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Asiatic Number



Entrance to gold mine (Gold quartz veins in schist) in the Kolar field, India.

Mineral Enterprise in China

By Thomas T. Read

Smelting Conditions
in Namtu, Burma

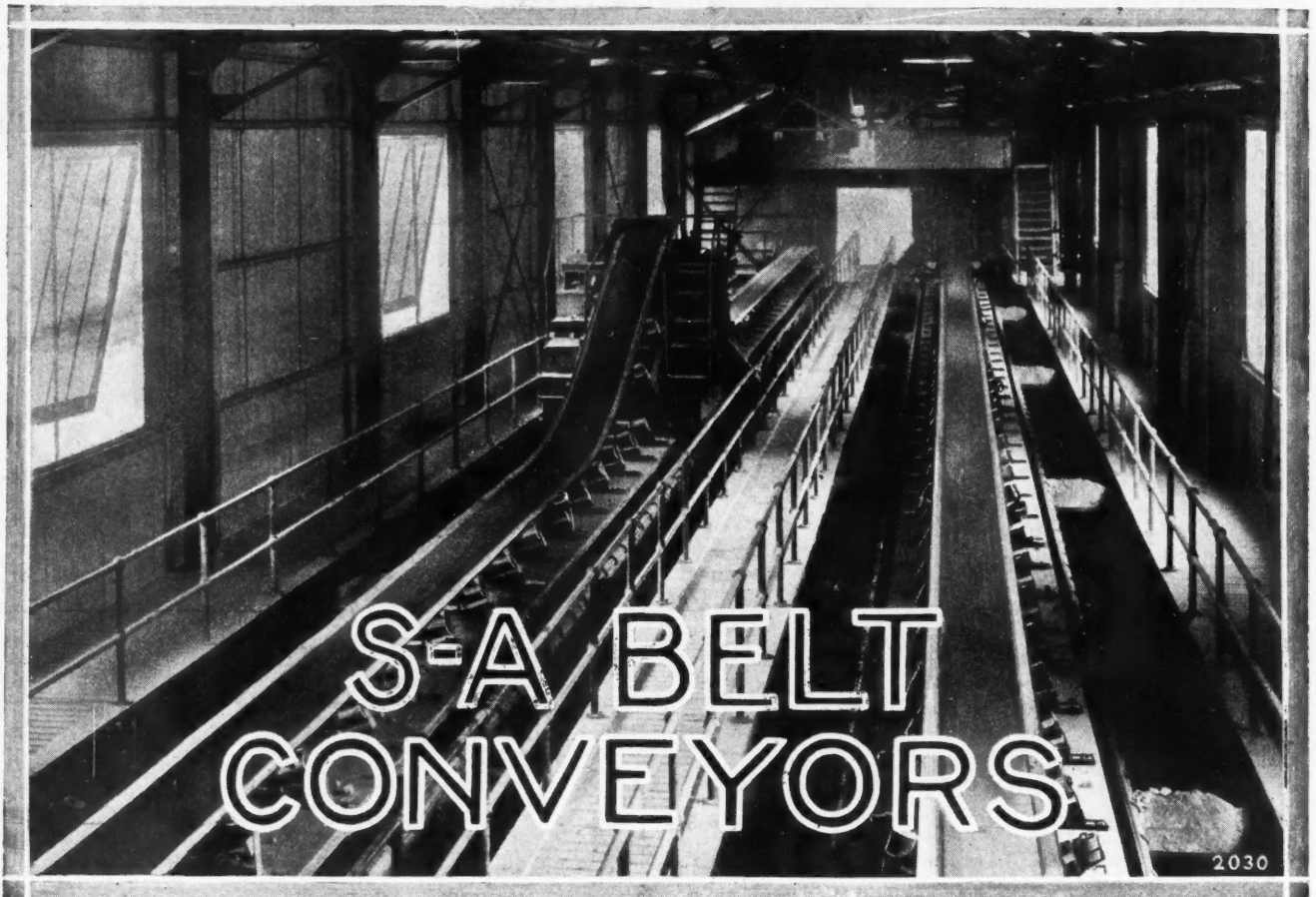
By Arthur W. Jenks

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Number 7

The Sleeping Nations

ASIA, the birthplace, so far as we know, of the human race—certainly the birthplace of civilization—shows many signs of rousing itself from its long dormancy. There is an element of compensation in nature which opposes many popular conceptions of evolution. The sons and grandsons of supermen are noticeably often mediocre or inferior—hence the fallacy of the aristocracy or “best families” theory. Races and nations surge upward and forward so as to command the admiration of all subsequent mankind, and then the surge dies away, inactivity supervenes, then degeneration. Where, asks every rhetorical orator on some occasion, are now the glories of Assyria, of Egypt, of Carthage, Greece and Rome?

A field that has been well tilled should lie fallow for a period if it is to repeat its productivity. The apple tree that bears phenomenally this year will bear very little next: it has exhausted its vitality and must recuperate.

The civilization of China and Japan, of India and Persia, flourished while Europe was the hunting-ground of husky savages—our ancestors—and then lapsed into the sleep of centuries. Is there a natural cycle of recurrence of virility in races or nations? Do they ever “come back”? Japan would answer in the affirmative and attempt to prove it. Is all Asia sensing some long-accumulated pressure of forward development? There are signs which may be so read. Much of Asia, like China, may be interpreted as having been static for centuries, rather than having degenerated. If all these races adopted the mechanical secrets of power which the European races have discovered in such relatively recent times, the result would be stupendous.

Students generally agree that our modern European civilization has not exceeded that of Greece, for example, in moral development, or in point of artistic or literary achievement: indeed, many believe that it perhaps has not attained so far. We have, however, exceeded all history in science, in knowledge, understanding, and mechanical appliances, which quite recently have all been put to savage uses. Asia is learning these secrets rapidly; and a possible development would seem to be in the process of time the transfer of the world's chief arena of interest back to the Great Continent.

Asia and the Silver Miner

NO DOUBT a flight of fancy is required to catch the connection between the ability of a Nevada silver miner to operate his silver mine profitably with silver at one dollar an ounce—any other value will do—and the speculative proclivities of some Chinaman, the bedecking of a dusky bride in far-off India, the favorableness of the monsoon, or the possibilities of educating the Oriental to the use of modern methods in

currency and finance. Yet the relationship of one to the other is very close and vitally important to the silver-mining industry, which, oddly enough, depends largely for its prosperity on the idiosyncrasies of the natives in the thickly populated Asiatic countries.

Ever since the adventurous and roving British and Spanish sailors several centuries ago began to venture to the Orient, exchanging silver pieces and bullion for the rich products and highly prized treasures of the East, an unabated stream of silver has flowed from the Occident to the Orient. Occasionally this stream would diminish in volume, as if the Oriental silver appetite were satiated, but more often this was only a lull in the vigor of the flow, and it continued in even greater volume. Practically all of the silver that finds its way to Asiatic parts is absorbed in the fullest sense of the word, and disappears from circulation as if removed entirely from the face of the earth, gradually percolating through the interior of India, China, and even Africa, finding ultimate lodgment no one knows where. The tremendous forces that account for what appears to us the enigmatical and peculiar behavior of the Asiatic native have been accumulating momentum through the years; they act ponderously yet surely, and a reversal of the flow would upset the habits and customs of generation after generation.

Silver enters into intimate daily association with the life of the Indian and Chinese native. Both have a striking fondness for the metal, and their handicraft, as exemplified by the painstaking ornamental work which they have produced, needs no eulogy here. Vast quantities of silver are consumed by the arts in the Far East, and comparatively trifling amounts of silver per capita assume staggering proportions when multiplied by the teeming millions of Asiatic inhabitants. China, with her enormous population, could account for 100,000,000 oz. of silver if the per-capita consumption were but $\frac{1}{2}$ oz. annually. This would be about half the world's production. India, which is a greater silver sponge than China, has actually taken more silver than the entire world's production, and did this last year, or from June, 1918, to June, 1919. In fact, that country accounted for more than 112 per cent of the world's output. No wonder silver reached such high prices last year! However, on a per-capita basis, even this ratio is small, $\frac{2}{3}$ oz. of silver per person. For ten years prior to the war, India imported about 35 per cent of the world's silver production.

The Oriental mind is noted for its aversion to changes in habits and customs of centuries. Hence the difficulty attached to the attempts to alter existing conditions in Asiatic currency and finance. There is talk of Chinese currency reform—India's is being continually modified. It needs it; and the world would welcome the change. Unification of the currency on a silver basis is suggested

as a start, with a gradual conversion to a gold standard or modification thereof. But to do this it is necessary to overcome the inclination of the Chinese to the present intricate currency system, which lends itself admirably to the speculative characteristics of the native. Even should currency reform become a reality, weaning the Oriental away from the use of silver as a monetary medium will not be easily accomplished. The importance of Asiatic conditions to the white metal, and vice versa, is astounding.

Mining in Siberia And Russia

IT IS SO DIFFICULT to form a clear idea of political conditions in Russia and Siberia that we are publishing the latest Siberian point of view in an article in this issue. It is interesting in this: that the Siberians have totally abandoned communism, Bolshevism, and anti-capitalism, and declare for an equitable co-operation of labor, brain work and capital. Capital is invited to come to Siberia to assist in the development of mines, and fair treatment and guaranteed profits are assured.

The idealism of the Siberian and his fair intentions are evident; but the reaction against the autocracy of the Czar, although recovered from the Bolshevistic extreme, still probably goes too far. It is doubtful if any loose scheme of government can function or hold together. The idea that mineral wealth is the property of the local community in which it is found, rather than of the larger community, such as the province, is not a sound one; nor, in spite of the enthusiastic optimism of the Siberians, can it be expected that local dealings with ignorant men of small caliber can be productive of anything but an unusual amount of corruption and graft. Some more compact form of government will have to be devised before capitalists can be sure of fair treatment and protection.

It will be noted that Vanderlip characterizes the Siberian scheme of government as "literally no government." In a way this is true—the "ideal" plan is really the primitive scheme which obtained in countries like those of Europe before the independent villages, cities and rural communities banded together for efficiency and strength, with an organized common government.

The offer to guarantee profits to mining enterprises is a seductive one, which many companies would gladly embrace if it were feasible; but it shows the lack of experience of those who, in the goodness of their hearts, offer it. We are familiar in this country with the vendors of oil or metal-mining stocks, who guarantee 24 per cent a year on the purchase price of the stock; and their offer does not get many takers from the initiated. Mining is a hazardous business. In most cases there is no profit; and a very large profit must be possible to make the speculative business attractive.

The author observes that the government of Siberia is really very much like that of Russia at the present time. We do not gather this from the scraps of enlightenment which are available to us regarding the true conditions in Russia. In Russia, we have apparently the tyrannical dictatorship of Lenine and his henchmen, an organized tyranny, militaristic and imperialistic, in which not only the army, but labor, is under the order of the so-called state. It has been pointed out that labor under such conditions finds its prototype in the slave labor of Egypt; and it is also like the Belgian slaves

which the Germans drove out of Belgium and put to forced labor, except that in Russia the slaves and the masters are both Russian.

Organized labor in the United States sees nothing but tyranny in Russia, and even Emma Goldman, prosperous and disturbing in America, has found that, so far from Russia being the land of liberty, liberty has totally abandoned it. The Russian leaders themselves have found out that the ideal democracy was impracticable, and they are frankly governing the moujiks "for their own good," as the Czar did. The chief difference between the old and the new autocracy, except for the disappearance of the nobility, is in the lack of any sense of moral responsibility or of business honesty in the new. This is a development that is characteristic of advanced demagogues and their followers the world over, even in the United States.

We do not know to what extent mining men are preparing to return to Siberia and to Russia; but it is plain that any government which refuses to recognize old titles is not trustworthy. In the United States we recognize the old titles to the Spanish land grants, given by the Kings of Spain, which grants became binding on the later government of Mexico, and still later on the Government of the United States, when the lands in question passed successively, by the fortunes of war, to these countries. Expropriation without compensation marks a dishonest government and people.

East Is West

WHEN Kipling wrote in his rhythmical strain that "East is East and West is West, and never the twain shall meet," it is quite probable that he was confining himself strictly to the meter and sense of the rhyme and concerned himself not with such a sordid matter as that generally known in business circles as foreign trade. At that period romance and business were regarded as separate, whereas today romance becomes more and more a part of everyday business. We are becoming more human in our dealings and broader in our vision. And with this gradual humanizing process comes a sweeping away of old prejudices, the approach to a common footing, and a keener appreciation of the value of co-operation. It is by this means that we approach and gradually reach the highest type of commercialism.

It may not be true that we of this country are suspicious of those with whom we deal in foreign lands, but we have at least been credited with "Yankee shrewdness," and that, after all, is not unlike certain characteristics shown by merchants of the Far East. But apparently this mutual shrewdness, or whatever we choose to call it, has not been detrimental to trade, for actual figures show a steadily growing commerce between the United States and our neighbors on the other side of the Pacific. So that in so far as the matter of exports and imports is concerned, there is little disposition on the part of the East or the West to establish an unsurmountable barrier.

Recent figures issued by the National City Bank of New York, state that our exports to Asia have increased from 113 million dollars in the year ended June, 1914, to 804 million in the fiscal year ended June, 1920. This shows a gain of 33 per cent above the figures for 1919, in which year they totaled 604 million dollars—particularly encouraging inasmuch as it was expected that

Asia would return to her former practice of dealing largely with Western Europe. Part of this increase is undoubtedly due to higher valuation and also to the fact that the supply of European stocks are depleted as a result of the Great War.

There is also an encouraging note in the fact that while exports have increased the same is true of imports, and such reciprocation lays the foundation for an amiable and lasting commerce between nations. Our imports from Asia for the fiscal year ended June, 1920, totaled 1,350 million dollars, as against 831 million in 1919.

It is interesting to note the increases and distribution of this trade. Sales to Japan for the fiscal year 1920 totaled 460 million dollars (51); to China, 115 million (25); India, 78 (11); Dutch East Indies, 45 (less than 4); Philippines, 72 (27); Hongkong, 20 (10); and to Straits Settlements, 15 million dollars (4). The figures in parentheses represent the totals for a similar period in 1914 in millions of dollars. Imports show corresponding increases, and are as follows: Japan, 500 million, as against 107 in 1914; China, 225, against 46; India, 180, against 74; Dutch East Indies, 97, against 6; and from the Philippines, 70 million in 1920, as against 18 million in 1914.

Truly, the order changeth and commercialism is wearing down the old barriers of racial prejudice.

A Great Eastern Enterprise

PROMINENT among the great mining enterprises of the Far East is that of the Burma Corporation, operating the lead-zinc-silver mines at Bawdwin. These have been worked for silver for centuries, though they did not attract the attention of Europeans until about 1795.

No one knows when it was that the Chinese began operations at Bawdwin. By some the date is placed at more than one thousand years ago, though others reduce this by half. According to J. Coggin Brown, of the Geological Survey of India, so little was known of the mines that in 1895, when the sixth edition of the quarter-inch topographical map was compiled, their position was not marked. The Chinese finally abandoned the district about 1868 as a result of the great Mohammedan rebellion in Yunnan. The first prospecting lease was applied for by Europeans about 1902, and the present operating company was organized about twelve years later.

"Bawdwingyi," as the Burmese call the mines, means "great silver mines," but neither they nor the Chinese have had any conception of their greatness. In the ignorance and unreadiness of the past lies the profit of today. Ignorance has played a greater part in conserving the world's resources than it has in wasting them, which probably even Gifford Pinchot will admit. Were it not for the backwardness of past generations, the search for raw materials might be even more difficult than it is.

Bawdwin is the only lead mine of importance that is being worked in the Indian Empire today, though it was never valued by the ancients for its lead. At the start, the company's smelting operations were directed to working over the slag dumps left by the Chinese. Today the chief tonnage smelted comes from the underground workings. Reworking old tailings has been profitable in this country in recent years. It is one of those pursuits in which men are glad to take some one else's leavings and willing to pay for the privilege.

Modern metallurgy is endeavoring to make these leavings as small as possible.

As the bonanza becomes increasingly scarce and even the promising prospect is harder to find, the gaze turns westward to the continent where civilization first had its home and where men have lived for countless generations unmindful of their mineral wealth that perhaps lay at their doors. But gazing westward to the East would profit little. Already more than one exploring party is abroad looking for other Bawdwins.

"Yellow Peril" Was "Made in Germany"

THE World War proved to be earth's greatest melting pot. It produced a fusing of the nations—of flesh and spirit. The tragic aftermath, in which we live, and concerning whose outcome the veiled future vouchsafes no vision—cannot obscure the fact of the forging of that confraternity of peoples and of racial aspirations which will in history mark its great result.

Yellow men fought side by side with white and brown in those terrible days of the spring of 1918—with the engineers. They were no "Peril" then—nor ever. Standing in the bright light flashing from the war, around the council table of reconstruction, China, Japan, America, England, France, and Italy may well clasp hands in mutual regard and self-respect.

In this new era, China and Japan are our next-door neighbors, and to erect spite fences and double blinds is the essence of folly. East needs West and West needs East. It has been ordained that we must live together on this acre of creation, and if statesmanship cannot contrive that we may exist in peace, it ought to go out of business.

China needs money. Japan has recently weathered a financial panic. The United States has so much money that its tokens have ceased to command their former respect. But with a plethora of wealth, America cannot obtain the labor needed to perform essential tasks—in mine and field, in forest, shop, and mill. Were it not for the bugaboos and ghosts of the past—Foreign Devils—that's us (we mean "we") and "Yellow Perils"—that's them (we mean "they")—the creation of mutually advantageous agreements would be both logical and easy.

The United States has the money and the technically trained men that the East must have to develop its vast mineral and other natural resources. The East possesses in great abundance that very class of labor which we most need to solve our present pressing problems. Common sense and business sense declare that arrangements could and should be made whereby the needed capital and technical labor might be afforded to the East, and the East supply our great need of human workers.

There is always a way to do that which ought to be done. Without sacrifice of ethnic pride or self-respect, with mutually acceptable agreements and guarantees, a way should be found—must be found, if peace, not chaos, is to rule—whereby the great financial and technical power of America can be placed where the world needs it most, and through which the labor that we must have may be made available.

We are conscious of the obstacles that have barred the consummation of such an arrangement as is here suggested. But what ought to be done ought to be done, and by those whose duty and destiny it is to do it.

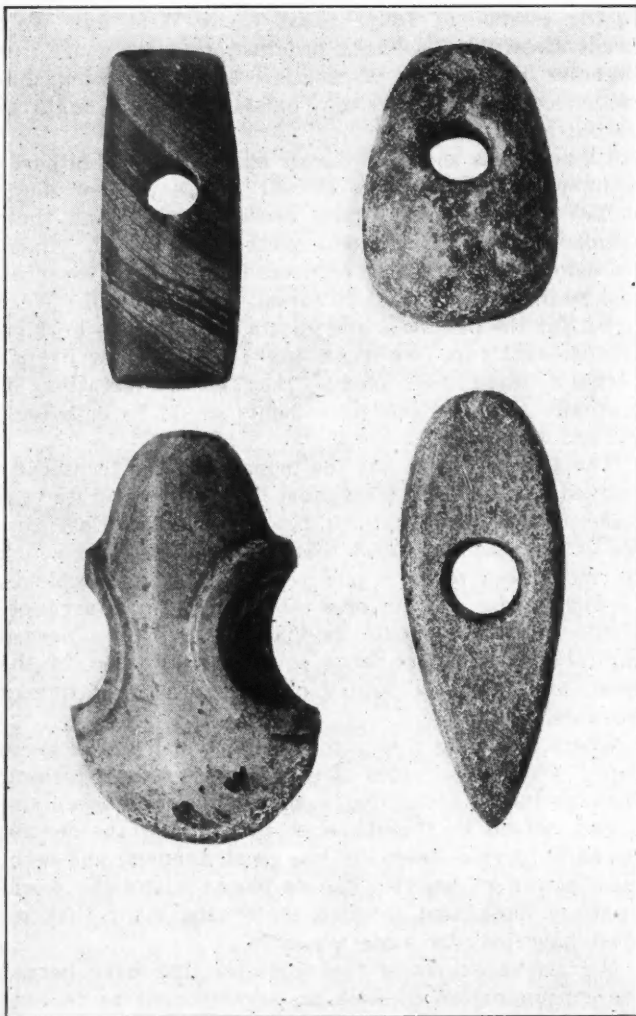
WHAT OTHERS THINK

Ancient Principles of Modern Machines

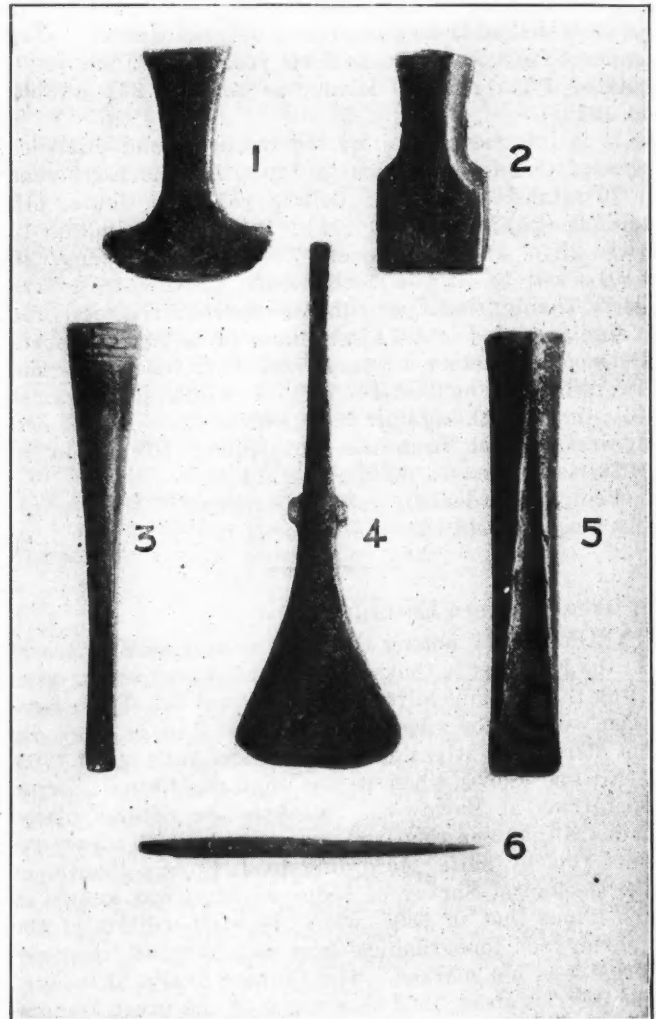
Supplementing K. S. Twitchell's interesting photographs of ancient machines in *Engineering and Mining Journal* of July 24, the accompanying photographs of exhibits in the British Museum may be of interest. These stone and bronze instruments are believed to belong to the Bronze Age of England and Ireland, about 2,000 to 500 B. C.

The stone hammers, which do not look much unlike hammers used by modern miners, are four or five inches long. The sockets, as is evident, are well bored, with straight edges, as metal was available. In the previous neolithic period the perforation was affected from both faces by means of a stick revolving in wet sand. The resulting hole was more or less of hour-glass form. The ancient Egyptians, as can be seen in the Metropolitan Museum of Art, did not put a socket in their bronze battle-axes, but merely tied them to a wooden stick.

The bronze razors of perhaps 3,000 years ago have a tang for hafting. They are about three inches long.



STONE HAMMERS OF THE BRONZE AGE



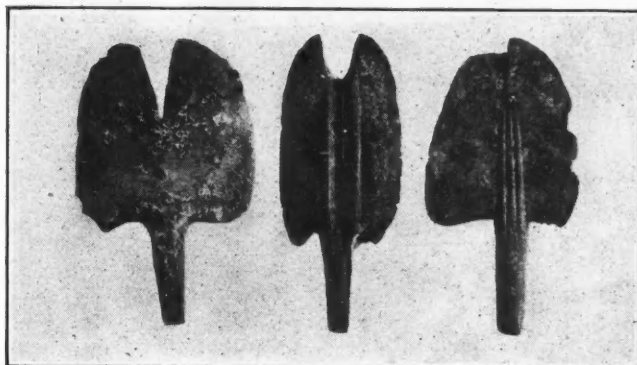
BRONZE TOOLS, BRITISH MUSEUM

Shaving, fortunately, did not become popular until Alexander the Great, who wished to retain his youth, set the fashion, and by that time better razors were in the market. However, the ancient copper miners long retained control of the metal market, and iron was a minor metal until comparatively recent time.

The other bronze tools are from the best period of the Bronze Age, after the invention of the socket. No. 1 is a socketed chisel from Ireland, No. 2 a socketed hammer, No. 3 a socketed chisel from the Thames, No. 4 a tanged chisel, No. 5 a socketed gage, and No. 6 an awl.

H. G. Wells in his "Outline of History" says that gold was the first known of the metals, and appears among bone, jet, and amber. Then native copper was used. Lord Avebury has suggested that the secret of smelting was discovered by the chance putting of lumps of copper ore with other stones around a fire. "In China, Hungary, and Cornwall," Mr. Wells remarks, "copper ore and tinstone occur in the same veins, and so, rather through dirtiness than skill, the ancient

smelters, it may be, hit upon the harder and more fusible bronze." This view of the origin of bronze is that of Dr. Gowland, "The Metals of Antiquity" (Huxley lecture, 1912); but Lord Avebury quotes the verbal opinion of the late Lord Swansea against the view. Tin was little known as pure metal for implements, although the Egyptians imported tin in the fifteenth



BRONZE RAZORS OF EARLY TYPE

century B. C. "In India," says Mr. Wells, "where zinc and copper occur together, brass was similarly hit upon."

If any reader is especially interested in the subject of early machines, he should not miss reading the excellent article on Leonardo da Vinci by Edward P. Buffet. That great artist and scientist filled his notebooks with sketches of lathes, drills, pumps, and war engines, at about the time of the discovery of America, besides painting several of the greatest pictures of all times.

P. B. McDONALD.

New York.

New Caledonia Nickel

In the July 3 issue of *Engineering and Mining Journal* you publish on p. 20, under the heading, "Three Nickel Companies Operating in New Caledonia," certain remarks to the effect that the firm of Ballande & Son is the trade name for a Roman Catholic order of priests, and also that the Société le Nickel has taken over the electric furnaces installed by the Hauts Fourneaux de Noumea.

We are the agents in this country of Ballande & Fils, of Bordeaux, and New Caledonia, and as a matter of fact Ballande & Fils are very closely connected with the United States Nickel Co. We in turn are closely connected with the Hauts Fourneaux de Noumea, which is one of Mr. Ballande's companies in New Caledonia. We know that Ballande & Son, or as the correct name should be, Ballande & Fils, are existant persons trading and doing business absolutely for themselves all over the world. Mr. Ballande's son, as a matter of fact, was a lieutenant in the French army and died in the war about the eighth of November, 1918. Mr. Ballande conducts all his operations for his own account and not for any order of Catholic priests.

With regard to the statement in your article that Société le Nickel has taken over the electric furnaces of the Hauts Fourneaux de Noumea, we know this to be an absolute inaccuracy, as evidenced by the fact that our matte is supplied us by the Hauts Fourneaux de Noumea and that we are continuing to receive such matte entirely from the Hauts Fourneaux de Noumea under

¹*American Machinist*, Oct. 28, 1909, "Leonardo da Vinci as Engineer and Machinist," p. 731.

our contract with that company, and also, to substantiate this statement, we have recently had a visit from some of our friends in New Caledonia, and no such question as allowing the Société le Nickel to take over the electric furnaces was ever thought of. Ballande & Fils or the Hauts Fourneaux de Noumea have no connection with the Société le Nickel or the other Japanese company which is said to be operating in New Caledonia at the present time.

We were inclined to disregard these statements in your magazine, but it seems that in preparing an article on "nickel" another magazine had taken this article bodily and incorporated it in its copy, and it is in this way that the small snowball may develop into an avalanche.

We wish that you would take steps to disabuse your readers' minds on the subject and if you will publish a correcting paragraph in one of your issues we shall be perfectly satisfied.

UNITED STATES NICKEL COMPANY.

New Brunswick, N. J.

The paragraph in question was copied from and credited to the *Chemical Engineering and Mining Review* of Melbourne, Australia. It is now up to our esteemed contemporary to explain the Australasian news.—EDITOR.

Ah Say Can You See?

An Essay

So much has been written about "Technical Writing" of late in some of the mining papers, and so much about the terms "Extraction and Recovery," that it may not be amiss to delve into the Pronunciation Department as well and educate the college-bred engineer so that when he enters the outside world of experience he will be able to spread the gospel of proper pronunciation as well as be a disciple of the gospel of the quill.

Many years ago I was taught to pronounce the word "assay" correctly, but I must own up to the fact that nearly all the mining men, of high and low degree, with whom I have come into contact, invariably mispronounce the word. It matters not whether they are from the "Hub" or from New York, or from the windy town of the Lakes, or from the mountains of Colorado; yes, from the far North to the extreme South, and even to the gentle Pacific; invariably my ears catch the same musical tone of the four-legged braying animal of the prospector—I am always reminded of the ass-say, of the prospector's friend. Never once does any disciple of Noah Webster pop up with the musical rhythm of as-say'.

In every dictionary that I have examined—and I believe I have looked into some eight or nine of them—from Johnson down to the Standard, published by Funk & Wagnalls, strange as it may seem, there are no two ways given of speaking the word. There is one correct pronunciation and only one for the poor little word of three different letters of the alphabet arranged so as to make two syllables. Why a college man does not conquer it and pronounce it "as-say'," as in all dictionaries of the English-speaking nations, is beyond my understanding. Usage has no more right to claim as-say than it has to claim that the word "ain't" should be used. So, may the overworked ass-sayers be brought into the proper realm of the as-say'ers!

Hedley, B. C.

ROSWHEEL.



CHINESE STUDENTS WORKING IN THE ASSAY LABORATORY OF PEE YANG UNIVERSITY

Mineral Enterprise in China

Difficulties the Foreign Operator Must Contend With in Mineral Exploitation in That Country
—Small Possibilities of Discovering Extensive Ore Deposits—Development of
Properties Hindered by Lack of Transportation Facilities

BY THOMAS T. READ*

Written for *Engineering and Mining Journal*

IN THE "K'ao Kung Chi," a work on the industries of the Chou dynasty (B. C. 1122-249), written during that period, six different bronze alloys are described in detail and their uses for the making of axes, hatchets, knives, spear and arrow heads, mirrors, bells, caldrons, gongs and a variety of utensils are carefully explained. A biographer of Lu-Tsu, who lived in the latter half of the eighth century, says that "among the eight stones he made most use of cinnabar, because from that he extracted mercury; and among the five metals he made most use of lead, because from that he obtained silver."

These historical references are introduced to illustrate that mineral enterprise in China is an art of ancient lineage, and as a result the search for mineral wealth in this part of the continent of Asia differs fundamentally from exploration in the continents of North and South America, where the natives before the coming of the white man were little interested in the mineral wealth of their country. Even the Aztecs and the Incas paid little attention to minerals other than gold, but the natives of eastern Asia had a well-developed metallurgical art when the countries that are now the principal producers of mineral wealth were inhabited only by people of the most primitive type of civilization.

This is a basic fact of great importance in considering the mineral wealth of China, for it indicates that, on the average, the possibility of developing profitable mineral enterprises there always involves some change in economic conditions, because for many centuries there have been available the necessary knowledge and skill for the working of deposits that could be profitably developed under the conditions then prevailing. An economic change to effect lower working costs by the application of modern methods naturally suggests itself, but its possibilities are almost invariably overestimated.

In a country where as recently as ten years ago the wage for skilled labor did not exceed 10c. per day few operations except those involving the expenditure of great power or special tools can be more cheaply performed by modern methods than in the primitive way. With the food costs and standard of living prevailing in China until recently the human mechanism was the most economical machine that could be employed. From the power standpoint it was cheaper to oxidize rice or millet in a coolie than coal under a boiler. Attempts to develop gold, silver, and lead mines in China under foreign direction have usually ended in nothing more profitable than a demonstration that working costs could not be lowered sufficiently to provide interest and amortization on the equipment investment.

An example of another aspect is the iron-mining and

*Chief, Division of Education and Information, U. S. Bureau of Mines.

smelting industry of Shansi. Next to agriculture this was and is still the principal industry of the province, but it offers no chance whatever for development by modern methods. The ore deposits are too small and irregular to permit of their being mined on a scale that would keep a modern blast furnace running. Yet they have been the basis of a considerable metallurgical industry, and before trade with the Occident made foreign iron available it was even an essential industry to the whole of North China. Another example is the quicksilver mining industry of Kwei-Chou, which had a somewhat similar local importance, but which, when made the basis of an Anglo-French mining enterprise, proved unremunerative. I will not further multiply instances.

It may be assumed that the large majority of mineral deposits existing in China have been the objects of a mining and metallurgical art that, though crude, is skillful and relatively economical. To make them the basis of a successful large-scale enterprise new economic conditions must be introduced. Provision of efficient means for handling water and working deep levels is one possibility, but the Burma enterprise at Bawdwin, in the Shan States, is about the only conspicuous example of success attained by this means. Though I have not personally examined the copper deposits of southwest China such evidence as I have been able to gather indicates that, like the iron deposits of Shansi, the ore deposits are probably not large and regular enough to be made the basis of cheap large-scale mining.

The tungsten deposits of South China are an instance of finding a use for a substance that the natives did not utilize, but this is a sporadic example, and scarcely likely to happen again. Perhaps, most commonly, transportation will be the new economic factor that is essential. This is especially true of iron-ore deposits, for except when they occur in close proximity to coal deposits they have not previously been worked by the natives to an important extent. All of the half-dozen or more iron-mining and smelting enterprises which have sprung up in China in the last decade are based on deposits which had not been worked in a large way by the natives. It is only fair to say, also, at this point that all these enterprises are as yet in the probationary stage of their existence, and it is by no means certain that they will be notably successful.

