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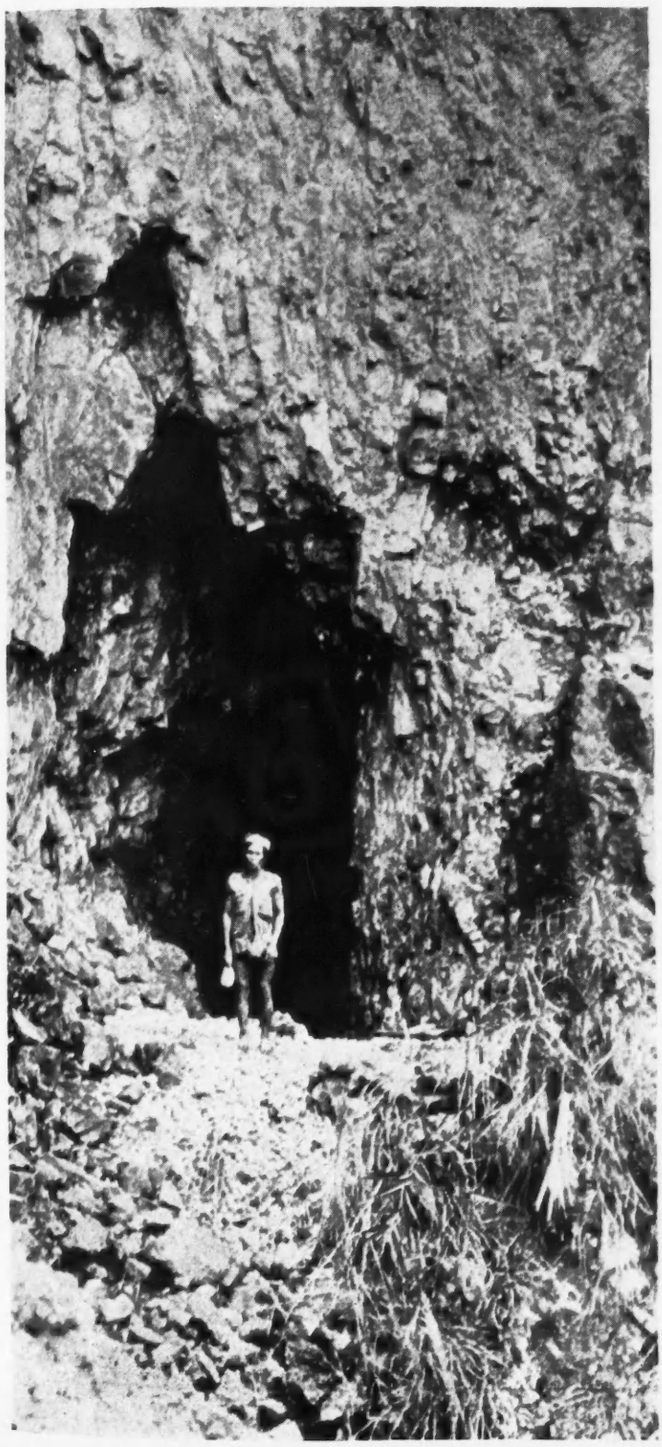

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Current Prices of Materials and Supplies

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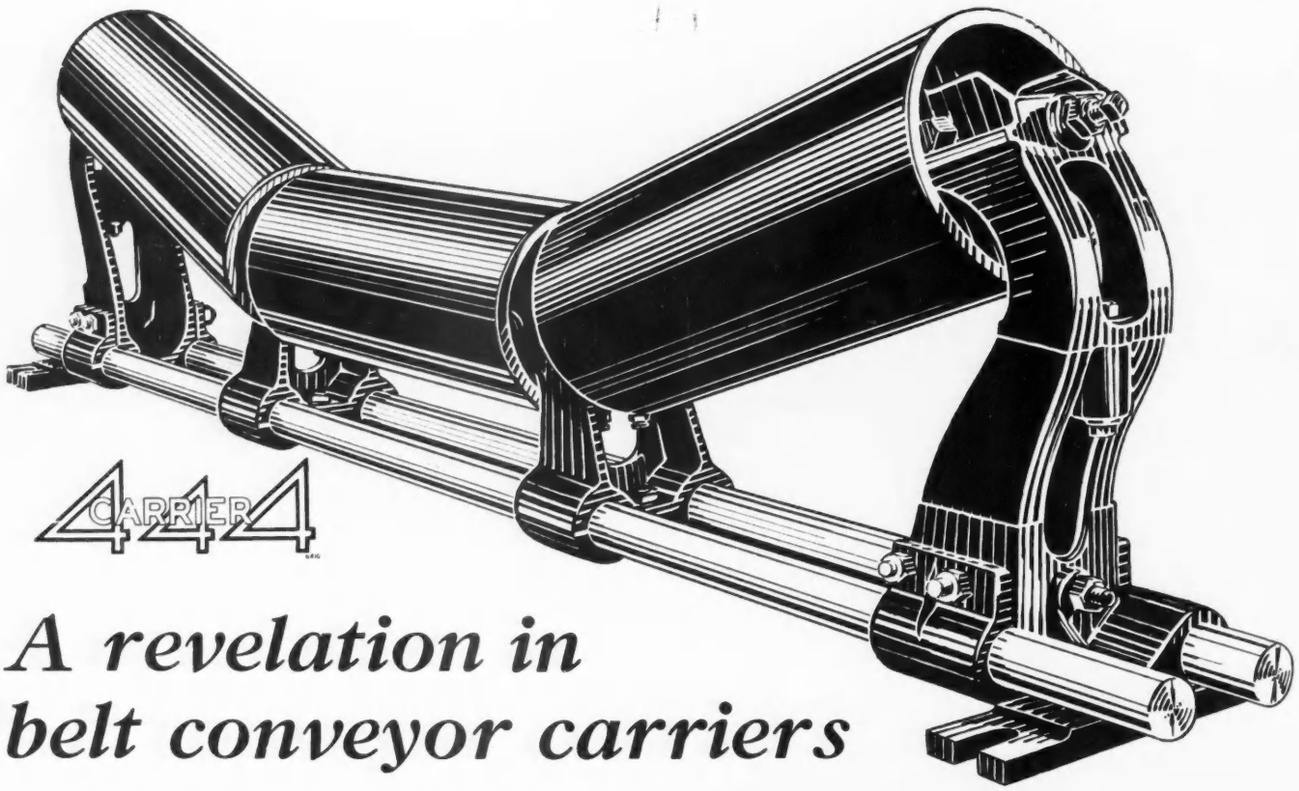
*Illustration* — An opening of the Mancayan mine on the Island of Luzon, the principal copper producer of the Philippines which was worked as far back as the seventeenth century

