in 1919. E. E. Carter is manager.

A deep tunnel will be started at the Hawley property as soon as the weather will permit.

The Idaho Development Co., which is controlled by the same interests who operate the Gold Hill, Banner and Edna mines and the Boston-Idaho dredges, has recently acquired a large group of claims near the Garden Valley summit and is doing considerable development work and prospecting.

At the Banner mine a crew has been working all winter in the long tunnel which cuts the vein over a mile from the portal. Very high-grade silver ore is found in this mine which is treated by flotation. Concentrates and sorted ore will be shipped during the warm weather when the roads are passable.

MICHIGAN

FIRST SHIPMENT FROM HANCOCK CONSOLIDATED EXPECTED SOON, ORE COMING FROM DEVELOPMENT WORK

Hancock Consolidated is getting ready to make its first shipment to the mills, following the resumption of operations 90 days ago. This shipment will consist of the ore which has been taken out in following the development program which has been under way since the re-opening. It is not an effort at production. The ore of the Pewabic lode, which appears to carry copper in commercial quantity has been sent to the surface, crushed and stored in the shaft rockhouse. When the quantity reaches the capacity of the rockhouse, 2,000 tons, it will be sent to one of the Calumet & Hecla subsidiary mills for treatment. The Point Mills plant, in which the Hancock company has an interest, is not operating now and will not be started up simply to care for the Hancock ore as this will not amount to much for six months at least.

The development program continues successful so far as it has gone. The working force at the mine is now 75 men. Ten drilling machines are operating double shifts. On the 44th level, the crosscut is working toward one of the branch veins of the Pewabic, designated locally as No. 12 vein. This crosscut ought to cut the expected vein within thirty days and then drifting will begin as soon as possible.

On the 53rd level, the miners are working in three veins, all branches of the Pewabic and known as Nos. 1, 2 and 3. All are east of the shaft and within easy tramping distance of it, in the foot wall of the general fault zone which is in evidence in this western sandstone.

On the 49th level, two veins are being opened, No. 2 and No. 3. The Pewabic and its branches all have similar general physical characteristics. The copper is disseminated across the formation, which rarely shows to a greater width than eight feet and sometimes narrows down to four feet. There is no pronounced increase in values toward the foot wall. There is a general tendency to masses some of which run to fairly good weight, all of them carrying practically pure copper.

MONTANA

ANACONDA MAKES MANGANESE SHIPMENT FROM EMMA MINE—REOPENS FIVE MORE MINES—BOSTON & MONTANA POURING CONCRETE FOR MILL

Butte—Shipment of 300 tons of rhodocrosite (pink carbonate of manganese) from the Emma mine of the Butte Copper & Zinc Co., which the Anaconda company is operating, has been made to the ferromanganese plant of the latter at Great Falls, Mont. Two and one-half tons of Emma ore are required to produce one ton of ferro. The Anaconda is operating the Emma under a lease on a 50-50 profit-sharing basis. The first-class manganese ore averages 37 per cent manganese with about 7 per cent silica. Within the last ten days a high-grade zinc orebody, about twelve feet wide has been opened on the 1000 level of the Emma, carrying more than 8 oz. of silver. Ore shipments from the property up to Jan. 15 had totalled 1,800 tons. In consequence of the improvement in the copper market, Anaconda has resumed operations at the High Ore, the Mountain View, the Bell and Diamond, the Silver Bow and the Belmont mines.

Crosscutting on the 2,700 level of the Colorado mine of the Davis-Daly company is progressing at the rate of 12 ft. per day, and within 60 days it is expected that several of the high-grade copper veins in evidence on the 2,500 level will be cut. Already on this level one orebody 6 ft. wide has been opened, the ore being of commercial grade. A deposit of "drag" ore of high-grade quality has also been found, together with a number of high-grade stringers. The old ore bins have been demolished and the pouring of concrete for the new bins is under way. Construction of an enlarged framing plant also has begun. Gasoline locomotives have arrived and will supplant horses for surface traction purposes including the hauling of ore from the mine bins to the railroad.

Mining of ore by Hayden Stone interests has begun on the 200 level of the Otisco claim, situated just to the south of the Davis-Daly, and the installation of a hoisting plant is under way on the Mary Louise claim, also to the south. It is rumored that a crosscut

will be driven south on the 2,500 level of the Colorado of the Davis-Daly and a raise driven either to the Otisco or Mary Louise shafts.

The Granite Mountain and Speculator properties of the North Butte company are operating at capacity, 2,000 tons of copper ore being hoisted per day. The grade of ore is running higher than for some time, with the north veins carrying more silver on the lower levels than was the case nearer the surface. January is expected to prove one of the best months the company has had in several years. Drifting on the 3,400 level of the Edith May vein is expected to be in under the 3,200 level within forty days where 24 ft. of 6 per cent copper ore has been opened.

In Butte & Superior's Black Rock mine, the tonnage of ore indicated and blocked out is so much greater that it would be possible to increase the amount hoisted from 1,700 to 2,500 tons, were the Black Rock concentrator able to treat this amount. The grade is a little over 6 oz. silver and 15 per cent zinc. Earnings of the company for the present quarter are at the rate of \$14 per share annually. Shaft sinking has started from the 2,050 level with the 2,350 level as the objective. Breaking of a sprinkler system in the compressor plant recently caused the loss of two shifts in the mine.