It was recently announced that the project for building a steel plant of 200,000 tons a year capacity at An-shan-chang, in Manchuria, has been abandoned, and the blast furnace plant, which was expected to have a capacity of 750 tons per day, at this time is turning out only about 200 tons per day, according to reliable reports. Ocean freight rates are low enough to permit iron and steel to be carried long distances in competition with the product of a plant whose working costs are high, and the transportation that makes a mineral enterprise possible may also prove its undoing.

Transportation is an economic factor in China that can scarcely be overemphasized, as it bulks so large in the development of mineral as well as every other form of enterprise. In the hills west of Peking excellent coal is mined, but it is not used even in the shops and restaurants of Tiensin, which is only fifty miles east of the mines as the crow flies. There the cooking operations in progress are being carried on in *kuo* (cast-iron pans placed over a clay or earthenware furnace), and the fuel used is all manner of vegetable refuse,

stalks of jute, *kao-liang* (a species of broom corn), corn, marsh hay, stubble raked up from the fields—in short everything of the general nature of cellulose that is not more valuable for some other purposes than the production of heat units.

Ten years ago the cost of the fuel used in preparing the food of an average Chinese in the neighborhood of Tientsin amounted to roughly one-half the food cost, or about 40 per cent of the total living cost of the laborer. Remembering that homes of this class are practically unheated in winter, and that much of the food is either cooked in public shops, where cooking in large quantity utilizes the heat most efficiently, or else over a domestic furnace that utilizes all the heat not absorbed in cooking to heat the brick bed on which the family sleeps, it is evident that heat economy is a prime requisite in a Chinese household. In an American household fuel cost is about 5 per cent of living costs. The comparison is interesting and suggestive.

Coal production in China is roughly one-twentieth of one ton per capita per year, as compared to 6½ tons per



UNLOADING CARS

This is done by carrying the ore in baskets slung on the "tan-tze" or carrying pole. The open-cut stripping and mining costs on this operation were almost exactly the same as those of the open-cut "porphyry coppers."

capita per year in the United States, though the coal resources per capita are, like those in the United States, large. There is plenty of coal in China for everybody who can afford to use it, and the reason the people use so little of it as yet is because the transportation cost makes it too expensive.

Along the coast of China the coal market is absorbed to a marked degree by coal brought from Japan, because many of the Japanese mines are conveniently situated as regards water transportation. The Kailan Coal Administration is the only large coal mine in China that is conveniently situated with respect to tidewater and so far able to compete in any effective way with Japanese coal for the bunker and export trade.

J. W. Beardsley has recently published a study of transportation costs in China. It is not necessary to go into details here, and photographs of the *tan-tze*, or carrying pole, the wheelbarrow, and the springless two-wheeled cart are familiar to everybody. Beardsley estimates the following costs: "Coolie with carrying pole, 20 to 30c. per ton-mile; wheelbarrow, 6c. per ton-mile up, according to character of road; two-wheeled cart, average 40 to 50c. per ton-mile; may be as low as

6c. per ton-mile on good roads. Costs of transporting goods by canals has been estimated at $\frac{1}{2}$ to $\frac{3}{4}$ c. per ton-mile and by railroad at $\frac{1}{4}$ c. per ton-mile." Beardsley does not give the source of the estimate in the sentence just quoted, and I regard the figures as too low.

These figures are interesting approximations, especially when compared with railway transportation in the United States, which averages somewhere near 1c. per mile. The railways do most of our moving for us, but railways in China do not bulk large yet, for the total now in operation in China is less than 6,000 miles. China, on the other hand, is estimated to have over 200,000 miles of canals and improved waterways, or, roughly, about equal to our own railroad mileage. I hope I have made my point clear that transportation in China is, on the average, not cheap. The Shanghai papers for June 16 quote house coal (bituminous) in their market columns at \$16 a ton and stove coal at \$20 a ton.

Shanghai is a competing point for Australian, Japanese, and Chinese coal. Probably most of the Chinese coal comes about 1,200 miles by sea from the Kailan mines, and though it is true that these mines make large profits, there is also abundant coal along the Grand Canal, 500 miles from Shanghai, with all-water routes between. The figures given do not represent abnormal conditions such as now prevail in our own coal markets. West Virginia bituminous coal can ordinarily be dumped into bunkers at Hampton Roads at about \$5.50 per ton,



A NATIVE GRAIN MILL

Exactly similar mills are used for crushing gold quartz. Sometimes the stone is pulled by a donkey, illustrating the close balance between the animals and men as a source of power.

total cost. This reminds me of the story of the man who sent a bale of rugs from China to New York. Ninety miles of the distance was by camel back, and the freight cost was \$4.70; the 17,000 miles by sea cost \$4.30, including one transfer charge. The example is rather extreme, but illustrates the point.

Another important factor in mineral enterprises in China is the title to mineral property, and this is so complicated a matter that general remarks regarding it are sure to be susceptible of misconstruction. Like some of the rules of grammar, there are as many exceptions as examples of the rules. Theoretically, mineral rights are independent of surface rights, belonging to the crown in the days of the empire, and now federal property under the republic. But in all the districts where

mining is important complicated local customs prevail which I will not attempt to describe. Inaccuracy of survey and record add to the complication. Land taxes in China are based on the transfer records in what corresponds to our county clerk's office, and after a large tract of land has been sold off piece by piece the original owner not infrequently finds himself still in possession of a remainder, on the records, upon which taxes are still due, though all the actual land has passed into the possession of others.

Overspreading this basal complex is the laccolith of concessions. Concessions differ from one another in extent and location, but they are all much alike in being couched in terms which offer infinite scope for diplomatic skirmishing at Peking to secure everything possible for the concessionaires and to keep out would-be intruders. The Prichard Morgan-Standard Oil difference over rights in Szechnan is still fresh in mind.

An example of the extreme type of concession is that granted in 1898 to Cheng Monyuen and his associates, which was afterward the basis of the Anglo-French Q. & M. Co., Ltd. This gave to the concessionaires the development rights for all kinds of mining in the Province of Kwei-Chou for a hundred years, and naturally would prove an obstacle to any other enterprise desirous of entering the field in Kwei-Chou. All such difficulties can be overcome by employing time, diplomacy, and some money, but the delays and complications are a source of irritation to business men accustomed to more direct methods and are therefore a handicap to the development of mineral properties in China.

In negotiating the agreement with the government of China for exploration of petroleum, the Standard Oil Co. stipulated that all difficulties as to titles and rights should be assumed by the Chinese government. This makes it simpler for the foreign investor and also simplifies the problem somewhat, for the government can bring a good deal of pressure on the natives, and if the issue is simply one between itself and a concessionaire, instead of between two concessionaires, only one embassy is officially concerned instead of the representatives of two governments. Recent reports indicate that co-operative agreements of the kind just mentioned, where the government participates in the profits of the enterprise, are regarded with favor by those now in power, and as such agreements have many advantages it will be well for any persons interested in the mineral possibilities to shape their plans with this in view.

Investors in mineral properties who are in the habit of sending out their scouts to look for promising properties without revealing the identity of their principals until an agreement is about to be concluded should not suppose that it is possible to work along the same lines in China. Every foreigner in China is under the jurisdiction of his legation or embassy, as the case may be. As soon as he begins to exhibit any activity inquiry is at once made as to his character and what he represents, and unless the legation is able to make a satisfactory reply no further progress can be made. It is obvious that this should be so, for any dispute between foreigners and Chinese has to be submitted to the legations, and the Chinese principals naturally wish to know the circumstances and facts before committing themselves in any way.

The American investor sometimes thinks that his officials do not exhibit as much interest in himself and his plans as their importance deserves, but it is well to

keep in mind the fact that the forwarding of such projects is not the chief duty of a legation, even though the practice followed at times by some European legations would seem to indicate the contrary. Besides, the officials have been on duty a long while and have seen many ambitious schemes come to nothing in the end, so a Missourian attitude on their part would be both natural and excusable. In the circumstances it is remarkable that they are able to summon as much enthusiasm as they do. I do not believe that there is justice in the accusation, less frequently heard of recent years, that American enterprise abroad does not receive the official support it merits.

Co-operation in the development of mineral enterprises has many points of interest. The investor, knowing the great risk inherent in any mineral enterprise, naturally wants the full benefit of the odds as to possible profits, and the owner, overestimating the potential value of his property and underestimating equipment cost and risk, naturally desires to retain a good part of profits for himself. This is especially true in China, for travelers since the earliest days have been misled by native operations and almost invariably report them as indicating deposits much larger and richer than is actually the fact, with the result that general ideas as to the mineral wealth of China, both at home and abroad, are exaggerated, making it just that much harder for foreigners and Chinese to get together on an equitable agreement.

A story is told that in the early days in Wyoming, before much of organized activity had developed, a resident of one of the little towns conceived the idea of starting a bank, which he did by placing a sign reading "National Bank" over the door of a shack and then waited for results. Within an hour somebody came in and deposited \$20, and soon afterward another deposited \$100, whereupon the embryo banker gained such confidence in his enterprise that he put \$50 in it himself.

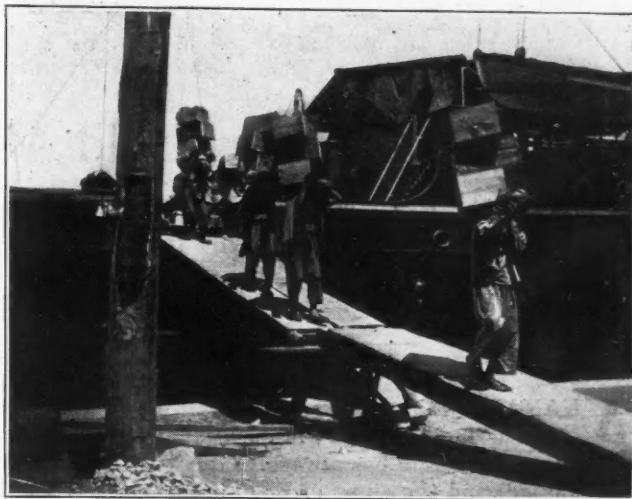
I am reminded of this tale because Chinese investors are generally reluctant to put any money into mining enterprises. They will plunge on a straight gamble, such as speculating in rubber shares, or put money into a trading enterprise, because they know how to play that game, but it is hard to interest them in mining to the extent of putting their own money into it. There are a number of rather complicated reasons why this is so, but it is not necessary to pursue the matter further than to make the point that in planning a co-operative enterprise expectations of the procuring of capital in China are not likely to be realized.

Not infrequently the proposal is made that American firms furnish the equipment for a property, taking payment in notes to be paid out of the future profits of the enterprise, and the Chinese always prefers to be surprised that such a proposition is unattractive to those who are counted on to supply the equipment. The Chinese are usually good business men, and I have never quite decided whether the making of such a proposal indicates ingenuousness or ingenuity.

A word must be said as to the mining laws of China, in closing. Actually there are none, for the treaty of peace after the Boxer outbreak provided that a revised mining law should be drawn up that would meet the approval of the foreign legations as well as the Peking authorities. A number of drafts of proposed laws have been made, but none of them have yet met the approval of both parties. The principal difficulties are extraterri-

toriality and Japanese aggression. The Chinese are unwilling to concede majority ownership in a mining enterprise to the foreigner, for that at once puts the enterprise under the jurisdiction of the foreign legation; each property becomes a little *imperium in imperio*.

Within the last few years Japanese investors have been able to get most of what they wanted in the way of Chinese mineral deposits, so it will soon be unnecessary to provide a lock for the stable door. The latest mining law is in a sense the prevailing one, but so far as I can learn the native miners continue to operate in much the same way they always have; most foreign projects are the subject of special agreements, and the constitution bears much the same relation to friendship in China as it used to in Tammany Hall. If a responsible American company is willing to proceed with the development of a mineral enterprise in China there is little likelihood that satisfactory arrangements cannot be made at Peking as to the conduct of the enterprise.



UNLOADING A SHIP BY HAND

To summarize in conclusion, the thickly settled million and a half square miles that constitutes China proper has been well prospected by the natives, and there is not much likelihood of finding any Goldfield Consolidateds. Even a Utah Copper is improbable. Such properties are the rare exception even in America, but every now and then in China a fair-sized property will develop. Behind this area lies three million more square miles of territory, nominally under Chinese control, that is as remote from transportation as Wyoming was in the time of Brete Harte and Bill Nye. The chances are that it will prove more like Wyoming, from the mineral standpoint, than like Colorado and Montana. But Wyoming, long a mineral disappointment to the mineral seeker, has developed a good deal of wealth in coal and oil, and the "back blocks" of China may prove valuable in the end.

The great distances involved and the delays arising from the causes described are likely to make the acquiring of a mineral property somewhat expensive, especially if the investor proceeds on the theory of rediscovering first principles for himself. But with Russia cut off from intercourse with us by Bolshevism, China is the only important area on the Northern Hemisphere that provides a field for mineral enterprise on the "open-door" basis, and its possibilities in that regard should be neither overemphasized nor overestimated.



A GENERAL VIEW OF THE OOREGUM SECTION OF THE KOLAR GOLD FIELD, SHOWING THE MODERN EQUIPMENT AND UP-TO-DATE COMPANY HOUSES

The Romance of Gold Mining in the Mysore State

An Historical Review of the Discovery of Gold in the Kolar Gold Field and the Inception of Operations in This Important Gold-Producing Area, Together With A Description of the Industrial Conditions

By E. W. T. SLATER

Written for *Engineering and Mining Journal*

A KANARESE proverb says that if gold is to be seen even a corpse will open its mouth. The search for gold has always held a keen attraction for mankind, and the story of how, in various parts of the world, men have been prepared to undergo every possible kind of suffering to obtain this precious metal is replete with romance.

The mining of gold in the Mysore State has not been associated with the hardships experienced in other fields, yet it affords romantic incidents. Few who now visit the Kolar gold field, with its up-to-date plant, and its advanced social life, can imagine that a hundred years ago the district was a wild, almost untrodden region. In a few years the field has become one of the most prolific producers of gold, and it is believed that there are still many reefs that are undiscovered, but which will yield handsome returns once they are exploited. Incidentally, while the mines have brought great wealth to the investors, the State of Mysore has greatly benefited through revenues received from the gold field.

GOLD AND RICE PLANTS

The beginnings of great industries are always full of interest, and some reference should be made to the early attempts to capture the hidden wealth of this district. It is generally believed that grains of gold found on the ears of the rice plants led to the discovery of gold here. An account of this tradition is given in one of the old records of the Mysore government. It appears that a Lieutenant John Warren, who was employed in surveying this part of the state in 1800, was told by a Brahman that "in the prosperous years, when the gods favored the village with an ample harvest of rice, now and then grains of gold were found on the

ears of the plants grown under the tank lying close to the village."

The explanation is simple enough. The rice plants are usually grown in nurseries and transplanted in bunches of several plants, after which the fields are flooded. When there are heavy downfalls of rain the plants are often submerged, and no doubt grains of gold could have been deposited on the plants. As these grew the gold would naturally rise with them, and thus often be found adhering to the rough-coated rice-grain.

Being interested in the reports, Lieutenant Warren visited the places referred to, and he thus records what he found: "When the women of the village were assembled, and each being provided with a small broom and vanning basket, and hollow board to receive the earth, they went to a jungle on the west of a village. Here they entered some small nullahs, or rather breaks in the ground, and, removing the gravel with their hands, swept the earth underneath into their vanning baskets, by the help of which they further cleared it of the smaller stones and threw it into the hollow board mentioned above. Having thus got enough earth together they adjourned to a tank and placed the hollow boards containing the earth in the water, but just deep enough for it to overflow when resting on the ground and no more. Then they stirred the earth with the hand, but keeping it over the center of the board, so that the metal should fall into the depression by its own weight, and the earth wash over the edges. After a few minutes' stirring they put the metallic matter thus freed of earth into a piece of broken pot, but only after examining it for gold, which they did by inclining the board and passing water over the metallic sediment which adhered to it. They thus drove the light particles

before the water, leaving the heavier metal behind just at the edge, where it could easily be seen, however small the quantity." Nothing could be simpler or more primitive, but what he saw evidently impressed the survey officer.

Warren next inspected several places where small

villages. Then they elect a duffadar, or head man, to superintend the work and sell the gold, and they subscribe money to buy lamp oil and the necessary iron tools. Then, partly from the knowledge of the ground, and partly from the ideas they have that the tract over which a peacock has been observed to fly and alight is

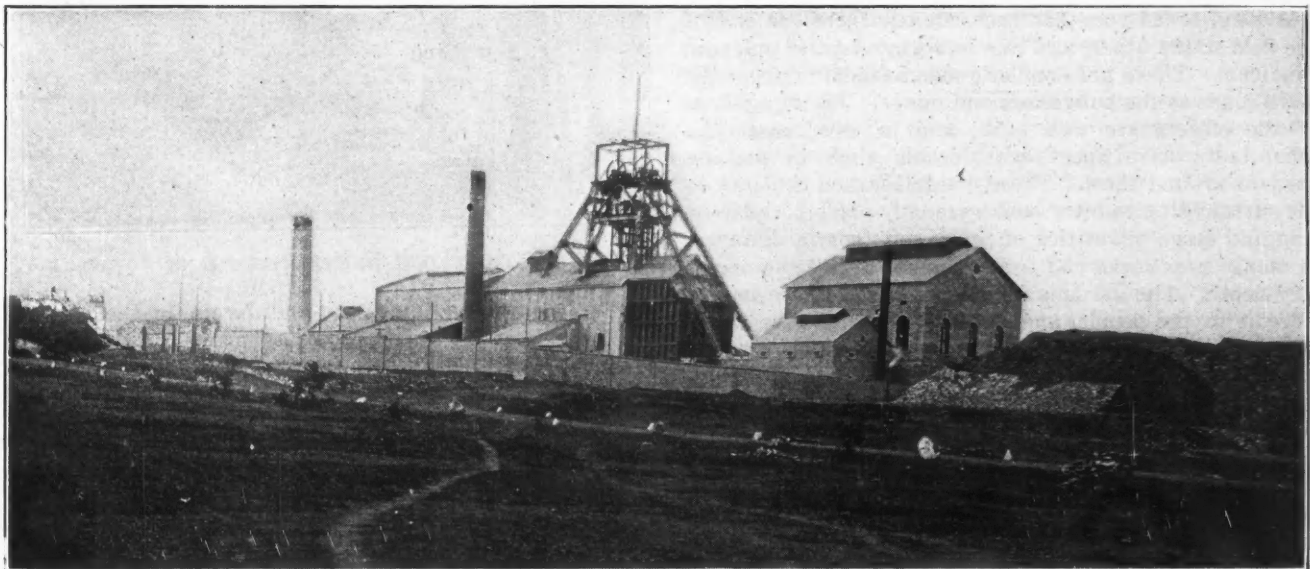


A COMPANY HOSPITAL IN THE KOLAR GOLD FIELD

mines has been dug and made a descent of one or two of these by means of small footholes which had been made in the sides of the mine. One mine was two feet broad and four feet long, with a depth of about thirty feet, and other mines were about forty feet deep, with a number of galleries. The miners passed the gold they extracted from hand to hand in baskets to men stationed at different points for the purpose of banking the stones. It was the work of women to take these stones to a large rock where they were pounded to dust. The pan-

ning process already described was then followed in the treatment of this dust.

Some of the native workings are still to be seen on the gold field, and in the opinion of skilful miners these primitive workers showed great knowledge and ability in their work. Some of the mines are about 260 ft. deep, but for the most part these workings are now choked up. Large quantities of water were found, and it required continuous pumping by modern machinery to keep them clear. It is not known how the early workers



HEADFRAME ON THE EDGAR SHAFT OF THE MYSORE MINE

It is also interesting to note the manner in which the Indian villagers organized for the gold search in their district. "When they resolve on sinking a mine they assemble to the number of ten or twelve from different

controlled the flows of water, but it is supposed they conveyed it to the surface by earthenware buckets, by passing them from hand to hand.

Having given this brief account of the way in which these workers carried on their limited mining it is of interest to review the events that have made this

district among the famous ones of the world. In 1873 a Mr. Lavelle applied for the right to carry on mining operations in the Kolar district, and the next year he entered into an agreement with the government. He was given the right to mine for twenty years, and it was stipulated that a royalty of 10 per cent on all metals and metallic ores should be given to the government. A small syndicate was formed, and though the work was carried on for some time it was later abandoned; but Mr. Lavelle was not without hope, and the next year he succeeded in initiating the formation of a number of companies.

In February, 1883, the Nundidroog mine was ordered closed, and practically every company was on the point of collapse. When one recalls the marvelous dividends disbursed by the Mysore Mining Co. it is interesting to remember that at this time the works were almost closed down. In 1884 ten or twelve thousand pounds of the subscribed capital remained and a meeting of the shareholders was called. Some were for closing down at once and dividing the balance of capital, but Messrs. Taylor & Co. advised them to hold on. Seldom has advice been so profitable. The 10s. shares were then sold at 10d., but within a short time a change took place and the value of the shares steadily rose until they could not be purchased under 100s. But apart from the direct gain to themselves, had the shareholders of this company not persevered there is little doubt all the other companies would have closed down and the industry would have been at an end.

COMMUNITY DEVELOPMENTS

Turning to some account of the Kolar gold fields as they are at present, it is to be noted that the total length now covered by the mines is about seven miles, and the average width from two to three miles. The general appearance of the country all around is rocky and sterile, but the companies at work here have done much to improve the appearance of the area where the mines are situated.

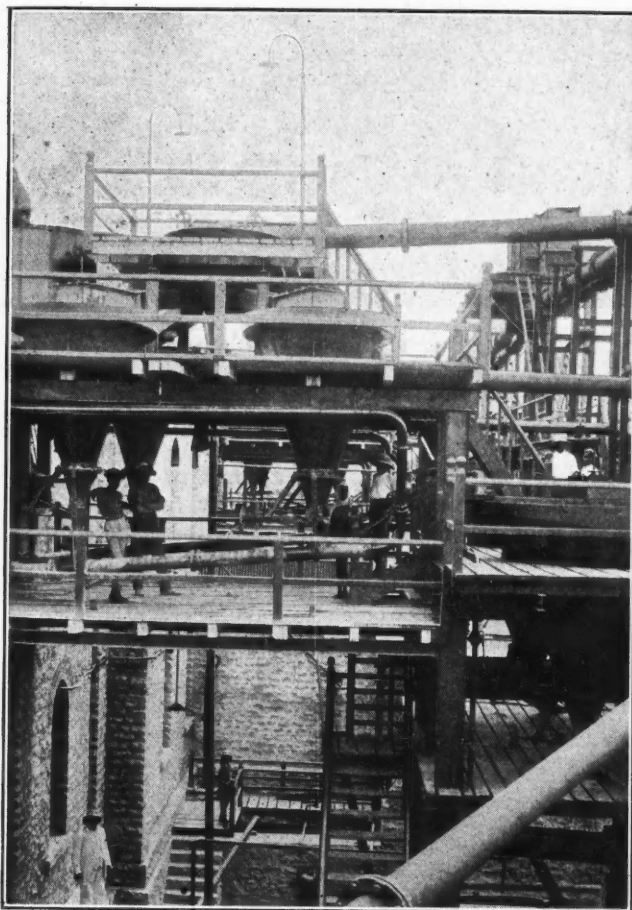
A long, broad road has been cut out from one end of the field to the other, and this is always kept in splendid condition. There are smaller roads branching from the main roads to the bungalows and mines. The bungalows of the officers are well built, and in most cases the inhabitants have spent considerable time in making gardens around them. These are in marked contrast to the surrounding country, and were only made possible by bringing large quantities of fresh soil from a distance. In many cases rocks had to be blasted to give the necessary depth. The gardens on these gold fields are indeed a credit to the people, and they do much to give relief to a district the physical attractions of which are not many.

The companies realized that the occupation of the Kolar gold field would be of considerable duration, and wisely determined to house their men well and to introduce as many social amenities as possible. For many years no women were permitted to live on the field, but gradually, as the work developed, the officers were allowed to bring their wives. In many ways this has transformed the whole aspect of life there, and instead of the roughness usually associated with mining life there is a refinement and even suggestion of luxury that would surprise most visitors to Kolar for the first time.

A fine club has been built, and in connection with it arrangements have been made for tennis, golf, and

other sports. The hospital is one of the best in South India, being manned by skillful British doctors, and provided with the latest surgical apparatus, no expense being spared in the care and treatment of either European or Indian workmen. This expenditure has more than justified itself, for it helps to create that sense of confidence between master and men that is so necessary in a work of this kind, involving considerable risk of life and limb.

For the high wages obtainable Indians are ready to risk the work underground, but they do so with full confidence that the authorities will use all care possible in the protection of their lives. Although their interests in connection with their work are not neg-



PART OF THE CYANIDE PLANT

lected, the companies are not indifferent to their comfort above ground. The provision made for the European workers is quite satisfactory, especially for those who are permitted to have their wives and families with them. The accommodation provided for the Indian coolies may not strike one as specially lavish, yet it does not fall behind the kind of house they would live in in their own districts.

GEOLOGICAL DETAILS

Without entering into details, a brief résumé may be given of the general occurrence of the gold on this important field. Dr. W. T. Smeeth, D.Sc., A.R.S.M., has written an interesting account of the subject, and I am indebted mainly to him for the following facts regarding the occurrence of gold here:

"The Main Champion Reef runs almost continuously through the Mysore, Champion Reef, Ooregum, and

Nundidroog mines. In places the quartz has been from thirty to forty feet wide, but the average of the parts worked is probably between three and four feet, although in places the lode is represented by mere stringers or veined schists. The quartz sometimes branches, and in several places there are occasionally parallel veins, from which a good deal of ore has been obtained. The veins strike north and south. The dip, or inclination, from the horizontal of the veins is to the west and is least in the Mysore mine, where it is about 45 deg.

"In recent years, as the mines have been sunk deeper, there has been a tendency for the veins to get steeper, so that at 4,000 or 5,000 ft. the dips are from 50 to 60 deg. in Mysore, and well over 70 deg. in the Champion Reef mine. The most important feature is the occurrence of the more valuable portions of the veins or shoots with intervening areas of poor quartz or lode matter, and the successful development of the Kolar gold field is due to the fact that these shoots are of considerable size and value, and sufficiently numerous to permit of new discoveries being made before the old ones are exhausted.

VEINS NOT UNIFORM IN CHARACTER

"The steady progress of the mines is not due to the uniformity in the veins, as the distribution of the gold is uneven, but to the very extensive exploratory work which is carried on far below the points where ore is being extracted, and which permits of work being planned several years ahead of the milling requirements. The existence of slides or faults cutting the veins has received much attention in recent years, particularly in Mysore and Champion Reef. . . . The auriferous veins lie in a narrow belt of hornblende schists and are believed to be older than the gneiss which cuts off the schists on both sides and below, and will therefore be cut off along with the schists at some depth below. This depth represents the ultimate limit of the Kolar gold field, and there is no reason to apprehend that it will be less than 10,000 to 15,000 ft. from the surface."

These facts are important, in view of the anxiety that always exists respecting gold mines as to how long they will continue to produce. It has been said that work may be done to the level of 8,000 ft., and at the present rate of working there seems no likelihood that the ore will be worked out under thirty years. Yet there are many uncertainties, and an expert recently stated "The problem of the continuance of the Kolar gold field is, therefore, a speculative one, and in mining work the more unfavorable contingencies are wont to occur with undue frequency. However, it is opined that the Kolar gold field should continue for another twenty or thirty years at least, with a probable diminution of output in the later years."

SIMPLE AMALGAMATION AND CYANIDATION METHOD USED

Though there is great similarity in the methods adopted in most mining fields, it may be said of this field in particular that the companies are keen to be abreast of every modern improvement, and their plants will probably compare favorably with those of any other mining field in the world. The head gears are of the latest type, the underground machinery is mainly electrical, and most of the surface work is electrically performed by current supplied by the generating plant at Sivasumudrum, and though there are differences in the

various mines, some following more antiquated methods than others, on the whole it may be said that the plant is modern and adequate.

The ore is worked and sent to the surface in lifts, and immediately sorted and broken up into workable sizes. At some mines the sorting is done in the head gear, whereby the ore is passed through various grids and the waste rock eliminated. By this process about 18 per cent of the total ore is rejected. The ore then goes into the rock breakers or primary crushing machines, where it is prepared for secondary grinding in the stamp battery, a practice that is followed in many gold mills all over the world, and is next passed on to the stamp mills, where it is pounded with water into a fine sand, to pass through wire screens having about a thousand holes to the inch. The product is then treated on amalgamating tables in the customary manner.

The greater part of the gold is recovered on the plates, but cyanide treatment is used as a supplementary process. Fine grinding accompanied by leaching of the sands, agitation of the slimes, and precipitation of the gold in zinc boxes is practiced. The cyanide treatment for low-grade ore has made available a large tonnage of old tailings.

The Kolar gold field is certainly one of the most interesting places in India and is among the most important of the gold fields of the world. It has proved a most profitable investment for those who have possessed original shares of stock, and has provided labor at high wages for large numbers of Tamils. The government of Mysore has reaped great royalties from the Kolar gold-mining industry, and under the care of Messrs. Taylor & Co. this field has prospered and has many years of prosperity before it.

Belgian Plastic Earth Industry Active

Intense activity is reported by Consul General Henry H. Morgan in the plastic earth industry at Saint-Ghislain and environs, where these manufactories are established, as well as in the faience and porcelain industry and in refractory plants. Stoneware concerns in the region of Bouffloux are also working at full speed, with the exception of two small plants whose production is used mainly in the arts. All the refractory industries at Tertre, Baudour, Jurbise, Hautrage, Sirault, and Saint-Ghislain are in full operation. A factory at Saint-Ghislain devoted to ceramic products has resumed work; two porcelain plants at Baudour are active, and there are reports of the establishment of a new enterprise at Quaregnon. The Usines de Sirault (tiles) are operating. Within a radius of several miles there are no fewer than twenty-five factories, some of which are not neglecting artistic production. Some of them have under consideration intensification of production and the question of better adapting their fabrication to present needs.

Graphite in Western Australia

The Western Australian Minister of Mines, according to the *Journal of the Society of Chemical Industry*, announces that an English company is making preparations to work the very extensive deposits of graphite in that state. He was advised that this deposit was one of the biggest in the world, and that in view of the fact that the world's requirements were about 300,000 tons per annum, and that most of the big sources of supply were dwindling, the enterprise should prove of great value.

The Mining Opportunities in Siberia Under the Present Régime of Zemstvo-Soviet Government

BY IVAN NARODNY*

Written for *Engineering and Mining Journal*

SINCE the overthrow of the Kolchak régime, Siberia has gone back to the same kind of half zemstvo, half soviet government that was established immediately after the first revolution in 1917. There are indications that this is going to be, in a modified form, the permanent government not only of Siberia and Central Asia but of all Russia.

While the news stories are still trying to paint Siberia in the grip of Bolshevik orators or those red-haired preachers of anarchy and absolute communism who marked the first era of the Bolshevik rule, the fact is that the economic-political conditions of this vast territory are as normal as they were in America when the states formed a union, if we disregard the bloody episodes in Russia of the past winter. Nearly all municipal and rural institutions are reorganized, and systematic reconstruction work has just begun.

A new free spirit emanates from every corner, and the population is looking forward for a prosperous and peaceful future. The purely economic conflict with Japan, which occurred in Vladivostok, Habarowsk, and Nicolaewsk, is only one of those natural results of the past turmoil and intrigues of the various political cliques. It will be solved in the immediate future with satisfaction to both parties, and there is no foundation whatsoever for the rumor of a war between Japan and Russia. Such a war would be harmful for both. In the same way, it would not benefit Japan to hold Vladivostok for any length of time, as her retention of that port would mean a commercial boycott of both countries and guerilla warfare for generations to come. This is fully understood by both governments, and they are working now to settle the matter soon. In fact, the Japanese authorities have not interfered with the local administration of Vladivostok, which is in the hands of the Russian institutions.

TRAFFIC SERVICE REORGANIZED

The Siberian Railway has begun to increase operation and has reorganized the passenger and freight traffic. Regular express trains have begun to run from Vladivostok to Irkutsk, Tomsk, and Moscow. The big rivers are being used during the summer months to take care of the freight accumulated all over the country. This summer will see everything fully re-established, so that a year from now Siberia will have trade and industry in a normal state, at least as it was before the war.

Siberia, having been an agricultural and mining country, has suffered less from the ravages of the revolution than any other parts of Russia, except in the towns and around the railway. The farmers have accumulated enormous quantities of hides, bristles, wool, and grain that could be kept, and have increased their

herds of sheep, cattle, horses, and camels. Hunters have not hunted much during the last five years, so the forests are full of wild animals. The people have had plenty to eat, have had fuel and lived retired from the exciting events of the outside world. The mines are unexploited, though the miners have worked here and there is a primitive way, as in the coal mines, and in the gold and platinum mines, which are under the control of the government. The Kuznetzk Mills, the big Lena Gold Mining Co., and various other mills in the Ural section have continued to work with reduced capacity. The Nerchinks Gold and Platinum Mines are abandoned, as here the machinery was ruined by the miners.

REPORT OF FINANCE-ECONOMIC COUNCIL

I have received a copy of the official report of the meeting of the Finance-Economic Council (Finanso-Ekonomichesky Soviet) at Vladivostok, on March 24, on which occasion Mr. Leonoff, the director of the Industrial Department of Siberia, gave an account of the situation. Leonoff, in his report, emphasized the importance of an immediate reorganization and increase of the river and railway traffic and the building of a railway from the harbor of Alexandrowsk, at the Island of Sakhalin, to the interior mining and lumber regions. The next step of importance, according to his view, lay in the establishment of a special mining reconstruction bureau and the opening of mines that belonged to the government and the companies controlled by foreign interests. The report emphasized the fact that all claims should be investigated by the new government, and justice done to everybody.