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ENGINEERING AND
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JOSIAH EDWARD SPURR, Editor

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## A Chair of Friendship

NOW that so much scrutiny is being given to the colleges, their moral as well as their cultural and economic value may well be studied. College life has its social peculiarities; its distinctions and classifications; its teams and letters; it fraternities. It is an intense even if a petty world. Many a young man emerges from college unduly impressed with his great prominence and worth; many another unduly humbled, and depressed and lonely. Youth is self-centered. The college years are those in which it first recognizes social distinctions, but is not yet sufficiently broadened to give them their true value. Many, of course, never attain this perspective. Undoubtedly the colleges, especially certain colleges, could strive further in the direction of ideals of democracy; undoubtedly snobbishness and aloofness is forced upon some that otherwise might have escaped it. The New York *Times* said editorially recently: "The ancient 'class' spirit, which bound every man to his fellows of the same year, has broken down under the weight of numbers, and there is nothing to take its place but a system of clubs or fraternities which tend to be as unrepresentative as they are exclusive."

It would take a more systematic survey before college fraternities could be designated as puerile; they have their strong talking points, which need no elucidation; and for those who never, even in after life, pass puerility, they continue to be an abiding comfort. The professional college man is one of the saddest examples of arrested development—of a senior moronism.

The young man who does not through personal charm or athletic feats—both of which are poor criteria—fall into a dizzying career of college popularity is apt to be abandoned to self-depreciation and loneliness. He is apt to be less happy than before he entered college; less happy than after he leaves, when he shall have had a wider elbow room and a freer and a more democratic jouncing about and comparative classification. The college accentuates the un-Christian motto of the world in general that every man must look out for himself, and the devil take the hindmost; the college concentrates on the popular favorites, whereas it should focus upon the failures, who are really those who need hospital attention.

Without wanting to be trivial or sentimental, it is sober truth that friendliness is a wonderful force. It makes for happiness, which inspires confidence, which makes for success and noble undertakings; and it is by no means too important to be studied and practiced scientifically in a great university. A great university should have the ideals of democracy and kindliness; it should not leave all the social welfare work to the Salvation Army and the slums. That is the great defect, as has often been pointed out, in our wonderful civilization. We have advanced much further in the material way than we have in the moral way. We have solved the problem of luxury better than we have the more fundamental one of happiness. Is it not within the function of the university to study this shortcoming and its remedies?

It is by no means a whimsical suggestion that some philanthropist, yearning to do one really good thing before he dies, in the all too brief period between his period of accumulation and that of his obsolescence, should found in one of our great universities a Chair of Friendship. Here would perhaps lie the key to the solution of a host of vexing problems. In the science and propagation of friendship lies perhaps much of the solution of treaties and wars, of capital and labor, of police and crime, of commercial panics. Can the colleges afford to be behind the great procession in this most important matter of friendliness, on which was once based a great religion?

## The Cat and the Canary

THERE WILL BE NO FIGHT between the Aluminum Company of America and the Duke interests. For a time it seemed that the latter had an excellent chance to enter the aluminum production field. Cheap power, bauxite, and abundant capital are essential for this purpose—Duke had all three, and the ambition to make aluminum. On the other hand, the Aluminum Company was said to have been short of power to carry out its plans and had even been buying it from Duke, in the South, on a contract that was almost ready to expire. In Quebec, on the Saguenay, were two remarkable power sites owned by the Duke-Price interests, who had almost completed the development of the upper site and were prepared to begin work on the lower, which by itself could develop 600,000 hp., it was said. Bauxite ore from the Guianas could be brought in ocean bottoms and delivered directly to a plant erected at this lower site. Thus Duke was in a position to produce not merely cheap aluminum, but probably the cheapest.

This budding competition has now been killed by kindness, kindness that recalls the death that Croesus died when his enemies poured molten gold down his throat. No facts have been definitely determined—they rarely are where the Aluminum Company is concerned—and the gentlemen involved are on vacations, but it is rumored that for the lower power site alone the Aluminum Company paid Duke $16,000,000 and more, and has given him the contract to built the dam and power plant it calls for. This will be a source of further easy profit to Mr. Duke and his associates, for the upper plant now is practically complete, the working force can be readily transferred, and the cost of the construction plant has already been written off. Besides, the Aluminum Company has agreed to purchase power from the upper plant, now ready, until its own plant at the lower site is finished. Thus enemies are choked to death

with money. Thus also the cat has swallowed the canary, that might otherwise have grown up to be an ostrich.

Following the purchase, construction work is said to have been suspended on the Aluminum Company's new oxide plant at Baltimore. This was intended ultimately to take the place of the present oxide plant at East St. Louis, Ill., which runs on bauxite, two-thirds domestic and one-third from Dutch Guiana, and which supplies oxide to the company's metal-producing plants at Baden, N. C.; in Tennessee, and at Niagara and Messina, in New York. Foreseeing the day when its Arkansas deposits shall be exhausted, the company has been erecting the new oxide plant at Baltimore to treat its Guiana ore directly on the seaboard. But the proposed plant on the Saguenay will make this Baltimore plant unnecessary.