A winze that is being sunk from the 110 level of the Mapleton claim of the Butte & Plutus continues in ore, the shoot showing a width of 7 ft. with an average assay of 24 oz. of silver.

A body of commercial ore of unknown dimensions has been opened on the 1,200 level of the Main Range property.

The December bullion report of the Barnes King company shows an output of \$52,652.11, an increase of several thousand dollars over the showing for November. Opening of new orebody in the North Moccasin mine is progressing satisfactorily. Barnes-King is operating gold properties in several districts throughout Montana, maintaining headquarters in Butte.

Elkhorn—Drifting by the Boston & Montana Development Co. on the Blue Jay fissure where 6 ft. of high-grade silver-lead copper ore was opened several weeks ago is continuing in ore. It is expected that the Elkhorn and Park veins will be cut within ten days. Pouring of concrete for the 500-ton flotation mill is under way.

Clancy—A carload of silver ore shipped recently by the Legal Tender mine netted about \$4,000. The Liverpool is about to ship to the smelter.

Basin—Construction of a 300-ton concentrator is under way by the Jib

Mining Co. Good ore is reported in the old Hope and Katie mines, which have been re-opened.

Vipond—Plans are under way by the Argyle Silver company for a resumption of operations at this old time silver property.

Copper Cliff—Crosscutting by the Potomac Copper Co. at the old Copper Cliff properties will be nearing the objective by the first or middle of March, it is estimated. The Leonard group of claims will also be opened about this time.

NEVADA

TONOPAH MINING CO.'S MILL TO RE-OPEN SOON—OPERATING AT ROCHESTER, GOLDFIELD AND ROUND MOUNTAIN

Tonopah—The 500-ton cyanide mill of the Tonopah Mining Co. will be re-opened early in February, treating at first 150 tons daily. It will receive custom ores in addition to the product of the company's mines at Tonopah, low-grade areas being opened up to supply eventually a capacity tonnage. A new orebody was found lately in opening virgin ground on the 400 level.

The Tonopah Extension company is developing far to the west and north of former workings and to 1,850 ft. in depth. All mills in the district are working at capacity.

Divide—Shipments from the Tonopah Divide mine to the MacNamara mill at Tonopah, six miles distant, have fallen below 30 tons daily, owing to inadequate settling capacity. The main shaft of the Divide mine has passed the 700-ft. point and is showing narrow seams of sulphide ore, at times yielding high assays in gold. A seam of this kind was cut in opening the fifth level station. This is 130 ft. from the silver vein. Interest now centers in the northwest drift on the fifth level, advancing to cut the so-called gold shoot that has been opened on the fourth level.

The Divide Extension will resume shipping, probably to the West End mill at Tonopah. Drifts on the 48, 100 and 200 levels have exposed good ore for a distance of 100 ft., the vein or fracture zone being greatly shattered by fault action.

The Dividend is showing some ore assaying from \$25 to \$60 in a drift at the 75-ft. level of the new shaft, northeast of the Divide Extension orebody. William H. Hart, at one time superintendent of the Portland mine at Cripple Creek, has recently been given charge of the Dividend property.

Belcher Extension has exposed high-grade ore in its No. 2 shaft, 900 ft. west of the main shaft. The new shaft followed a wide seam from the surface and at 60 ft. the ore was 5 ft. wide, continuing to the 100-ft. point.

Rochester—Workings of the Rochester Mines Co. have been connected at depth with those of the Nenzel Crown Point and Charles Kaeding, manager, who is also chief engineer for the Dome Mines Co., reports more ore in sight than ever before. The mill is working successfully and the water supply assured for the future. The Nevada Packard continues to earn good profits from its mill operation.

Goldfield—Properties of the Goldfield Consolidated and part of the territory of the Florence Goldfield are being worked under a long-term lease by the Goldfield Development Co. The Consolidated 100-stamp mill is being repaired and will begin treating 600 tons within 60 days. If the necessary funds can be obtained, the mill will be enlarged to treat 2,000 tons daily.

A carload of high-grade ore from the Combination ground will be shipped soon. This ore, a seam from 12 to 18 in. wide, was found in the ground that is to be caved for milling.

The Yellow Tiger company has been revived, absorbing three other properties, and work will begin in the old main shaft and in the Red Lion claims. Leases on the Florence continue to produce rich ore. Part of the ground formerly embraced in the Florence Divide lease, which has produced over \$125,000, has been given to the Cracker Jack company. The latter, in its own ground, has exposed good milling ore, which will be sent to the Development mill.

The Kewanas has taken a lease on the eastern part of the Jumbo Extension, in which a quantity of milling ore is exposed. The Grandma opened a small pocket of ore above the shale at the 815 level. The Great Bend is developing on the 400 level.

Round Mountain—Reports show the mine to be in better shape than ever before. Leases have been discontinued and company work resumed on a broad scale. Better water supply and deep snow in the canyons insure a profitable placer season. L. D. Gordon, president and engineer in charge, has operated the adjoining Fairview Round Mountain mine, paying \$150,000 in dividends in thirteen months. The discovery of ore in fault fissures lying parallel with the main vein system led to applying methods in the Round Mountain mine that had succeeded in its neighbor, with most gratifying results. The mill is being enlarged to treat 200 tons daily.

Loring—The Jose-Davis Mining Co. has resumed operations in the northern part of the Loring district with ample funds, it is claimed, to develop a good showing on the Shepherd. The 30-ton Gibson mill should be in operation within ten days.