The local co-operative societies had already started the establishment of tanneries, canneries, soap factories, and flour mills. When Siberia is organized its dairy products can control the markets of the world, as the butter produced in the Omsk, Semipalatinsk and Tobolsk regions only, would be twice as much as that of the United States. Siberia will have always the advantage of cheap labor and hay, as alfalfa here grows wild. Leonoff insisted that the zemstvos should liberally help the co-operative societies and farmers' unions in the establishment of big dairies for butter, cheese, casein, and milk sugar, on the one hand, and modern slaughter houses on the other. While the population in Petrograd and Moscow was dying of starvation, the herds of Siberia increased, as there was no market in which to sell the meat.

As the vast territory of Siberia, which stretches from the frozen arctics to the semi-tropics, has forests, mines, plains and riches that represent enormous values, and as the debts incurred by the past régime are comparatively nothing, this part of Russia will recover immediately from the turmoil. The Siberian population has a more practical spirit and greater active energy than that of European Russia; therefore it plays a great rôle in political life. To quote Mr. Leonoff:

"We need in Siberia now most of all foreign industrial co-operation: machinery for exploiting the mines;

We publish this article without subscribing to the views therein. Frank A. Vanderlip, recently returned from the Orient, has this to say regarding Siberia: "In Siberia there is literally no government. There is no money there that is readily acceptable, although there is plenty of paper currency; no banking; nothing necessary for law and order. The Japanese say they have 40,000 troops in Siberia making an attempt to maintain order. They originally went there with the Allies, but the latter and the United States have no policy in regard to Siberia and gradually withdrew their forces. The Japanese went back alone." See editorial, p. 249.

—EDITOR.

machinery for the building of iron, steel, copper, and other plants. We need machinery for paper mills, canneries, tanneries, shoe factories, textile mills and saw-mills. We have all kinds of raw material. Our Altai coal region is the richest in the world, and there the iron, copper, and manganese ores adjoin the anthracite fields. We have unlimited markets in China and Central Asia. We have the cheapest labor. Our own Russia will consume for a generation to come everything that we can manufacture.

FOREIGN CAPITAL INVITED

"The industrial policy of Siberia is co-operation between labor, the intellectual leadership, and the government. In order to pursue the evolutionary course, we will propose to foreign capitalists to come and take charge of our mines and mills and bring their machines and engineers. We give the labor and the raw materials. At many places we can give mines and mills which were operated by the past régime or its favorites; and, finally, we take responsibility and guarantee the profits. All we want is co-operation and just treatment of everybody. But we will not tolerate criminal exploitation as used to be, or corruption and all the methods of an autocratic government. More important than anything else, we will guarantee that there will be no strikes or destruction of any property, and see that always a fair profit is made by everybody.

"Therefore our proposal to foreign capital is this: Bring us your machines and engineers, and we will give the rest. Should the foreigners not like the agreed profit, we pledge ourselves to repay the value of the machines and other expenditures. We realize that a perfect state of co-operative industry cannot be established immediately, as some communists think in European Russia, and we admit that there should not be a hostile capital and labor, and the government should not be hostile. Our principle is harmony between these three factors in commerce and industry. We fully admit that the intellectual and talented mind should control physical force, but that control should not consist in economic but in purely moral power.

LOCAL GOVERNMENT SYSTEM

"The Siberian zemstvo government has concluded peace with the soviet government of European Russia, and is in many ways like the latter. The difference between a Russian soviet and Siberian zemstvo is merely in details and in certain forms of administration. The Siberian zemstvo is practically the same institution as in the state government of the United States, only with the difference that the provincial zemstvo of Siberia is far more independent from the central government than is an American state from the Federal Government.

"Besides, the Siberian provincial zemstvo consists of the county zemstvo only in certain major matters, but not as much as a state controls a county in America. Finally, there is the *mir* of the local district, or the *volost*, which, again, has its individual governing body for the immediate locality. Matters of land and forest concessions, in many cases even of mines and mills, depend not upon the central, provincial, or county zemstvo, but upon the peasant community, the *mir*. The zemstvo and soviet system of government is therefore the most free government imaginable and the possibility of rule by politicians is excluded. Though independent locally, zemstvos and soviets are united morally, and a concession granted a foreign capital by a local

zemstvo is traditionally not objectionable to the provincial or the central zemstvo.

"Therefore dealings regarding concessions have to be conducted with each local administration; yet these all have their executive secretaries in a town like Vladivostok or Irkutsk, where the preliminary negotiations can be carried on till the final sanction has been granted. Also, the present government honors all the concessions and rights that were sold or granted to any company in the past by a municipal or local government. All that Siberia objects to is the method and way the Czar's régime granted such concessions, which were without any exception fraudulent, and contradictory to the local interests.

FUNCTION OF GENERAL GOVERNMENT

"It is only matters pertaining to national questions, as the general financial policy, the declaration of war, making of peace, negotiations with the foreign countries, postal, railway, telegraph, shipping and other services, that are decided by a federal board, elected for one session only from all the provinces of the republic. Therefore dealings in matters pertaining to a mining, industrial, or trade question in Siberia are to be concluded with the Siberian local governments only.

"The Siberian zemstvo government is at this particular moment most favorably inclined to the manufacturers, engineers, and business men of the United States, and will be greatly pleased to grant to those the most favorable privileges and concessions and give preference over those of any other country except China. The American troops and their leaders in Siberia won the love and confidence of the whole Siberian population, and the American engineers left the warmest memories among the population wherever they came in touch with the people. Siberia is grateful to those who are her sincere friends; therefore what our local governments might even not accord to our own promoters, they are happy to grant to the Americans. We are a hospitable people."

This semi-official statement of an important functionary of the new government is a sufficient proof of the opportunity that an American business man or manufacturer can expect now in Siberia. Though there will not be a chance to heap billions in Siberian enterprise, as it will be under the control of the government, there will be a fine opportunity and an enormous field for new activity. One thing is sure: industrial enterprises will not be subject to taxes and bribes, blackmails of politicians and bureaucrats, but all transactions will be open for everybody.

SIBERIA SEEKING DEMOCRACY

Democracy, the power of the people—that is the tocsin of new Siberia. Never before in the history of the nation has Siberia been shaken so strongly in its fundamentals as at present. Probably in no country in the world was the government so misrepresentative of the people as was the old government of the Czar.

It is the Siberian people and their qualities that eventually will show forth in their new institutions, just as the character of the Saxon has asserted itself in English institutions, and as it was the character of the first American settlers that molded the United States into what it is. For what the Siberian peasant is today, that, quickened and refined by education and by the stir of larger interests, will the Siberian population be tomorrow.

More than three hundred years ago Russia began to exile here the political offenders and the followers of new religious sects. Later the Department of Justice exiled here all the common criminals, with the exception of petty thieves and burglars. Those exiles became farmers, hunters, or miners, and they usually organized their individual colonies. Then emigration was encouraged, and young couples who found the village too limited for their energy wandered out to Siberia. Therefore it is the village more than the city that is the backbone of all the life and peculiarities; therefore it is the village and not the city that will give the best ideas of Siberia. Out of a thirty million population, only one million or a little more are living in the cities. It is through Vladivostok and Irkutsk or Omsk and Tomsk that the outside world thus far has seen Siberia—a class too highly colored by foreign influences to afford a fair view of a people whose life from time immemorial has been one with the open fields.

The first thing that strikes one on seeing the Siberian rural life is its strong similarity to the American colonies in the West. Like the American settler, the Siberian by his nature is an individualist. He is willing to take his chances in a general mix-up and yet remain an individual socially. Though the American colonist always envied the patrician until he himself settled in a town, a Siberian moujik loves nature and land and comes always back to his village. The European farmers sold their land to the nobility, but the Siberian peasant community never recognized any nobles.

CHARACTERISTICS OF THE PEOPLE

The average Siberian is exceedingly hospitable, generous, simple, religious, and highly emotional. Emotionalism has been, to a great extent, the cause of many Siberian social-political troubles in the past, for a moujik would sacrifice his last property for a cause, an idea, or a venture, regardless of results. You will not find a better-hearted man in the world than a Siberian moujik or Cossack. With all his illiteracy, his lack of education, he is a born artist, a man for whom the æsthetic ends of life are everything. For that reason you will find big municipal theaters, music halls, museums, and schools of drama and dancing in all the Siberian towns. You will find all the impulsiveness of a child-like nature. In all the communal life a Siberian peasant has remained always a strong practitioner of co-operative methods.

THE "ARTEL"

Despite the early start which the other nations had over Russia in industrial development, there has quietly grown up in Siberian towns an institution which shows a deep philosophy in the national character. This institution, which is known as the *Artel*, had its origin in the traditions of the village. Though still in a most primitive state, the ancient Russian farmers perceived a truth which the western nations are only now beginning to realize: that it is better to co-operate than to compete. And so, instead of working their fields, selling their products, and purchasing their supplies individually, they acted in groups and divided the profits. Despite the allurements of the "civilization" of the city, the Siberian peasants have continued their barbarous practice of co-operation.

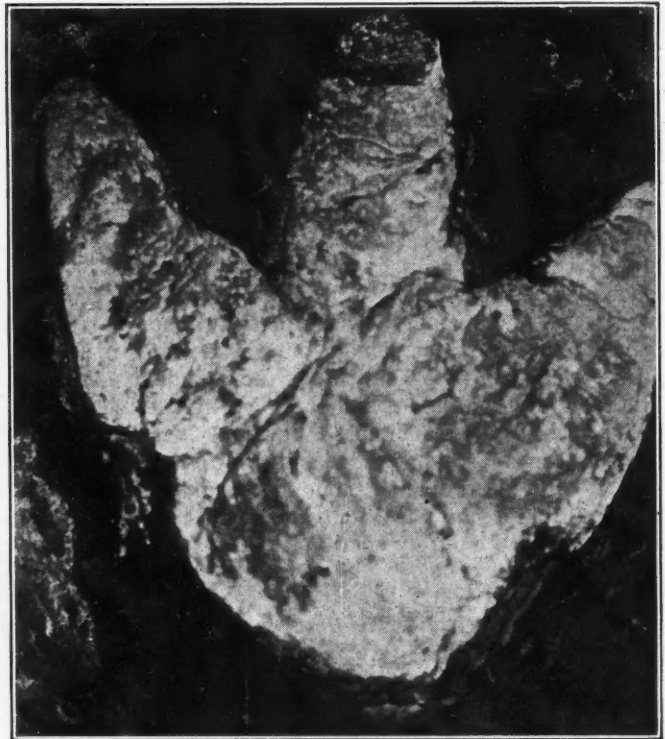
The co-operative tendency is so widespread, both in the rural districts and in the cities—it has taken hold of the people's imagination so strongly—that they can-

not conceive any big success in a large commercial or industrial enterprise unless it is based upon co-operative principles. The number of Siberian co-operative societies has increased so fast, and they are so powerful, that they compose the controlling financial force. The co-operative societies form a nation-wide trust. Everybody earns money and is satisfied with the system. This is proof that the Siberian peasant and workman are instinctively democratic.

The Gentle Dinosaur

Written for *Engineering and Mining Journal*

If some of our readers have difficulty in visualizing the fact that sedimentary or stratified rocks have accumulated slowly as actual layers of sand, gravel, and mud, the footprint of the monster shown in the photograph may bring the conception home to them. This is one of two prints showing through the shale of a 26-ft. coal bed at the Castle Gate mine of the Utah Fuel Co. This airy creature trod the slimy mud (which is now



FOOTPRINT OF GIANT DINOSAUR IN ROOF OF COAL MINE

The photograph was taken by A. C. Watts, chief engineer of the mines of the Utah Fuel Co.

shale) in the swamps where the vegetable layers had previously accumulated to form what is now coal. Note how the mud "squashed" away from his foot—quite as if it had not happened a matter of thirty million years ago, more or less. The gentleman evidently was a three-toed dinosaur, or "terrible lizard," as the derivation of the name indicates. With a paw measuring two feet in each direction (the size of this track), he was really quite a terrible lizard.

The Production of Refractory Brick in the United States may be roughly divided as follows: Silica brick, 18 per cent; fireclay brick, including bauxite brick, 80 per cent; and magnesite and chrome brick, 2 per cent.

Smelting in Namtú, Burma

Trying Conditions During the War — Shortage of Labor, and Supplies Unobtainable — Plague, Cholera, and Influenza Epidemics — Details of Treatment of Lead-Zinc-Silver Ore in Smelter and Refinery

BY ARTHUR W. JENKS*

Written for *Engineering and Mining Journal*

THE lead-silver plant of the Burma Mines, Ltd., up to the spring of 1919, when I left Burma, had experienced many difficulties caused by the war in that region, so remote from manufacturing centers. The plant was not up-to-date, and, during the war, extensive construction to remedy that state of affairs could not be entertained. Early in the war, the activities of German agents in Bangkok were successful in organizing an expedition against Burma. This expedition was

were not conducive to the smooth running of a plant.

Up to the time of the entry of the United States into the war, there was much feeling among the British subjects against America. Later, this feeling was lessened; fortunately so, because, in the staff, composed as it was of Americans, English, and Australians, nationalistic antagonisms were developing.

As the war progressed, the Indian government was obliged to become more and more stringent in its regu-



LOOKING SOUTHEAST DOWN THE NAMTU RIVER

promptly met by the British near the frontier, and numerous trials and sundry executions in Mandalay were the sequel. But at one time the matter looked serious in Namtú, and the best possible military measures were taken to repel the expected attack. The Europeans were organized into a company of volunteers; frequent and regular military drills were carried on; and the military organization then started was continued throughout the war. In fact, this local company, furnished with arms by the Indian government, was all the protection that could be provided, as no outside troops could be spared for isolated places like Namtú. As a matter of fact, no fighting occurred, but the time consumed by these protective measures, and the anxiety,

lations to compel the conservation of supplies. Coke suitable for retorts soon could not be obtained, and fuel oil from the Burmese field was substituted. Good belting and belt lacing were very scarce; repair parts for telephones and motors were unobtainable; and coal brought from Calcutta soared in price, and, besides, was difficult to obtain. The government listed the stocks of iron and of other supplies in all forms, in the hands of firms and corporations in India, and put its veto on the purchase of many articles. Yet, owing to the fact that the Burma Mines, Ltd., were listed in "Class A" of the manufacturing establishments, that being the classification given to the essential industries, preferential treatment was obtained. The fate of establishments with lower classification can be inferred. The

*Formerly smelter manager, Burma Mines, Ltd.

shortage of supplies was such as to preclude serious construction work at the plant, and even many most necessary repairs and replacements, such as ventilating hoods at the blast furnaces, were not effected, owing to lack of available material.

In 1918, the price of food began to rise, and the coolies were complaining of the cost of living. Wages in the smelter, by bonuses and otherwise, had to be raised somewhat, and the ordinary roustabout coolie received a rupee (32c.) per day on day wages, about twice what the same coolie would have received in Bengal. On contract the coolies were making from $1\frac{1}{4}$ to $1\frac{1}{2}$ rupees at the beginning of 1919.

A calamity not directly connected with the war, but which in connection with the war difficulties badly upset regular operation at the mine and smelter for many

ties was caused by pneumonia resulting from influenza; the scarcity of doctors was such that it was impossible, for a time, to give proper attention to the large number who were ill. The company maintained in Namtú an excellent medical and sanitary staff, but the work at that time was entirely beyond their capacity. Many physicians had left Burma for the seat of war, and, though the company endeavored to secure more medical assistance, it was impossible to do so. The total number of deaths in and near Namtú was about 200, which was a good record in comparison with most places in India. In the whole of India, the deaths from the 1918 epidemic of influenza were estimated at from five to six million.

The effects of the epidemic of cholera and influenza upon the ignorant and superstitious laborers can be



LEAD SMELTER AND REFINERY, LOOKING SOUTHWEST

weeks, was a succession of epidemics. The first, that of bubonic plague, was not so serious; a vigorous campaign against rats, vaccination of Europeans and of many Asiatics, and other sanitary measures checked it. But in August, 1918, cholera appeared, and, almost immediately, the influenza. The European staff were largely withdrawn from their usual vocations and used to form a defensive quarantine cordon around Namtú. Only one case of cholera developed among the Europeans, and by injection of saline solution the victim's life was saved. However, there were a number of deaths among the natives in Namtú. Outside the cordon, along the narrow-gauge railway connecting Namtú with Namyáo on the meter-gauge Burma railway, the deaths were numerous.

The bodies were cremated, when they could be found; the natives often would not report illness to the doctors, or even deaths. But by far the larger number of fatali-

imagined. Only 40 per cent of the men at the smelter and refinery remained, 60 per cent being either victims of the epidemic or frightened away. The worst of the shortage was over by the end of November, but even in mid-winter of 1919, when the supply of coolies from the Chinese Province of Yunnan should have been good, the number of men was insufficient in Namtú, and the wood choppers, of whom there formerly were several thousand, had almost entirely failed to appear.

WOOD FUEL NOT AS ECONOMICAL AS HIGH-PRICED OIL

Until the year 1918, the supply of wood fuel, cut from the surrounding government forest reserves, had been sufficient to supply the roasters, the lead refinery, and the boilers furnishing power for the blowers of the blast-furnace department; but the increasing distance of the timbered areas from Namtú, the higher rates at which

it was necessary for the company's forestry department to let the wood-cutting contracts, the large amount of handling required in the plant, then, finally, the demoralization of the labor market by cholera and influenza, necessitated a sudden and complete change, at the close of 1918, from wood fuel to oil throughout the plant. Despite the high cost of fuel oil at that time, 81 rupees per ton, the change was economical as compared with the wood fuel.

The wood choppers persistently split the wood too fine, and added small limbs, with the object of increasing the cordage; but laborers were too few in the forest in the first half of 1918, and almost entirely absent in the last half, and no output commensurate with the needs of the works was possible. If sound fuel of proper size had been available, very possibly wood fuel might have been as economical as the high-priced Burmese oil; but owing to the scarcity of fuel for many months, old, partly decayed wood, a fuel giving no heat, and many small sticks, were shipped to the works; and this procedure necessitated the opening of the fire-doors with excessive frequency. The great amount of such wood fuel required, and the large amount of iron ore coming from Namyáo, strained the transporting capacity of the company's railway to the utmost, and fuel shortages were frequent. In consequence of the decreased rolling stock available on the Burma railways, threatened famines of oil supply, and of coke, often occurred; though it must be admitted that usually the coke and oil arrived before a serious shut-down was imperative.

HINDUS WILL WORK IN RAIN, BUT YUNNÁNESE WILL NOT

The rainy season is from May to October, continuing somewhat into November. This is the season of labor shortage, because the Chinese generally return to their homes in Yunnán province to work their farms. Besides, the Yunnánese do not enjoy working in the rain, even when, as in our case, they were furnished with rain coats. The same remarks apply to the Mainthas, a border tribe whose territory is partly in Burma and partly in China. The Yunnánese and Mainthas are usually excellent laborers, intelligent and cheerful. Their faces are expressive, and in that respect they differ widely from the Chinese seen on the Pacific Coast. They are very fond of meat, whereas the thin Hindu on whom one must depend mainly in the rainy season for any outdoor labor, eats little animal food.

The Hindu will work in the rain, but is inferior to the Chinese as a laborer, this difference being largely due to the fact that, on the same wages, the Chinese spend more for food than the Hindus. Early in December, the rains having ceased and the weather having become fine, the coolies normally poured into Namtú from the north, and there was labor enough until the beginning of the next rainy season. But large numbers of laborers were sent from India into Mesopotamia during the war, and this fact rendered it difficult to maintain in Namtú the needed quota of men in the various departments. As the sale of opium was permitted in the vicinity of Namtú, and as it was prohibited in Yunnán, confirmed opium smokers remained on the Indian side of the boundary. Such men naturally are nearly useless as laborers, and were only employed in case of dire need.

Though in 1916 and 1917 the shortages of labor in

Namtú were not as frequent as in Mexico, they were often prolonged and led to many shut-downs of the furnaces, and delays in repair and construction work; but in 1918, the labor situation became excessively bad. As a result, the men, in the fall of 1918 and on into the following winter, were mainly new to the work, and were the despair of the European foremen. The furnace men often would come for a few shifts and then disappear; it would be necessary to begin again and replace them by absolutely green men. A bonus based on the production, or tonnage per month, and another based on the number of shifts worked in the month, helped considerably, but it was impossible to effect large economies of labor until three new shifts, mainly composed of raw material, had been trained.

CRUSHING PLANT UNSATISFACTORY

The crushing plant for sulphide ore and iron ore gave much trouble and was not efficient. There were several causes. It was difficult, and sometimes impossible, to crush the iron ore from the Manpwe deposit, because it contained so much clay; there were mechanical difficulties; and it was impossible under the conditions at that time to secure competent men in charge of that plant. The Mong Tat deposit, which was being developed, yielded a hard ore high in iron, and gave no trouble in crushing and screening to $\frac{1}{2}$ -in. mesh. The lead-silver ore itself, from the Bawdwin mine, crushed readily, except when it came from a stockpile, or when it had been wet much in transit by rains.

The roasting was done in six Godfreys running at the rate of 40 tons per 24 hours, and bringing the sulphur down to 11 per cent. They were used as pre-roasters, followed by sintering pots. One Dwight-Lloyd was finished in the fall of 1918, after much delay, and received its charge also from the Godfreys. The calcine from the pots ran between 4 and 5 per cent sulphur; from the Dwight-Lloyd, running at the rate of 90 tons per 24 hours, the sinter averaged $3\frac{1}{2}$ per cent sulphur in material running 16 to 18 per cent zinc.

DWIGHT-LLOYD MACHINE EFFICIENT

The selected Bawdwin ore sent to the crushing plant was running 40 per cent lead with 37 ounces of silver per long ton, 22 per cent zinc, over one-half of 1 per cent of copper, and a similar amount of nickel. At the crushing plant, the mixture for the Godfreys was made, and consisted of 25 per cent crushed iron ore and 75 per cent crushed lead ore. Material so high in zinc had not, as far as I was aware, been treated on the Dwight-Lloyd machine, and I naturally felt considerable anxiety until the machine had been tested on our mixture and found efficient. Additional testing and adjustment were necessary to improve costs and methods of operation, and were being carried out.

Our coke was shipped to Rangoon from Calcutta. It contained 22 to 24 per cent ash, and was not as dense as it should have been to obtain proper reduction in the blast furnaces. Usually 14 per cent was used on the charge. Better coke was being made in India, but it was all used by the iron and steel companies on war work. The two blast furnaces ordinarily used put through 180 tons of charge each per 24 hours. A third and smaller furnace had a capacity of 100 tons, and was principally used for the smelting of refinery residues. Of course the iron flux was largely contained in the sinter itself, but there was no arrangement whereby

the iron ore and limestone added direct to the charge at the blast furnaces could be crushed mechanically.

The blast-furnace slags up to the fall of 1918 had run 15 to 16 per cent ZnO. At that time, a small amount of matte was being made, and occasionally a speiss with 25 to 30 per cent nickel. To increase lead fall in the charge and the lead output of the plant, higher zincs were attempted, and were being run successfully, the average for January, 1919, being nearly 26 per cent ZnO, if the zinc is considered to be an oxide in such a slag. But there is manifest impropriety in so doing, as such slags contain 4 to 5 per cent of sulphur. An average slag of that character with a specific gravity of 4.1 ran approximately: Pb, 4 per cent; ZnO, 26 per cent; FeO, 39 per cent; SiO₂, 18 per cent, and CaO, 4 per cent.

The alumina was not determined daily, but was running about 5 per cent. The slag also contained much of the copper and nickel occurring in the ore, because there was no separation of matte. The limestone required for such a zincky slag was much less than had been required previously, and as against the increased *percentage* of FeO in the slag must be placed the lessened quantity of slag produced as compared with the slag formerly used, with 15 to 16 per cent of ZnO. The slags ran well, the tuyères were bright, but there was a decided tendency to form a zincky accretion on the bottom and sides of the crucible.

DWIGHT-LLOYD SINTER IMPROVED BLAST-FURNACE TONNAGE

The ores sent to Namtú from the mines were entirely sulphides, requiring roasting. The Burma Corporation began its operations on the slags, low in zinc but high in lead, produced in the ancient small Chinese furnaces; but of this material little remained. Consequently, the quantity of ore smelted was limited by the roasting capacity of the plant. Additional Dwight-Lloyds have since been provided. The use of Dwight-Lloyd sinter at the blast furnaces increased the tonnage put through; also, as was to be expected, the lower the sulphur in the roast was, both from the Dwight-Lloyd and from the pots, the better the furnace ran on these high zinc charges. Slag with 4 per cent lead, with 1½ to 2 oz. of silver, with appreciable percentages of copper and nickel and 20 per cent of zinc, can hardly be considered a waste product. In emergencies it can be made to produce lead and silver for the refinery with great rapidity.

As roasting capacity was limited, it was not practicable to utilize any of the Godfreys in the pre-roasting of blast-furnace matte. It was also impossible to export concentrated copper matte, because of the shortage of ships. These facts militated against the normal practice of working up the copper products of the blast furnaces and reverberatory residue furnace as quickly as possible. Baghouses or a Cottrell plant were needed at the refinery and blast furnaces, but during the war it was not found practicable to obtain the materials.

REFINERY HAD NO KETTLE PLANT

As the necessary kettle plant for dressing and cleaning the blast furnace lead had not been provided, the bullion was run into rakes of molds at the lead well, weighed, and sent direct to the refinery. There it was charged into a reverberatory dressing furnace, the heavy copper-nickel skimming being withdrawn at a low heat.

The composition of this was variable, but the following may be taken as fairly representative: Silver, 40 oz. per ton; lead, 62 per cent; copper, 10 per cent; antimony, 2 per cent; arsenic, 4 per cent, and nickel, 5 per cent.

This material was charged into the residue furnace, with the antimonial skimmings from the softening furnace, a small amount of ore from the mine, and the usual coal or coke dust as a reducing agent. The resulting copper matte ran low in nickel, but a speiss was formed abundantly, running 35 per cent nickel, this material being stored for possible future treatment. The speiss often gave trouble in the residue furnace, freezing around the lead tap.

The zinc used for desilverizing came largely from Japan and was of good quality. For example: Silver, 1.2 oz. per ton; lead, 1.21 per cent; copper, trace; zinc, 98.68 per cent; arsenic, trace; antimony, none, and iron, 0.05 per cent.

The percentage of zinc actually consumed was reasonable, but the cost of the spelter delivered in Namtú rose to nearly 1,000 rupees per ton, and the effect on refinery costs can be imagined.

The pressure for the double-cylinder Howard press at the kettles was deficient, and the mechanical arrangements for handling it were slow. These defects were remedied gradually, but the mechanical department was handicapped in many ways by the war conditions. The lead in the desilverizing kettle ran 100 to 150 oz., and when, occasionally, the high pressure was obtained, the assay of the crusts rose to 3,500 or 4,000 oz. per ton.

WOOD A SATISFACTORY FUEL

Scotch coke, followed in 1917 by fuel oil, was used at the retorts; otherwise wood fuel was formerly used throughout the refinery and gave good results. With selected fuel, this was true even of the cupels. But the increasing cost and scarcity of wood fuel, as already explained, combined to cause the change to oil fuel throughout the refinery, which decreased the fuel expenditures. Besides, the Chinese workmen quickly became accustomed to the use of oil, and regulated the heat better than was possible when using the variable wood fuel delivered in 1918.

The Bawdwin ore contains no gold; or, more strictly speaking, there is one ounce of gold to twenty thousand ounces of silver. Consequently, no parting was done. The silver bars as sent to the mint ran about 998 fine, the principal impurity being copper.

A three months' average analysis of refined lead produced in 1917 gave 99.982 per cent lead. The bars of lead as sent to the Indian government weighed 115 lb.; but much heavier bars were molded for the Chinese market, as the import duty on lead in China is reckoned per bar, and not by weight. The Burma Mines Co. furnished the Indian government with all the refined lead it required during the war, 1,500 tons per month. The excess of the monthly production, 300 to 400 tons, went to China and to the local trade. The refined silver was sent to the Indian mint.

Deposits of Inter-Bedded Magnesite and dolomite beds, with small amounts of slate and promising deposits of talc, occur in South Manchuria, according to a bulletin issued by the Guaranty Trust Co. Though the Japanese have secured large areas of the deposits, considerable areas are under the control of the Chinese.

Mining Engineers of Note

W. H. Shockley

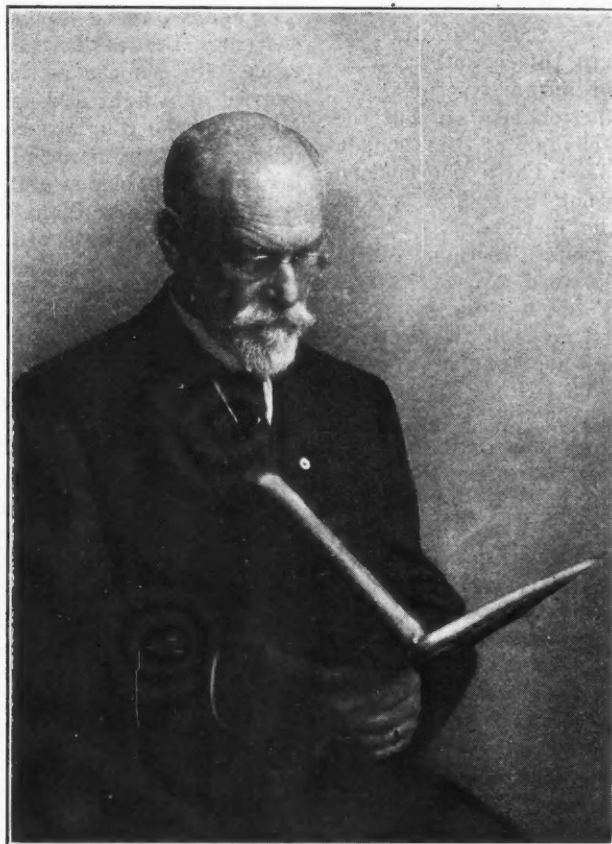
REGARDLESS of the merits or demerits of simplified spelling, W. H. Shockley can be credited with having the courage of his convictions in his advocacy of the movement, and, although disliking the notoriety which his views have brought, he is convinced that the measure is a necessary step toward a needed reform. Few American engineers can include in their list of experiences the numerous and extensive travels which have fallen to the lot of Mr. Shockley, and it is probable that his championship of spelling reform is due, in part at least, to his contact with the complexities of many languages. William Hillman Shockley was born in 1855, at New Bedford, Mass. His father was a whaling captain and his mother had been a school teacher. His maternal grandfather was Jethro Hillman, a builder of whaling ships, famous for their durability, and his paternal grandfather was a ship carpenter, a farmer of rocky soil, and the father of fourteen children. Mr. Shockley married May Bradford, an engineer (formerly a U. S. Deputy Mineral Surveyor) and artist, and they have one son. Following his graduation

from the Massachusetts Institute of Technology in 1875, Mr. Shockley went to Florida as a surveyor, and later to California. From 1880 to 1893 he was employed at the Mount Diablo mine, Candelaria, Nev., as assayer, surveyor, bookkeeper, and finally as general manager. During this period he built a dry-crushing silver mill that was said to have held the record for capacity at that time. He operated a small gold mine at Grass Valley, Cal., for a few months in 1893, and the two years following studied languages, literature, art, and music in New York and Europe.

Late in 1896 Mr. Shockley was sent to China by Bewick & Moreing as mining engineer for an expedition headed by William Pritchard Morgan, ex-Member of Parliament, with the aim of obtaining concessions, making loans, and establishing a mining administration. A nearly completed British loan of £16,000,000 was thwarted by Russia's threat to send troops into Mongolia. In 1898 he took over the Shansi concession of the Peking Syndicate. On this journey, Mr. Shockley religiously followed Agent Luzzatti's instructions to "be

kind to Chinese," but, despite this kindness, two years later a reward was offered for his head by the Shansi officials.

During 1899 Mr. Shockley spent eight months searching for petroleum and visited the noted "fire-wells" of Shansi, long extinct and now mere seepages of dark oil. During his stay in China he made a collection of porcelains and embroideries, which are now loaned to the Stamford Museum. After leaving China in 1899, he "globe-trotted" through India, took a side trip to Egypt, and in 1900 went to Vladivostok, where an iron tramp steamer was placed under his charge. In this, with a gang of Russian and Korean workmen, Mr. Shockley and some American assistants explored the Siberian coast opposite Cape Nome. No gold was found, but considerable coal was seen. Mr. Shockley had a semi-mutiny among the men, but was able to complete the work planned and examined copper deposits at Petropavlosk, Kamchatka, and gold placers near Gejiga, at the head of the Okhotsk Sea. During 1901 Mr. Shockley examined gold mines scattered over



W. H. SHOCKLEY

western Australia and in 1902 surveyed a concession in Korea. In 1903 he reported on quicksilver mines in Texas and a gold mine in Peru, where, instead of the tens of millions of dollars reported by the vendors, Mr. Shockley found only a few rich spots of ore guarded by myriads of bats. Later he examined a large property in the Urals, comprising iron mines and furnaces, copper mines and smelter, gold placers and dredges, a chemical manufactory and a fleet of steamers plying on more than 2,000 miles of rivers. The wealthy Russian family owning this domain had invested \$10,000,000, and never received a dividend.

Mr. Shockley investigated a concession in the eastern Sudan bordering on the Red Sea and Abyssinia during the early months of 1905, and later in the same year prospected gold and platinum claims which he, in company with a Russian engineer, had located in the northern Urals. Platinum was found on the property, but its occurrence was not in payable quantity. In 1913 Mr. Shockley returned to California, where he now resides.

BY THE WAY

Who Put the Ass in Assay?

Our Bolshevik editor, who never can be tamed, contributes the following comment on Roswheel's letter in our What Others Think department. We disclaim all responsibility:

"Although it is true that the dictionaries all accent the last syllable of the word 'assay,' even when used as a substantive, it is nevertheless true that the first syllable is universally stressed in this country. This in itself constitutes the best of authority, for usage makes language, of which the dictionaries are but the tardy recorders. By gradual change of the spoken language, Old French developed from Latin, and modern French from Old French. It is not the task of spoken language to keep back with the dictionary; but for the dictionary to keep up with modern diction. Moreover, when the same two-syllable word is used both as a substantive and a verb, it is the modern spirit of the language to stress the first syllable when used as a noun, and the last syllable when used as a verb. My dictionary (said the Bolshevik editor) states that 'assay' and 'essay' are substantially the same word, but the meaning of the two forms has drifted somewhat apart. Yet the dictionary stresses the first syllable of 'essay,' used as a noun, and the last syllable of 'assay,' as Roswheel points out. Wherefore (said the Bolshevik editor)? The trouble is (he said) that the dictionaries are not quite up to date.