Perhaps with the Aluminum Company making a large part of its aluminum at low cost on the Saguenay, it will not want the tariff that it now enjoys. Or will it still need protection against itself?

## The Ghost of the Molten Magma

GHOSTS are constitutionally likely to bob up again in unexpected places long after they have been laid with proper holy water and incantations. Prof. J. V. Lewis' clear-cut little essay on this subject in the issue of *Mining Journal-Press* for Aug. 16, 1924, was designed to lay this terrifying ghost, so disturbing to geological infants; but it will be long before it ceases to visit and frighten away the prospective disciples of pure magmatism. In a paper on Magmatic Ores, published in London as part of a symposium by the Faraday Society, Prof. J. W. Gregory resuscitates the ghost in all its horridness. Quoting an early definition in 1909 that magma is "molten rock material" (which it certainly is not), Professor Gregory proceeds to limit the term "magmatic ores" to "those ores which have been attributed to the direct cooling of molten materials." If one should limit the term thus, the discussion should be short, like the oft quoted essay: "There are no snakes in Ireland." "Even as thus limited," Professor Gregory proceeds, "the variety of ores claimed as magmatic is large. It includes many useful minerals such as monazite, cryolite, mica, and molybdenite, and such gems as tourmaline, kunzite, and rubies, when found in such pegmatites as have been formed as molten injections." That mica has crystallized from a "molten" condition must shock the shades of all the classic investigators of the conditions of mica formation.

Coming down to gold-quartz veins, viewed in part as magmatic injections by Spurr and earlier by Belt, Professor Gregory decides that they were not "molten."

"That the ordinary gold-quartz lodes were not formed by the injection of molten material seems proved by the absence of marked contact metamorphism in the adjacent rocks. I have examined microscopically many slates on the margin of these quartz veins, and have seen no sillimanite or other high-temperature contact minerals. The structure of these lodes appears to be fully explained by replacement of the country rock by hot solutions. They are aqueous ores."

Let us pass by for the moment the useless criterion of contact metamorphism. Many dikes of igneous rock show no contact metamorphism; even cases of basic dikes cutting bituminous coal without altering it have been noted. Neither is contact metamorphism due, to any important degree, to the heat of the injected magma. This is a subject that evidently should be elucidated, but not at the moment. The further fact that many veindikes of quartz and other ores exhibit contact metamorphism in the true sense cannot be gone into here—only noted. But the expectation of Professor Gregory that magmatic quartz must be injected as "molten material" certainly should be briefly and unfavorably mentioned. And it is only necessary to quote from papers published in the same pamphlet, such as that of Dr. J. W. Evans or, a few pages before, that of Dr. J. S. Flett:

"As has been long known, such minerals as quartz, the alkali feldspars, micas, hornblende and garnet cannot be produced in dry melts."

Professor Gregory's conclusions as above given are dogmatic. Dogmatically answered, there are certainly gold-quartz veins which are due to replacement; there are also certainly many gold-quartz veins that have nearly the same origin as certain pegmatites, which in turn have nearly the same origin as certain granites. They are all due to the injection of magma. But not the molten magma: in the case of granites not one whit more than in the case of quartz veindikes. A bas the molten magma! As to the rôle of replacement processes of and in ore veindikes, pegmatites, granites, and other igneous rocks, that is another story.

## Financing and Selling Engineering Experience

WEARY OF WORKING for lower pay than is given out-of-door laborers, 3,500 municipal engineers of the City of New York have formed an association to carry on an active campaign for better salaries. Statistics show, according to the *New York World*, that 76½ per cent of the engineers get less pay than city mechanics; that 88 per cent receive less than the foreman of a street-cleaning crew; and 10 per cent receive less than a common laborer. Statistics also show that the salaries of city engineers have advanced only 44 per cent since 1913, while the cost of living today is 75 per cent greater than before the war. In the Department of Public Works, Boston, 400 engineers are employed, the majority of whom receive less than $1,800 per year. The engineers of both cities are asking for a flat increase of 25 per cent, a very modest request in the face of increased rentals in these same cities.

The work of these men is important, being the basis of all municipal improvements such as subways, sewers, water works, streets, and pavements which are to be paid for out of public funds. It is the engineer who prepares the estimate for all these improvements, often involving millions of dollars. He holds the key to the money chest of the municipality, and upon the basis of his training, experience, and judgment contracts are let by political appointees who receive five to ten times the salary of the one who plans, supervises, and completes the work.

What is the matter with the selling of the engineer's training, experience, and judgment? The very essence of engineering is detail. Every minute item must be scrutinized before it is assembled into the finished product of a bridge design, office building, smelter, or power plant. Being engrossed in details of construc-

tion and cost he has not the time or opportunity to capitalize his training and judgment. The engineer's aim is to turn out a complete design, with no thought of profit therefrom. The man who finances the project does so for one sole purpose—viz, making money—and in this he also capitalizes the engineer's judgment and receives dividends thereon.

The engineer is usually deeply interested in his work, has a certain code of ethics, and can not and will not resort to militant measures to improve his condition. A resolution adopted by a large majority of 150 delegates representing the engineering employees of the New York City municipal departments said that their association proposed "to better the present unsatisfactory compensation of engineers by appeals to reason and not by coercion." On the other hand, a group of engineers in Chicago staged a "three-day vacation," and, according to the *World*, the city authorities capitulated within thirty minutes.

The municipal engineer is appealing to reason. The mining and civil engineer are always looking for a new and better job. In most cases the very nature of the work of the latter renders a long-tenure position almost an impossibility. Neither method will enable the engineer to live a life of comparative ease and satisfaction at fifty. All he will have is experience, unless he has early formed the habit of allowing his vision to go beyond the drafting table or range pole.