NEW MEXICO

NEW SILVER STRIKE IN COOPERATIVE MINE—EIGHTY-FIVE MINING CO. RE-ELECTS DIRECTORS

Lordsburg—There is considerable excitement in local mining circles on account of another strike of high-grade silver ore in the 150-ft. drift of the Co-operative mine. The ore shows large patches and wires of metallic silver in a siliceous gangue. This company will begin development at once of the Yankee Girl claim, recently purchased from Klein & Reynolds. This ground has a 40-ft. shaft and shows three feet of 15-oz. ore.

Three cars of silver-lead ore have been shipped since Dec. 1 by W. Hughes from the Ruth claim owned by Smith & Reynolds, these averaging \$70, \$80 and \$35 per ton, respectively.

Messrs. Gartney et al are hauling another car of gold-silver-copper ore from the Miser's Chest mine, this ore coming from the west end of the Bonney vein.

The Nelly Grey, that adjoins the Bonney mine on the north, is under examination by Nevada parties who are interested in its showing of silver as well as of gold and copper. Considerable interest is being shown by Nevada operators in the rich silver strikes made in the district.

At the annual meeting of the Eighty-five Mining Co., held Dec. 19, the following officers and directors were elected: A. P. Warner, president; James Barclay, vice-president; C. H. Warner, secretary-treasurer and A. J. Interrieden, manager.

The engineering plans of the Bonney-Consolidated Copper Co. have been changed somewhat to provide for a larger scheme of development prior to mill construction.

UTAH

EUREKA KING SHAREHOLDERS PROTEST AGAINST ASSESSMENT — SILVER SHIELD CO. ELECTS NEW DIRECTORS

Eureka—Ore recently opened by a lessee in the Gemini and followed to within 20 ft. of the Eureka Mines line will probably lead to a revival of work in the latter's property on the 900 level near the Gemini side line. The Eureka Mines is now doing development work on the 1,000 and 1,100 levels.

Shareholders of the Eureka King recently absorbed by the Tintic Paymaster are protesting an assessment levied against their stock in the latter, on the ground that the sum of \$50,000, which they claim was to be expended in development before any assessment should be levied, had not yet been spent.

Shipments from the Tintic district for the week ended Jan. 17 were 145 cars.

Salt Lake City—At a recent stockholders' meeting of the Silver Shield Mining & Milling Co., of Bingham Can-

yon, Utah, held owing to a change in stock control, the following directors were elected: Harry S. Joseph, Allen T. S. Sanford, R. E. Miller, N. G. Hall, D. L. Wertheimer, J. A. Barclay, and Henry Cohn. Harry S. Joseph is general manager, as before. A cash balance of \$4,441 was shown as compared with an indebtedness of \$7,162 on Oct. 1, 1918.

Big Cottonwood—A crosscut from the tunnel of the Logger Mining Co., which is developing ground in Big Cottonwood Canyon and following the "Logger" fissure is showing some mineralization. The tunnel has followed the fissure 475 ft., and the present work is 350 ft. from the portal.

BRITISH COLUMBIA

LADYSMITH CORP. ACQUIRES CLAIMS ON MT. SICKER—EMERALD CONCENTRATOR AT SALMO COMPLETED

BY ROBERT DUNN

Vancouver Island—Fourteen copper claims situated on Mount Sicker are reported to have been secured by the Ladysmith Smelting Corporation. Exploration work has been under way on the property of the old Tyee mine in the same mineral zone for several months, the object being to locate the vein which, after its having faulted was fruitlessly sought by the original operators. If the present development is successful and the claims recently taken up are put on a shipping basis, as is promised, it is probable that the Ladysmith smelter, which has been operated intermittently and unsatisfactorily for some years, will be able to re-open with an assurance of an ample and steady supply of ore.

Another section of Vancouver Island which gives promise of mining development is the Buttle's Lake district. A large body of low-grade copper-gold-silver-lead ore is reported to have been located in this section and engineers have made examinations within the last few weeks. From what is said there appears to be no doubt that the deposit is large, as far as may be judged from surface indications. It was suggested that the Temiskaming company, of Toronto, Ont., had bonded the property but this is denied by Joseph Errington, who has represented that company in British Columbia for some time. This mineralized area, it is interesting to note, is within the limits of what is known as Strathcona Park, which was closed to mining operations until little more than a year ago. With the lifting of the restriction there has been much prospecting within its boundaries.

Salmo—The new concentrator of the Emerald Mine, Iron Mountain, near Salmo, B. C., is practically complete. A test run of the plant will be made as soon as water conditions permit, prob-

ably next June. The history of the Emerald Mine started in 1906, it being the first in the silver belt of the Sheep Creek Camp. It has shipped between 40,000 and 50,000 tons of ore to the Trail smelter.

Slocan—A number of properties in the Slocan district that have ore running well in silver are active this winter. The Republic, Ottawa, Meteor, and Neale are among those that can be mentioned. High-grade ore is being shipped over the snow to the railhead from both the Republic and the Ottawa while the two latter properties, situated on Springer Creek, are being developed.

Trail—During the first week of January the ore receipts at the Trail smelter of the Consolidated Mining & Smelting Co., of Canada, totaled 5,604 tons, of which 451 tons was concentrates and the balance ore. There were fifteen shippers.