"Anyhow (he said) I claim that 'Ain't,' to which Roswheel appeals as a horrible example of bad habit, is a perfectly good English word. It is the abbreviation for 'am not.' The proper conjugation of this form is: 'I am not or I ain't; you are not, or you aren't; he is not or he isn't; we, you, they are not or we, you or they aren't.' Can you make a better shortened form for 'am not'? It is in accordance with all the rules of euphony and elision given by the best of grammarians (said he). It has been a good form, hallowed by usage and correct in origin, since before the lexicographers were born, but they had nobody to explain it to them and couldn't find it in the Latin dictionary." (We have given the Bolshevik editor his time. He would have broken out into a defense of spelling "rhyme" as "rime," or some other fool thing, next).

Early Mining in California

"A roving and reckless miner, known as Bill, who had been washing gold on the Middle Fork of the American River, had occasion in 1849 to visit Coloma," says Hittell's "History of California." "There he managed to purchase for eight dollars a bottle of French brandy, which had been laid by for medicinal purposes. Upon drawing the cork, he insisted on the persons from whom he had bought it assisting him in emptying the bottle. Upon their refusing several times, he dashed it violently against a tree and broke it in a thousand pieces. On another occasion in the course of his spree, while paying for something, he dropped a small lump of gold, worth some three dollars, which a bystander picked up and offered to him. Bill, without taking it but looking at the man with a comical mixture of amazement and ill-

humor, exclaimed, "Well, stranger, you are a curiosity. I guess you haven't been in the diggings long. You had better keep that lump for a sample." About the same time Bill, finding a congenial spirit in a man from Philadelphia, whence he himself hailed, induced him to join in purchasing a barrel of ale at \$3 per bottle and a case of sardines at half an ounce per box. They then, armed respectively with a bottle under each arm, a glass in one hand and a box of sardines in the other, went about almost forcing everybody they met to eat and drink; and finally they settled down by the side of what was left of their refreshments for a general evening entertainment, to which everybody was invited and welcome. Scenes like the above were of frequent occurrence. But sometimes the dissipation wound up with a quarrel or a fight and sometimes bloodshed. Practical joking of the roughest character was also occasionally indulged in. An instance is related of a party of roistering mountain blades getting very full one evening in 1849, when one of them, unperceived, emptied a can of alcohol over the head of another who was somewhat of a bully, and, seizing a candle, set it ablaze. In an instant, "Man on fire! Man on fire! Put him out! Put him out!" was shouted on all sides; and put him out his companions did with a vengeance—many of them embracing the opportunity, in extinguishing the fire, of paying off old scores and effectually curing the bully of any further propensity to indulge in bluster.

No Use for Witchsticks

The State Commissioner of Corporations of California does not believe in so-called "witchstick" methods of locating oil or minerals. "I have no time for or patience with these age-old superstitions," he recently stated, "and, while the men who advocate them may be entirely honest in their belief, yet the fact remains that these methods are questionable and, I believe, entirely unreliable. Permits to sell the stock of corporations are not issued by the Commissioner of Corporations based upon any such representation.

"I have formed no definite opinion concerning the accuracy or value of the so-called 'Vibratile Motion Instrument' which, I understand, is being used to determine the presence of oil and minerals, and any representation made to the effect that this method of locating oil has my approval is absolutely incorrect."

Catacomb vs. Honeycomb

The following description of a Nevada mining property is credited to a Missouri engineer by the paper which published it:

_____ should be called the Catacomb Mines of Nevada, for man, with all of the ingenuity that gave rise to the term, could never equal Nature's results there. It is, in fact, a great repository that promises to keep many workers busy for a great length of time, as they uncover and remove the precious metals now known to have been cached by the caprice of forces that combined to create what we call a phenomenon because we do not understand them.

That Missouri engineer was thinking of "honeycomb" when he wrote "catacomb." The latter is about as good a name for a promising mining proposition as "cemetery" would be. Many a mine or prospect is indeed a cemetery of lost hopes. The claims could well have been located with tombstones at the corners, as happened a few years ago in Nevada when a rich strike was made in a certain graveyard. But this condition should never be reflected in the name.

CONSULTATION

Manganese Battery Ore

"Being a subscriber of your journal I am taking the liberty of writing you for some information on manganese dioxide. We are producers and shippers of high-grade metallic manganese ore. This class of ore we have no trouble in disposing of but we have a good grade of pyrolusite that runs about seventy-nine in dioxide which we have been unable to find a market for as a dioxide. A complete analysis of the ore follows:

Moisture.....	1.20	Calcium carbonate.....	3.15
Silica.....	9.00	Calcium fluoride.....	5.40
Iron oxide.....	0.43	Magnesium carbonate.....	1.00
Manganese dioxide.....	78.73	Gold, silver, phosphorus	
Aluminum oxide.....	0.92	trace; platinum, none	
		Nickel, copper, cobalt,	none

"You can see it is a suitable ore both for battery and dye purposes. While it is a little high in silica we can get it down to about 6 per cent by sorting. It contains no copper, small iron, no other metals.

"I would appreciate it very much if you would give me some information as to who could use this ore and about what price it should bring."

Manganese ore for use in dry cells or batteries is customarily supplied by brokers to the manufacturers in lots ranging from 5 to 100 tons under guaranteed specifications. There is no general and definite schedule existing in the market for manganese ore suitable for battery purposes as there is in the manganese for use in the steel industry. There are not many known deposits of manganese ore in the United States that are capable of meeting the rigid requirements of battery manganese (less than 1 per cent of iron and not more than traces of nickel, copper and cobalt) and furnishing a steady output—one that will not vary too much in grade. The analysis you present indicates a suitable battery grade or ore. Prices we are quoting for this sort of material vary between \$75 and \$90 per ton at New York, depending upon the analysis.

The value of an ore for battery use depends upon its content of manganese dioxide rather than upon its metallic manganese content, although naturally the compound is directly dependent upon the metallic manganese. Formerly Russian manganese ore from the Caucasus region was imported, as its richness and unusual purity made it admirably suitable for battery purposes. Analyses ran from 85 to 90 per cent and higher in manganese dioxide and usually contained considerably less than 1 per cent of iron. The analysis shown contains a lower percentage of manganese, but as considerable ore during the war containing but 70 per cent manganese dioxide was used, as the Caucasian ore was unavailable, the analysis is relatively high in that particular. The market for domestic battery ore depends upon the possibility of obtaining richer ore from other sources. The readily available Russian ore, its excellent quality and general superiority over American supplies made competition by United States producers practically impossible before the war. It was only after the Caucasian supplies had been shut off that attempts were made to experiment with domestic "battery" ore to determine the suitability of the various manganese minerals and to define the impurity

limits. Battery users have found that by manipulation, results from domestic ores and foreign ores other than Caucasian closely approximate the results from the Russian ore.

Experimental work has shown that minute quantities of copper, nickel, and cobalt are harmful and that four-tenths of 1 per cent of these impurities render the ore unfit for battery purposes. It has also been found that 2 to 3 per cent of iron oxide does not necessarily harm the efficiency of a dry cell. Frequently, however, a 1 per cent limit is arbitrarily set.

The physical properties of manganese battery ore are also important and the ore should be somewhat porous to be most efficiently used in the dry cell. A hard but porous ore has been found to give better results than a hard dense ore, in spite of a higher oxygen content in the latter. Coarsely ground ore gives longer life to the cell than finely ground material. Screen analysis, hardness and density are all important in determining the qualities of a manganese ore.

We would suggest as possible interested buyers dealers who are practically all located in the East, or the manufacturers of dry cells. Consumption of manganese ore in glass and battery manufacture is estimated at 25,000 tons per year.

Relative Output of Electrolytic Zinc

"How does the production of electrolytic zinc compare with the total amount produced in the United States, and where is the largest electrolytic zinc plant?"

In 1919 there was produced 27,056 short tons of electrolytic zinc out of a total domestic production of primary zinc, amounting to 456,743 tons, or roughly 5.75 per cent. In 1918 the production of electrolytic zinc was larger, 39,669 tons, or 7.65 per cent of the total production of 517,927 tons. The following table gives comparative results compiled from U. S. Geological Survey statistics since 1914:

	Electrolytic Zinc	Total Primary Zinc	Ratio in Per Cent
1914	353,049	..
1915	252	489,519	0.05
1916	12,916	668,343	1.94
1917	26,910	669,575	4.10
1918	39,669	517,927	7.65
1919	27,056	465,743	5.75

The largest electrolytic zinc plant is at Anaconda, Mont., operated by the Anaconda Copper Mining Co., and with a capacity of 150 tons of zinc daily.

Increasing Production of Zinc Dust

"Has the domestic production of zinc dust increased in the past few years?"

The production of zinc dust in the United States

Tons	Tons
1910— 69	1915— 1,755
1911— 254	1916— 2,609
1912— 492	1917— 5,913
1913— 423	1918— 6,995
1914— 1,004	1919— 6,598

shows a gradual increase from 1910 to 1919, with a slight decrease last year, and is given in the table.

THE PETROLEUM INDUSTRY

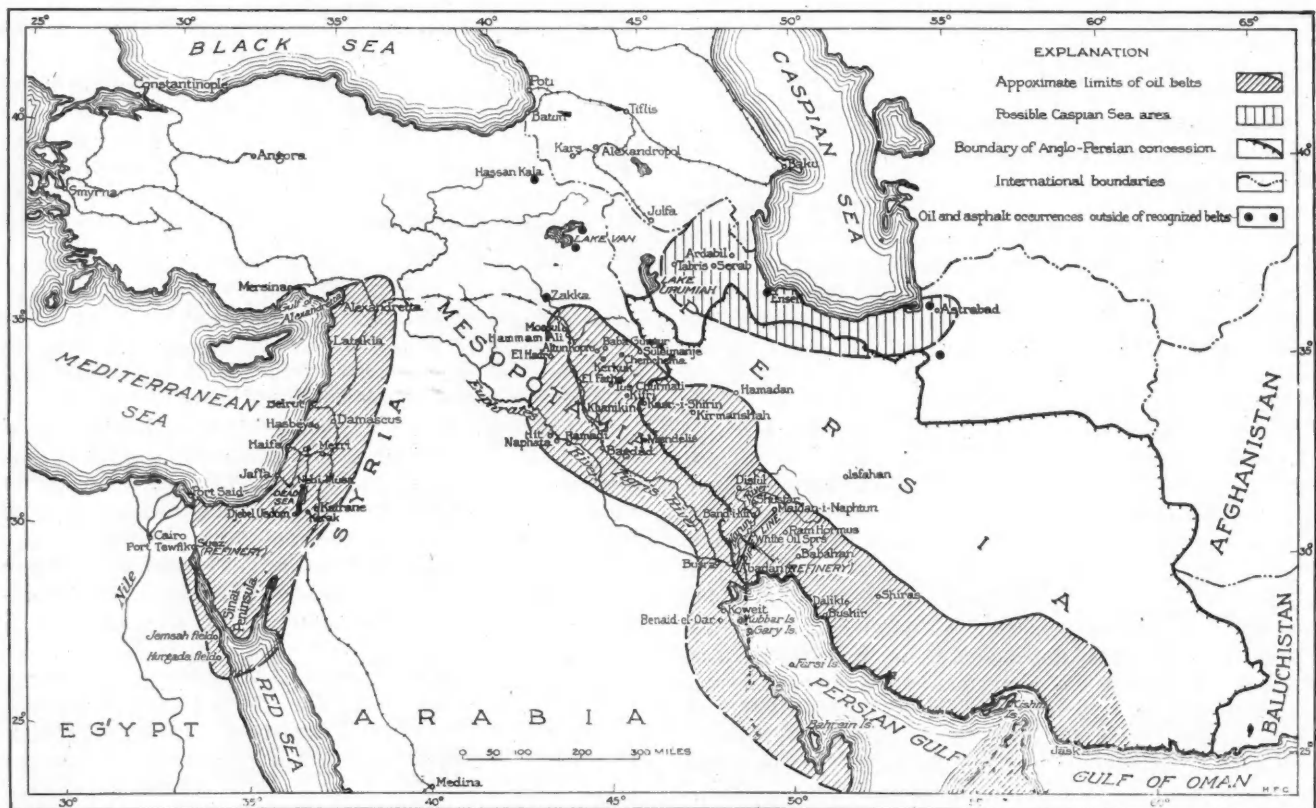
Petroleum in Persia and the Near East

Area Comprises What Is Probably the Richest and Most Extensive Oil-Bearing Region of the Globe—Geological Characteristics and Commercial Possibilities—Potentialities of Development Indicated by Recent Changes of Political Control

BY EDMUND M. SPIEKER*

Written for *Engineering and Mining Journal*

IN A RECENT publication¹ of great interest to American oil executives a detailed summary of the occurrence and development of oil in Persia and in the former Turkish territories of the Near East is investigation and seeking a basis for intelligent first action. The author is a scientific assistant in the Hamburg Colonial Institute, and the work is doubtless a byproduct of German imperial ambitions and activities



OIL REGIONS OF THE NEAR EAST

presented. The work might be characterized as a business man's paper, as it emphasizes, in particular, political and legal matters, the business history of oil concession-seeking, prospecting, and development. In addition, it summarizes in a fairly complete manner the available geologic and other technical data. It is the most comprehensive summary concerning petroleum in these regions yet published, and it is obviously of great value to an oil enterpriser planning a campaign of

in these Asiatic territories during the period antedating the beginning of the war.

The importance of the region as a source of future oil production appears to be of first rank. Within ten years British operations in a single field in Persia have developed an annual capacity of over 30,000,000 bbl. of crude oil, and the scope of territories with similar geologic conditions and surface indications is so great that it seems more than likely that similar exploitation elsewhere in the Near East region could be multiplied many-fold.

With nothing more than normal commercial competition to meet, and under a fair "open-door" policy, these

*Published by permission of the Director of the U. S. Geological Survey.

¹Schweer, Walther, "Die Türkisch-Persischen Erdolvorkommen. Hbh. Hamburgischen Kolonialinstituts Bd. XL, 1919"; (Large 8 vo., 249 pp., with maps and illustrations.)

fields would doubtless be very inviting to American oil interests. At present all of the Turkish territories described are included in the so-called "mandatory area" of the peace-treaty settlement, and are the subject of great diplomatic and political activities, especially by the British, aimed mainly at control of the oil resources.

The interesting surface occurrences of oil in Persia and the Near East, mention of which is woven into the literature and primitive religion of remote periods in the history of these areas, are fully described, the data having been gathered from many sources. These facts, coupled with what little is known of the geology of the region, form the basis for the many optimistic forecasts of the oil possibilities of the area.

A remarkable belt of seepages lies along the entire southwest coast and frontier of Persia, extending in a general northwest-southeast direction into Mesopotamia. It is about 1,200 miles long, and appears to be the longest single stretch of territory, with more or less continuous surface indications of oil, yet found on the globe. In addition to the seepages of this Persian-Mesopotamian belt, scattered showings are known in all of the major divisions of the former Turkish areas, the most important of which are those in Palestine, Syria, and Arabia.

MESOPOTAMIAN OCCURRENCES

The northwestern limit of the Persian-Mesopotamian oil belt appears to lie about twenty miles north of Mosul, on the Tigris. A seepage for which an exact locality description is lacking, appears to be the northernmost indication along the belt. To the south of Mossul, at the town of Hamman Ali, there are seepages at hot sulphur springs, some of which are used as curative baths. Oil and asphalt rise continually to the surface of the salt-sulphur water in a small pit at one of the springs. About 80 km. southwest of Hamman Ali, at El Hadr, is another seepage at which the natives collect the oil in pits.

A series of much richer occurrences extends to the south of Hamman Ali, in a zone which is called the Gajara field. This region, which is of great extent, contains many seepages which, having long been active, have built up asphalt deposits several meters thick. In this field the locality at the narrows of the Tigris, near El Fatha, where thick beds of bitumen outcrop in the steep river banks and indications of petroleum are plentiful, is especially worthy of note. Here a soft white limestone is the source of many streams of petroleum and asphalt which trickle down the banks into the river. These occurrences promise to be of much importance, particularly as they are on the line of the Bagdad railway.

To the north of the caravan road from Mossul to Bagdad, at a point about five miles northwest of Kerkuk, are occurrences in which the oil seeps from gypsum beds, running out over the road; and at Baba Gurgur, north of Kerkuk, there is a gas spring. Ten other seepages, the odor of whose petroleum is noticeable at a considerable distance, have been found in the bed of a small stream to the north of Kerkuk. Here the natives have dug pits about twelve feet deep, from which they obtain from eight to ten gallons of petroleum a day. The oil is carried by camels to Kerkuk. Other seepages, of which less is known, exist at Guil, to the east of Kerkuk, and south of Chemchema.

At Tus Churmati, about 20 km. south-southwest of

Kerkuk, are several productive oil springs, which have been exploited in primitive fashion by the natives. The source of the oil at this locality is a series of marls, gypsum beds, and highly saliferous red sandstones dipping from five to thirty degrees to the northeast. Other oil springs are in the vicinity of Kifri, about 150 km. northwest of Bagdad, where beds of gypsum yield quantities of salt, sulphur and petroleum.

Farther to the south, about half-way between Mendeli and Khanikin, and on a series of hills approximately 200 m. above the Naphat River valley, an oil-bearing clay-shale is worked by the natives, several dug wells furnishing daily about 100 gal. of petroleum. The oil seeps out on the surface of salt water springs at the faulted crest of an anticline, and flows down the valley-sides to the river, making the water unpotable for a long distance down-stream.

ANCIENT ASPHALT DEPOSITS OF EUPHRATES

On the Euphrates the most important occurrence is at Hit, between Wadi Mohamedi and Kubeisa. The asphalt deposits at this place were known and much used by the ancients, and are today, with the exception of the famous localities in Trinidad and Venezuela, the most remarkable known. The crude working methods of the natives yield about 2,500 tons of asphaltic oil yearly, and those who have visited the place say confidently that the amount could, with little difficulty, be greatly increased.

The oil-bearing formations, which form a series of gypsum beds in layers up to two meters thick, intercalated with sandy clays, are similar in geological association to the beds at Mendeli and Tus Churmati, and have been pronounced of Eocene age. The oil flows freely in numerous springs and at scattered points in valley bottoms about Hit, gathering on the surface of the water, and hardening on exposure to the air to form a brittle substance of the consistency of hard pitch. This is collected by hand as it forms on the water and is used by the natives for many purposes. The oil is highly inflammable. Other seepages of oil and asphalt occur along the Euphrates at Nasrieh, Ramadi, and Naphata.

Near the Turko-Persian boundary, on the pilgrim road from Mesopotamia to the Persian interior, are seepages of oil near the town of Kasr-i-Shirin. The uncertainty of the course of the international boundary at this point makes it impossible to say with certainty whether the individual occurrences are in Turkey or Persia. The oil seeps from a sandstone exposed in a small creek valley on the axis of an anticline in the Tertiary strata which form the hills in the vicinity of Kasr-i-Shirin, and is accompanied by salt water and some ozokerite. In 1901 D'Arcy drilled to a depth of nearly 3,000 ft., with discouraging results, but later attempts are said to have met with more success.

OCCURRENCES IN PERSIA

The principal oil belt in Persia is a continuation of the Mesopotamia area. Extending in a northwest-southeast direction along the western frontier and the Persian Gulf, seepages and other indications of oil occur in well-distributed succession from the region north of Shustar to the southeastern corner of the country, comprising an area about 1,000 miles long and 100 miles wide. Actual production is confined as yet to comparatively small areas, but the success of operations in those areas

which have been drilled, and the similarity of conditions in the remaining parts of the region, promise much for Persia in the matter of oil production.

The topography of most of the Persian oil belt is rough and mountainous. There are only a few regions of low relief in the southeastern part of the zone, along the coast of the Persian Gulf. The northern part of the main belt, which includes the Maidan-i-Naphtun field, is the most important developed oil region in the Near East. Outside of this fairly well-defined belt, there are scattered occurrences of oil in northern Persia, and it is believed that there may be another belt of similar importance along the south shore of the Caspian Sea.

PETROLEUM SPRINGS YIELD WHITE OIL

In the mountains near Shustar, which is one of the largest cities in west Persia, are four petroleum springs which yield a clear white oil that is sufficiently light for use in lamps without refining. The rocks of the vicinity are red sandstone, soft limestone, gray marls, gypsiferous marls, and black marly shale, from which last the oil seeps. The general strike of the rocks is reported to be N. 45° W., and the structure at the seepages is apparently anticlinal. About twenty-five years ago attempts were made here to obtain oil by drilling, and although large quantities of gas were found, there was no resulting oil production.

About 115 miles from Shustar, at Haf Sheid, are seepages which yield small amounts of oil for native use. The source is a bed of light yellow loam, rich in sulphur and gypsum, and the daily production of three of the springs is 90 liters. Other occurrences have been found to the north of Disful, on the Kir-ab plain. The oil springs are in a deserted spot surrounded by the high Bakhtiari Mountains, and are worked by the inhabitants of the region, the production of the year 1850 being approximately 20,000 kg. Strata of sandstone, marl, and gypsum in disturbed position form the surrounding region.

THE RICH MAIDAN-I-NAPHTUN FIELD

To the east of Shustar lies the producing field of Maidan-i-Naphtun, where the Anglo-Persian Oil Co. has enjoyed great success since 1908, in which year D'Arcy drilled the first well. The oil-producing region is situated in the foothills of the Bakhtiari Mountains, a wild and barren spot which in summer is intensely hot. Evidences of oil are to be found on every hand for great distances about, and following the unsuccessful attempt in the district of Kasr-i-Shirin and in the southern part of the Anglo-Persian concession, D'Arcy moved the drilling equipment to Maidan-i-Naphtun. His initial success there has been followed by further drilling, the succeeding wells all flowing under strong pressure, and after ten years or more of phenomenal production showing no signs of exhaustion. Several geologic surveys of the region have been made, and the information amassed to date is sufficient to indicate tremendous reserves of petroleum, which definitely establish the position of Persia as one of the world's leading producers of crude oil.

From the Maidan-i-Naphtun field the oil is conveyed by two pipe lines, one six inches and the other ten inches in diameter, to the refinery at Abadan, an island at the head of the Persian Gulf. Upon the completion of pumping stations now building or projected the line will have a capacity of 22,000,000 bbl. a year. The refinery,

which had an initial capacity of about 1,750,000 bbl., has been enlarged, and is now able to treat much of the company's production. The oil is reported to be of high grade, containing a very large proportion of gasoline and kerosene of high quality, excellent lubricating oils, fuel oils of good quality, and a good percentage of paraffin.

KARUN VALLEY WELLS OF ANGLO-PERSIAN COMPANY

South of Maidan-i-Naphtun, in the Karun valley, are other evidences of petroleum. Near Band-i-Kir are seepages which have long been used by the natives, and at White Oil Springs, 54 km. southeast of Maidan-i-Naphtun, are producing wells of the Anglo-Persian Co., which are connected with the refinery at Abadan by the pipe line above mentioned. There are no surface indications of oil at this point.

About 250 km. southeast of Shustar, in the general vicinity of Ram Hormus and Shardin, are occurrences of petroleum which have been described by several travelers. Seepages about 16 km. southeast of Ram Hormus afford a local supply of petroleum and a thick oil, which is used as a varnish; and at Shardin are beds of hard bitumen up to thirty inches thick. Shallow wells drilled at Shardin have yielded a good quantity of oil, and a deep well drilled there in 1908 is said to have flowed under appreciable pressure.

A series of occurrences from Babahan, at the upper end of the Persian Gulf, to the vicinity of Jask, on the Gulf of Oman, give ample evidence of the continuation of the Karun oil belt along the Persian coast and in the southern interior. Near Babahan is a locality at which bituminous material oozes out of the rock, and at a point south of the road between Babahan and Isfahan are deposits of asphalt and bitumen.

The most productive occurrences of southern Persia are at Daliki, a stopping place on the road from Bushir to Shiras, 80 km. from the coast. Here oil flows in large quantities from a bed of limestone, and travelers report that in hot weather the air is almost saturated with the vapor of naphtha. The springs are worked on a small scale for native use, and attempts at more extended operations have not thus far met with success. The yield of all these springs has been noticed to increase materially immediately after earthquakes.

OIL SPRINGS OF KISHM

On the Island of Kishm, west of the narrows separating the Persian Gulf from the Gulf of Oman, are springs in which the oil issues from a sandstone which is said to be of Lower Miocene age, but which does not seem to be the original source of the oil. Drilling carried on here by the Mining Rights Corporation achieved little success, and later attempts are said also to have proved fruitless. On the mainland opposite the island are small occurrences at Latihun and Chamaevallah, and other indications of smaller importance have been reported from localities in the same general region.

In middle and north Persia are many localities which give evidence of petroleum. There are strong suggestions of an oil zone extending for 600 miles along the south coast of the Caspian Sea, from the Elbrus Mountains, at Ardabil, to Shah-Kuh-i-balae, 40 km. south of Astrabad, and on the east coast seepages are known to exist. However, the geological features of the region are too little known to admit of more than a supposition.

The petroleum zone of Kasr-i-Shirin appears to be continued through the Province of Kermanshah as far as Hamadan and perhaps farther. Oil springs have been reported in this region, and De Morgan states that oil is brought to market at places in the province, but here the evidence is likewise too meager to permit of definite statement. Drilling in the Province of Kermanshah has disclosed the presence of gas, but no oil is mentioned.

ARABIAN OCCURRENCES

On the Arabian side of the Persian Gulf occurrences of oil are known to exist at Basra, where the presence of bituminous matter has been known since ancient times; and on Bahrein Island, where a deposit of asphalt very much like that of Trinidad was discovered in 1902. Indications of petroleum are said to be present also near Koweit, at Benaïd el Oar. Travelers sailing along the gulf have reported the presence of oil on the water in the vicinity of Farsi Island, and a similar occurrence is said to be noted between Kubbar (Khubla) and Garu islands. Arabian sailors say that such occurrences are frequently noted in many parts of the gulf.

Further data concerning the indications of petroleum in Arabia are not available, and indeed so little is known of the country, as far as the geology is concerned, that it is not possible to suggest anything concerning its promise as a future source of oil beyond the obvious inference that the indications so far known easily justify further carefully directed investigations.

SYRIA AND PALESTINE

Occurrences of asphalt and bituminous limestones, as well as showings of petroleum, are distributed throughout Syria and Palestine. Many of the deposits in Palestine were important sources of oil and asphalt in ancient times, and at the present time some of the more favorably located occurrences are being exploited profitably for both local and foreign trade.

On the east coast of the Gulf of Alexandretta, at the upper end of the Syrian coast, several small brooks flowing from Alma Mountain show traces of oil, and in the vicinity of the city of Alexandretta some drilling was done in the 90's, although apparently with no success. Farther down the coast, in the neighborhood of Latakia (Laodicea, Ladikije) are beds of asphalt and bituminous limestone, which are mined at several small villages, the most important of which is Kefrie.

In the Beirut province, 56 km. south-southeast of the city of Beirut, are deposits of asphalt at the town of Hasbeya, in the upper Jordan valley on the west slope of the Hermona Mountains. Here occur beds of pure asphalt as thick as 4 m., and much greater thickness of limestone containing 10 per cent of bitumen, from the rubble of which the asphalt is extracted either by solution in benzene or by mechanical concentration of the crushed rock. The yearly production of the locality is said to be between four and five hundred tons of asphalt, which could be increased by better methods.

There is a very rich deposit of bituminous limestone in the valley of the Jarmu, a stream flowing into the Jordan to the south of the Lake of Genesareth, at which place drilling just before the outbreak of the recent war is said to have disclosed petroleum at a depth of 400 m. Outcrops of asphaltic limestone have been noted at Mrani, about eight miles from Mezrib, at Ain-el-Tineh, north of Damascus, and at Sunuhre. Seepages of petroleum are found between Katrane and Kerak.

The region about the Dead Sea has been known since ancient times for its deposits of asphalt, and at present the natives exploit the better occurrences by rather crude methods, though, despite the good quality of the asphalt, and its consequent high market value, the trade in it is not actively carried on, and production is small. The asphalt, which is apparently the residual product of partial evaporation of petroleum, occurs in Cretaceous limestones and sandstones, in Pleistocene formations, and in the Dead Sea itself as floating lumps, which, having been separated from deposits along the shore and on the sea bottom, are brought ashore by the natives for local consumption.

ASPHALT MASSES RECOVERED FROM SEA

On the southern coast of the Dead Sea, southwest of Masada and near Djebel Usdom, is an asphalt conglomerate which contains 18 per cent pure asphalt. Not far distant from the asphalt outcrop are several oil seepages. On the northeast coast, in the lower course of the Wadi Muhamvat, the upper Cretaceous dolomites are veined with asphalt, and are of rather high bituminous content. On the east coast are seepages of a viscous, barely fluid asphalt at Ain-el-Hommar, where the asphalt gathers until the mass breaks off and falls into the Dead Sea. In the Juda desert, at Nebi Musa, on the northwest shore, are bituminous limestones which have been reported to contain 25 per cent of asphalt, and which are burned by the natives to make lime for plaster.

At many other places in the Dead Sea region the Cretaceous limestones and sandstones are charged with bituminous material. The occurrences of greatest importance to the natives, however, are the masses which rise occasionally to the surface of the sea and under the influence of the wind and waves drift to the shore. It has been noted that after earthquakes unusually large masses make their appearance. Following the shock of 1834 there appeared a mass from which the Arabs obtained twenty tons of pure asphalt, and after the earthquake of 1837 another mass, from which fifteen tons were obtained, rose to the surface. Smaller masses, which appear at the surface from time to time, are gathered by the native Arabs and sold at the market in Jerusalem.

Prospecting and Exploitation of the Oil Fields

LEGAL CONSIDERATIONS

The apportionment of mineral land concessions in Turkey and Persia has always been purely a political and diplomatic procedure, involving negotiations between diplomats and capitalists, and in consequence the matter of national interest has figured prominently even when the mineral rights have been sought by private individuals.

A source of much difficulty in the settlement of territorial rights has long been present in the form of the Turko-Persian boundary disputes. The uncertainty of the location of the national frontier, particularly in oil-bearing regions, has led to questions of concession tenure and caused considerable trouble, particularly in English companies whose oil fields are in disputed territory.

Since the Turko-Persian War of 1823 a long series of attempts at reaching a decision concerning the boundary has failed, despite the activity of numerous commissions and deputations of both interested and foreign powers.

Co-operation between England and Russia brought about an understanding between Turkey and Persia in 1913, the result of which was the erection of 223 boundary monuments, but the matter is not yet entirely settled.

The most important points on the boundary are the Karun region, the Kasr-i-Shirin district, and the Urmia region. In the Karun region the English interests have protected their holdings by reaching a friendly agreement with the Sheik of Mohammerah, but the boundary in the Kasr-i-Shirin district has been the source of conflict between Turkish and Persian troops, and as, through Turkish invasions in 1913, the region about Tschiasurk then became Turkish territory, the question of boundary regulation at this point in particular has become an important political problem.

Other difficulties in the exercise of concession rights have been found in the application of the land laws of Turkey and Persia. The Turkish law in particular was very complex and difficult to apply. Divisions of land into classes which were hard to define, and mining conditions which were not easy to follow, made prospective development a rather unsure undertaking, and it is to be

branch of commerce, including not only natural resources of all kinds, but also building and manufacture, banking, railway building and operation, and general financial activity. It failed, as did many other attempts on the part of outside interests, to establish business in Persia between 1872 and 1888.

FAILURE OF PERSIAN BANK MINING RIGHTS CORPORATION

After the opening of the Karun River to shipping in 1888, the number of concessions increased greatly. The Persian Bank Mining Rights Corporation, Ltd., in 1890 gained the privilege of exploiting undiscovered mineral land, but after spending its capital in fruitless exploration the company failed in 1894, and the French lost an opportunity to gain mineral rights of considerable value, chiefly through the counter-activity of the Russians and the English, in 1898. The history of English control of the oil industry in southern Persia begins with the granting to W. K. D'Arcy, in 1901, the rights of the Persian Bank Mining Rights Corporation. The detailed conditions of this agreement were not published beyond

TABLE I. SUMMARY OF CONCESSIONS AND CORPORATIONS IN SOUTH PERSIA SINCE 1901

Date Granted and Term	Owner	Character, Rights, and Locality	Remarks
901-60 years	W. K. D'Arcy.....	Monopoly for the exploitation, sale, and export of petroleum and its products in all of Persia excepting the five northern provinces.	1. All unimproved lands offered free of cost and taxes. 2. Exemption from import or export duties. 3. Sixteen per cent of net earnings to be paid to the state. 4. After 60 years properties and improvements revert to the state.
1903	First Exploitation Co.....	Established for development of the D'Arcy concession. First operation in the Karun River region. Later limited to an area of one square mile in the Maidan-i-Naphtun field.	Founded by D'Arcy with the aid of the Burma Oil Co.
1905	Concessions Syndicate, Ltd., Glasgow.	Established for the development of the D'Arcy concession.....	Mainly owned by Burma Oil Co.
1906-110 years	Persische National Bank....	Prospecting and development of meta's from vacant and state-owned lands.	Presumably a German corporation.
1909	Anglo-Persian Oil Co., Ltd., London.	Formed to take over the D'Arcy concessions and most of the stock of the First Exploitation Co., and the Concessions Syndicate.	Control of directorate by British Government.
1909 1915	Bakhtiara Oil Co..... Tanker Co.....	Subsidiary of Anglo-Persian. Subsidiary of Anglo-Persian.	

hoped that the distribution of authority over Turkish territory resulting from the war will bring about a simplification of the law.