Detail work is tiring and often exasperating. By the time an engineer walks a few miles through a rough timber or swamp land to and from his railroad survey he is too tired to think in terms of personal finance. The corporation president who sends him out is at all times thinking in terms of dollars, at his office, at his club, and when with his business associates. In addition to being a slave to detail, the engineer is too often of a reclusive nature—he does not take a proper interest in civic affairs, and thus he actually misses many local opportunities to make a turn that would net him a substantial dividend.

There is no reason why the engineer cannot think in dollars as well as lines, curves, and angles. Many examples could be cited where engineers have gotten out of "the rut" and utilized their engineering training in other lines with wonderful success. What the engineering profession needs is not more engineering in commercial projects but more business in engineering.

## A Four-Mile Hydro-Electric Development Tunnel

THE COMPLETION of a four-mile tunnel, part of the development of No. 3 power plant on the Pit River in California by the Pacific Gas & Electric Co. on July 18, 1925, is an achievement that reflects credit upon O. W. Peterson, engineer of general construction for the company, and the operating staff. The work was done in a little less than two years. Excavation, timbering, and lining a tunnel 23 ft. in height, 22 ft. wide, and four miles in length in such a short period of time predicates the availability of compressor and rock-drilling equipment, loading machines, and other mechanical appliances of a dependable, high-grade kind. Of as great importance is the organization of the work and its conscientious direction. The mucking problem was solved by the adoption of a caterpillar tractor-mounted shovel of the revolving type operated by compressed air. These shovels were placed in four of the six headings and proved to be efficient, making a saving of $1,500 per month at each heading over manual loading. Although the tunnel was driven in rock of intermediate hardness that facilitated drilling, the formations penetrated were such as to require the timbering of practically the entire tunnel. The record advance in one month was 600 ft. in a single heading. This is noteworthy when the size of the section and the use of timbering are considered.

Without the use of mucking equipment it probably would have been impracticable to have completed the tunnel within the time set and attained. The importance of mechanical loading in large-scale tunnel work is now almost universally recognized. Loading machines for development operations in metal mines where the cross-sections are much smaller are in process of evolution and are obtainable for drifts and adits of large cross-section. The development of a machine for work in closer quarters has perhaps not advanced as far as has that of larger machines. But rapid progress is being made.

## Copper Stocks

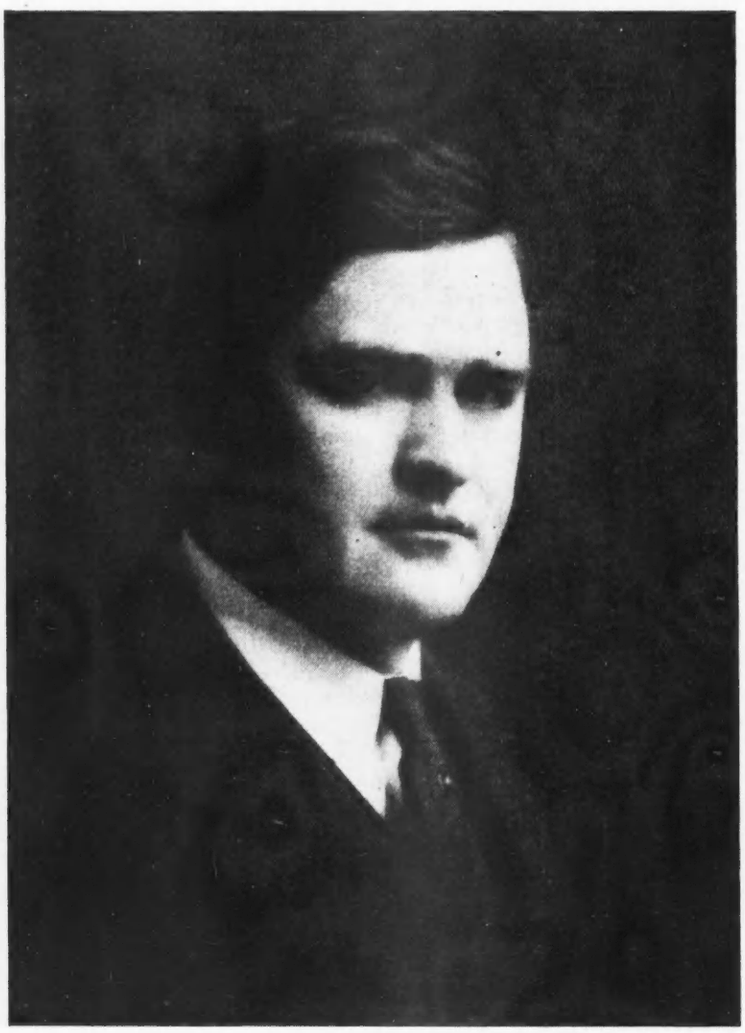
AS COPPER STOCKS GO DOWN, will copper stocks go up? Or, to be more explicit, will the marked decline in the supplies of blister and refined metal in the hands of American producers be reflected in a better metal market, in increased mine earnings, and in a material upward movement in the stock-market prices of copper securities? Copper shares have not met with popular favor in recent years. Several false starts have been made toward higher prices for the metal, only to be followed by almost disastrous reactions. These have been reflected in decreased earnings. Professional speculators have been suspicious, and owners of shares among the general public, wearying of small dividends or none at all, have frequently sacrificed their holdings.

The stock of refined on Aug. 1, according to the American Bureau of Metal Statistics, had been reduced to 88,088 tons, from 91,326 on July 1. The latter figure had marked a new low since the war. Stocks of blister in transit and at refineries also were reduced by 11,716 tons during July. Production of refined copper during the month was 114,182 tons, compared with an average of 112,434 in the second quarter, but of this 108,998 tons was primary metal, compared with an average of 109,281 during the second quarter. United States primary production in July was 67,648 tons, compared with an average of 70,375 for the second quarter.