ONTARIO

Boston Creek—The shaft of the Boston McCrea property is down 60 ft. at which point a level is being run and crosscutting has begun. No. 2 vein, paralleling that on which the shaft is sunk, has been opened up on the surface and is reported to carry \$8 to the ton over a width of several feet.

The shaft of the Miller Independence has reached a depth of 450 ft. When down to the 500 level a working station will be cut and lateral work started.

Matachewan—A complete mining plant has been purchased by the syndicate operating the McAlpine and Rawhide properties. Operations will for the present be confined to the McAlpine, the shaft on which, now down 100 ft., will be deepened. Several good veins have been uncovered on the surface.

At the Matachewan, twenty diamond drills have been put down so far, the greatest depth being 525 ft. Deeper drilling will be done.

West Shining Tree—The shaft on the Wasapica has been carried down 160 ft. and is being confined to the 200 level. The big vein has been cut at the 100 level and found to be wider than on the surface. There is in addition a wider body of lower-grade ore.

Cobalt—The Crown Reserve company plans to develop a large section of the old workings on the quarrying system. There are several lean faces of workings which might develop high-grade ore and a portion of the rock between the veins may be commercial milling ore.

QUEBEC

Beaverhouse Lake—A new cyanide and concentration plant will be installed at the Argonaut property.

PERSONALS

E. P. Mathewson of New York City, consulting engineer in non-ferrous metals, has gone West on a professional trip.

J. G. Parmelee resigned his position with the Utah School of Mines to become sales engineer for the Hardinge Conical Mill Co.

Archie McDonald, formerly with the United Copper Co. of Chewelah, Wash., has resigned that position to become resident manager of the Sterling Mining & Milling Co., Flesher, Mont. The main offices of the company are at Pullman.

Norman Kurtz, for three years on the engineering staff of the Miami, Ariz., Copper Co., left Miami on Jan. 7 for Mexico City where he will accept a position with the Aguila Mining Co. (British) operating mines in the Pachuca district.

John E. Penberthy, formerly superintendent of the Shannon Copper Co.'s mines at Gleason, Ariz., is now in Aire Libre, Puebla, Mexico, as manager of the Teziutlan Unit of the Mexican Corporation, S. A., who have taken over the management of the Teziutlan Copper Co.

F. G. Moses, hydrometallurgist at the Salt Lake City station of the U. S. Bureau of Mines, has resigned to accept the position of flotation engineer with the Barrett Co., New York City. **C. A. Wright** of the Moscow, Utah, office of the bureau takes his place at Salt Lake City.

Frederick J. Rowlands, formerly of Butte, Mont., has been for the past year in the mining machinery and supply business in Vancouver, B. C., where he is a member of the Chamber of Mines as well as a member of the Canadian Mining Institute. His address is 910 Dominion Building.

Miss Doska Monical, mineral geographer in the section of Foreign Mineral Deposits, U. S. Geological Survey, has resigned that position and is now on the staff of Augustus Locke, mining geologist, of San Francisco, where she has charge of the inquiry department for his geological staff.

H. Lipson Hancock, general manager of the Wallaroo & Moonta Mining & Smelting Co., Ltd., Wallaroo, South Australia, is visiting the United States for a few months to investigate mining and smelting conditions here. He is giving special attention to the use of pulverized coal in place of coke in blast furnaces.

Millard K. Shaler, formerly on the staff of the U. S. Geological Survey and for years in charge of important Belgian-American mining interests in the Congo Free State with headquarters in Belgium, has been in the United States for a few months. He left again for Belgium on Jan. 20. Mr. Shaler has been prominent in Belgian Relief work in association with Mr. Hoover. It was Shaler's trip to London to secure food for the starving Belgians, early in the war, that led to his asking the assistance of Hoover whose interest became thus permanently fixed.

William A. Burr, for fifteen years mineral expert for the Department of Fomento of Mexico and for ten years a consulting engineer for many of the larger mining companies of that republic, writes that he is now probably located at San Luis Potosi, S. L. P., Apartada 132. At the solicitous hands of Villa he has lost much of the little fortune he invested in Mexican enterprises together with his horses, while Oroasco's ambulance train deprived Burr of a brand-new Cadillac. Worst of all, perhaps, his extensive technical English library was destroyed by appreciative revolutionists at Inde, Durango, in 1910.

OBITUARY

William F. James, pioneer mining man of Salt Lake City, died at Long Beach, Cal., on Dec. 21, 1920. Mr. James was born at Harper's Ferry, W. Va., Jan. 24, 1845. In 1864 he joined the Twentieth Wisconsin regiment and served with that organization in the Civil War. He was mustered out in 1865.

He came west shortly after leaving the army and was associated with mining interests in Montana and Nevada before coming to Utah in 1871. He located and worked many important claims in the Bingham Canyon district and left there for the West Tintic, the Big and Little Cottonwood and other sections.

He was for many years president of the Utah Ore Producers' association; was a member of the assay commission under President Harrison, and was influential in regulating the lead tariff.