Persia has no definite mining law. According to the Persian constitution of 1906 the granting of concessions was put within the power of Parliament, but an exception was made if the interests of the Persian government or people make advisable a special arrangement, and in such cases the consent of the Parliament was not necessary. However, these conditions have no practical interest at present, as under existing conditions they are no longer in force.

PETROLEUM CONCESSIONS IN SOUTH PERSIA

The weakness of the Persian government and the strength of Russian-English competition were important features of the history of concession granting in Persia during the nineteenth century. The advance of loans, and even military protection by stronger powers whose subjects were interested in developing natural resources, brought the Persian government nearer and nearer to complete dependence on outside assistance, until at present the production of mineral commodities, particularly of petroleum, is almost entirely in the hands of foreign interests.

The first grant of importance, the Reuter concession of 1872, was the cause of much international strife. The result of a strong political movement on the part of the English, it embodied sole rights to practically every

the statement that 16 per cent of the net earnings of the company were to go to the Persian government.

In 1909 the Anglo Persian Oil Co. was formed to take over the D'Arcy concession. (See summary for details.) An important feature of this grant was the promise of full protection to the enterprise from attack by hostile natives, and a guarantee of reimbursement for loss by damage to any of the property of the company. In a country as wild as the Persian interior this is a provision of great value. In 1914 the British government entered the company, obtaining important representation on the directorate, and later arrangements made the government the dominating interest.

RUSSIAN CONCESSIONS IN NORTH PERSIA

Before the war Russian political and economic influence in northern Persia was so great that no other powers considered the territory in their search for mineral land, but recent developments have made the tenure of monopolies there a matter of doubt, and the strength of any national interests will naturally depend on the outcome of the diplomatic negotiations now in progress.

The history of Russian attempt at monopolization of the mineral resources of Persia begins with the plans for railroad and highway construction made in 1874 and 1882. Both of these plans failed, but later arrangements, details of which are set forth in the following table, afforded Russian capital the opportunity to com-

plete for itself a thorough grasp on the natural resources of the northern provinces of Persia, and from the date of the first successful enterprise of Mr. Sapekhdar in 1896 the record of Russian activity is one of success. With the granting of the concessions of 1916 (see summary) the monopolization of the petroleum resources of Persia was made complete.

CONCESSIONS IN MESOPOTAMIA

European capitalists began to take active interest in Turkish mineral resources in the middle of the nine-

The shortage of fuel and illuminating oil in Mesopotamia during the war brought about an attempt to increase local production, but such efforts as were made did not achieve much success.

AMERICAN INTERESTS' ACTIVITIES

American interests began to try to gain a foothold in Turkey in 1910, when the "Chester Project," believed to have been sponsored privately by the Standard Oil Co., was involved in a long series of negotiations concerning the construction of a railway and the exploitation of the

TABLE II. SUMMARY OF RUSSIAN CONCESSIONS IN NORTH PERSIA SINCE 1896

Year Granted and Term	Owner	Character and Locality	Remarks
1896-99 years	Mr. Sapekhdar.....	Development of oil resources in Tunekaoun, Rujur, and Kalalestag.	
1902-75 years	Russian Discount and Loan Bank.	For the construction of a road from Julfa via Tabris to Kasuin and for exploitat'on of petroleum and coal 63.9 km. on both sides.	Twenty per cent of the returns to be paid to the Persian government.
1915-99 years, beginning one year after the end of the world war.	A.M. Khoshtaria.....	Purchases Sapekhdar concession for 50,000 rubles, and acquires exclusive prospecting, development, and export rights for petroleum, gas, asphalt, and ozokerite on all other state and private lands for 70 years.	Sixteen per cent of return to be paid to the Persian government, and 6,000 rubles for the salaries of Persian commissioner. Advance of 100,000 rubles to the state. Royalty of one kopeck per pood. Owner has right to dispose of the concessions and to form subsidiary corporations. Free importation of all materials and free use of state lands.
1916	Russian Persian Oil Production & Trading Co., Repento.	Acquires Khoshtaria concession.....	All preliminary investigations to be completed not later than one year after the end of the world war.

teenth century. The Crimean War, which brought Turkey into the group of larger European powers, was followed by a period of business activity in the East, during which banks were established by the English and French, and the first attempts at extensive exploitation of the oil occurrences were made. Most of the early schemes for the development of Turkish oil territory failed, and, indeed, during the entire latter half of the nineteenth century no important progress was made toward the discovery and utilization of the petroleum resources.

Between the years 1854 and 1875 a swarm of speculators entered Turkey, the absence of sound business principle in their dealings being a drawback to development, and the panic of 1875, with its attendant political unrest, made it unprofitable for foreign interests to concern themselves with Turkish prospects for a number

mineral resources, chiefly oil, on either side of the right of way; but the concession asked was not granted. French capitalists, too, became interested in Turkish oil land at about this time.

The progress of advance made by German capital toward obtaining oil rights in Turkey, which began in 1903, is not entirely clear. In 1905 the Deutsche Bank sent a commission to Mesopotamia to study the oil lands, the substance of whose report was that the occurrences appeared to be local in extent; and that there was not sufficient evidence of continuous oil-bearing horizons to warrant the large expenditure involved in drilling in so distant and inaccessible a place. They considered that it might be worth while to drill at Gajara. The most prominent members of this commission were Dr. Kissling, of Berne; Dr. Backing, of Strassburg; and Dr. Cesare Porro, of Rome. As a result of the unfavorable

TABLE III. SUMMARY OF CONCESSIONS IN MESOPOTAMIA

Year Granted and Term	Owner	Locality and Terms	Remarks
1903-99 years	Société Imperiale ottomane du Chemin de fer de Bagdad.	Concession to build railroad from Konia to Basra with branch lines. Mining rights in territory 20 km. on either side of railroad. The company to receive 350,000 francs yearly from the Turkish government to defray expenses.	Concess on for exploitation of oil field unsettled. Commission to study situation appointed 1905. Rights transferred in 1912 to the Turkish Petroleum Co., in which the Deutsche Bank, as part owner, was given stock to the value of £20,000.
1910	Ottoman-American Development Co. "Chester Project." Dr. B. M. Glasgow, representative for J. G. White & Co., New York.	Negotiations entered into concerning construction of railway from the Black Sea to Mossul and exploitation of mineral resources 20 km. on either side of line.	Concession not granted.
1914	Turkish Petroleum Co., London	Development of oil fields in Vilayet Mossul.....	Acquired rights of concession of 1903. Originally 50 per cent British, 25 per cent German and 25 per cent Dutch.

of years. During this time several unsuccessful attempts were made by the Turks themselves to produce oil.

In the time of Abdul Hamid further political turmoil held back development and increased Turkey's dependence on outside powers. The result of these disturbances was an increase in the keenness of competition among foreign powers in their efforts to gain political control in Turkey.

In the period just preceding the recent war several companies are said to have been formed, but nothing has been heard of activity on the part of any one of them.

report of the commission the Deutsche Bank allowed the concession rights of 1903 to lapse.

IMPORTANCE OF NEAR EAST FIELD TO ENGLAND

The economic importance of the Mesopotamian oil fields to the English, due to their nearness to the holdings of the Anglo-Persian company in Persia, is clear; and it is interesting to note that the boundary disputes, which threatened constantly to change the political control of some of the oil fields, caused the English little anxiety, as their interests were protected by the Anglo-

Persian concession as long as the territory remained under Persian control, and an agreement with the Turkish Grand Vizier Hakki Pasha (?) gave them promise of concessions in Mesopotamia which would guarantee the safety of their holdings in the event that the Turks gained the territory.

CONCESSIONS IN ASIA MINOR, SYRIA, AND PALESTINE

The isolated petroliferous occurrences of Turkey have also been the object of negotiations concerning concessions. In 1889 a company was formed in Basel, Switzerland, with a capital of 5,000,000 francs, for the purpose of exploiting oil springs at Dschebel Musa, near Antioch, and others on the Gulf of Alexandretta, but after three years of prospecting the company failed. During the years 1892-1895 the Vereinigten Deutsche Petroleumwerke drilled at Alexandretta, with no success.

The occurrences in Vilayet Erserum have been sought by several groups of capitalists. They are said to have been granted to a Turk in 1906, and later several international financiers supposedly obtained the concession. In 1914 the Standard Oil Co. sent men to prospect the locality.

The Red Sea fields never has quite equaled the capacity of the refinery, the company has accepted crude from other fields so that it might utilize the full resources of the plant, and in the earlier days of the Anglo-Persian activity in Persia, part of the Maidan-i-Naphtun oil was treated at Suez.

The Eastern Petroleum Co., which is an outgrowth of the Sinai Petroleum Syndicate, owns three concessions on the Gulf of Suez. The Fersan Islands Oil Co. was formed in 1912 to work oil lands on the Fersan Islands, at the south end of the Red Sea.

Brief Notes on the Geology of the Oil Belt

The geological characteristics of the regions mentioned in this report are known only in incomplete details. With the exception of the region surrounding the Maidan-i-Naphtun field, which has been studied by the geologists of the Anglo-Persian Co., geologic knowledge of the Persian oil territories, being almost entirely the result of hurried examinations, is fragmentary; and even less is known of the other regions in the Near East. Over most of these countries the only regions which have been brought to the attention of the outside world as possible oil fields are those in which seepages or other

TABLE IV. SUMMARY OF CONCESSIONS IN ASIA MINOR, SYRIA, AND PALESTINE SINCE 1906

Year Granted and Term	Owner	Locality and Terms	Remarks
1906	General Zeki Pasha.....	Oil concessions in Vilayet Erserum.	
1907	Company for construction of Hedja Ry.	Oil rights at Heraclea.	
1909-99 years	Société minière syrienne Haiffa	Oil and asphalt rights in Vilayet Damascus.....	Took over older concessions.
1912-99 years	Syrian Exploration Co., Ltd., London.	Took over rights of Société minière syrienne, including 60,000 acres of oil land in Vilayet Damascus.	Royalty of 10 per cent, including annual rents of 10,000 francs. Under direction of Dr. G Schumacher, Haiffa.
1913	British Ottoman Oil Syndicate, London.....	Negotiates with E. A. Abravanel for purchase of a concession in the village Ayghim Veran, Boyobad district.	
1913	Prince Jussuf Pasha Kamel...	Development of petroleum and asphalt in the Beirut province...	
1914	Standard Oil Co., New York..	Examined concessions in Vilayet Erserum.	
1915	Latakia Oil Co.....	Asphalt and oil production at Latakia.....	Purchase of older concessions.
1916	Standard Oil Co., New York..	Prospecting for oil and asphalt in the Dead Sea region.....	Acquired seven oil concessions southwest of the Dead Sea from local owners, as well as the sulphur, bitumen, and phosphate deposits of the surrounding region.

Many attempts have been made to mine on a large scale the asphalt deposits at Latakia, but difficulties of transportation and handling the material prevented the success of the undertakings. The summary given herewith gives the essential details known of other concessions granted and operations carried out at Beirut and in the Vilayet Damascus.

In 1914 the Standard Oil Co. sent a corps of geologists, engineers, and laborers to explore the Dead Sea region, and the party had just completed organization in the field for carrying out the work when the outbreak of the war put an end to its activity.

CONCESSIONS ON THE RED SEA

Many English companies are producing oil in the territory fronting the Red Sea. For a long time the operations were carried out by a large number of small companies, which later led to the formation in 1911 and 1912 of three larger companies, the Fersan Islands Oil Co., the Anglo-Egyptian Oilfields, Ltd., and the Eastern Petroleum Co. The Anglo-Egyptian Oilfields, which is a branch of the Shell Trust, controls the fields at Jemsah and Hurgada, whose annual production reached 128,998 tons in 1917, and owns the refinery at Suez, which is connected with Port Tewfik by four pipe lines and has a monthly capacity of 15,000 tons. As the production of

showings of petroleum exist. The vast areas in which development might be successfully guided by detailed geologic information have not been touched, and a comparison of the sum total of geologic exploration here with that of any of the great producing fields of today shows at once the tremendous opportunity offered by the practically unknown territories of southwest Asia.

In the Mesopotamian-Persian belt the oil occurrences are situated in the low hills skirting the main mountain ranges, in a zone about 1,200 miles long, parallel to the general direction of the Persian Gulf. The mountains, which in places attain elevations well above 16,000 ft., are formed mainly of older rocks overlain by Cretaceous and Tertiary sediments, and the slope from the mountain wall to the valley of the Tigris and Euphrates, on which most of the oil seepages have been found, is formed mainly of Tertiary beds.

In Mesopotamia, Maidland has distinguished four anticlines, all parallel to the general trend of the belt. The largest extends from a point northwest of Mendeli to the Tigris and thence northward to Hammam Ali. A second extends from Khanikin to Altun-Kopru; a third lies parallel to the Kara Dagh, and the fourth extends to the northwest from Suleimanje. The surface formations of this region are all Tertiary, and are apparently chiefly Miocene in age.

In the Maidan-i-Naphtun field the chief petroliferous beds are members of the Fars series, of Miocene age. A portion of the Tertiary section of this region is as follows:

Bakhtiara series, Pliocene, 15,000 ft.	{ Upper: massive conglomerates. Lower: clays, sandstones, shales, conglomerates.
Fars series, Miocene, 7,200 ft.	{ Upper (arenaceous): clays, shales intercalated red and brown sandstone. Middle (transition): clays, shales, intercalated gypsiferous limestone and sandstone. Lower (gypsaceous): massive gypsiferous shale, clay, and intercalated limestone. <i>Main oil zone.</i>

The oil occurs chiefly in detrital vesicular limestones of the Lower Fars series. There are seepages from the Middle Fars at places, but the only locality at which it has been tested by drilling is at White Oil Springs, where a show of white, naturally refined oil was en-

ing. To the east of Tabris are Mesozoic formations, with deposit of rock salt and gypsum, and about Serab carboniferous shales are found.

To the south of Serab is a long anticline, along which oil and gas are said to escape at places. The question as to whether this general region is geologically a continuation of the rich Baku field has given rise to disagreement among the geologists who have visited it. Tiehe thinks it is not to be connected directly with the Baku area, and others apparently believe that it is. Beyond the fact that locally, at least, a similarity to the Baku geology has been reported, not enough is known of the region to justify definite statement of conditions.

In the Dead Sea region the asphalt, which is undoubtedly the product of the evaporation and oxidation of

TABLE V. SUMMARY OF CONCESSIONS AND CORPORATIONS ON THE RED SEA SINCE 1907

Year	Owner	Conditions, Locality, Capitalization
1907	Anglo-Saxon Petroleum Co., Ltd., London.....	Total capitalization to 1914, £18,000,000. Subsidiary of Shell-Royal Dutch combination.
1907	Egyptian Oil Trust.....	Took over shares of Cairo Syndicate and later in part absorbed by Anglo-Egyptian Oilfields.
1909	Eastern Petroleum Co.....	Oil concessions on the Jubal Islands. One concession on the Gulf of Suez sold to the Suez Oil Co.
1910	Suez Oil Co., London.....	Formed to buy twenty-five square miles of oil land on the Gulf of Suez near Anglo-Egyptian properties from the Eastern Petroleum Co., the Jemsah Syndicate, and the Isthmian Oil Co. Also obtained four concessions at Jemsah from the Egyptian Government.
1910	Red Sea Oilfields.....	In part absorbed by Anglo-Egyptian Co.
1910	Sinai Petroleum Syndicate, London.....	Purchased from the Cairo Syndicate twenty-five square miles of prospective oil lands on the Gulf of Suez.
1911	Anglo Egyptian Oilfields, London.....	Absorbed many minor companies. Egyptian government represented on directorate and owns shares. Properties at Memsah, Hurghada, and on Gulf of Suez.
1911	Asiatic Petroleum Co. (Egypt), London.....	Selling organization of Anglo-Egyptian.
1912	Fersan Islands Oil Co., Ltd., London.....	Purchased from the Turkish government concessions on the Fersan Islands, at the south end of the Red Sea.

countered. The Upper Fars is in general considered unpetroliferous.

The structure at Maidan-i-Naphtun is anticlinal, with many minor modifications and faults. There is also an anticline at White Oil Springs.

Along the coast of the Persian Gulf, in the south-eastern extension of the Mesopotamian-Persian oil belt, most of the seepages issue from the Nummulitic series of the Eocene and Oligocene, with a few occurrences in the Fars. As a whole, the region does not appear as promising as does the Bakhtiari country, but in the absence of detailed knowledge no intelligent prediction can be made. The presence there of members of the oil-bearing series, together with surface showings and a series of anticlinal structures along the south coast, will undoubtedly offer sufficient encouragement to warrant thorough investigation within the next few years.

On the Island of Kishm, at the narrows separating the Persian Gulf from the Gulf of Oman, there is a series of gentle domes lying along an axis whose strike is E. N. E.-W. S. W., and extending the length of the island. The Upper Fars beds form most of the island, but there are outcrops of the Hormuz (Upper Cretaceous) series, and of the Tersai (Pliocene) series.

CONFLICT OF GEOLOGICAL OPINION

The geology of the north Persian area, the possible belt along the southern shore of the Caspian Sea, is not only imperfectly known, but there is a difference of opinion among the men who have thus far reported on it. In the region between the Caspian Sea and Lake Urumiah the formations are apparently chiefly Tertiary in age, with some areas of Carboniferous rocks. At Ardabil, extensive shell beds are found resting on Pliocene sediments similar to those at Baku. The structure is apparently complicated, with much folding and fault-

ing. petroleum, occurs in Cretaceous dolomites and to some extent in Pleistocene deposits. On the Red Sea a Miocene series which has been correlated with that of the Mesopotamia region is present. Oil is produced from the horizons on the Egyptian side, but so far more is known on the Arabian coast of the sea.

Pipe-Line Construction in Poland

Work is proceeding on the construction of an oil pipe line from Drohobycz to Danzig, 621 miles in length, according to *Kurjer Warszawski*. Some time ago a pipe line was constructed from Baku to Batum, a distance of 683 miles. This pipe line has as object the pumping of petroleum directly from its sources to the Polish littoral and its exportation thence in foreign bottoms, supplying on its way the different Polish towns.

Oil and Coal in Costa Rica

The Sinclair Oil Co. has spent about \$50,000 in drilling for oil in the Pacific slope area of Costa Rica, but the results have not been encouraging. The company still holds a government concession, but has allowed some of its private land contracts to lapse. There are indications of oil also on the Gulf of Mexico slope, and though options have been taken there, no work has been done to explore in this part of the country.

In the gulf slope region, coal has been discovered, and efforts are being made to interest American capital in its exploration. It is claimed to be a bituminous lignite and to be fairly high in carbon, with a high volatile content and no sulphur. As practically no coal is used in Costa Rica, owing to the climate and the great abundance of cheap electricity, the market will have to be found outside, either at Panama or in Cuba.

NEWS FROM THE OIL FIELDS

July Production in Coastal Fields Shows Gain

Other Districts Increase—Wildcat Wells in Eastland County, Tex., Heavy Gassers

From Our Special Correspondent

The coastal fields made a large increase in production during the last week in July. No. 1 Abrams well of the Texas Co., at West Columbia, Brazoria County, the big gusher, has increased its flow to 26,000 bbl. of oil daily. This is being made, too, with the drill stem and bit in the hole. It is impossible to set screen against the tremendous pressure, and some concern is being felt lest the sand coming up with the oil cuts out the casing before the top pressure subsides enough to permit removing the drill stem and setting an oil string and screen. Another big well in this field is the most easterly of the Humble Oil & Refining Co., flowing 10,000 bbl. daily.

An important completion at Hull, Liberty County, is the No. 14 Phoenix of the Gulf Production Co., which came in at 2,600 ft., making 4,000 bbl. of oil a day.

In Stephens County the production has also fallen off a little. New wells are being brought in frequently in the Breckenridge town site field, and apparently this district will develop into a larger producer than at present. In the Caddo field of this county the American Oil Engineering Co. has worked over its Standard No. 2 well, securing an initial production of 2,000 bbl., and which it is believed will stabilize at about 2,300 ft. A pipe line was completed last year, making 4,600 bbl. a day, and subsequently went dead.

Two wildcat wells of great interest were completed in Eastland County recently. One, the Terry Jacobs well of the Rising Star Production Co., is two and one-half miles northwest of Rising Star. This well is making a small production by flowing by heads from a depth of 2,460 ft. It is also gassing heavily. Storage capacity is being built before testing the well out further. The other wildcat well is the Prewett of the Pittsburgh Western Oil Co., half way between Carbon and Sipe Springs. It is making a small flow by heads from about 2,300 ft. A pipe line is being built.

The Texas Pacific Coal & Oil Co. has brought in a big gas well, the Riebe well, eight miles north of Strawn, Palo Pinto County. This well is said to be making thirty to forty million cu.ft. of gas daily from a depth of 3,700 ft. The Garner well, also a big gas producer, southeast of Strawn, is also owned by this company. It is believed that the district may develop into a large gas producer.

Oil Placer Claims Take Precedence Over Homesteads

From Our Special Correspondent

Homesteaders who have recently been filing on oil-shale lands in Garfield County, Col., are facing the loss of their homesteads if those who have previously filed placer claims avail themselves of their rights under the law. It appears that considerable land north of the valley of the Grand River in Garfield County have been designated as oil-shale lands, and are to a large extent covered with oil-shale locations. These lands are also being entered under the homestead law, resulting in conflicting claims between homesteaders and placer claimants.

As to the rights of the respective claimants in a situation such as this the Commissioner of the General Land Office at Washington has advised the local field division of the U. S. Land Office that the placer law as to oil shale is repealed by the leasing act of Feb. 25, 1920, since which date no further placer claims may be initiated for oil-shale lands. However, as to oil-shale placers located prior to the leasing act, if same were lawful, complete, and perfected by discovery prior to the act, the land being vacant and open to location at the time the location was made, such claims would operate to segregate the land. The claimant of such a claim would doubtless prevail in a contest against a conflicting subsequent agricultural claimant. In such a case the placer claimant should proceed to protect any interests he may have, as the land department has no record of mining locations in the absence of an application for patent. In case the land is covered by a mineral application for patent no other application should be allowed, but if the agricultural entryman is prior in time to the placer locator such location would be ineffectual unless the agricultural claim was an entry under the grazing act, which reserves all minerals subject to appropriation under the existing mineral laws.

High Prices Stimulate Formation of New Companies in California

The high price of crude oil has led many interests in California to form new companies during the last few weeks. The majority of the companies plan to develop the southern sections of the state, having in view the country about Orange, San Diego, and the Imperial Valley. Much work in the southern fields has been held up from lack of materials. The Shell Co. plans spending several hundred thousand dollars in the development of the new oil field in the Buttonwillow district, thirty miles west and a little north of Bakersfield.

Large Gas Well in Barren County —Other Kentucky Fields

From Our Special Correspondent

A gas well said to be the largest ever found in Kentucky, and estimated at a production of 50,000,000 cu.ft. of gas daily, was brought in on the B. L. Smith farm, in Barren County, last Wednesday by Merry Brothers. Oil men of Louisville who have discussed the report seem inclined to accept it as an accurate estimate.

Stockholders of the Old Dominion Oil Co. during a recent meeting voted for the consolidation of the company with the Superior Oil Corp. to form a new syndicate belonging to the Atlantic Refining Co. The deal has been pending since May 3, and has been reported "closed" and "off" several times. The meeting today ended negotiations. The price was announced as \$5,923,007.25. The company owns extensive holdings in Lee and Estill counties.

In Warren County three fair-sized wells were brought in on the T. G. Sledge, Bailey, and Potter leases. These wells will produce between 300 and 500 bbl. daily, it is estimated. No. 3 on the Sledge lease was brought in last week, estimated as 25 to 30 bbl. The Houston Coal & Coke Co. shot a well on the farm owned by William Davenport's heirs, estimated at 30 bbl. per day. Haskell & Kerstatter, owners of the Perkins lease, shot No. 2 last week.

Calcasieu Parish, La., Active

From Our Special Correspondent

At Ederly, Calcasieu Parish, La., the old No. 29 Bright-Penn well of the Gulf Refining Co., which was worked over and brought in July 27, making 15,000 bbl. of oil a day, has been reduced to 1,000 bbl. daily by the encroachment of water. This well when first completed several months ago made only 75 bbl. of oil daily, but deeper drilling recently induced the larger flow.

In this same field the White Oil Corporation and Mrs. L. H. McMullen, of Dallas, Tex., have begun drilling on the 950-acre lease of the Union Sulphur Co. south of the present field.

At Vinton, Calcasieu Parish, the largest completion recently was the No. 7 Gray well of the Rescue Oil Co., pumping 500 to 600 bbl. daily. The chief operating companies in this field are the Gulf Refining Co., Texas Co., Gum Cove Oil Co., Rescue Oil Co., and the Vinton Petroleum Co.

Several rigs have begun drilling in the vicinity of Buffalo Gap, in the Black Hills section of South Dakota. The possibilities of oil drilling in the central part of the state will be tested before fall, as the contracts for drilling rigs have been let for a test well a short distance from Fort Pierre.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

"China—Future Mecca for Engineers"

Many Problems Await Honest Engineering Heads—Native Talent Offers Adequate Help—People Favor America

Under the above title Roy A. White writes entertainingly in *The Transit*, published annually by the College of Applied Science of the University of Iowa. "China," he writes, "today offers perhaps the greatest opportunity for the engineer of any country on the globe. A nation of four and one-third million square miles of territory, with over four hundred millions of thrifty, hard-working people. They have only some six thousand miles of railway, very few factories, and scarcely any of the modern improvements that we, in this country, deem necessary to everyday life. . . . With an area a third greater than that of the United States China has approximately one fortieth of our railway mileage; and in terms of per-capita per mile, while we have one mile of railway for every four hundred inhabitants, China can claim only one mile for every seventy thousand of its people."

Mongolia is comparable in area to our great West, and though it covers one and one-third million square miles it has not a single mile of railroad. Sze-Chuan (how many of our readers ever heard the name before?) an enormous inland province of seventy million people, also has not one mile of railroad; and in this province wheat brought 10c. a bushel during the war when it was selling for \$2.50 a bushel at Shanghai!

Nevertheless, in 1918, China had 5,790 miles of railroads.

"Of this mileage 3,793 miles were classified as 'Chinese Government Railways,' 1,847 miles as 'Concessional Railways,' and, besides, there were about 150 miles of private lines in operation. There were also 330 miles under construction, and if one were to take into account all the lines contracted for the figures would reach the 100,000-mile mark with little difficulty. One who is not familiar with local conditions may reasonably ask, 'Why don't the Chinese build their own railways?' Owing to the lessons of the past the Chinese have learned not to put up money for corporation uses, for, more often than not, these funds find their way into the pockets of the officials, and the railroad, or whatever the project may be, never sees more than the first stages of construction."

Railway investments in China have been remunerative; in 1917 a net surplus for all roads of over \$21,000,000 having been shown from operating reve-

nues of nearly \$64,000,000. Railways prove profitable in the beginning, being built into thickly populated districts.

"Most of the roads," Mr. White observes, "have foreign executive and engineering staffs; for instance the Peking-Han-kau line, having been built with Belgian capital, employs only Belgians on the staff, aside from the Chinese. There being no American railroad in operation, aside from a thirty-mile section noted elsewhere, there is no demand at present for American engineers. But it is hoped our financial interests will soon begin investing in that field, and then there should be a considerable demand for engineers' services. At the present time the ground is being laid for what may develop into enormous works in a multitude of fields: mining, railways, manufacturing, irrigation, forestry, and other lines."

The author points out that the Chinese in the past have accomplished great engineering feats. The canal system is thousands of miles in extent, and was begun 4,100 years ago. The Emperor Yang Ti started the Grand Canal from Shantung Province to the Yangtze River, hundreds of miles distant. During the last few centuries the canal became silted up but is now being reopened by American dredges, as a result of the researches of the American Red Cross into the causes of floods and famines.

"Another enormous engineering task which the Chinese accomplished was the building of the Great Wall. This wall has become known as one of the wonders of the world. It was built by various emperors, extending over several scores of years, and was constructed for the purpose of keeping in check the invasions of the tribes to the north and west.

"The wall starts at Shan-hai-kuan on the seacoast, two hundred miles east of Peking, and winds, in a circuitous route, westward about 2,000 miles to the northwestern corner of Kan-su, adjoining Mongolia on the north. There are many spurs to the main wall as well."

The writer observes that this great wall was built with great engineering genius, and that the lime and brick are wonderfully well preserved. He closes his article with a notable philosophic reflection:

"To the foreign well-wishers of China, who, on the one hand, see scattered all over the land such evidences of the constructive skill of that once powerful race, and on the other hand the present helpless state of affairs, a country with its customs and other taxes collected and administered by foreign powers, with its postal system

and railways under the control of and built by other nations, it is a pitiful sight and one worth studying by the leaders of those countries that are all-powerful in this day and age, lest in some future generation they too shall have suffered a like fate. Had China's rulers and officials always been as efficient as her engineers, builders and workmen, we would not see the largest country in the world today the least able of any power to protect itself from grasping neighbors."

Minerals Separation Claims and Methods Explained to Utah Mining Men

George L. Nye and Gilbert H. Montague, attorneys for the American Mining Congress, who attended the Minerals Separation hearings in New York, San Francisco and Salt Lake City, were the guests of local mining men and operators at a smoker given in their honor at the Alta Club of Salt Lake City, Utah, recently. Mr. Nye and Mr. Montague gave an interesting review of the general flotation situation in connection with the methods of the Minerals Separation corporation. The point of attack is the system whereby the corporation, by claiming the right through its contracts to all improvements on the patents made by licensees, seeks to perpetuate its monopoly,—claiming also all rights to machinery inventions and to information gained in flotation operations. The company seeks an entire monopoly of flotation in as much as when over one per cent of oil is used claim is made under another patent. No objection is made to the payment of fair royalty, although the rates asked by the company are often excessive, and should be lowered. The Minerals Separation company has very complete lists of users of flotation processes, and classification is made according to whether the users are successful and in good condition for the exaction of royalty. Classification is made by states and districts, and according to what courts the hearings will come before in case the company claims infringement. An elaborate spy system is maintained so as to keep track of the operations of users of flotation processes and their methods.

Board of Regents Can License

The Attorney General of the State of New York has ruled that the Board of Regents has the right to license the prospective members of the examining board under the new registration law and then appoint them to the board of examiners. The Board of Regents had contended otherwise.

Book Reviews

The Examination of Mines in China.

By E. M. di Villa. Cloth, 6x8, pp. 108. Printed by the North China Daily Mail, Tientsin, China.

The remoteness of China from the haunts of most mining engineers, the totally different language and customs of that country compared to those with which Americans and Europeans are familiar, and the absence of any organized geological survey, combine to make China comparatively unknown to most of us. If suddenly called to go there to examine some property many difficulties would be met. This excellent little book has been written to make it easier for those interested in mining in China to write a comprehensive report and to understand the information which a report should convey. Books of a like nature describing conditions in some other foreign countries would be a welcome addition to technical literature.

Simplicity characterizes the text. Much information is given which should be read by young engineers whose only interest in China consists in trying to persuade Charley Sing to return their laundry by Saturday night. Several pages are devoted to the basic principles of mine examination and the preparation of a report, information which applies as well to work in this country as in China. A part of the book, also of general though somewhat elementary interest, discusses ore formations and the important igneous and derivative rocks, with references to Chinese examples.

The last half of the book gives brief descriptions of the various mineral industries, separate sections being given to coal, iron, antimony, tin, zinc, gold, platinum, silver, mercury, copper, mica and oil. Representative mining costs and some valuable Chinese conversion tables occupy the last few pages.

Those who are familiar with "Mineral Enterprise in China," written by William F. Collins, and published two years ago, will find Mr. di Villa's book quite unlike the other, in that Chinese political history and conditions as affecting the mining industry receive but scant attention. We understand the edition is limited, but the author tells us he shall be pleased to send a copy to any engineer interested in China.

E. H. R.

Technical Papers

Asbestos—The Department of Mines of Tasmania has issued a thirty-one-page bulletin on "Asbestos in the Beaconsfield District." Unsuccessful operations were conducted in the Beaconsfield asbestos district, Devon County,

Tasmania, from 1899 to 1901. A revival of the industry in 1916 led to active exploitation of the best deposits known, but after two years' activity the pockety nature of the deposits, and greatly increased cost of operation, led to a cessation of mining for a second time. The purpose of the inquiry outlined in this bulletin was to determine the continuity of the deposits, and the possibility of so modifying methods as to develop continuous successful operation.

The fibrous serpentine of the area consists of picrolite, a coarse splintery variety, and chrysotile, which is the commercial fiber. Although a maximum fiber length of 4 in. has been noted, the bulk of the fiber runs from $\frac{3}{8}$ to $\frac{3}{4}$ in. A discussion of the origin of the deposits is followed by a description of the mining properties. An unusual feature is the presence of certain places of abundant fibrous magnetite. The low-grade character of the deposits may be inferred from the fact that the marketable fiber in the more important deposits constitutes only 1 per cent of the rock quarried, whereas in Canada it averages between 5 and 6 per cent. The description is comprehensive, the deductions are reasonable, and in general the publication is a valuable addition to the literature of asbestos.

Manganese—U. S. Bureau of Mines Bulletin No. 173, 209 pages, (price 30c. from the Superintendent of Documents, Washington, D. C.) is possibly the most complete and authoritative book on the subject of manganese which has been published. The eleven chapters are devoted to general information; uses of manganese other than in steel making; problems involved in the concentration and utilization of domestic low-grade ores; preparation of ore; leaching of ores with sulphur dioxide; the Jones process for concentrating ores; cost of producing ferromanganese ores; production of manganese alloys in the blast furnace; importance of allocating low-ash coke to the manganese-alloy furnaces; electric smelting; and the use of manganese alloys in open-hearth steel practice. The bulletin represents the results of work done in the course of war minerals investigations and the chapters enumerated above have already been issued separately in mimeographed form. About 95 per cent of the manganese consumed in this country is used in the steel industry. The manganese deposits of the United States are, with few exceptions, irregular, pockety, and uncertain.