No reason appears for anticipating any lessening in the rate of consumption either at home or abroad. In fact, it is believed that the stocks in the hands of consumers are unusually low and that increased deliveries may be expected. Statistically, copper is in a better position than it has been for years.

It may be that a big increase in production as the prospect for 15 or 15½c. copper brightens will cause a repetition of the frequent reactions in recent years; but if the lessons of experience are not entirely ignored by the mining companies, this ought not to occur.

The saying that "copper securities follow the metal" is more than a catch phrase; but investors are going to be unusually circumspect this time. They will want to see what happens to the leader before they push the securities after him.



# *Metallurgists of Note*

## *Edward Hoit Nutter*

THE position of chief engineer of Minerals Separation during the period since flotation was first introduced is of historical importance. To influence, in co-operation with other engineers, the technical progress that has been made in the recovery of minerals from finely divided pulps is a privilege that many would have been glad to have had. Withal, Edward Hoit Nutter is, like many another technician, a level-headed, hard-working man who is decidedly approachable.

Nutter comes of old American stock. He was graduated in geology and mining at Stanford University in 1902. Digging the foundations for a cyanide plant in Trinity County, Calif., was his first mining job. Foreman of a small mine in Siskiyou County, editor of a little mining paper at Redding, and then assistant superintendent at the Standard Consolidated, at Bodie, Calif., under T. J. Hoover and R. Gilman Brown, were succeeding positions which gave Nutter a substantial foothold in the industry. From the post of superintendent at Bodie he went to the Liberty Bell mine, in Colorado, as assistant general superintendent under Charles A. Chase and Arthur Winslow. He succeeded to the superintendency in 1907, and in 1909 made a trip through Western Alaska looking for mining properties. Nutter joined the staff of Minerals Separation, Ltd., on T. J. Hoover's recommendation, in 1910. He was sent to Australia, where he studied and reported upon the Broken Hill situation. The huge accumulation of lead-zinc tailings in that mining district presented an important problem. As the more easily workable material was being exhausted, the Minerals Separation process was becoming of increasing importance to the Broken Hill operators, for without it they could not work their slimes and calcitic tailings. It was at Broken Hill that Nutter conceived the idea of selective flotation, and in conjunction with Henry Lavers basic patents were taken out. The idea originated in an interesting way: Nutter noticed that in one of the mixing compartments of a flotation machine the scum in the corners of the compartment appeared to be richer in lead than the froth which was being obtained from the machines. He called Lavers' attention to it, and samples were taken which assayed over 30 per cent lead. This tendency of lead to float ahead of zinc was explored experimentally, and resulted in the first patents in selective flotation.

The discovery that certain of the acid sludges from petroleum refining which otherwise were practically waste products were good flotation agents was made by Nutter, and for nearly ten years the Anaconda company's flotation operations were dependent on the use of kerosene sludge, one of this group. In 1911 Nutter returned to the United States as chief engineer in charge of the introduction of the flotation process in North America, and has been engaged continuously in that work ever since. He has therefore played an important part in introducing the flotation process and increasing its efficiency. He is chief of a staff of able engineers and research men who are engaged in extending and improving flotation practice. The discovery of xanthate is one of the results of comparatively recent research in the laboratory under his charge in San Francisco.

# The Petroleum Supply of Japan—I*

*A Research Made to Determine the Status of This World Power With Respect to Its Oil Resources*

**By Arthur Huber Redfield**
Assistant Geologist, U. S. Geological Survey

*Arthur H. Redfield*

THE RISE of Japan to national prominence is one of the striking phenomena of modern times. In 1868, within the memory of many who are still living, Japan almost overnight shook off the shackles of tradition and stepped from medieval ways into those of modern times. Within a generation the methods of American and western European civilization had been either adopted or adapted. The transformation from old ways to new ways was as complete as it was startling. The first test of the vigor of the rejuvenated nation came in 1894 in a war with China. Japan emerged from the struggle in 1895 not only victorious but enlarged by one-eighth in territory and one-sixteenth in population through the acquisition of Taiwan (Formosa) and the Hoko (Pescadores) Islands. Ten years later the war with Russia in 1904-1905 raised Japan definitely to the rank of a great power. By the treaty of Portsmouth, Russia surrendered the Liaotung Peninsula, with Port Arthur, and the southern half of Sakhalin to the Japanese. Japan succeeded to the Russian "sphere of influence" in Manchuria and Chosen (Korea). The menace of a powerful and aggressive empire at Japan's door was in part allayed.

Chosen was the next addition to the growing Japanese Empire. By the war with China in 1895 Chosen had been declared independent of China. This independence was little more than a shadow. At the outbreak of the Russo-Japanese War the peninsula was occupied by Japanese troops. In 1907 a Japanese protectorate over the peninsula was declared. Three years later, Chosen was annexed to Japan as a dependency of the Empire.

The Russo-Japanese War had removed one powerful European rival from Chinese territory; the World War of 1914-1918 removed a second. In August, 1914, Japan, entering the war as an ally of Great Britain, demanded of Germany the withdrawal of all German warships from Japanese and Chinese waters and the surrender to Japan of the leased province of Kiaochow, on the Shantung Peninsula of China. When Germany refused, Japan attacked and captured the German possessions in China as well as several groups of islands in the Pacific Ocean. By the peace treaties of 1919 Japan was given a mandate over the former German island possessions in the Pacific Ocean north of the equator. The end of the war left Japan also in possession of the Shantung Peninsula, which was returned, however, to China in 1922 as a result of the Washington Conference for the Limitation of Armaments.