Richard Cockburn MacLaurin, president of Massachusetts Institute of Technology, died of pneumonia at his home in Boston, Mass., on Jan. 15, at the age of 49. He particularly deserved the devotion of M. I. T. alumni for his services in developing and firmly establishing the Institute on a broad new basis with

worthy buildings for its work. **Dr. MacLaurin** was born in Lindean, Scotland, June 5, 1870, spent his early boyhood in New Zealand, but like many another received his preliminary and university training in English schools. He received the degrees of bachelor and master of arts in 1897 from Cambridge, and at that time showed very considerable talent in mathematics. After a post-graduate period of travel in the United States he returned to England to study law; but in 1898 he accepted the call to a professorship of mathematics in the University of New Zealand. For ten years he served that school and the cause of technical education in New Zealand. In 1907, however, he returned to the United States to occupy the chair of mathematical physics at Columbia University and afterwards became head of the Department of Physics there, a position he retained until elected to the presidency of the Institute in 1909. He received many degrees of distinction including an LL.D. from Cambridge in 1904, and was a member of numerous societies. His novel scheme to interest the commercial men of the country in the Institute of Technology, when campaigning to secure adequate funds for the foundation, seems to contain wise suggestions of a proper method for insuring a continuation of that essential interest throughout the future.

Robert H. Chapman, an expert topographical engineer associated with the U. S. Geological Survey, died of pneumonia at Hotel Wolcott, New York City, Jan. 18, 1920. Mr. Chapman was born in New Haven, Conn., July 29, 1868, but received his professional training at the Corcoran Scientific School of what was then called Columbian College, Washington, D. C. He entered the service of the United States Geological Survey in 1890, then under J. W. Powell and beginning to produce the series of topographic atlas sheets for which the survey has since won international fame. Mr. Chapman was thus one of the older topographers, and also one of the most skillful, in the survey's employ. He continued in the service without a break save for the years 1909 to 1911, inclusive, when he was detailed by the director to go by request to Ottawa and introduce Federal topographic methods in the Geological Survey of the Dominion. During those three years he was in charge of the Canadian field work on Vancouver Island. During 1912 he was acting superintendent of the Glacier National Park, indeed from its inception he was an enthusiastic and active promoter of the National Parks movement. Among many societies receiving his adherence we note particularly the American Insti-

tute of Mining and Metallurgical Engineers, Washington Society of Engineers, American Geographical Society, American Association for the Advancement of Science, and the American Alpine Club. He was secretary of the latter and was attending one of its meetings when he became ill. During our participation in the war Mr. Chapman saw active overseas service as Major of Engineers in the Reserve Corps of the Army.

INDUSTRIAL NEWS

Mine & Smelter Supply Co., announces that W. A. Leddell has been appointed manager of its engineering department with headquarters at Denver, Col. Mr. Leddell is a graduate of the Stevens Institute of Technology.

Research Corporation, New York City, announces the appointment of P. E. Landolt as manager of its commercial department. Mr. Landolt is long in this service and familiar with the applications of the Cottrell electrical precipitation processes.

Charles Butters & Co., Ltd., London, New York City, etc., announce that they are operating a complete engineering and ore-treating laboratory under the supervision of A. H. Jones at Salt Lake City. Mr. Jones invented the Jones-Belmont flotation machine.

Walter A. Zelnicker Supply Co., St. Louis, Mo., announces that Hugh L. Siegel, formerly sales manager for Ford Roofing Products Co., is now with them as assistant to the president. The company handles railway, power plant, contractors' equipment and machinery of all kinds.

Otto Wartenweiler & Co., Los Angeles, announce that S. K. Dahl has joined the firm, which in future will conduct the business of engineers' designing and constructing mine, metallurgical and industrial plants under the name of Dahl & Wartenweiler, at the Central Building, Los Angeles. Mr. Dahl recently returned from four years in the Union of South Africa where, as mill superintendent, he remodeled and operated the Messina Transvaal Development Co. concentrating plant.

The Fairbanks Co., Broome and Lafayette Sts., New York City, are pushing that ingenious and useful device, the "Radbore Head," which will drill a square hole in any metal out of the solid material without previous preparation and without subsequent finishing. The tool is based on the well-known principle of the Cardan Circles, and with its special guides constitutes an

attachment easily and rapidly applied to any milling machine or drill press. It cuts either square holes with filleted corners or square holes with sharp corners. In the latter case a peculiarly ground drill and a special guide are used. Blind square holes can be obtained in one operation. The heads are manufactured in various sizes.

TRADE CATALOGS

Allis - Chalmers Oil Engines, Diesel Type. Allis-Chalmers Manufacturing Co., Milwaukee, Wis. Bulletin 1532-A, September, 1919. 8 x 10½; 18 pp., illus. Explains operation and detailed construction of the Allis-Chalmers type of oil engine.

The Dorr Co., of New York City, has just published an attractive, illustrated booklet of 12 pages, describing their experimental mill at Westport, Conn. The building was an old grist mill of Revolutionary days, but it has been fitted up today as a testing plant capable of commercial-scale tests along many lines.

National Tube Co., Pittsburgh, Pa., in its bulletin No. 24A, just issued, discusses "The Rise of Steel Pipe," illustrating the discussion by numerous graphic diagrams and statistical tables. The results stated briefly are that from 1905 to 1913 the gain in steel pipe was over 1,200,000 tons, and only 140,000 tons of this was at the expense of iron pipe. This is an example of expansion unparalleled in that time in any other line of production.

Portland Cement Association issues a generally interesting and instructive pamphlet of 19 pages on "Concrete Chimneys." It is pointed out that hundreds of reinforced concrete chimneys or stacks are in successful use throughout the world, that they are particularly efficient, maintenance free, obviate chimney insurance, as permanent and resistant as rock, and usually of lower first cost than other types in the case of the larger sizes. The association offers aid to intending builders in the matter of design and qualified contractors.