Mine Warnings—Technical Paper 244 of the Bureau of Mines, (price 10c. from the Superintendent of Documents, Washington, D. C.) describes experiments on the use of stench as a warning in mines. Several substances have been used, the most favorable being butyl mercaptan, but there is no commercial source of this substance at present. However, a manufacturer is experimenting with a view to producing it. Ethyl mercaptan, butyric acid and

amyl acetate are also satisfactory. These substances are injected into the compressed air line and soon permeate every part of the mine workings. In cases of fire, the unusual smell serves as a warning to the miners to come to the surface. Suitable ventilation must of course be provided to clear the mine air after using such warnings.

Recent Patents

1,347,200. Treatment of Zinc Solutions Preparatory to the Recovery of Zinc by Electrodeposition. David Avery and Rowland T. D. Williams, assignors to Electrolytic Zinc Co. of Australasia Proprietary, Ltd., Melbourne, Victoria, Australia. Filed July 25, 1918.

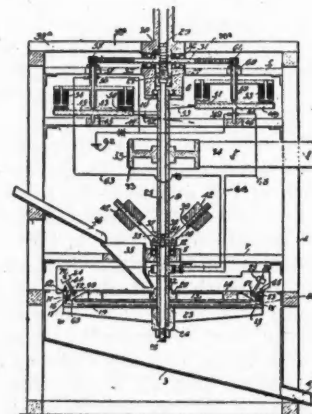
In the treatment of zinc solutions containing cobalt preparatory to recovery of zinc by electrodeposition the method of removing cobalt which comprises precipitating the cobalt by means of zinc dust in the presence of arsenic.

1,346,819. Flotation Process. Rudolf Gahl, Denver, Col., assignor, by mesne assignments, to Pneumatic Process Flotation Co., New York, N. Y. Filed Dec. 10, 1918.

A process of concentrating ores by flotation which consists in introducing additional sand substantially free from slimes into the normal pulp and subjecting the mixture to froth flotation.

1,344,519. Centrifugal Ore Separator. John Ainsworth Rice, San Francisco, Cal. Filed June 25, 1919.

In a machine for separating materials differing in specific gravity, a separating element mounted for rotation and comprising an upper member having a central inlet opening, a lower



ring-like member, a peripheral discharge opening being formed between said members, and a table between the members, and of less diameter than the members, said table extending over the opening of the ring-like member and forming with said members an annular peripheral chamber.

MEN YOU SHOULD KNOW ABOUT

Sidney Paige is engaged in an underground study of the origin of the ores of the Homestake mine.

E. O. Ulrich has just completed a study of the correlations involving Devonian and Carboniferous formations.

Kirby Thomas has returned to New York after an examination of salt and gypsum deposits in Tennessee and Virginia.

Will W. Boyer has been appointed a mineral geographer to serve with the land classification board of the U. S. Geological Survey.

F. C. Schrader, who made the original reconnaissance of the Jarbidge, Nev., district for the U. S. Geological Survey, is again in that field making an examination.

Walter L. Remick, recently assistant metallurgist with the U. S. Metals Refining Co., is now test engineer with the Research Corporation, 31 West 43d St., New York City.

D. F. Hewett has been transferred temporarily from the U. S. Geological Survey to the Bureau of Mines in order that he may make his report on Cuban War Minerals Relief claims.

Stephen Birch, president, and W. P. Hamilton, director of the Kennecott Copper Corporation, Alaska, are expected in New York this week. They have just finished an inspection of the Alaskan properties.

Marden W. Hayward, mining engineer, recently returned from a six-months' trip into Peru, Bolivia, and Chile, where he was making examinations for the American Metal Co., Ltd. Mr. Hayward's future address will be 263 South Clarkson St., Denver, Col.

J. C. Brumblay, Nevada representative of U. S. Smelting & Refining Co., returned to Reno July 30 from an extended trip into Inyo County, Cal. Mr. Brumblay has now left Reno for Salt Lake City, Utah, where he will take general charge of the field work for the Midvale plant.

H. W. Bell has been appointed to succeed R. E. Collom as head of the U. S. Bureau of Mines demonstration work in the oil and gas fields of Texas and Louisiana. Mr. Bell's headquarters will be at Dallas, Tex. He has spent the last three and one-half years as deputy supervisor with the California State Mining Bureau in the California oil fields, being last located at Santa Maria. Mr. Collom, who has temporarily been in charge of the Dallas office for the last six months, is resuming his work in the San Francisco office of the Bureau of Mines in the investigation of oil field problems.

Charles G. Yale is still in charge of the San Francisco office of the U. S.

Geological Survey, where James M. Hill is now associated with him. Mr. Hill will assist Mr. Yale in statistical work for certain periods of the year and the rest of the time will act as geologist under orders of chief geologist of the Survey. It will be his duty in that connection to attend to certain geological work in Pacific Coast States, including Arizona and Nevada, to save time by prompt investigations of matters as they come up in the San Francisco office.



H. C. WANG

H. C. Wang, vice-president of the Chinese-American Industrial Corporation, Ltd., has come to this country in the interests of his company and of his native land. The corporation, which is made up of Chinese and American business men, has among its officers some of the most prominent and influential men of North China and its object is to develop direct trade relations with American manufacturers. It would also secure American co-operation in developing China's natural, industrial and manufacturing resources.

Mr. Wang is a graduate of Peking University and a man of wide accomplishments. He was professor of mathematics at Imperial Tientsin University for five years before resigning to enter business. For four years he was in the Chinese Government Customs Service, and his services during the Tientsin flood of 1916 won him a government decoration. He was also counsellor of the Tientsin Chamber of Commerce, and for 13 years president of the Y. M. C. A. in that city.

Mr. Wang, who is probably the first native merchant of North China to come to this country, is also a gentleman of some property. He is owner of a tannery, of the Yung An gold mine, and secretary of the Kailan Mining Administration, which is the largest coal mining company in China, producing 14,000 tons daily and employing 20,000 men.

Alexander Anderson, mining engineer of Edinburgh, and representative of interests in China and Sumatra, is in the United States for a few months on a tour of inspection to study certain mining problems. He expects to visit some of the principal mining districts here, particularly the oil fields. Mr. Anderson has had an extended mining experience in Mexico and other countries.

OBITUARY

Arthur J. Ellis, a geologist of the U. S. Geological Survey, died in Washington on July 22, after undergoing an operation for appendicitis.

A. J. Sullivan, formerly general superintendent of the Chisholm district of the Oliver Iron Mining Co., died on July 7 following an illness of five years. Mr. Sullivan was born at Eagle Harbor, Mich., in 1866, and spent the earlier years of his life following mining on the Michigan ranges. In 1893 he went to Virginia, Minn., to work at the Auburn mine, and was later transferred to the Fayal and Genoa mines, being made superintendent of the latter in 1900. His authority was gradually extended, until in 1909 he was made general superintendent of the Chisholm district, which position he held up to 1915, when he was forced to give up active work by the nervous disorder which finally caused his death.

SOCIETY MEETINGS ANNOUNCED

Thirteenth Annual Conference on Taxation will be held on Sept. 6-10, 1920, at Salt Lake City, Utah, under the auspices of the National Tax Association. Among the many interesting papers promised, four bearing on the taxation of mines are scheduled for the morning session of Friday, Sept. 10. Among the speakers on that day are Governor Boyle of Nevada, Prof. William Peterson, of Utah Agricultural College, and R. C. Allen, vice-president of Lake Superior Iron Ore Association. Inquiries concerning the meeting and accommodations should be addressed to W. N. Beatty, care of Utah Power & Light Co., Salt Lake City, or to A. E. Holcomb, Secretary, 195 Broadway, New York City.

Lake Superior Meeting of A. I. M. E., the 122d meeting of the Institute, will be held Aug. 20 to Sept. 3, next, the party leaving Buffalo on the "Tionesta" and picking up other members en route. They will reach Houghton, Mich., Aug. 23 for a two-day stay. Parties will leave Aug. 24 for Ishpeming and Vulcan, and all reassemble at Minneapolis, Minn., Aug. 25. The Mesabi Range will be visited on Aug. 27, and Duluth reached in the afternoon of Aug. 28.

THE MINING NEWS

LEADING EVENTS

Number of Abandoned Claims in Mexico Large

Inability To Pay Taxes Under Old Policy and Great Accumulation of Fines the Reason

Mining agents of the Mexican government have been instructed when requested by mine owners to receive taxes one year in advance instead of quarterly only, as hitherto. Further, in the event of any district being in a disturbed condition owing to banditry taxes may be paid in Mexico City upon a proper showing.

According to the last report of the Department of Commerce and Industry there were 51,087 mining claims denounced in Mexico, covering an area of 442,225 hectares (2.47 acres in a hectare). Of this number more than three-fourths have been practically abandoned because of the refusal or inability to pay taxes and the enormous accumulation of fines. The recent presidential decree will probably result in a considerable portion of the owners reviving their claims.

The Department of Commerce and Industry of Mexico has just given out the following statement as to mines actually being worked at the present time in the Republic:

State	No. of Mines	No. of Companies
Durango	412	21
Guerrero	37	4
Guanajuato	97	48
Hidalgo	455	24
Jalisco	81	25
Mexico	110	21
Michoacan	146	42
Nayarit	42	5
Nuevo Leon	376	11
Oaxaca	8	3
Puebla	100	6
Queretaro	20	8
San Luis Potosi	244	18
Sinaloa	116	17
Sonora	316	23
Tamaulipas	28	6
Zacatecas	154	30
Lower California ...	12	2
Aguascalientes	71	5
Coahuila	206	25
Chihuahua	187	20
Total	3,138	365

A. S. & R. Considering Amarillo, Tex., as Possible Site for Smelter

The American Smelting & Refining Co. is studying conditions at Amarillo, Tex., with the idea of possibly locating a new smelter there. Nothing definite has been decided. The proximity of an abundant supply of gas for fuel at Amarillo is an important factor in the considerations.

WEEKLY RESUMÉ

Contempt proceedings, renewed by Minerals Separation against Miami Copper, were again dismissed on July 29 in the Federal court at Wilmington, Del. It is also reported that Nevada Consolidated has admitted infringing on the Minerals Separation flotation patents. A second orebody has been cut at depth in the Stewart mine at Butte by the Anaconda Copper Mining Co., causing a revision of ideas as to the probable life of the camp. In the Joplin-Miami district the United Zinc Smelting Corporation has obtained leases on 2,000 acres of land near Waco, Mo. The coal situation is reported to be easier on the iron ranges of Michigan and Minnesota, though car shortage in the East is still holding up shipments. Suit has been brought against the Inland Steel Co. for wasteful mining methods used by it at the Thompson mine, which it leases. Captain McDougall's suit against the Oliver Iron Mining Co. for patent infringement has been set for Sept. 20.

In Washington the phosphate and sodium land leasing regulations have been approved. Secretary Payne is back from Alaska and planning for the territory's development.

McDougall Suit Against Oliver Iron Co. Set for Sept. 20

The opening of the suit of Captain Alexander McDougall against the Oliver Iron Mining Co. to obtain large damages for alleged infringement of patents in concentrator construction, is set for Sept. 20 in the Federal court in Duluth. McDougall alleges that ideas that he had worked out and patented were used in the construction of the large washing plant at Coleraine, on the Mesabi Range.

Arguments in Utah Power Case Nearing Close

Arguments are being closed in the hearing before the Utah Public Utilities Commission in regard to an increase in power rates which the Utah Power & Light Co. is seeking to impose on some companies having special contracts. The Utah Copper Co. has just ended its oral argument, in which it maintained that the rates charged under special contract brought adequate returns even under existing conditions of higher costs, etc., and that the valuation of the power company at \$42,000,000 was excessive.

The power company argued that the power contracts, having been agreed upon before the creation of the commission, were subject to revision upon the date when the commission was empowered to act. It was also claimed that few of the contracts were made upon rates which today were paying adequate compensation. Other metal mining companies protesting have still to make their oral arguments.

Contempt Proceedings Against Miami Again Dismissed

Court Handles Minerals Separation Application in Record Time—Nevada Con. Admits Infringing

Minerals Separation again appeared before the U. S. District Court in Wilmington, Del., on July 26, with a renewed application for leave to file a supplemental bill charging Miami with renewed acts of infringement. Three days later Judge Morris rendered his decision, in which he denied the application, stating that he found nothing in Minerals Separation's arguments to justify him in a conclusion different from that of his recent opinion (*Engineering and Mining Journal*, July 24, p. 179,) upon the previous application in contempt proceedings which he had dismissed.

The rendering of an opinion on July 13, the hearing of another application on July 26, and the rendering of an opinion denying this latter application on July 29, all within practically a fortnight, is a remarkable record in a case that has been looked upon as of interminable length. Judge Morris' opinion, which is largely a quotation from his previous one, is, in full, as follows:

"This case is again before the court upon an application of the plaintiff for leave to file a supplemental bill charging the defendant with new acts of infringement since its discontinuance of the three processes heretofore adjudged to be infringements (244 Fed. 752).

"When considering the application heretofore made by the plaintiff that the defendant be adjudged guilty of contempt and/or that a further injunction be issued specifically enjoining and restraining the defendant from using the processes therein set forth I arrived at and stated the conclusion that 'in view of the nature of the new processes used by the defendant as charged by the petition, the questions raised thereby, and the decision of the Circuit Court of Appeals in this case (244 Fed. 752), I am of the opinion that the plaintiff must obtain the relief to which it is entitled, if any, touching the new processes, either through the proceedings now being had before the master and the decree to be entered thereon, or by a new bill, and not otherwise. Which of these procedures is the proper one under all circumstances or whether both must be resorted to, one as to some of the processes and the other as to the remaining processes, need not now be determined.'" The words 'new bill' were therein used to indicate a new original bill. I have considered the argument made in support of plaintiff's present application

and find nothing therein justifying a conclusion different from that at which I arrived when considering the petition hereinbefore mentioned. The present application must, therefore, be denied."

NEVADA CONSOLIDATED ADMITS INFRINGEMENT

The Nevada Consolidated Copper Co. has admitted openly that it has infringed that patent of the Minerals Separation North American Corporation governing the use of oil in flotation in amounts less than 1 per cent on the ore. This admission was made before Judge Hale in the U. S. District Court in Portland during discussion of a motion requesting further answers to interrogatories in connection with the infringement suit of the Minerals Separation against the mining company. The period of infringement extended from September, 1914, to August, 1917, when flotation was used in Janney machines.

The suit of Minerals Separation against the Magma Copper Co. has also proceeded another step, although the latter's motion for a bill of particulars has been denied. In this instance Judge Hale said: "It appears. . . . an attempt to force from the complainant a statement of what his endeavor is to be upon certain material allegations in the bill. . . ."

The litigation with the Magma company, as with Nevada Consolidated in the same court, has to do with two patents, one for the use of less than 1 per cent of oil and the other covering soluble frothing agents. As matters now stand each defendant must file answer to the Minerals Separation's bills of complaint before Oct. 1.

Butte & Superior Accounting Hearing Late This Fall

Hearing of the accounting to be made by the Butte & Superior Mining Co. as the outcome of its litigation with Minerals Separation is not expected to take place until late this fall, according to counsel for the latter company. It is said that it will require at least two months more for the Minerals Separation engineers to digest a ten-volume report made to the Federal court by the Butte & Superior, setting forth its side of the accounting. The defendant company asserts that if it is liable at all the damages should not exceed \$451,000. The plaintiff claims damages amounting to as high as \$18,000,000, asking for all the profits made by the Butte & Superior through the employment of the flotation process.

Atmospheric Nitrogen Co., formed late last year by Solvay Process Co. and General Chemical Co., with authorized capital stock of \$5,000,000, has begun erection of the first unit of a plant at Syracuse, N. Y., for the fixation of atmospheric nitrogen. Buildings and equipment of this unit will be completed in about a year and will cost more than \$2,000,000.

Would Remove Colorado School of Mines from Politics

Recent Ousting of Mines Experiment Station Last Straw—Prominent Men of State Disgusted

For several months prominent mining men of the State of Colorado have been smarting under the growing criticism of conditions at the Colorado School of Mines. This well-known institution has received more than its share of unenviable notoriety recently on account of the unfortunate and ill-adviced action of the present administration in severing relations with the U. S. Bureau of Mines, and thus depriving the school of Federal recognition and co-operation. What practically amounts to the ejection of the Rare Metals Station of the Bureau of Mines on the pretext that the building occupied by the bureau was needed by the school, is the last straw so far as mining and metallurgical men of the state are concerned. Influential mine operators, and others who have the best interests of the Golden school at heart, are determined to devise some means to remove the institution from the control of an incompetent and irresponsible board of trustees that has committed one blunder after another in school administration.

One of the plans under consideration aims to place the School of Mines under an educational board, and probably under the management of the board of regents of the State University. In this event the school would remain at Golden, and in addition to its present functions would assume the research work now conducted by the State Geological Survey. Its work would be coordinated with that of the State University, and considerable duplication of engineering courses would be avoided. Further, an effort would be made to re-establish co-operation with the U. S. Bureau of Mines, by securing for Golden one of the new branches of the bureau, two of which are to be organized in the near future. Friends of the school realize that in order to accomplish this purpose, they must first place the school under a competent and dignified administration, and make it independent of the baneful political influences that have been such a handicap to its advancement for many years.

New Diesel-Driven Iron-Ore Carrier Completed

Cubore, a Diesel-driven ship of 11,500 deadweight tons, is about to make her maiden voyage to Cuba. Built by the Bethlehem Shipbuilding Co. for the Bethlehem Steel Corporation, she represents what is said to be the greatest advance in American marine engineering. She is propelled by a two-cycle, American designed and built, oil engine of 3,200 hp. This ship, which is 496 ft. long, 57 ft. wide and 37 ft. deep, will carry iron ore from the company's mines in Cuba consigned to steel plants in the United States.

Opening of 79 Mine in Arizona Noteworthy

Continental Commission Co.'s Efforts Achieving Interesting Results—Future Considered Promising

The first six months spent in opening up a prospect rarely show a balance on the profit side of the ledger. Mines that have paid from "grass roots" are dreamed of by prospectors but they are not often found. The record of the 79 mine in Gila County, Ariz., though lacking the spectacular features which surrounded some of the famous gold and silver boom camps, is none the less interesting.

The 79 group, consisting of 23 claims, is located in Gila County, near the Pinal County line, in the southern extremity of the Mescal Mountains. The nearest railroad point is Burns, a siding on the Arizona Eastern, about five miles distant by road. The concentrator of the Ray Consolidated Copper Co. and the Hayden plant of the American Smelting & Refining Co., in the deep valley below, seem but a stone's throw from the highest point on the wagon road leading to the mine.

The early history of the 79 mine is not unlike that of thousands of other prospects. It was originally located in 1879, hence the name. For years the principal owner was Mike O'Brien, who had a few associates. O'Brien, a typical prospector of the old school, lived on the property in a tunnel. Having placed on his interest in the property a definite cash value and having formulated hard and fast rules for a sale, the stage setting being his tunnel home, to which capitalists must come with the full purchase price in gold coin, O'Brien never saw the fulfillment of his plans. He was murdered about three years ago, presumably by Mexicans, who believed he had large sums of money with him or hidden in his tunnel.

The administrators of the O'Brien estate gave a bond and lease on the property in December, 1919, to the Continental Commission Co., of which Lee Reagan is president and Miss Alice McFaddin secretary and treasurer. At the time there was no road to the property. Everything was packed in on burros, but a start was made. A five-mile wagon road has been built, over a mile of it being solid rock work. In the meantime the company shipped 31 cars of ore, packing it all on burros to the end of the wagon road, then in wagons to the railroad. The ore, which was shipped to El Paso, returned an average of \$1,126 per car after deducting the freight and treatment charges. The company's achievement during its first six months is certainly worthy of mention.

Rising slowly for nearly two miles over long hogbacks of rounded contour composed chiefly of Gila conglomerate the road reaches the older sedimentaries forming the higher parts of the Mescal Range. The mountain sides become more precipitous and the grades steeper. The underlying rock is chiefly

limestone, dipping gently to the east and southeast. The mine is 1,600 ft. above the Gila River at an elevation of 3,600 ft. above sea level in a very rugged section. Here the limestone forms steep-sided canyons, broken now and then by low scarps, which mark a bed harder than its neighbors. The limestone is a hard, compact variety, gray in color and generally magnesian. In places it is more yellowish, a characteristic which is conspicuous on some slopes when viewed from a distance. The thickness of the individual beds rarely exceeds two feet. The limestone is assumed to be the Martin limestone of Devonian age.

Within the limits of the property the only intrusive rock observed was a medium grained porphyritic to granitoid rock occurring as dikes of considerable width and great lateral extent. The rock is probably a monzonite or quartz-diorite.

The orebodies, which have a strike of N 15-20 deg. E and a dip to the south of from 35 to 50 deg., occur in the limestone. The principal outcrop, which is dark red, is very conspicuous, covering a whole hillside owing to the fact that the vein is exposed along its dip. The vein system consists of three parallel veins separated by more or less barren ground. The two outer veins are slightly over 4 ft. in thickness and the middle vein is about 28 in. thick. The ground between the veins varies in thickness from 2 to 4 ft., for the most part barren, though sometimes mineralized to a certain extent. Future development of the property may determine the extent of this mineralization and make it possible to mine with profit some portions of this intermediate ground.

The ore is lead carbonate occurring chiefly as "sand carbonates," though many large pockets of long, slender, white cerussite crystals have been found. There are rare nodules of galena and occasional bits of copper sulphides or carbonates. The ore carries some gold and silver. The ratio of silver to lead appears to be about one ounce of silver to each 4 per cent of lead. Ore carrying copper either in the form of sulphides or carbonates is uniformly higher in silver.

Small deposits of molybdenum and vanadium also occur on the property. Of these the molybdenum deposit has received most attention because it has afforded the greater quantity of lead, as large boulders of galena occur with the wulfenite. The vanadium occurs almost wholly as descloizite and is of undetermined extent.

The development done by the Continental Commission Co. totals approximately 2,000 ft. Practically all of the material removed by this work has been ore. The company's engineer estimates that they have blocked out nearly 45,000 tons of ore. The completion of the work now mapped out will in all probability prove up as much more.

The immediate plans of the company provide for loading bins at the mine

to facilitate handling the ore there, the substitution of auto trucks for wagons, and the installation of some of the more necessary mining equipment. The ore taken out by the development work proposed will probably pay the greater part, if not all, of the operating expenses for some time to come. The management is commendably cautious, proceeding on sound lines, resolved to prospect the property thoroughly before indulging in large expenditures for surface improvements and equipment. The development of the property will be watched with interest for it is confidently expected that the present efforts will produce a mine of considerable importance.

United Zinc Adding to Holdings in Joplin-Miami District

Quietly and without ostentation the United Zinc Smelting Corporation, the firm with which Charles M. Schwab is associated, has secured something in excess of 2,000 acres of leases on lands immediately east of Waco, Mo., and now has drills at work prospecting the tracts. The company also has numerous leases south of Galena, Kan., and also south of Baxter Springs, Kan., and is now preparing to put drills on these lands. The United Zinc company already owns the Manhattan mine and mill in the Picher field, and the Media and Electrical mills and mines in the old Webb City camp as well as the Coyote and Airdale mills and mines in the sheet ground section of the Joplin camp. It is conceded that should any good strikes be made on the tracts now being drilled the company would move some of its mills in the Joplin or Webb City camps to the site. The leases have been obtained and the drilling is being carried on under the management of George Moore, an ore buyer of Joplin and representative of the Victory Metal Co. in this field.

Simon Silver-Lead Mines Preparing Plans for Mill

An official report states that a mill is being designed to treat ores of the Simon Silver-Lead Mines Co. A process has been evolved by Minerals Separation which has been proved practicable by both laboratory and mill test. It is stated that two concentrates will be produced; No. 1 containing 39 oz. silver, 67.6 per cent lead, 9.6 per cent zinc, 2.8 per cent iron, and 2 per cent insoluble, and worth \$125.82 per ton; and No. 2 containing 8.2 oz. silver, 3.2 per cent lead, 46.8 per cent zinc, 9 per cent iron, and 2.6 per cent insoluble, and worth \$39.34 per ton. The extraction is given as 93.9 per cent of the silver, 93.7 per cent lead, and 71.3 per cent zinc. That the mine has a future is indicated by the fact that the annual report of the company states ore reserves to be 400,000 tons with an estimated profit per ton of \$7.20 on Dec. 31, 1919. Favorable reports are made on developments from the 700 level which will add to reserves.

Early Hopes of Iron Operators Dashed by Car Situation

Tonnage from Lake Superior Ranges Dropping Behind Last Year's—Coal Arriving More Freely

The car situation in the East is still delaying shipments from the iron mines of the Lake Superior district and the tonnage for the season may prove to be less than that in 1919, which was below the average of the last five years, unless the ore can be moved from the lower-lake docks to the furnaces with greater rapidity. The Iron River district of the Menominee Range has sent out about three-fourths of the ore contracted for delivery in 1920. There are large stocks of ore at the mines on the Marquette Range. The Gogebic Range mines will not move the tonnage looked for earlier in the year.

The chief difficulty in the East is to keep the cars moving from docks to furnaces, and there is a shortage of rolling stock to handle the business. Some boats are compelled to tie up for a week at Lake Erie ports to await unloading. No time is lost in the mining district, there being plenty of cars, and the boats are loaded without delay. Many of the lake vessels will enter the grain trade in the fall and will not be available for carrying iron ore.

Iron ore shipments from the head of the lakes are 440,000 tons behind 1919 as of Aug. 1, the figures for this year being 21,423,110 as compared with 21,862,626 at the same date last year. The entire loss in shipments is found in the falling off by the Duluth Missabe & Northern docks at Duluth, which are now 2,820,000 tons behind last year's record. All other docks have improved the 1919 record. Below are the detailed figures:

Dock	Shipments to Aug. 1, 1919	Shipments to Aug. 1, 1920
D. M. & N., Duluth.....	9,821,136	7,000,222
D. & I. R., Two Harbors....	3,616,110	4,121,853
G. N., Superior.....	4,596,179	5,726,362
Soo, Superior.....	649,087	647,900
N. P., Superior.....	235,269	320,665
C. & N. W., Ashland.....	2,489,673	3,066,976
Soo, Ashland.....	455,172	539,132
Total.....	21,862,626	21,423,110

The coal situation, which was fast becoming critical, has been taken in hand and if the program now under way is carried to completion the Northwest will not suffer for coal during the coming winter. Below are comparative figures of coal receipts on the Duluth-Superior waterfront as issued by Col. F. A. Pope, chief of the United States Engineers office for Duluth-Superior harbor:

	Anthracite	Bituminous
Received to Aug. 1, 1919....	692,048	4,648,221
Received to Aug. 1, 1920....	662,662	1,682,918
Decrease.....	29,386	2,965,303

Receipts will have to be maintained at an average rate of 53,521 tons per day from Aug. 1 to Nov. 30 to place on dock a reserve equivalent to that of 1919. The Federal orders regarding coal movement to the Northwest have helped relieve the anxiety of operators.

Anaconda Cuts Second Orebody at Depth in Stewart Mine

New Discovery Held To Have Important Bearing on Future of Butte District

Another new orebody has been cut by the Anaconda Mining Co. at 3,860 ft. depth in the Stewart mine in Butte in the course of shaft sinking. The other deposit recently discovered was found at a depth of 3,740 ft. and showed about 6 ft. of high-grade ore. The second shoot has a width of 10 ft., all high-grade, the ore being a heavy bornite with an admixture of "yellow" copper, and samples, it is said, ran as high as 47 per cent copper and 6 oz. of silver. Thus far this is the greatest depth at which ore has been found in Butte. The disclosure of ore at this depth has resulted in much elation in Anaconda circles, and is regarded as one of the most important the company has had in a number of years.

Inland Steel Sued for Wasteful Mining Methods

Thomas Keating, of Minneapolis, fee owner with George H. Crosby, of Duluth, of the Thompson mine at Iron-ton, has filed suit in the district court at Brainerd, Minn., against the Inland Steel Co. for \$380,000 for alleged failure to mine ore properly from the Thompson mine under the terms of the lease. Keating owns three-quarters of the fee and George Crosby own the remaining one-quarter. The lease was surrendered by the steel company on Oct. 10, 1919. Keating alleges that more than 400,000 tons of ore was mined and removed as low-grade ore, which was not treated as provided in the lease. Some if it is alleged to have been wasted by placing sand and other material upon it after it had been dumped. The royalties asked for on the alleged wasted ore are \$120,000. The complaint also alleges unskillful mining and pit work, for which damages in the sum of \$250,000 are asked, and for alleged removal of mine supports, tramways, etc., from the property a further sum of \$10,000 is asked.

Freight Rate Lowered on Lead

Lower rates on pig lead and bullion in carload lots from points in Idaho and Washington to Chicago and intermediate points have been ordered by the Interstate Commerce Commission, according to reports received at Spokane, Wash. The current rate is \$13.10 a ton and the new rate will be \$11.50, a difference of \$1.60 a ton. The change will become effective about Oct. 1. It affects about half of the lead shipped from Idaho and Washington smelters. The total annual shipments from these states is estimated at 75,000 tons. Up to the time of the hearing, the rate to New York and other seaboard points was the same from Idaho and Washington as from Montana, Utah and Arizona, but to Chicago and intermediate

points the rate was lower from Montana, Utah and Arizona than from Idaho and Washington. The blanket rate to New York placed all shippers on the same competitive basis, but the differential to Chicago and intermediate points forced Idaho and Washington producers to pay \$1.60 a ton more than their competitors in Montana, Utah and Arizona.

Scandinavian Labor Situation at Crisis

There is every appearance that the mediation of Herr Kvarnzelius in the conflict between the miners and allied unions and the Luossava-Kirunavara Aktiebolag and the Grängesberg-Oxesund Trafikaktiebolag will shortly result in the resumption of work generally, according to advices from abroad. *Svenska Dagbladet* believes that if his decision, which has not been publicly divulged, is accepted by both parties, and there is every sign that it will be, work will be resumed in August. In Norway the result of the state compulsory arbitration has been all in the favor of the men. Alluding to it, in an interview by *Morgenbladet*, Director Paus said: "There can be only one opinion as to the result. It was in the men's favor. During the negotiations they asked for an increase of 50 öre per hour, and upheld that claim in the court of judgment, but they never were of the opinion that they would actually get it. Experience in negotiations during a conflict goes to show that a considerably larger increase in wages is always claimed above what they will accept in order that the margin can be reduced during the negotiations. Judgment being in their favor it will involve the greatest difficulties in the iron and metal industries. I do not think it at all improbable that many of these industries will have to shut down. It has already been shown that we are behind in competition with foreign undertakings."

Searles Lake Lessees Desire County Taxes Reduced

Appeal for reduction or elimination of county taxes on government leases to mineral rights in the Searles Lake region of California was recently urged before the board of supervisors, sitting as the board of equalization, by the independents who are attempting to promote plants alongside of the Trona, Borosolvay and West-End companies, all of which are operating on patented land and are therefore not involved.

Joining in the appeal for elimination of taxes, or a nominal tax, are the Merrill Chemical Co., the Nevada Chemical Co., Eagle Chemical Co., George B. Burnham, Willard W. Butler, Robert B. Phillips and W. W. Chapin. They have leased from the government on a royalty basis approximately 15,000 acres of land in Searles Lake, and Assessor E. J. Gilbert has assessed the possessory interest at \$420,320. The taxes would be \$10,965.

Civil Service Examinations

Those interested in the following examinations should apply to the Civil Service Commission, Wash., D. C., for form 1,312, stating the title of the examination desired.

Mining draftsman, \$1,200, Sept. 8. An open competitive examination for both sexes. Examinations will be held at various points throughout the country. A vacancy in the Pittsburgh station of the U. S. Bureau of Mines may be filled from the results.

Curator, \$2,400; assistant curator, \$1,800; both sexes. Open competitive examination, Aug. 10, 1920. Vacancies in the division of mineral technology, National Museum, Washington, D. C., and positions requiring similar qualifications may be filled from the results. Not required to report at any place for examination.

Statistical draftsman, \$1,500; both sexes. An open competitive examination, Aug. 3, 1920. A vacancy in the Bureau of War Risk Insurance at \$1,500, and vacancies requiring similar qualifications, may be filled from the results. Not required to report at any place for examination.

Recent Production Reports

Phelps-Dodge Corporation produced 8,357,000 lb. copper in July against 7,552,000 in June.

Anaconda's July output was 11,700,000 lb. copper against 12,700,000 in June.

Miami produced 4,549,298 lb. copper in July compared with 4,400,000 in June.

Old Dominion's production in July was 2,640,000 lb. against 2,999,000 in June.

Chile Copper produced 7,500,000 lb. copper in June compared with 10,300,000 in May. The decrease was caused by shortage of fuel oil.

Shattuck Arizona produced in July 166,938 lb. copper, 919,886 lb. lead, 45,495 oz. silver and 505 oz. gold. Its copper output in June was 198,327 lb.

Anaconda produced 11,700,000 lb. copper in July and 12,700,000 in June.

Oriental Consolidated, Unsan, Chosen, obtained \$66,000 from its July clean-up against \$80,000 in June.

Inspiration Consolidated produced 6,500,000 lb. copper in July, against 7,300,000 in June.

Calumet & Arizona's July output was 3,528,000 lb. copper, compared with 3,812,000 lb. in June.

New Cornelia produced 3,522,000 lb. copper in July, as against 3,664,000 in June.

Cerro de Pasco produced 3,652,000 lb. copper in July, against 3,944,000 in June.

Backus y Johnston produced 1,458,000 lb. copper in July.