Thus in three generations Japan has risen from a small backward Asiatic kingdom to one of the leading powers of the world. To play effectively the rôle of a great nation, however, not only population, area, and armaments, but certain natural resources, are necessary. Of the basic minerals of modern industry, Japan has coal, copper, silver, tungsten, pyrite, and phosphates in more or less sufficient quantities for its needs. In Chosen, there are iron, copper, silver, lead, gold, coal, and graphite. In Taiwan there are coal, salt, gold, and sulphur. Of the basic minerals of modern industry, Japan lacks chiefly iron and petroleum in sufficient quantity for her requirements. The need for iron must be dealt with elsewhere. The need for petroleum has become apparent since 1916, when the production of crude oil in Japan reached its peak, only to decline.

## Petroleum a Vital Necessity Today

From the Japanese standpoint it is highly unfortunate that Japan's shortage of petroleum should be made manifest just at that period of the world's history when the competition for petroleum, both mined and unmined, is keenest. The World War showed how vital a necessity is petroleum both for war and for peace. Marshal Foch is quoted as saying, "A drop of gasoline is worth in war a drop of blood"; and the statement is often repeated as a truism. Modern armies fight in tanks, fly in airplanes, and travel by automobiles and trucks, all consuming gasoline. Modern navies and merchant vessels are propelled in increasing numbers by engines that burn fuel oil. The machinery of modern industry requires millions of gallons of lubricating oils. This period of the world's history may well be called the Age of Petroleum.

Japan has never been a large producer of petroleum. Production, which began in 1875, yielded only 61,817 bbl. in 1890; about 870,548 bbl. in 1900; 1,825,098 bbl. in 1910; and 2,942,722 bbl. in 1916; but only about 1,947,000 bbl. in 1924. To the world production of crude petroleum Japan contributed only 0.2 per cent in 1924. Her total contribution to the world's production from 1875 to 1924 has been only 49,000,000 bbl., or 0.4 per cent of all oil produced in the world from 1875 to 1924. Among the countries of the Orient, Japan stands a poor fourth in production. Whereas the Dutch East Indies and Persia each export annually several million barrels of crude and refined oil, Japan must import considerable quantities of petroleum.

The climax of production was reached in 1916, when 2,942,722 bbl. was produced. Since that year the output of crude petroleum in Japan has shown a progressive decline. The falling off in crude oil production since

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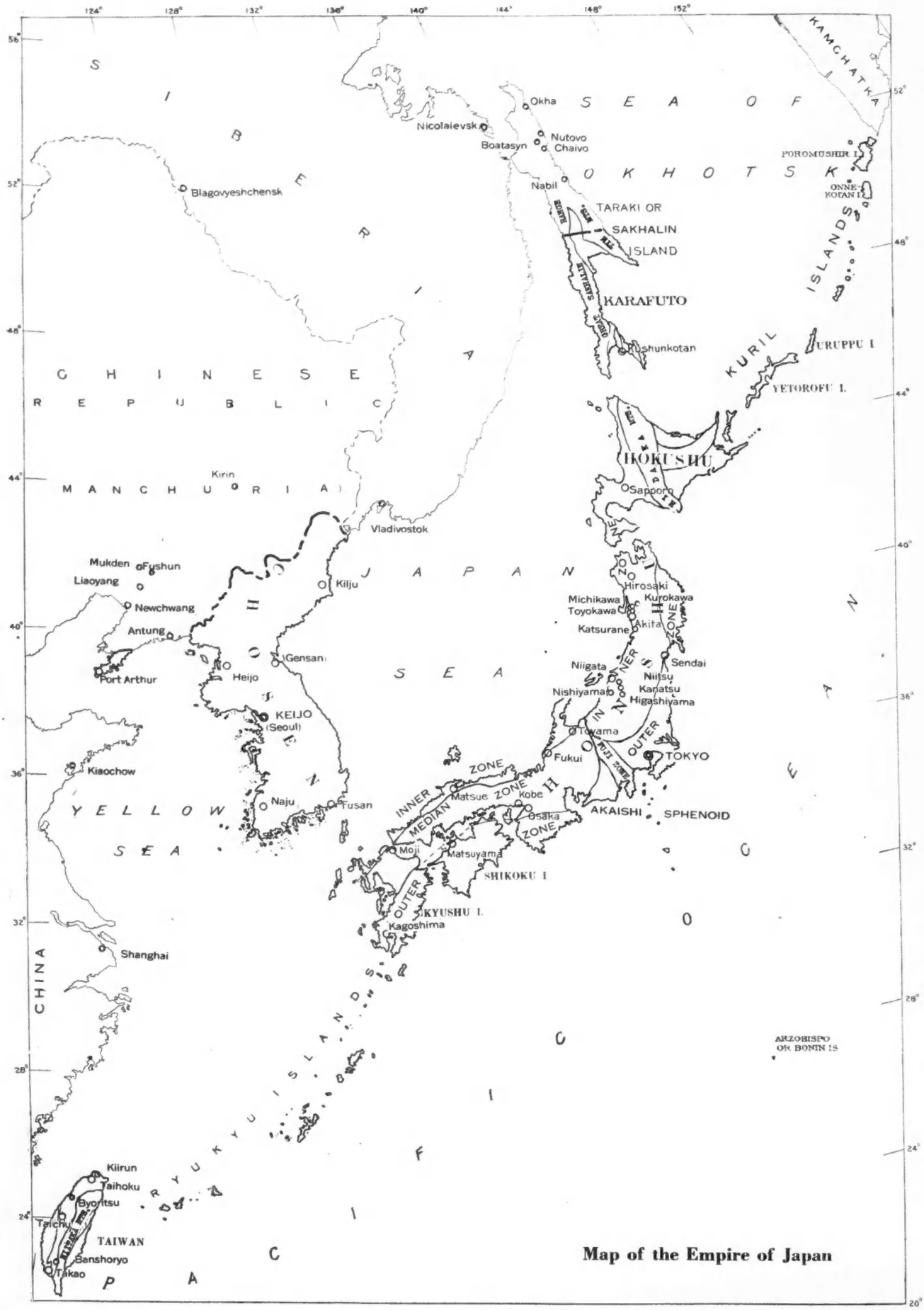



**Map of the Empire of Japan**

1916 was at first attributed to the stoppage in the importation of well-drilling machinery and supplies. Since the ban on the importation of these articles was removed in 1919, the expected increase in production has not been realized. This decline, occurring at a time in the world's history when the competition for supplies of petroleum, both mined and unmined, is at its keenest, has occasioned grave and ill-concealed concern on the part of the Japanese oil industry and the Japanese Government.