The tallest concrete chimney in the world is stated to be that of the Saginoseki Copper Co.'s smelter at Saginoseki, Japan. It is 570 ft. high (15 ft. higher than the Washington Monument, D. C.), has an inside diameter of 26 ft. 3 in., and withstands the frequent earthquakes of the island. It has been in use three years, was built by the Weber Chimney Co., Chicago, and has proved entirely satisfactory.

NEW PATENTS

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

Aluminum Chloride—Process of Manufacturing. John R. Mardick. (1,325,203; Dec. 16, 1919.)

Briquets—Means for Drying Briquets. Burke Baker, assignor to American Briquet Co. (1,324,758; Dec. 9, 1919.)

Castings—Pouring-Head and Skim-Gate for Castings. William J. Alford. (1,324,021; Dec. 9, 1919.)

Chromium—Process of Isolating Salts of Chromium. Gerhard Nicolaas Vis. (1,324,328; Dec. 9, 1919.)

Clay—Treatment of Clay. William Feldenheimer. (1,324,958; Dec. 16, 1919.)

Drill—Rotary Boring Drill. Howard R. Hughes. (1,325,944; Dec. 23, 1919.)

Drilled Wells—Means for Cutting off Water from Lower Strata of. Nicholas S. Sibert. (1,326,141; Dec. 23, 1919.)

Dumping Apparatus—(Rotary). Erskine Ramsay. (1,325,536; Dec. 23, 1919.)

Electric Furnace—Frederick T. Snyder, assignor to Industrial Electric Furnace Co. (1,325,539; Dec. 23, 1919.)

Fuel—Apparatus for Using Powdered Fuel. William H. Stevens. (1,324,081; Dec. 9, 1919.)

Fuel—Pulverized-Coal Feeder. Walter Dongan Wood, assignor to Fuel Saving Co. (1,324,366; Dec. 9, 1919.)

Galvanizing Process. Edward Lacey Watrous, assignor to E. L. Watrous Galvanizing Co. (1,324,220; Dec. 9, 1919.)

Lamp—Miner's Lamp. William Mosso. (1,324,921; Dec. 16, 1919.)

Lead Arsenate—Method of Making. Matthew W. Butler, assignor to the Harshaw, Fuller & Goodwin Co. (1,324,300; Dec. 9, 1919.)

Leucite—Recovering Potash From. Franz A. Rody, assignor to Metallurgical Co. of America. (1,325,881; Dec. 23, 1919.)

Magnesia—Process for the Manufacture of. Eric Edward Dutt. (1,325,932; Dec. 23, 1919.)

Mining-Car—Adolph G. Bauer. (1,325,609; Dec. 23, 1919.)

Mining System—Adolph G. Bauer. (1,325,610; Dec. 23, 1919.)

Ore bodies—Means for Locating by Audio-Frequency Currents. Wendell L. Carlson and Earl C. Hanson. (1,325,554; Dec. 23, 1919.)

Ores—Process and Apparatus for Extracting Ores. Rosa Wallner. (1,326,125; Dec. 23, 1919.)

Shales and Coals, Treatment of. David E. Day. (1,323,681; 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
22	360 ⁵ / ₈	131 ³ / ₄	79 ⁵ / ₈	26	360	134	81 ¹ / ₈
23	362 ¹ / ₂	132 ¹ / ₄	79 ⁷ / ₈	27	356 ¹ / ₄	134	82 ¹ / ₂
24	362 ¹ / ₄	132 ¹ / ₈	80 ¹ / ₄	28	352 ¹ / ₄	135	84 ¹ / ₂

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	Spot	N. Y.	St. L.	St. L.
22	18.75@19.00	62	62	8.50@8.60	8.25@8.35	9.00@9.05
23	18.80@19.00	61 ⁷ / ₈	61 ⁷ / ₈	8.50@8.60	8.25@8.35	9.00@9.05
24	18.80@18.95	61 ³ / ₄	61 ³ / ₄	8.50@8.60	8.25@8.35	8.95@9.10
26	18.85@18.90	61 ³ / ₄	61 ³ / ₄	8.50	8.25@8.35	8.95@9.10
27	18.85@18.90	61 ³ / ₈	61 ³ / ₈	8.50	8.25@8.35	8.95@9.10
28	18.85@18.90	60 ⁷ / ₈	60 ⁷ / ₈	8.50	8.25@8.35	8.95@9.10

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	
	Spot	3 M.	Electrolytic	Spot	3 M.	Spot	3 M.	Spot	3 M.
22	114 ³ / ₄	116 ³ / ₄	121 ¹ / ₂	384 ³ / ₄	386	46 ³ / ₄	47	58	59 ³ / ₄
23	115	116 ³ / ₄	121	387 ¹ / ₄	387 ³ / ₄	46 ⁵ / ₈	47	58 ¹ / ₄	60 ¹ / ₄
24	117 ¹ / ₈	119 ³ / ₄	122 ¹ / ₂	389 ¹ / ₄	388 ³ / ₄	46 ¹ / ₄	47	58 ¹ / ₂	60 ³ / ₄
26	117 ¹ / ₈	119 ³ / ₄	122 ¹ / ₂	389 ¹ / ₄	388 ³ / ₄	46 ¹ / ₄	47	58 ¹ / ₂	60 ³ / ₄
27	119 ³ / ₄	121 ¹ / ₄	123	389 ¹ / ₂	388 ³ / ₄	46 ¹ / ₂	47 ¹ / ₄	59	60 ³ / ₄
28	120 ¹ / ₄	122 ¹ / ₄	123	388 ¹ / ₂	388 ¹ / ₂	46 ³ / ₄	47 ³ / ₈	59 ¹ / ₄	61

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. 28, 1920

The noteworthy features during the week have been the quiet market for copper, the absorption of available supplies of lead, and the falling off in the price of zinc, due partly to rather heavy selling by certain important interests. Trans-Atlantic freight rates remain unchanged and easy. Trans-Pacific rates continued at \$12 from Hongkong and Kobe.