U. V. Extension produced 3,304,878 lb. copper in July, against 2,828,020 in June.

Arizona Copper produced 3,000,000 lb. copper last month unchanged from the month before.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Reno Station Must Limit Its Experimental Work Would Otherwise Duplicate Research Being Conducted at Other Points, Says Dorsey Lyon

Some disappointment has been expressed in Nevada because the experiment station which is to be located at Reno is to confine its work to rare and precious metals. The complaint is made that the station should include research on other metals found in Nevada, as well as oil shale. This has led Dorsey A. Lyon, supervisor of stations for the Bureau of Mines, to state: "It will be impracticable for each station to attempt to give attention to all the problems which might occur in the district in which it is located. For example, the station at Salt Lake City confines itself practically entirely to problems connected with the extraction of lead and zinc from low-grade and complex ores. There may be many problems in Nevada which are more important to the state than are those relating to rare and precious metals, but if the station at Reno should take up work on problems relating to oxidized ores of lead-silver, for instance, it would bring about a duplication of work already being done at Salt Lake City. As a matter of fact the principal work in oxidized lead-zinc-silver ores is being done in co-operation with the Yellow Pine Mining Co. at Goodsprings, Nev.

"With regard to the research on low-grade copper ores, the bureau's station at Tucson is giving its attention to such problems and, in connection with that work, has taken into consideration the possibility of treating the low-grade copper ore deposits said to exist at Mina. In fact, one of the bureau's engineers has made at least two trips to the district in order to investigate the possibility of treating Mina ores by processes developed at Tucson.

"As for oil shales, the bureau already has taken up research and investigation work at its station at Salt Lake City and is carrying on special work in co-operation with the State of Colorado at Boulder. It would be impossible to attempt to deal with all the problems met with in the mining and metallurgical industries of Nevada at the experiment station at Reno. The results of experimental work, while done outside of Nevada, are applicable to problems of that state as well. With the bureau's limited appropriations and the necessity of having specialists for each line of work it is important that the Reno station devote practically its entire time and attention to the problems arising in the mining and treatment of rare and precious metals."

Dr. Smith Breaks All Records As Survey Director

Dr. George Otis Smith, the director of the U. S. Geological Survey, has held that position longer than any of his predecessors. On August 13 he equaled the term of service of J. W. Powell. Major Powell was director of the Survey for thirteen years, three months and twelve days, and on August 13 Dr. Smith put behind him exactly the same period of service as director.

During the 41 years since the Survey was created it has had but four directors. Due to the fact that the first director, Clarence King, took the position simply with the idea of organizing the new bureau and was in office only one year the Survey, practically speaking, has been under the direction of only three men since it really began to function. That time has been almost equally divided between Major Powell, C. D. Walcott and Dr. Smith. It is a generally held opinion that the long tenure of office of the directors of the Geological Survey has been an important factor in the effectiveness of the bureau's work.

Phosphate and Sodium Land Leasing Regulations Issued

The General Land Office has issued regulations concerning phosphate and sodium leases and prospecting permits. The phosphate regulations provide that applicants for phosphate leases must file application in the Land Office of the district in which the land is situated; that the district office shall advertise the same for thirty days and forward to the General Land Office. The minimum royalty is 2 per cent of the gross value of output and the rental of 25c. an acre will be charged the first year, 50c. an acre from the second through the fifth years, and \$1 an acre thereafter. Leases will be given for not more than 2,560 acres.

The sodium regulations provide for filing applications in the local office to cover not more than 2,560 acres; for issuing permits for two-year leases on a royalty and rental basis, the royalty to be not less than 12½ per cent of the value of production and the rental to be 50c. an acre for the first year and \$1 for each year thereafter.

No particular forms of application are required.

Plan New Mine Rescue Truck

By far the best appointed mine rescue truck ever made is to be manufactured for the U. S. Bureau of Mines. The lessons of many years of experience with this type of equipment will be embodied in the new vehicle.

Payne Back from Alaskan Trip Must Reduce Present High Costs There, He Says—Would Lighten Load Due to Conservation

Alaska's industrial progress is going to be stimulated if it lies within the power of the influence of the Secretary of the Interior. Secretary Payne is just back from his Alaska trip and, in a special interview with the correspondent of the *Engineering and Mining Journal*, declares that he is going to do all in his power to lighten the burden which was placed on Alaska's shoulders during the Pinchot wave of conservation. He is going to make it the first duty of a live committee to study ways and means for stimulating Alaskan activities.

Judge Payne realizes that one of the most helpful things that could happen to Alaska would be a greater incentive to mine gold. While he understands that time must be the most important factor in restoring gold to its normal buying power he believes that there is a great deal of gold in Alaska which can be mined under present conditions if capital and labor are made available and transportation improved, and other steps taken to reduce some of the unnecessarily high costs now hampering all mining operations in Alaska.

The principal purpose of the visit of Secretary Payne and Secretary Daniels to Alaska at this time was to look into the matter of the production of coal from Alaskan mines. Secretary Payne authorized the construction of a washing plant at the Eska mine, which is on the line of the Alaska railroad. The product of this mine is now being used as railroad fuel, but the coal can be greatly improved by washing. It is intended to mine this coal in quantities sufficient to meet the commercial requirements of the territory tributary to the Alaska railroad.

The Chickaloon mine, which is at the terminus of the Matanuska branch of the railroad, produces a grade of coal equal to that of Pocahontas, Judge Payne says. The vein is 16 ft. wide. There are 400,000 tons of coal which have been blocked out. There are a 600-ft. shaft and five levels on the property. Just at the present time it is not possible to forecast definitely what the future of the mine will be, as the vein is known to be faulted. It is believed, however, that it will be picked up again and its development continued. The Navy has \$1,000,000 to spend in an effort to develop Alaskan coal.

Further in the interior the extensive lignite fields are expected by Judge Payne to have a decided bearing on industrial development. He also calls

attention to the fact that there are promising anthracite veins in Alaska as well.

The Secretary thinks that other industries in Alaska are going to be stabilized by the development of its agriculture. He was very much impressed with the high productivity of the soil and the large output per acre which can be had in a much shorter season than in the principal agricultural districts in the United States.

Judge Payne is very much impressed with the favorable indications of the

occurrence of oil in Alaska. At his request A. H. Brooks, of the U. S. Geological Survey, is looking into the petroleum situation, with a view to making recommendations as to steps which may be helpful in encouraging prospecting for oil. Considerable prospecting is being done even under present conditions, according to reports that have been received.

Awards were recommended during the week ended July 31 by the War Minerals Relief Commission, as follows

(the name of the claimant, the mineral, the amount recommended, its percentage relationship to the amount claimed are shown): Fred A. Babcock, manganese, \$225.17, 10 per cent; Eleanore E. Hoeft, chrome, \$5,138.30, 39 per cent; O. C. Irwin, chrome, \$4,146.27, 12 per cent; Auburn Chrome Mines, chrome, \$5,970.56, 30 per cent; Holbrook & McGuire, chrome, \$5,905.18, 37 per cent. To date, the average percentage of the amounts claimed, which have been recommended for payment, is 30.34 per cent.

NEWS BY MINING DISTRICTS

MEXICO

Political Conditions Improved in General But Economic Conditions Still Bad

Durango

With the opening of the American Smelting & Refining Co.'s smelter at Asarco, Durango, at the beginning of this year a new impetus was given to the mining industry in this state and adjacent territory, which has been practically dead since 1912 on account of disturbed conditions and failure of transportation facilities.

Political conditions in the states of Durango, Zacatecas and Coahuila have improved materially during the last three months and there is a feeling of optimism noticeable that the improvement is permanent and further advances toward a normal condition can be expected. This is the feeling in spite of sporadic labor strikes, which have generally been adjusted satisfactorily to all concerned.

Only one or two operators were able to continue work during the worst period of disturbed political conditions, but in 1919 several others renewed operations on account of the high prices of silver, and during the present year still more have commenced work, and with the growing confidence there is something like a general rush at the present time to start development work and begin shipments from the mines already in paying orebodies.

One of the companies that is making rapid progress toward renewed operation of its mines at Tejaman, Durango, is the Cia. Minera Eureka, Melchor Ocampo y Anexas, S. A., where Theodore E. Dickel, the new mine superintendent, is installing a 100-ton mill, using table concentration and re-grinding to be followed by flotation. The ores run from half a kilo to one kilo silver and some lead. It is expected that the plant will be in operation by Oct. 1. The company has about 40,000 tons on the dump and 3,000 tons of old sands to be worked up before treating newly extracted ore.

The Santa Cruz Mining Co., whose mines are located in the Otaez district,

but with offices in Durango, is preparing to put in a mill to take the place of its old one, which is too small to handle the new production. This company has been notable for the quantity of high-grade ores shipped, which has been its principal production, but it is now intended to work up the accumulated dumps, which run from one to five kilos of silver per ton.

An increasing number of companies are resuming operations in the Guanaceví district, and with the encouragement given by the Government officials that a railroad will be built into that camp in the near future the prices of mining properties have stiffened considerably and many new denunciations have been made of properties previously passed over.

The three mills now operating in Guanaceví are still running on the old dumps, the mines not having been unwatered since they were forced to close down a number of years ago. The Soto Mines Co. has completed its new mill and concentrating plant and has commenced shipments.

In western Durango the Bacis Gold & Silver Mining Co. is again producing bullion and concentrates, since reopening January 1. The Ventanas mines are again working on a small scale. The Mexican Candelaria and the San Luis Mining Co., both near San Dimas, in western Durango, did not stop work during the disturbances of the last eight years.

Many of the smaller companies have resumed operations or are preparing to do so at once. L. C. Phillips has recently reached Durango on his way to start development work for the Cia. Minera Occidental, whose property is in the Canelas district.

Sonora

North Tigre Leasing Co. Ships First Concentrates

Agua Prieta—Ore shipments through the Douglas-Agua Prieta port for July greatly exceeded those for June. One hundred and ninety-five cars of ore and concentrates with a tonnage of 7,822 crossed from Agua Prieta in June,

against 218 cars with a tonnage of 8,715 which crossed in July.

The estimated value of July shipments was \$1,138,000, and July shipments were valued at \$2,145,500. Figures for July follow:

Origin	Cars	Tons
Nacozari	179	7,160
El Tigre	22	810
Estrella	10	450
Nuevo Potosi	1	45
Palacio de Hierro	1	43
Promontorio	1	42
Belen	1	41
San Ygnacio	1	39
San Pablo	1	42
San Luis	1	43

Total 218 8,715

Total customs collections, including \$528 head tax, amounted to \$3,295.55.

The first car of concentrates from the North Tigre Leasing Co. is now en route to Douglas, Ariz. The company has recently put into operation a 50-ton flotation mill. The mill was built under the direction of Frank Holmes, who is manager of the property, the stock of which is held mostly in Douglas and Bisbee.

Chihuahua

Minerales y Metales To Increase Shipments

Santa Eulalia—The Cia. de Minerales y Metales is shipping to its Torreon smelter and is arranging transport to increase its shipments. The San Toy aerial tramway is being repaired and will convey all the company's ore from various leases to the standard-gage railroad which connects with the Mexican Central. The ore from the company's San Antonio Chico lease will be taken to the San Toy aerial tram in four-wheel-drive motor trucks.

The A. S. & R. Co. has installed an electric hoist and compressor at its San Antonio Grande lease, which is in the east camp and is now being managed by E. B. Butts. It is going to build an aerial tramway to transport the ore from this mine to the Velardeña-Mina Vieja tramway.

The striking miners of the A. S. & R. Co. have returned to work and shipments are again normal.

The improvements on the Chihuahua Mining Co.'s railroad are nearing completion. A switch from "Three Mile" is in operation to the smelter and the company is shipping directly there without rehandling the ore as before.

The Buena Tierra Mining Co. has installed a 1,378-cu. ft. compressor and is overhauling its main hoist.

Don Juan Rivera has installed a hoist on his Santa Rita lease.

Dr. J. M. Smith is shipping from his lease on the Coronel. A. H. Davison has examined the Central.

Guerrero

Many Claims Jumped in Recent Years

There is practically nothing doing in the state in the way of work or development. This section was pretty badly mauled during the various revolutions and uprisings since 1910 and the few important properties, such as Campo Morado, have been worked at and butchered by local bandits for their own account. Campo Morado, which has been under option for several years, waiting the dawn of peace, to an English syndicate, is still nominally in the hands of local patriots, though it is probable that the central government will take expeditious methods shortly to return the property to its owners.

During the last few years, when mines were almost entirely abandoned in this state, large numbers of properties were "denounced" or, properly speaking, "jumped." The absence of the local mining authorities and the fact that mining agencies belonging to the government were closed, created a confusion that made lawlessness quite possible. The present government has set its face against these methods, however, and under recent decrees all such irregularly acquired properties have been ordered vacated and the titles of the original owners sustained, even in the absence of the payment of taxes and other legal requirements. That is, sufficient time will be allowed all mine owners, absentees as well, to put their house in order, if they choose to do so.

The Department of Public Works has revived the concession for a railway from Toluca to the Pacific coast which will put into productivity a number of important old-time producers, among them the Inguarán copper properties belonging to the Rothschilds, which are now idle for lack of transportation. The department has also approved a plan for opening the Balsas River to navigation for about 150 miles above its mouth, thus connecting up a large area of smaller mining properties and an immense mineralized zone now practically unprospected. Preliminary work on the latter proposition has already begun.

San Luis Potosi

The Cia. Metalurgica Mexicana, owned and operated by the Towne interests, is operating only a few furnaces for copper and lead, owing to lack of transportation and scarcity of fuel oil caused by the recent strike in the oil fields.

There has been no general revival of work throughout the state although some few options have been extended to foreign concerns. Politically the state is quiet and free from brigandage, but economic conditions are very bad.

Jalisco

Larger Companies Again Shipping—Prospectors Active

Jalisco is one of the first states to recuperate after the revolution and, in fact, for some time most of the larger mines have resumed work and are shipping ores and bullion. The mineralized part of the state is being actively prospected by natives as well as foreigners and a large number of new denouncements were filed during July. Shipping facilities have been improved throughout the state and it is expected that work will be resumed this month on the Southern Pacific line from Nogales to Guadalajara. The new government is exceedingly anxious to have the road completed both as an economic and as a military measure.

Michoacán

Mining Dead and Transportation Paralyzed

Michoacán may be considered dead in the mining calendar. The transportation facilities have been completely paralyzed and no immediate effort is being made to improve the situation: There are still numerous small groups of bandits in the mountains with the result that no attempt is being made to revive work at any of the mines, except a few scattered properties near the Pacific coast and the Balsas River.

Aguascalientes

The A. S. & R. is operating only one or two copper furnaces and no lead furnaces. The recent strike resulted in an average increase of forty per cent in wages at the smelter and a reduction in the force. The company still refuses to recognize the unions, an attitude which is sustained by most of the large mining concerns of the country as well as the iron and steel foundries, oil operators and manufacturers in general.

There is some slight activity in locating new properties in the state, one recent location being a tin prospect.

Mexico

El Oro—All four of the principal mining companies in this district, namely, Dos Estrellas, El Oro Mining & Ry. Co., Esperanza Mining Co., and Mexico Mines of El Oro, Ltd., are practically in full operation.

CHINA

Rich silver mines are reported to have been discovered in China in the Province of Kirin, between Tienpaoshan and the River Tumen. The construction of a light railway for the conveyance of the ores is proposed.

CHOSEN

Unsan—Water shortage caused by lack of rain continues to cause curtailment of operations. All mills and equipment on the concessions were driven by steam power in June. Wood is also scarce. The mine air is bad owing to lack of power for proper ventilation. The June cleanup of about \$80,000 was purposely low, as low-grade ore was treated, because the recovery always falls off in summer.

NEVADA

Rochester Combined Property Ordered Sold

Rochester—All the real and personal property of the Rochester Combined Mines Co., including a 350-ton mill that never treated a pound of ore, were advertised for sale on Aug. 7 to satisfy a judgment for \$200,000 secured by William Adams and Nelson L. Bruck, trustees for creditors. At one time it was intended to take the Combined into the consolidation known as the Rochester Silver Corporation, but the deal was not consummated.

Divide—In the Tonopah Divide mine development on the 1st, 3rd and 5th levels, together with shaft sinking, totaled 120 ft. The shaft is now 915 ft. deep and it is intended to sink to 1,000 ft. On the 1st, or 165, level drifting on the new ore showing continues to prove ore of milling grade. On the 5th level the southeast drift was extended 35 ft. with ore of good grade showing across a width of 3 ft.

UTAH

Tintic Standard Using Scraper for Underground Loading—Judge M. & S. To Have New Office

Eureka—Ore shipments from the Tintic district for the week ended July 30 amounted to 146 cars.

The Tintic Standard is reported to be using a scraper similar to a road scraper on one of its levels for loading ore, and in this way meeting the present shortage of muckers. A small hoist has been installed and connected with the scraper by a steel cable, which both loads the scraper and hauls it up an inclined slide to the cars. Two men are required at the scraper, two loads from which are sufficient to fill one mine car. Space is, of course, necessary for this method of handling ore. In the present instance the stope is in dry siliceous silver ore on the 1,100 level. It is opened about 100 ft. west of the No. 2 shaft and has been found, as far as development has gone, to be 40 to 50 ft. wide, with ore continuing in all directions. Vertically the ore has been proved to continue to the 1,400 level. July shipments from the property are expected to amount to about 100 cars.

Park City—The Judge Mining & Smelting Co. is planning the construction of a new and modern office building to take the place of the one at present in use in Empire Canyon.

MONTANA

Neihart—Directors of Cascade Silver Mines have voted a note issue of \$100,000, to bear 8 per cent and to be offered to stockholders at par. The issue is made to take care of merchandise accounts, it is explained, so that the company will not be forced to operate its mines until the I. W. W. strike, started June 1, is broken. The mines speedily can be reopened, it is stated, and the ore in sight will average \$20 per ton.

CALIFORNIA

Unwatering Argonaut Rapidly—Deeper Development Planned at Kate Hardy—Juniper Still in High Grade

Jackson—New pumps have been added to the powerful plant of the Argonaut and dewatering is proceeding rapidly. It is thought that the use of compressed air caused the freezing of sections of the pumps, but this condition has now been almost eliminated.

Forest—Sinking of a double-compartment shaft from the main tunnel of the Kate Hardy mine is proceeding rapidly, the shaft following a rich ore shoot. It is planned to sink several hundred feet and to drift on the vein at several points. The property is well equipped, and the work now planned will be the first deep work ever done at the mine.

Susanville—The Juniper mine continues to show high-grade ore. The vein is said to be comparable with the bonanza ledge worked in the Juniper by the pioneers.

Bishop Creek—With \$80,000 available for re-modeling its mill, the Wilshire Bishop Creek company has torn out all the old flotation machines and has installed two rougher and one cleaner machines. It is expected to have the mill handling 150 tons daily by Sept. 1.

ARIZONA

Sinking of Junction Shaft at Bisbee Started

Bisbee—Actual work of sinking the Junction shaft has been started. All preliminary work has been completed and the hoist placed on the 1,800 level. The shaft will be sunk from this level to the 2,300 level. The new ventilating shaft near the Briggs shaft had 300 ft. more to go on Aug. 1. It is expected that the shaft will be completed before the last of next month.

During July the Boras Leasing Co. shipped 1,250 tons of copper ore to the Copper Queen smelter at Douglas. The grade of the ore is about 8 per cent copper. In July the company paid its second monthly dividend of 10c. per share. The shaft has been completed to the 600 level and connection made with the stopes on this level.

The Night Hawk Leasing Co. during July shipped 15 cars of ore. Development continues on the 750 level.

Tombstone—Dr. H. H. Hugart and associates have opened the old Winters mine on the south edge of the town

and have a car of good silver ore ready to ship. There is said to be considerable ore worth milling and construction of a mill is planned.

Jerome—At the U. V. Extension the 1,600 level crosscut recently cut 5 per cent copper ore. Ore has not yet been reached by development on the 1,700 level. Development on the 1,500 level has proved the ore to run 5.9 per cent copper and to have an area about two-thirds of that on the 1,400 level.

Chloride—The Dardanelles Mining Co. has installed its new pump and is pushing the sinking of the shaft to the 200 level.

NEW MEXICO

Peerless Mine Unwatered by Walnut Creek Co.

Lordsburg—Ore shipments from this district for August consisted of 95 carloads of an approximate value of \$73,000.

The Co-operative Mining Co. received \$2,500.41 for 37 tons of silver ore recently shipped to the El Paso smelter.

Silver City—The Walnut Creek Mining Co. has succeeded in unwatering the old Peerless mine that has not been worked for 40 years. Exploration work will begin at once. Jack Stark is superintendent.

Some very high grade silver ore has been struck in the old workings of the Telegraph mine, now being explored by W. P. Dorsey, son of the original locator.

Separ—A. J. Stockbridge has completed the erection of a Gibson pony mill at the Young Bounds ranch. This is intended to handle the free milling gold ores from the Rocky Trail property, a mile and a half east. Should this test apparatus prove satisfactory larger equipment will be installed.

MICHIGAN

Marquette Range

Shipping Graphite from Taylor Dump at L'Anse—Season Good in Cascade District

L'Anse—A shipment of 500 tons of graphite ore has been made from the Taylor mine dump to the Detroit Graphite Co.'s factory. It will be used in paint manufacture. Other shipments are to follow. The mine has been idle for years, but considerable graphite was left in stock at the property.

Palmer—Development work only is under way at the Isabella. Only ore taken out in drifting and raising is being hoisted. The results have been satisfactory. The Maitland, Richmond and Empire continue to be steady shippers. The Maitland will have the best record in its history. There seems to be a good market for low-grade silicious ores of the Cascade district this season.

Menominee Range

Youngs Mine Now Shipping—Riverton Shaft Almost Completed

Stambaugh—The new Riverton shaft is now down 1,200 ft. with 50 ft. to

go. The underground pump station is in commission. A laboratory and engine house are under construction.

Iron River—Shipments have started from the Youngs mine, recently purchased by the Florence Iron Mining Co. from the Youngs Mining Co. No time was lost in getting ready for mining after the deal was closed and shipments are averaging 150 tons daily. Considerable new machinery, including a new electric compressor, has been installed. Eventually, all of the mine machinery will be driven electrically. The power line is to be extended from the Fogarty to the Youngs.

MINNESOTA

Vermilion Range

Vermilion—Pickands, Mather & Co., one of the largest independent operators on the Mesabi Range, has organized the Vermilion Mining Co. and taken over the lease of the Zenith mine at Ely, Minn., one of the finest properties on the Vermilion Range. The Zenith was operated by the Oliver Iron Mining Co. from its opening until 1919, at which time the lease expired and the property reverted to its owners, T. F. Cole, R. B. Whiteside and associates, who have operated it themselves for the past year through the Zenith Iron Mining Co. The mine has shipped 5,620,000 tons and is credited on the Minnesota Tax Commission's records with a reserve of 2,100,000 tons. Kenneth Duncan, superintendent of the mine under the Zenith Iron Co., will remain in charge for the Vermilion Mining Co.

JOPLIN-MIAMI DISTRICT

Missouri-Kansas-Oklahoma

Iowa Mining Co. Erecting Mill—New Baker-Howell Concentrator Planned

Baxter Springs, Kan.—The Iowa Mining Co. is erecting a concentrator on a 40-acre lease on Gilmore land, two miles south of Baxter. In part the plant is being made over from the Oak Orchard Custom mill, until recently located north of Joplin. Gas engines will be used to furnish power, and the capacity will be about 150 tons per shift. The plant is to be ready about Sept. 15. Mining will be carried on at a depth of 145-ft., where several drifts have been run. About 800 tons of ore is on the dump. A. F. Place, of Leon, Ia., is president, and Fred R. Hobart, of Joplin, secretary and manager. Development has been under way for two years, there having been much water to handle until pumping by the Chanute Spelter Co., about two miles northwest, reduced it to about 400 gal. per min.

The Baker-Howell Co. is preparing to erect a concentrator at its property just across the state line in Oklahoma, two miles southwest of Baxter. The mine has been operated for some time as a hand jig plant, but recent development work is thought to warrant the erection of a mill.

Quapaw, Okla.—The West Virginia Mining Co. has resumed operations.

THE MARKET REPORT

Daily Prices of Metals in New York

Aug.	Copper		Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.	
5	18.35@18.60	45.00	49.25@49.50	8.65	8.25@9.00	7.55@7.65	
6	18.35@18.60	44.75	49.50@49.75	8.65	8.25@9.00	7.60@7.70	
7	18.35@18.75	44.75	49.00@49.50	8.65	8.25@9.00	7.65@7.75	
9	18.35@18.75	44.50	48.50@49.00	8.65	8.25@9.00	7.70@7.80	
10	18.35@18.75	44.00	48.00@48.25	8.65	8.25@9.00	7.75	
11	18.35@18.75	43.75	47.75@48.00	8.65	8.25@9.00	7.75	

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point. All prices are in cents per pound.

Copper is commonly sold on terms "delivered" which means that the seller pays the freight from refinery to buyer's destination. The delivery cost varies, and it would be confusing to figure net prices on individual transactions. Consequently, an average deduction is made from the "delivered" price. At present the average cost of delivery from New York refineries is 0.15c. per lb., and that deduction is made to arrive at the New York price. When copper is sold f.o.b. or f.a.s. New York, of course no deduction is made.

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

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

London

Aug.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3 M	Spot	3 M	Spot	3 M
	Spot	3 M							
5	94	96	111	283½	289	37½	37½	42½	44
6	94½	96½	111	283½	288	37½	37½	42½	43½
7	94	96	111	283½	288	37½	37½	42½	43½
9	93½	95½	111	279½	285½	36½	36½	42½	43½
10	93½	95½	111	279½	286½	36½	36½	42½	43½
11	93½	95½	112	276½	283½	36½	36½	42½	43½

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

Silver and Sterling Exchange

Aug.	Sterling Exchange	Silver			Aug.	Sterling Exchange	Silver		
		New York, Domestic Origin	New York, Foreign Origin	London			New York, Domestic Origin	New York, Foreign Origin	London
5	358½	99½	94½	58½	9	361½	99½	96	59½
6	362	99½	95½	59½	10	361½	99½	95½	59½
7	366	99½	95	58½	11	364½	99½	94½	58½

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.

On the authority of the Secretary of the Treasury, we quote 100c. per oz. for silver, 1,000 fine, delivered at the option of the Director of the Mint to the New York Assay Office or to the mints in Philadelphia, Denver, or San Francisco, and proved to the satisfaction of the Treasury Department to have been mined, smelted, and refined in the United States. This quotation is retroactive to May 13.

Metal Markets

New York, Aug. 11, 1920

Continued inactivity characterized the metal markets during the last week, tin and zinc being particularly neglected. Sales of copper picked up somewhat, and lead remains firm and scarce.

Copper

Fair buying but no concerted activity have marked the week. Domestic consumption continues good, and is probably about twice what it was before the war. United States production is slightly more than the pre-war figure.

The stocks of metal, which may be around 400,000,000 lb., and the difficulty which European nations have in buying our copper, prevent the price from rising to a figure which would give a reasonable profit to producers.

Some of the smaller traders are trying to ease the increased freight rates on to consumers by quoting f.o.b. refinery, whereas, before, they quoted the same price delivered.

Spot and August delivery could be obtained during the week at 18¼@18¾c., f.o.b. refinery, September at 18¼@18.60c.; and later deliveries, nominal at 18¼@18¾c.

Lead

Large consumers, particularly white-lead, storage-battery, and cable manufacturers, are very actively in the market for September lead, of which there is a pronounced scarcity. Production is not as great as producers would like, owing to the fact that labor is going into pleasanter and more remunerative work for the summer months, with the full knowledge that the men's old jobs will be open to them in the fall. Mexican lead is coming into this country better, but a car shortage exists in that country the same as here. Lead is also coming in from England, that which has so far been imported being largely American brands. Consumers are not so anxious to take a chance on foreign metal, of which they know nothing, which probably accounts for the fact that more business has not been done. English lead has been freely offered at 7c. per lb., c.i.f., by dealers, including tin brokers who have been attracted by the lead market. This is equivalent to about 8.60c., duty-paid, New York. Lots up to 1,000 tons for August or September shipment can be obtained at this price. The quantity of the English supply is problematical. Duty-paid spot lead is obtainable at 9c. per lb.

We quote both New York and St. Louis spot lead for the week at 8.90@9c.; September at 8.75@9c., and October 8.75c. Our prices for average sales take into account the A. S. & R. price, which remains unchanged at 8.50c. New York and 8.25c. St. Louis.

Zinc

Demand continues very poor. Large producers prefer to accumulate metal rather than sell at present prices. Stocks in general are low, and consumers are probably not supplied with more than one month's production. With limited production and increased freight rates, the leading producers expect zinc to sell at 8c. in the near future. The prices which we quote are for August and September delivery. No demand exists for later deliveries.

Tin

Tin continues woefully dull, though the demand for electrolytic picked up slightly during the week, with sales at 46¼@47¾c. There has been 700 tons of Chinese tin on the market, which second-hands are trying to unload at 44@45c. This is equivalent to the best brands of so-called 99 per cent tin. The poorer brands of 99 per cent cannot be sold even at 43@44c.

Straits tin for future delivery: Aug. 5th, 49.25@49.50c.; 6th, 49.50@49.75c.; 7th, 49.00@49.50c.; 9th, 48.50@49.00c.; 10th, 48.00@48.25c.; 11th, 48@48¼c.

Arrivals of tin in long tons: Aug. 3d, Singapore, 100; 4th, China, 25; 5th, China, 475; London, 50; 6th, London, 25; 9th, Singapore, 35; London, 150.

Silver

The London market has been erratic for the last week, with prices ranging between 58½ and 59½d., due to the fluctuations in sterling exchange, and also to buying or selling orders on a narrow market with limited supplies. The demand for the Indian bazaars continues good, with an upward tendency. China exchanges continue below the New York parity. The New York market has ruled firm on moderate demand and limited offerings.

Mexican Dollars—Aug. 5th, 71½; 6th, 72½; 7th, 72½; 9th, 73½; 10th, 72½; 11th, 71½.

Gold

Gold in London on Aug. 5th, 114s.; 6th, 114s. 3d.; 9th, 113s. 3d.; 10th, 113s. 8d.; 11th, 113s. A license is now required for the exportation of gold from Canada.

Foreign Exchange

Heavy offerings of grain and cotton bills in a market made panicky by the Russian-Polish war news have accounted for the recent upsets in the foreign-exchange market. Yesterday, francs were 7.21c., lire, 5.03c. and marks 2.14c. Argentine exchange declined to 86.5c. and Brazilian rios to 20.9c. New York funds in Montreal, 12½ per cent premium.

Other Metals

Aluminum—Ingot, 33c. per lb., with 32c. open market for 98@99 per cent virgin.

Antimony—Market continues weak. Spot, 7½c. per lb.; Cookson's "C" grade, 14@15c. Chinese and Japanese brands, 7½c. W. C. C. brand, 7@7½c. Chinese needle antimony, lump, firm at 9@10c. per lb. Standard powdered needle antimony (200 mesh), 10@12c. per lb.

Bismuth—\$2.70 per lb., 500-lb. lots, and \$2.72 per lb., 100-lb. lots. Market quiet.

Cadmium—Nominal, \$1.40@1.50 per lb. Market dull.

Cobalt—Metal, \$3 per lb.; black oxide, \$2 per lb.

Iridium—Nominal, \$350 per oz. Heavy demand, but small supplies.

Magnesium—Crude, 99 per cent or over pure, \$1.75 per lb., for the metal in 100 lb. lots and over, f.o.b. Niagara Falls.

Molybdenum Metal in rod or wire form, 99.9 per cent pure, \$32@40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c., f.o.b. Bayonne, N. J.; Monel metal, shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—Open market, \$50@75 per troy oz.

Palladium—In sympathy with platinum jumped from \$80 to \$100 per oz.

Platinum—Firm at \$100@105 per oz. \$95 per oz. in 100 oz. lots.

Quicksilver—Market steady; \$85@ \$88 per 75-lb. flask. San Francisco wires \$85. Weak.

Ruthenium—\$200@220 per troy oz. Selenium, black, powdered, amorphous, 99.5 per cent pure, \$2@2.25 per lb.

Thallium Metal—Ingot, 99 per cent pure, \$20 per lb.

Metallic Ores

Bauxite—About 52 per cent alumina content, less than 2 per cent iron oxide, up to 20 per cent silica and artificially dried to contain not more than 4 per cent free moisture, \$10 per gross ton at mine; 54 per cent alumina and about 15 per cent silica, \$11; averaging 57 per cent alumina, 8 to 12 per cent silica, less than 3 per cent iron oxide, \$13 on basis of 8 per cent free moisture. Ores of very low silica content suitable for the manufacture of aluminum oxide and hydrate of alumina command a fancy price.

Chrome Ore—Guaranteed 50 per cent Cr₂O₃ foreign ore with a minimum of 6 per cent silica, 80@85c. per unit, New York. California concentrates, 50 per cent Cr₂O₃ and upward, 60@65c. per unit, f.o.b. mines.

Iron Ores—Lake Superior ores, per ton, delivered at Lower Lake ports: Old Range bessemer, \$7.45; Old Range non-bessemer, \$6.70; Mesabi bessemer, \$7.20; Mesabi non-bessemer, \$6.55. Congestion at Lake Erie ports due to car shortage has resulted in decreased tonnage. Other ports show gain in shipments. Shipments of Lake Superior iron ore were 9,638,606 tons during July, according to *Iron Trade Review*.

Manganese Ore—70@80c. per unit, 50 per cent Mn content, c.i.f. Atlantic seaport; chemical ore (MnO₂) \$75@85 per gross ton.

Molybdenum—85 per cent MoS₂, 75@85c. per lb. of contained sulphide, New York.

Tantalum Ore, guaranteed minimum 60 per cent tantalic acid, 65@70c. per lb. in ton lots.

Titanium Ores—Ilmenite, 52 per cent TiO₂, 14@2c. per lb. for ore. Rutile, 95 per cent TiO₂, 15c. per lb. for ore, with concessions on large lots or running contracts.

Tungsten Ore—Scheelite, 60 per cent WO₃ and over, per unit of WO₃, \$7 f.o.b. mines; wolframite, 60 per cent WO₃ and over, per unit of WO₃, \$6@7, in New York.