### Japanese Crude Deficient in Quantity and Quality

The Japanese crude oils are inadequate not only in quantity but in quality. They are for the most part heavy oils with an average density of 25 deg. A.P.I. (specific gravity 0.903), deficient in gasoline and benzine. The refineries are able to maintain their output of these lighter fractions only by distilling large quantities of imported crude.

About two-fifths of the refined oils, waxes, greases, and bitumens consumed in Japan are imported chiefly from the United States and the Dutch East Indies. For many years the Japanese petroleum industry has striven to free itself from the competition of these foreign refined oils. Crude petroleum has been imported from the United States and the Dutch East Indies to be refined in Japan. This policy was apparently successful down to 1917 or even to 1918; the Japanese press could point triumphantly to the increase over pre-war days in the proportion of refined oils furnished by the domestic refineries. But in 1918 the decrease in the production of crude petroleum was becoming obvious; the two succeeding years brought a still more diminished output of crude. Imports of crude oil to eke out the declining domestic supply promptly jumped in 1919 to double the 1918 figure, and in 1920 exceeded the pre-war level. Still the output of the Japanese refineries decreased progressively from the peak of production in 1917.

At the same time the growth in the manufacturing industries and the higher standards of comfort have caused an increase in the consumption of refined oils from 2,990,000 bbl. a year before the World War to 3,284,000 bbl. a year since the war. The shortage had to be made up by increased imports of refined oils. Moreover, the consumption of gasoline and benzine has increased at the expense of kerosene, which was formerly the chief mineral oil consumed. As the Japanese crude oil is deficient in these lighter fractions, this has caused an increased dependence on the importation of higher-grade foreign crude.

### Adequate Supply a National Problem

The problem of a petroleum supply soon forced itself on the attention of the political and commercial leaders of Japan. The government at the end of 1921 adopted a comprehensive program of its future petroleum policy, which embraces the following points: Investigation of the yet unexplored oil fields of Japan and her colonies; modernization of the industry of the already explored fields; furtherance of work of investigation and prospecting of the unexplored oil fields, especially by financial support; study for the purpose of creating substitute fuels; investigation of the economic utilization of fuels; increase of the import duties on petroleum products; methods of control of oil production; obtaining of foreign oil fields; increasing the importation of crude oil. So far as regards the development of her own oil production, the program can hardly secure a real improvement; only in Sakhalin, according to previous prospecting work, do very favorable prospects occur, and these indeed in the northern or Russian part of the island, which has been occupied by the Japanese only since the Russian revolution. Japan's efforts to bring under Japanese control promising oil fields in the Djambi district of Netherlands India have so far miscarried.

The search for new supplies of crude oil began in the Japanese islands, extended to the Japanese dominions, and finally to foreign countries. No important new fields have been discovered in Japan proper. Drilling in Taiwan (Formosa) has been disappointing. Karafuto (Japanese Sakhalin) apparently offers little hope of productive oil fields. Japan's best opportunities for obtaining new supplies of mineral oil appear to lie outside Japanese territory, in northern or Russian Sakhalin and in Manchuria. In northern Sakhalin petroleum has been obtained, but production is not yet on a commercial basis. In Manchuria preparations are being made to distill abundant and easily accessible beds of moderately rich oil shale.

### General Geology of the Islands

Of the five festoons of islands that fringe the eastern coast of Asia, three belong to the Japanese Empire. This island realm extends from northeast to southwest for more than 2,900 miles over 37 deg. of longitude and over 29 deg. of latitude. In the northeast the islands of Araido and Shumshu, in the Kuril group, lie in the latitude of northern Newfoundland, and in the southwest, Cape Garampi, the southern extremity of Taiwan, lies in the latitude of central Cuba.

The Japanese islands are arranged in three arcs, a principal or Honshu arc in the center and two smaller arcs at its ends, the Ryukyu arc on the southwest and the Kuril arc on the northeast. The principal arc consists of the five larger islands of Sakhalin, Hokushu (Hokkaido or Yezo), Honshu (or Hondo), Shikoku, and Kyushu, with many smaller ones.

Geologically, the principal, or Honshu, arc is further divided into two halves, which constitute southwestern and northeastern Japan. In southwestern Japan a "Sinian" or "Chinese" trend of east-northeast-west-southwest prevails in the folded ranges; and in northeastern Japan a "Sakhalinian" or north-south trend. The nature of the dividing line, which extends across central Honshu from north to south roughly along the 138th meridian, is a matter of disagreement among geologists.

Southwestern Japan may be divided lengthwise into three zones, an outer, a median, and an inner zone. The boundary between the outer and median zones is well marked by a line of a great dislocation, and was determined by H. Yabe.[1] Between the median and inner zones, however, there is observed no sharp tectonic boundary.

### Igneous Rocks Scarce in Outer Southwest Zone

The outer zone of southwestern Japan is characterized by well-developed longitudinal ridges and valleys, by the regular parallel arrangement of various forma-

[1] H. Yabe, *Sci. Rep.* Tohoku Imp. Univ., ser. 2, vol. 4, No. 1 Eandai, 1915.

tions and by the great scarcity of igneous rocks. The predominant formations are crystalline schist and Paleozoic and Mesozoic sedimentary rocks, closely folded and even overturned toward the sea along east-northeast-west-southwest lines. The formations are separated from each other in many places by longitudinal dislocation lines. Tertiary formations occur only in a few small areas, and practically no volcanic rocks of Cenozoic age are found. Granitic rocks are rare, and they are mostly of late Mesozoic or post-Cretaceous age.