Copper

During the past week business has been light, and many consumers have stopped buying on the assumption that a turn will come in the near future. It has not been a sellers' market, and actual business in large lots has been rather light, about 80 per cent of the sales of one large producer being made at 19c. delivered, equivalent to 18.85c.

New York, cash basis. Some copper changed hands at 19¹/₄c. delivered, which price is regarded as a premium over the general run of sales for nearby delivery. A large part of the copper sold during the week went into the wire trade. There was a fairly good foreign business through the Export Association; yesterday and today there was inquiry leading to future business, and some large producers reported sales for as far ahead as April, May, and June delivery at prices ranging from 19¹/₄c to 19¹/₂c. c.i.f. Some offerings by speculative traders have been reported at lower prices than those we quote, but on diligent inquiry consumers cannot obtain any substantial quantity of the metal at the prices named. Such speculative offerings have tended to keep the outside market down and apparently at an artificially low level. Large consumers

appear to be pretty well supplied, not only so far as present requirements are concerned, but for the future.

Copper Sheets—No change in nominal price of 29¹/₂c. per lb., set Jan. 7. Wire, 22¹/₄c. per lb.

Tin

The tin market has been quiet, with a tendency to weaken, due to desire on the part of speculators to dispose of their holdings. During the week 99 per cent tin declined from about 62c. on Jan. 22 to a little below 61c. on Jan. 28. Straits tin was quoted at 62¹/₄c. during the latter half of last week, and down to 61¹/₂ to 61¹/₄c. on Jan. 28. A recent slight advance in the London market was offset by fall in sterling exchange. In London there was a fair demand for spot tin, the price of which advanced over forward tin, which remained relatively quiet. The tin-plate trade in London has been fairly good. In this country tin has been recently selling at 2 to 2¹/₂c. below the cost of import, suggesting that pressure is being brought to bear on speculators who are forced to dispose of their holdings. Arrivals during the week were 75 tons from China on Jan. 22, 375 tons from London on Jan. 23, and 220 tons from Liverpool, 825 tons from Singapore, and 50 tons from Hongkong on Jan. 26. Total receipts for the month up to Jan. 26 were 3,285 tons at Atlantic ports and 490 tons at Pacific ports.

Lead

The market has been a little more active this week, with a tendency toward a slightly higher level. Sales have been relatively light during the week, due principally to short supplies. Early in the week a fair supply existed around St. Louis, and some lead is reported to have been offered at 8.35c. without getting any business. Later in the week this local supply is reported to have been disposed of. In general, the market has been quiet, with immediate requirements of large consumers pretty well supplied. There was more inquiry toward the end of the week, when the market became firmer, some large producers having little lead to offer. The largest producer came into the general market and practically dominated it at its official price of 8¹/₂c. N. Y.

Zinc

During the week large interests sold considerable zinc at 9c. per lb. for near-

by delivery. This was below what other producers were willing to sell, and probably represented the closing out of available stocks. Second quarter deliveries were generally offered at 9c. St. Louis. There has been a falling off in the demand from abroad due chiefly to the very unsatisfactory rates of exchange, consequently the large supplies were disposed of by interests which anticipated lower prices in the near future. There was some demand from domestic consumers, particularly from galvanizers desiring early delivery. The future for the market depends largely on the European situation, exchange being a disturbing factor. A fairly good business is reported done in high-grade zinc between $9\frac{1}{4}$ and $9\frac{1}{2}$ c. St. Louis.

Zinc Sheets—\$12 to \$12.50 per 100 lb. less 8 per cent on carload lots. Slightly higher prices for export.

Silver

The London market has been an advancing one, owing partly to the decline of exchange on London from 360% to 352 $\frac{1}{4}$ c. and partly to buying in London on China account. China at present is not buying as freely but special interests are absorbing all floating silver destined to eastern points. The Shanghai rates are 154c. for spot and 152c. for March. Shipments from San Francisco to the east for December, 1919, were 10,100,000 oz.

Mexican Dollars at New York—Jan. 22, 100; Jan. 23, 100 $\frac{3}{4}$; Jan. 24, 101 $\frac{1}{2}$; Jan. 26, 100 $\frac{1}{2}$; Jan. 27, 102 $\frac{1}{2}$; Jan. 28, 103 $\frac{3}{4}$.

Platinum—Unchanged at \$155 per oz. Demand steady.

Palladium—Unchanged at \$130 per oz.

Iridium—Quoted nominally at \$300.

Aluminum—Producers are asking 33c. per lb. Some small lots, largely of remelted scrap, sold down to 31c.

Antimony—Ordinary grades are quoted at 11 $\frac{1}{2}$ c., an advance over week with demand stronger W. C. C. 11 $\frac{3}{4}$ @ 11 $\frac{1}{2}$ c. and genuine Cooksons "C" brand, 14@16c.