Uranium Ore (Carnotite)—\$2.75@3 per lb. for 96 per cent of the contained oxide (U₃O₈). Ores must contain a minimum of 2 per cent U₃O₈.

Vanadium Ore—\$1.25 per lb. of V₂O₅ (guaranteed minimum of 11 per cent V₂O₅), New York.

Zircon—Washed, iron free, 5c. per lb. Zirkite—\$90@100 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at \$1.15 per lb. in ton lots.

¹Furnished by Foote Mineral Co., Philadelphia, Pa.

Zinc and Lead Ore Markets

Joplin, Mo. Aug. 7—Zinc blende, per ton, high, \$51.15; basis 60 per cent zinc, premium, \$48.50; Prime Western, \$47.50@46; fines and slimes, \$45@42.50; calamine, basis 40 per cent zinc, \$36. Average settling prices: Blende, \$44.85; calamine, \$38.16; all zinc ores, \$44.71.

Lead, high, \$102.90; basis 80 per cent lead, \$100; average settling price, all grades of lead, \$99.81 per ton.

Shipments for the week: Blende, 8,178; calamine, 169; lead, 1,267 tons. Value, all ores the week, \$499,700.

A considerable tonnage was reported purchased on \$46 basis by one purchasing agency, but others report \$47.50 basis, Prime Western grades.

The purchase of the week was 9,600 tons and the shipment of zinc 8,400 tons.

Platteville, Wis., Aug. 7—Blende, basis 60 per cent zinc, \$49.25 per ton base for high-grade. Lead ore, basis 80 per cent lead, \$100 per ton. Shipments for the week: Blende, 1,295; lead, 101; sulphur ore, 35 tons. Shipments for the year: Blende, 43,073; calamine, 2,300; lead, 3,781; sulphur ore, 1,177 tons. Shipped during the week to separating plants, 2,263 tons blende.

Non-Metallic Minerals

Asbestos—Crude, No. 1, \$2,400@ \$3,000; No. 2, \$1,400@1,700; spinning fibres, \$400@800; magnesia and compressed sheet fibres, \$325@400; shingle stock, \$110@150; paper stock, \$60@75; cement stock, \$17.50@30; floats, \$8.50@15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax. Freight rate from mines to Sherbrooke, Quebec, over Quebec Central R.R., 20c. per cwt.; from Sherbrooke to New York, 27½c., carload lots; freight to New York for crude No. 1, f.o.b. Thetford mines, \$8.45 per ton, carload lots.

Barytes—Crude, 88 to 94 per cent barium content, \$10@12 per net ton; ground (white) \$22@25 in bags, carload lots; (off-color) \$18@20 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, \$12 per gross ton; ground (white) \$23@25; ground (off color) \$16@19 per net ton, f.o.b. Cartersville, Ga. Crude, 88 to 94 per cent, \$23; ground (white) \$40.50; ground (off color) \$27 per net ton, less than carload lots, f.o.b. New York. Crude, not less than 98 per cent, \$11@11.25 per ton, f.o.b. cars, Missouri; floated, \$28 per ton in bbls.; \$26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—Domestic, extra light, 5@6c. per lb.; light, 4½@5½c.; heavy, 4@5c.; English, extra light, 5@7c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin)—Crude, \$9@12; washed, \$12@15; powdered, \$18@22; bags extra, per net ton, f.o.b. mines, Georgia; crude, \$8@12; ground,

\$15@40, f.o.b. Virginia points. Domestic lump, \$10@20; powdered, \$25@30; imported lump, \$25@35; powdered, \$30@60, f.o.b. New York.

Feldspar—Crude, \$7.50@8 per gross ton, f.o.b. Maryland and North Carolina points; \$7.50@10, f.o.b. Maine; ground, \$30, car lots, f.o.b. Baltimore; ground, \$17@20, f.o.b. North Carolina points; \$17@20 per ton, No. 1 ground, f.o.b. New York State; \$21@23 per ton, ground, f.o.b. Maine.

Fluorspar—Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, \$25 per ton, f.o.b. Illinois mines, and \$27.50, f.o.b. Kentucky; ground, suitable for acid, chemical or enameling purposes, \$60; lump, \$17.50, f.o.b. Tonuco, N. M.

Graphite—Crucible flake, 85 per cent carbon content, 8c. per lb.; 88 per cent, 9½c.; 90 per cent, 10½c., all f.o.b. New York. Crucible grades of Alabama graphite sell as follows, f.o.b. Ashland, Ala.: 80 per cent, 5c.; 90 per cent, 10c. Lubricating grades in increasing demand, with price ranging from 11c. for the 85 per cent guaranteed grade in car lots to 30 and 40c. for higher grades. Mexican, amorphous, \$45@55 per short ton; Korean, 3¼c. per lb.; Madagascar, 8c.; Ceylon, 4¼@15½c.

Gypsum—Raw crushed rock, \$3.50@4 per ton; raw ground fine, \$4@4.50; calcined stucco, \$9, all f.o.b. works. Containers extra. Wholesale, plaster of paris, carload lots, \$3.75 per 250-lb. bbl., alongside dock, New York.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, \$1.60@1.65; 2@8 in., \$1.55@1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, \$1.65@1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite, Calcined—High-grade caustic calcined, lump form, \$35@40 per ton, carload lots, f.o.b. California points. Freshly ground calcined, suitable for flooring trade, \$65@75 per ton, f.o.b. Eastern points.

Dead-Burned—\$32.50 per net ton, Chewelah, Wash.; \$52@58, Chester, Pa. Austrian grade, \$52@55 per ton, f.o.b. Baltimore. (Magnesite brick—See Refractories.)

Mica—Imported block mica slightly stained, per lb.: No. 6, 50c.; No. 5, \$1.20@1.40; No. 4, \$2@3; No. 3, \$4.25@5; No. 2, \$5.50@7; No. 1, \$8. Clear block: No. 6, 55c.; No. 5, \$2; No. 4, \$4; No. 3, \$5.75; No. 2, \$7; No. 1, \$9; A1, \$14; extra large, \$25, all f.o.b. New York; ground, \$85@100 per ton, Philadelphia.

Monazite—Minimum of 6 per cent thorium oxide, \$35 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, \$13; 75 per cent, \$11.50; 75@74 per cent, \$11; 70 per cent, \$8.35; 68 per cent, \$7.85; 68@66 per cent, \$7.60. There is no price schedule for spot for domestic uses.

Pumice Stone—Imported, lump, 4@50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish, fines, per unit 12c., c.i.f. Atlantic seaport; furnace size, 16½c.; run of mine, 12@14c.; domestic, fines, f.o.b. mines, 12@14c.

Quartz—(Acid tower) fist to head, \$10; 1½ to 2 in., \$14; rice, \$17, all net ton, f.o.b. Baltimore; lump, carload lots, \$5@7.50 net ton, f.o.b. North Carolina mines. F.o.b. Wausau, Wis., the price is \$16 per ton in car lots, and \$22 less quantities, including bags.

Sulphur—\$18 per ton for domestic; \$20 for export, f.o.b. Texas and Louisiana mines.

Talc—Paper making, \$10@20 per ton; roofing grades, \$9@15; rubber grades, \$10@15, all f.o.b. Vermont. California talc, \$20@45, talcum powder grade. Southern talc, powdered, carload lots, \$15@20 per ton; less than carload, \$25, f.o.b. cars; freight to New York \$5.25 per ton, carload lots; less than carload lots, \$9.25. Imported, \$60@70; Canadian, \$20@40 per ton.

Mineral Products

Arsenic—White arsenic, 15½c. per lb.; sulphide, powdered, 20@21c. per lb., f.o.b. works, carload lots.

Nitrate—Soda, \$3.85 per cwt., ex vessel, Atlantic ports. Market quiet.

Potassium Sulphate—Domestic, \$2.25@2.50 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocobaltitanium—For 15-18 per cent material, \$200@250 per ton, f.o.b. Niagara Falls, N. Y.

Ferrocerium—Per lb., \$12@15. Foreign conditions as affecting the price of American goods remain unchanged.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 17@18c. per lb. of chromium contained; 4 to 6 per cent carbon, 19@20c. f.o.b. works.

Ferromanganese—For 76@80 per cent, prompt delivery, \$200@225 freight allowed; last half, \$200@220; English, \$195@200, c.i.f. Atlantic seaports. Spiegeleisen, 18@22 per cent, \$75@80, f.o.b. furnace.

Ferromolybdenum—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, \$2.50@3 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, \$60@65; 50 per cent, \$80@85; 75 per cent, \$150@160.

Ferrotungsten—70 to 80 per cent W, \$1.10@1.15 per lb. of contained tungsten, f.o.b. works.

Ferro-uranium—35-50 per cent U, \$7 per lb. of U contained, f.o.b. works.

Ferrovandium—Basis 30-40 per cent, \$6.50@8.50 per lb. of V contained, f.o.b. works.

Metal Products

Copper Sheets—Current New York price, 29½c. per lb.; wire quoted, 22¼@23c.

¹Furnished by Foste Mineral Co., Philadelphia, Pa.

Lead Sheets—Full lead sheets, 11c.; cut lead sheets, 12½c. in quantity, mill lots.

Nickel Silver—Unchanged at 39½c. per lb. for 18 per cent nickel.

Yellow Metal—Dimension sheets, 26½c.; sheathing, 25½c.; rods, ¾ to 3 in., 23½c.

Zinc Sheets—\$12.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 12c. per lb.

Refractories

Bauxite Brick—56 per cent alumina, \$145 per 1,000, f.o.b. Pittsburgh.

Chrome Brick—\$90@100 per net ton, carload lots, eastern shipping points.

Chrome Cement—45 to 50 per cent Cr₂O₃, \$50 per net ton, and \$55 in sacks, carload lots, eastern shipping points.

Clay Brick—First-quality fire clay, 9-in. shapes, \$50@55 per thousand, Pennsylvania, Ohio, and Kentucky works; second quality, \$45@50. First quality, St. Louis, \$45; New Jersey, \$75.

Magnesite Brick—\$100@110 per ton, eastern shipping points; 9-in. straights, \$90@100; 9-in. arches, wedges and keys, \$95@105; soaps and splits, \$110@120.

Silica Brick—9-in. per 1,000, \$51@55, Birmingham, Ala.; \$55@60, Mount Union, Pa.; \$55, Chicago district.

Iron Trade Review

Pittsburgh, Aug. 10, 1920

Shipping conditions in the iron and steel industry continue to improve in general, although slowly. Some railroads are performing much better than others. There is particular difficulty in the movement of billets and sheet bars, resulting in idleness of finishing plants.

The railroad rate settlement is expected to have a favorable influence upon industry in general, but the steel industry expects no large orders in the near future. It is more anxious to see improved shipping conditions than to receive railroad orders, as the industry's other customers would buy more steel if they had better transportation.

Pig Iron—Basic is quotable up 50c. as a result of recent sales. We quote: Bessemer, \$47; basic, \$46.50; foundry, \$46, f.o.b. Valley furnaces, freight to Pittsburgh being \$1.40, to advance about 40 per cent August 26. Pig-iron consumers are interested only in early deliveries, and furnaces, being well sold up, are making no effort to sell for late deliveries.

Steel—Several purchases of sheet bars have been made, at not over \$70 in any case. A fortnight ago \$75 was being paid. Several mills are anxious to sell billets and sheet bars if they can be shipped. We quote billets at \$60@65 and sheet bars at \$68@70.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 6c. per lb., in 250-lb. bbls.

Connellsville—Furnace, \$17@18; foundry, \$18@20.

A Review of the Japanese Lead and Zinc Market

A Statistical Summary of the Activity in Japanese Mines and the Movements of These Metals During the War

PRODUCERS and smelters were encouraged by high prices during the war, according to Vice-Consul H. T. Goodier, by the hope that strikes and political conditions in the United States, Spain, Australia, and Mexico, the principal lead-producing countries of the world, would create a world-wide shortage. However, this hope does not seem to have fully materialized, and the lead market has become quiet as a consequence. Paint manufacturers, having lost a considerable share of their trade with Singapore, the East Indies, and India, as a result of renewed competition from Europe, are buying lead only for actual needs. This, together with increased cost of materials for smelting, and higher wages, has caused a considerable reduction in output as compared with 1917. If the 1919 figures were available they would undoubtedly show a still more noticeable decrease in amount and value, many of the companies being in greater financial difficulties than in 1918.

The quantity and value of the annual production of lead in Japan from 1913 to 1918 is given as follows:

Year	Pounds	Value	Year	Pounds	Value
1913	8,393,138	\$308,006	1916	25,268,685	\$1,872,332
1914	10,138,205	412,400	1917	35,127,077	2,822,018
1915	10,567,457	486,729	1918	23,742,236	2,070,266

Prices for lead (Australian) reached their highest in September, 1918, when 1 picul was worth \$15.52 in Yoko-

When the war broke out, zinc experienced a boom in Japan, due to heavy demands from Great Britain and Russia. Prices went up, and many new companies, both mining and smelting, were formed. Though there was a marked disparity between costs and selling prices, these companies all made good profits. However, with the beginning of summer, 1916, prices started to go down. With decreased foreign demands, and increased cost of production and transportation charges, many companies have had to either temporarily suspend operations or considerably restrict their activities, the latter course being taken by even several of the middle-sized companies. Much of this financial trouble noticeable among the smaller zinc operators is probably due to pyramiding subscribed capital on the basis of abnormal profits and excessive dividends.

The estimated cost of production of refined zinc at the smelters is about \$11 per picul, or 8½c. per lb. Prices of 98 per cent pure zinc per picul ranged from \$6.41 in June, 1914, to \$27.40 in December, 1915. Since then prices have hovered around \$12 as an average. In March, 1920, the price per picul was \$13.96. The margin of profit, considering transportation charges, is thus proportionately low at present.

The imports into Japan of zinc ore, of ingots, slabs, and grains, of sheets, and of waste during the past five years were as follows:

Year	Ore		-Ingots, Slabs and Grains-		-Sheets-		Waste	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
1915	(a)	(a)	6,487,784	\$637,056	1,210,100	\$157,277	11,125,057	\$769,465
1916	(a)	(a)	7,218,985	980,277	1,203,998	228,577	4,401,937	427,889
1917	207,450,533	\$3,899,905	10,015,693	879,392	2,694,150	595,171	1,633,445	110,124
1918	133,093,068	2,433,883	5,443,656	681,263	2,981,136	759,511	1,622,656	122,903
1919	61,845,733	1,122,932	12,629,181	1,463,480	3,276,672	555,480	722,444	36,661

(a) Not known.

hama. The lowest was \$5.85 per picul, in June, 1914. In March, 1920, the price was \$13.21. The cost of production of refined lead is estimated at about \$8 per picul at the smelters.

Imports of lead and lead ore into Japan from 1915 to 1919, largely from Australia (for lead ingots and slabs), are stated as follows:

Years	Lead Ore		Lead Ingots and Slabs		Other	
	Pounds	Value	Pounds	Value	Pounds	Value
1915	(a)	(a)	32,279,973	\$1,450,656	2,872,805	\$175,860
1916	(a)	(a)	46,230,232	3,720,089	3,460,964	278,704
1917	50,520,532	\$1,253,759	35,024,068	2,926,798	1,567,652	144,154
1918	7,989,466	191,130	120,283,002	7,351,379	1,447,808	153,538
1919	330,667	8,007	79,607,814	5,432,046	(b)	(b)

(a) Not known. (b) Statistics not yet available.

In 1915 Australia sold to Japan 24,599,868 lb. of lead ingots and slabs, valued at \$1,102,933. The same year the United States sold to Japan 5,790,156 lb., valued at \$248,307. In 1919, while imports of lead slabs and ingots from Australia had increased to only 32,366,341 lb., valued at \$2,551,042, imports from the United States jumped to 27,239,280 lb., valued at \$1,604,866.

In 1914 Japanese consumption of lead was estimated at 43,753,000 lb., a great share of which was imported from Australia. In 1918 the estimated consumption had reached 144,025,000 lb.

Only since 1913 has Japan engaged in zinc smelting. Prior to that time zinc ore was shipped abroad and the refined product then imported. The estimated consumption of zinc in Japan increased from 25,512,000 lb. in 1914 to 60,761,000 lb. in 1918. Consumption has, however, materially decreased since 1918.

The following table shows that the production of zinc has been steadily declining since 1913, but that the output of refined zinc increased until 1918, in which year it decreased.

Years	Zinc Ore		Refined Zinc	
	Metric Tons	Value	Pounds	Value
1913	34,676	\$472,303	(a)	(a)
1914	14,138	140,752	13,140,265	\$682,454
1915	6,121	179,845	46,958,601	6,456,866
1916	2,187	91,257	86,652,236	13,462,052
1917	163	13,576	121,596,436	13,462,153
1918	(a)	(a)	88,701,073	8,838,867

(a) Production not stated.

During 1917 and 1918 a great deal of zinc ore was imported for smelting, mostly from Australia. However, since 1918 imports of zinc ore have decreased considerably, owing to a smaller foreign demand for the refined article, thus causing many smaller smelters in Japan to suspend operations.

Although no definite statistics in support thereof can be presented, indications are that foreign refined zinc and zinc manufactures, principally sheets from the United States, will once again find a growing market in Japan, owing to transshipping and speculative activities in connection with the increased demand for plating in China.

The exports of zinc ore have shown a steady decline since 1915, when they amounted to 13,618,250 lb. On the other hand, exports of zinc ingots and slabs increased until 1917, since when they have shown a noticeable decrease. Japanese exports of zinc ore and of ingots and slabs from 1915 to 1919 are given as follows:

Year	Zinc Ore		-Zinc Ingots and Slabs-	
	Pounds	Value	Pounds	Value
1915	13,618,260	\$179,846	(a)	(a)
1916	4,865,332	91,258	51,586,452	\$9,596,461
1917	362,400	13,576	81,853,012	10,442,511
1918	11,332	234	37,739,584	4,519,766
1919	(a)	(a)	12,629,180	1,463,480

(a) Statistics not available.

The principal countries of destination for the exports of zinc ingots and slabs during the last three years were as follows:

Countries	1917		1918		1919	
	Pounds	Value	Pounds	Value	Pounds	Value
Asiatic Russia	16,370,736	\$1,943,703				
British India			7,851,343	\$931,442		
China					2,912,616	\$296,935
France	13,277,885	1,777,815	15,802,908	1,753,365		
Great Britain	42,452,701	5,472,124	9,330,916	1,166,264	8,586,588	1,048,423
Kwangtung Province					357,452	30,946

In Japan, the principal uses of lead are in the manufacture of paint, cables, and piping and in producing acetic acid. The principal uses of zinc are for galvanizing and paint manufacture.

Both primitive and modern mining methods are used.

MINING STOCKS

Week Ended August 7, 1920

Table with columns: Stock, Exch., High, Low, Last, Last D'v. Section: COPPER. Lists various copper stocks like Adventure, Ahmeek, Alaska-B.C., etc.

Table with columns: Stock, Exch., High, Low, Last, Last D'v. Section: LEAD. Lists stocks like Hecla, St. Joseph Lead, Stewart, etc.

Table with columns: Stock, Exch., High, Low, Last, Last D'v. Section: ZINC. Lists stocks like Am. Z. L. & S., Am. Z. L. & S. pf., etc.

Table with columns: Stock, Exch., High, Low, Last, Last Div. Section: GOLD. Lists various gold stocks like Alaska Gold, Alaska Juneau, Carson Hill, etc.

Table with columns: Stock, Exch., High, Low, Last, Last Div. Section: SILVER. Lists various silver stocks like Arizona Silver, Beaver Con., Coniagas, etc.

Table with columns: Stock, Exch., High, Low, Last, Last Div. Section: GOLD AND SILVER. Lists stocks like Atlanta, Barnes-King, Bot. & Mont., etc.

Table with columns: Stock, Exch., High, Low, Last, Last Div. Section: SILVER-LEAD. Lists stocks like Caledonia, Consol. M. & S., Daly Mining, etc.

Table with columns: Stock, Exch., High, Low, Last, Last Div. Section: NICKEL-COPPER. Lists Internat'l Nickel, Internat'l Nick. pf., etc.

Table with columns: Stock, Exch., High, Low, Last, Last Div. Section: QUICKSILVER. Lists New Idria, etc.

Table with columns: Stock, Exch., High, Low, Last, Last Div. Section: TUNGSTEN. Lists Mojave Tungsten, etc.

Table with columns: Stock, Exch., High, Low, Last, Last Div. Section: VANADIUM. Lists Vanadium Corp., etc.

Table with columns: Stock, Exch., High, Low, Last, Last Div. Section: ASBESTOS. Lists Asbestos Corp., Asbestos Corp. pf., etc.

Table with columns: Stock, Exch., High, Low, Last, Last Div. Section: MINING, SMELTING AND REFINING. Lists Am. S. & R., Am. S. & R. pf., etc.

*Cents per share. †Bid or asked. ‡Quotations missing. Q, Quarterly. SA, Semi-annually. BM, bimonthly. K, Irregular. I, Initial. X, includes extra

INDUSTRIAL NEWS

S. E. Atkins Co., Alworth Building, Duluth, Minn., contract diamond and churn drilling, has just been organized to take over the drilling work of the Duluth Diamond Drilling Co., which is retiring from the contract drilling field.

Wilson Welder & Metals Co., Inc., formerly at 2 Rector St., New York City, has moved its general office to 253 Thirty-Sixth St., Bush Terminal, Brooklyn, N. Y. The offices of the Wilson Welding Repair Co. are now at 263 First St., Jersey City, N. J.

The Associated Petroleum Engineers, 120 Broadway, New York City, N. Y., resulted from a reorganization of The Associated Geological Engineers. It remains an association of experts. The principal difference from its predecessor is one of greater specialization in personnel and facilities for professional work in the petroleum field. The business of the organization is to furnish the services of oil geologists and petroleum engineers throughout the various domestic and foreign fields.

In the field work the more detailed and routine phases of the work are usually done by the less experienced men under the general supervision of the more experienced geological engineers. The result is economy to the clients, and increased reliability of the results by bringing to bear on a given piece of work at least two points of view.

The organization is also equipped to take charge of geological surveying, examinations, and reports on all classes of mineral deposits, metalliferous or non-metalliferous, in any part of the world. Such testing and chemical analyses are undertaken as are necessary to determine the quality or extent of any deposits investigated. Other classes of work undertaken are the examination or testing of foundations and dam sites and the supervision of borings for coal or other minerals. In fact, the same ground is covered as by any geological or mining engineering organization.

Thew Shovel Co., an Ohio corporation (F. A. Smythe, president), has acquired all the outstanding capital stock of the Thew Automatic Shovel Co., Lorain, Ohio, and the two companies have been consolidated. The former has assumed all the assets and business of the latter, together with the legal liabilities and obligations. The consolidation gives the Thew Shovel Company net assets of \$2,000,000.

Reliance Weighing Machine Co., Malers Building, Chicago, Ill., announces the purchase of the business of National Automatic Scale Co., makers of the Reliance automatic grain scale and other automatic recording continuous weighing machinery.

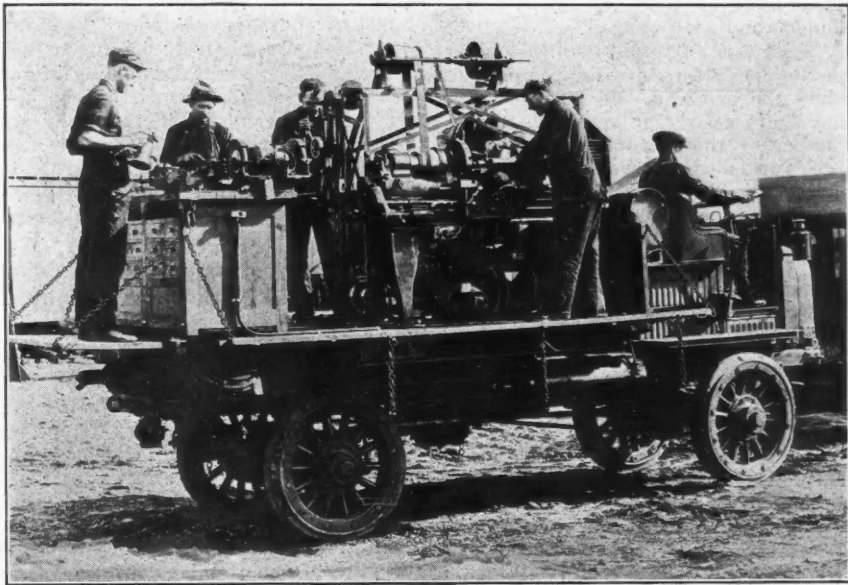
**Suggestions to Sellers in China
Parades and Storytellers Best
Ad Media**

Two interesting suggestions to those introducing goods into China are made in *Commerce Reports* by Trade Commissioner J. W. Sanger and Consul Stuart J. Fuller of Tientsin. Mr. Sanger suggests that as the effectiveness of advertising in Chinese papers is somewhat nullified by the fact that their circulation is small when compared to the population, many of whom cannot afford to buy papers and could not read them if they did, the employment of itinerant storytellers and narrative parades should receive consideration, as these means have proved their effectiveness in some cases. This indicates a new field for ingenious advertisers.

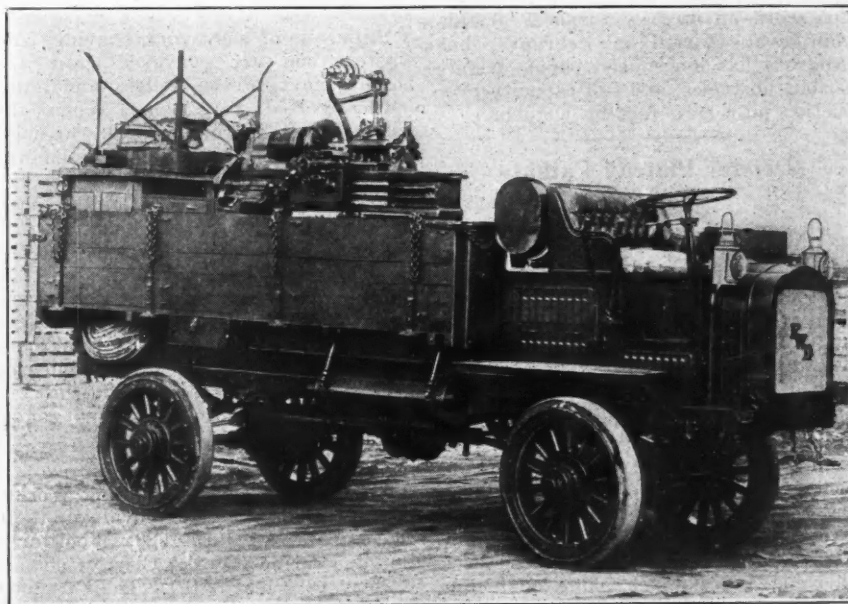
**Machine-Shop Trucks Keep the
Fleet Moving**

**Slight Repairs Promptly Made Save
Large Repairs Later, Avoid Long
Halts and Hasten Deliveries**

Moving repair shops, mounted on motor trucks, which were extensively used by the Government during the war to care for its large fleets of trucks at home and abroad, are destined to play an important part in facilitating the successful operation of the ever increasing fleets of trucks operated by large companies, contractors, and road builders throughout the country, according to C. J. Van Landeghem, transportation engineer of the Four Wheel Drive Auto Co., Clintonville, Wis. With the increasing use of fleets of trucks in various lines of business, the machine-



F. W. D. REPAIR TRUCK OPEN SHOWING COMPLETE EQUIPMENT FOR HANDLING ANY REPAIR JOB



F. W. D. REPAIR TRUCK PACKED AND CLOSED BY TURNING UP SIDE AND END PANELS

shop truck, as a flexible medium for keeping fleets of trucks in constant running order, at a minimum loss of time, will become as necessary and vital a factor for commercial use as it was during the war, is his prediction.

"The continuous operation of every truck is an important consideration with a fleet owner, and in this respect the machine-shop truck has proved itself a time and money saver through its ability to go direct to the crippled truck and put it in condition at a minimum of time" says Mr. Van Landeghem. "Mounted on the chassis is a complete equipment to handle any kind of repair job. A separate motor furnishes the power for operating the various machine tools. These embrace such mechanical apparatus as a drill press, screw-cutting lathe, electric grinder, blow torch, welding outfit, forge, and more than 1,000 other pieces of machinery and tools.

"Each tool and piece of machinery has its own place, insuring compactness when the end and side panels are up and the truck is in motion. A great number of these moving repair shops were furnished the United States Government by the Four Wheel Drive Auto Co. during the war. With the increasing tendency to operate fleets of trucks in various industries, the efficiency of the machine-shop truck will soon make it an important factor with every fleet owner."

New Colorado Zinc Oxide

By F. N. SPENCER

Due to increasing zinc oxide needs, South American and West Indian importers interested in the paint and rubber industries are informed that ores are now being roasted in the Empire Zinc Co.'s new plant at Cañon City, Col., preparatory to actual production of the Palmerton, Pa., grade of zinc oxide. The concern is a subsidiary of the New Jersey Zinc Co. Construction work on its new furnaces at this point was started in February, but progress has since been rapid, despite serious obstacles, and full capacity production may be a fact by October.

Deister Plateau Patents Sustained

Diester Machine Co. announces that earlier this year the United States Court of Appeals at Chicago sustained its three main plateau patents. One of the main features of these PLAT-O concentrating table is the plateau covered by patents owned and controlled exclusively by the Deister Company. The plateau consists of the mineral-cleaning zone somewhat higher than the general stratifying or concentrating portion of the table, and these two surfaces are substantially parallel. Intervening the plateau and the concentrating portion of the deck there is a resistance plane or incline along a diagonal line. The ends of the riffles are slightly bevelled to conform to the slope of this resistance plane.

Oxweld Cuttings and Welding Aided Hibbing, Minn., Removal

An interesting feature of the partial removal of Hibbing, Minn., was the oxwelding of about 35,000 ft. of pipe for the new gas distributing system. This is an example of the new way in which gas-pipe lines are now installed, a continuous length of pipe being oxwelded and doing away entirely with the old threaded connections at the joints. The new process requires only the Oxweld cutting and welding blow-pipes and the necessary supplies of oxygen and acetylene, which are conveniently conveyed to the work in Linde and Prest-o-Lite cylinders, the whole outfit being moved along with the work as it progresses. This is the first time that two-inch pipe has been welded in the Mesabi region. About 8,000 ft. of the new Hibbing gas piping is of this size, the rest being four-inch and eight-inch pipe. Oxwelding of pipe lines has been found satisfactory, both as to serviceability of the lines and economy of installation.

The new Hibbing will lose little by its change of foundations, and it will gain much in the way of general improvements.

Efficient Steam Power Plant Needs No Coal

The various sizes and shapes of Conneaut shovel blanks, handles, and complementary tools are now being put through their preliminary steps of shaping under the plant's own steam-generated electric power.

All the drainage from the heating systems, from the many drinking fountains that supply spring water to the men, and the condensation from the engine, goes through a filter and a heater and is used again in the boilers, making a continuous operation and in this way effecting a saving of considerable water.

By means of conveyors, shavings and waste wood are conveyed from the handle plant to the boilers and automatically fed to them. When the handle plant is running full capacity, no coal has to be bought. For emergency use, two tanks on top of the engine room, storing 180 tons of coal, feed by gravity to the chain grate stokers. This coal is elevated from the track to these bins by a conveyor. The ashes from the chain grate stokers are dropped into a pit back of the stokers and by a conveyor carried from there into an ash bin storage. One man can operate the entire plant. Only the conveyors, and other machines and gages, need to be watched.

Atlantic Smelting & Refining Works, Inc., announces the removal of their offices to room 1987-1989, Woolworth Building, New York City, (phones Barclay 8872 and 8019). Their factory has been moved to Plum Point Lane and Doremus Ave., Newark, N. J., (phones Market 6720 and 6721.)

TRADE CATALOGS

Armored Hose—The Sprague Electric Works, of 527 West 34th St., New York, in their illustrated pamphlet No. B-3567, list and describe the various parts of their flexible armored hose for industrial work. The highly flexible, yet steel-hard, spiral armor makes such hose both handy and durable for air or steam installations, and the perfected couplings and mending devices facilitate rapid set-up and take-down that will be appreciated by rock-drill men. The air-brake hose of this company is specially illustrated and described in Bulletin 44553.1 for June, 1920.

Still—The many commercial needs for clean pure water, whether for drinking, manufacturing, for storage batteries, or for the laboratory; and the economy today in recovering alcohol lost by water dilution, make the subject of water stills always important. The Barnstead Still & Sterilizer Co., Forest Hills, Boston, Mass., shows in its recent annual catalogue a line of proved appliances adapted to this great variety of needs. The publication aims to be exhaustive, and will be useful to anyone interested in these devices.

Ore-Handling Machinery—The Wellman-Seaver-Morgan Co. has recently issued Bulletin 41, together with several others dealing with the various types of machinery manufactured by the company. This bulletin, "Coal and Ore-Handling Machinery," contains reproductions of photographs showing unloaders, traveling bridges with grab buckets, car dumpers, car haulages, transfer cars, boat loaders, bucket handling cranes, excavating buckets, and weighing larries. A short description of each, together with a sectional drawing, is included.

Belt Fasteners—Crescent Belt Fastener Co. has issued a new circular entitled "Modern Scientific Methods in Belt Joining." It contains practical belt-joining data for the practical man. This information is of permanent value to anyone interested in belt upkeep, and it is so designed that when opened up and tacked to a wall it presents on one page full information for joining the belt to insure its best service under all conditions of work. Copies of this illustrated circular, Form N. Y. 227, will be sent on request. Address Mining Engineering Service Department of Crescent Belt Fastener Co., 381 Fourth Ave., New York City.

Fuel Oil Burner—John Foerst & Sons, 80 West 22d St., Bayonne, N. J., have issued a catalog illustrating and describing the various types (conical and fan tail), of fuel oil burners which they manufacture. The catalogue also contains illustrations of the burners and their application to various equipment.