Bismuth—Demand steady at \$2.50 for 500 lb. lots.

Cadmium—Unchanged at \$1.40@1.50 per lb. Market quiet.

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

Quicksilver—Price held at \$93 per 75 lb. flask with fair demand. Receipts not large. San Francisco telegraphs \$88; dull.

Chrome Ore—Few offers and previous quotation of 75c. per unit for 50 per cent ore still reflects the market.

Feldspar—\$13.50 to \$18 per ton, according to quality.

Fluorspar—Lump ore containing 85 per cent calcium fluoride, 2 and not

over 5 per cent silica, is quoted unchanged at \$16 f.o.b. mines at Tonuco, N. M. Freight to Chicago, \$7.50; to New York, \$15. Prices quoted f.o.b. Kentucky and Illinois mines are about \$25 for washed gravel grade. A price increase possible.

Graphite—Ceylon grades are quoted unchanged; lump, 15@16c; chip, 11@12c; dust, 8@9c. Domestic flake, about 10c. per lb. Crude Mexican, \$34 per ton.

Molybdenum Ore—65c. per lb.; molybdenum sulphide, nominal, for 90 per cent concentrate. Market extremely quiet.

Nitrate—Price continues to rise, due to shortage of shipping and increases in selling price by producers, \$3.60@ \$3.75 per cwt. for carload lots.

Pyrites—Spanish pyrites is quoted unchanged at 15c. per unit for furnace size ore free from fines, c.i.f., New York or other Atlantic ports. Decrease in exchange the past week compensated for by an increased freight rate. Total shipments from Huelva, Spain, to the United States in 1919 were 301,692 long tons.

Sulphur—Prices average \$18 per ton for domestic and \$20 for export f.o.b. Texas and Louisiana mines. Practically no change in past two or three months.

Tungsten Ore—Market very quiet but some Chinese wolframite sold at \$5.50 per ton; probably less than 100 tons. It is expected that some action will be taken by the Tariff Commission, which meets today, to settle this question.

Manganese Ore—Buyers willing to pay high prices but shipments from Brazil almost impossible to obtain.

Ferromanganese—The domestic market on ferromanganese is about sold up on immediate stocks; all orders now received are for the last half of this year. Importation of English ferromanganese has fallen off appreciably and it is rather scarce at \$140@150. Domestic is holding firm at \$150 with some sales recorded as high as \$160. The only hitch to an otherwise strong market is the shortage of cars for shipment. Buyers would pay still higher prices if they would be assured of delivery on date. Spiegeleisen continues active and firm.

Zinc and Lead Ore Market

Joplin, Mo., Jan. 24.—Zinc blende per ton, high, \$58.75; basis 60 per cent zinc, premium \$56; prime Western, \$57.50@ \$52.50; fines and slimes, \$52.50@50; calamine, basis 40 per cent zinc, \$35@ \$40. Average settling prices: blende, \$56.07; calamine, \$38; all zinc ores, \$54.36.

Lead, high \$101.25; basis 80 per cent lead, \$98@100; average settling prices all grades of lead, \$97.88 per ton. Ship-

ments the week: blende, 12,308; calamine, 61; lead, 1,815 tons. Value all ores the week, \$870,090.

Though a considerable tonnage was bought early in the week on \$57.50 basis, the price dropped to \$55 in mid-week and \$52.50 today was the best offering at the close. A few sellers were caught in the drop, having declined the higher offerings early in the week. The elevation in lead prices is accepted as a needed basis price to support the lowering price of blende. The production of calamine has declined to the lowest point in many years.

Platteville, Wis., Jan. 24.—No sales of premium or prime western grades blende reported. Lead ore, basis 80 per cent lead, \$100 per ton. Shipments for the week are 1,385 tons blende and 128 tons lead ore. For the year to date the totals are blende, 6,406; calamine, 360; lead, 665 tons. During the week 2,099 tons blende was shipped to separating plants.

Iron Trade Review

Pittsburgh, Jan. 27, 1920

Steel production has increased further and is now between 85 and 90 per cent of capacity, though probably not much above 85 per cent. There is increased complaint of transportation which has grown still worse. The movement of coal and coke has increased slightly but not in keeping with demand. Several blast furnaces were kept idle by nothing but the lack of coke. The railroad congestion has now become a serious matter in connection with the movement of steel products from mills.

Pig Iron—Foundry, \$2 higher per ton for forward delivery at \$40, valley with no definite market for prompt; basic up \$1 to \$37 valley and bessemer up \$2 to \$39 valley.

Steel—As high as \$55, Pittsburgh, is bid for small billets in thousand ton lots and over against the March 21 price of \$52. Some large mills recently sold sheet bars to regular customers at \$50 against the March 21 price of \$42, but now want \$55. Rods remain quotable at \$52@66.

Coke—Furnace, \$6; foundry, \$7, at Connellsville ovens.

Ferromanganese—Domestic producers continue to advance prices and are now asking \$150 delivered for 76 to 80 per cent. They seem to be sold out entirely for first half. Spiegeleisen is \$47@48 for prompt and \$48@55 for futures, furnace.

Ferrosilicon—Electrolytic ferrosilicon is rather quiet at \$80 for 50 per cent and \$140 for 75 per cent delivered Pittsburgh, Valleys and Cleveland. 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.