In eastern and southern Kyushu, the volcanoes Aso, Kirishima, and Sakura mark the beginning of a new island arc, that of the Ryukyu (Luchu) Islands. This archipelago of the Ryukyu, like that of the Lesser Antilles, is composed of several longitudinal bands. On the outside of the arc are the Tertiary formations; in the center a Paleozoic axis; in the interior are volcanic islands, which are the smallest in dimension. The fracture that these volcanoes mark appears to be continued on the western border of Kyushu, whose volcanoes, Unzen-dake and Kaimon-dake, might, like those of the interior, be considered as belonging to the Ryukyu arc.

The median zone of southwestern Japan presents a striking contrast to the outer zone both topographically and geologically. Topographically it forms the Hida plateau, dissected by numerous transverse valleys. Geologically it is built of a complex of Paleozoic and a few Mesozoic beds striking north-northeast-south-southwest intruded by great bosses of hornblende-granite and granitite, and capped in places by volcanoes.

Between the Median fault, which curves sharply to the north along the upper course of Tenriu River to join the Fuji fissure, and the southward continuation of the Fuji fissure itself lies a triangular area, known as the "Akaishi sphenoid." This is composed of crystalline schist and Paleozoic slate, quartzite, and graywacke, overlain on its southern or seaward margin by a belt of folded Tertiary beds. This belt has yielded a little oil in the Prefecture of Shizuoka.

The inner zone, represented by a narrow coastal region along the Japan Sea, has many characteristics that distinguish it from the median zone. It contains several areas of depression, in which sedimentary rocks of late Tertiary age and volcanic materials of late Tertiary to recent ages have been laid down.

### The Fossa Magna

All the older formations that compose the east end of southwestern Japan are abruptly cut off in central Honshu, along a line with a north-northwestward trend. Both the parallel ridges and valleys of the Akaishi mountain system in the outer zone and the plateau of Hida in the inner zone end in a well-marked continuous slope and are adjoined on the east side of this line by a low rolling surface underlain by Tertiary formations. Upon this low land, which traverses the main island of Japan, large amounts of volcanic rocks of varied composition and types occur. The volcanic zone includes the Myoko, Yatsuga, and Hakone Mountains and famous volcano of Fuji. The southern continuation of this zone is traced to the volcanic islands of the Shichito group and then to the Ogasawara (Bonin or Arzobispo) islands, the Kazan (Volcanic) Islands, and the Mariana Islands.

The nature of this boundary line between southwestern and northeastern Japan has been much discussed. Naumann called the transverse depression the "Fossa Magna" or "Great Trench" and ascribed it to a great fissure, not necessarily a fault, formed in the late Paleozoic. Along this line of weakness the andesitic flows of the Fuji zone rose during the upper Tertiary. Yabe, however, believes that this transverse fissure was formed after the Cretaceous. Harada, Suess, and Ogawa suggest that the Fossa Magna is due simply to the syntaxis or junction of two arcs of folding, that of northeastern Japan and that of southwestern Japan.

### Less Known About Northeastern Japan

The fundamental geologic structure of northeastern Japan is less completely known than that of southwestern Japan. Nevertheless a marked geologic contrast may be noted between an outer zone of the Pacific side and an inner zone on the side of the Japan Sea. The outer zone of northeastern Japan differs geologically from the outer zone of southwestern Japan, but presents a rather striking similarity to the median zone of the southwest. The inner zone appears to present some similarities to the inner zone of southwestern Japan.

The older formations of the outer zone of northeastern Japan are divided into the four individual segments of the Kwanto, Abukuma, and Kitakami Mountains of Honshu and the Hidaka Mountains of central Hokushu. These four blocks are composed chiefly of gneiss, crystalline schist, and Paleozoic and Mesozoic sedimentary rocks, folded along north-northwest-south-southeast lines, together with notable amounts of intrusive rocks. A narrow strip of Tertiary beds borders the Abukuma Mountains on the eastern side. In this respect these mountain lands have the general character of a dissected plateau and resemble the inner zone of southwest Japan, although they do not constitute a continuous zone. They are separated from each other by wide areas of the Cenozoic formations and the present sea. Recently these blocks are believed by B. Koto, T. Ogawa, and Ferdinand von Richthofen to be distinct horsts.

The inner zone of northeastern Japan is characterized by an extensive development of younger Tertiary sediments, and by accumulations upon them of volcanic materials. Smaller intrusive masses of andesitic or liparitic rocks are also associated with these Tertiary sediments on the west coast. The inner zone may be subdivided into an eastern portion, in which volcanic rocks prevail, and a western portion, in which the Tertiary beds have been less affected by vulcanism.

### Volcanic Zone Starts in Kotsuke

The zone of vulcanism begins in Kotsuke with the Chikuma Mountains, which extend parallel to the Fuji zone and culminate in Mount Asama. They are succeeded to the north-northeast by the andesite massives of Mount Haruna and Mount Akagi. On the northeast the mountains of Nikko join Mount Akagi. They are a mountain massive, built upon Paleozoic beds that still outcrop as scattered islets between the eruptive masses, in large part, however, intruded and overlain by granite and principally by augite-andesite. North of Agano River in Iwashiro Province, the main watershed of northern Honshu, called by Naumann the Meridional range and by Harada the Mutsu Range, is built partly of granite and other old igneous rocks and older sediments, and also in large part of Tertiary

sediments and volcanic rocks. It extends from the downfaulted basin of Aizudaira to the north end of Honshu and may be continued in the Iburi volcanic zone of southwestern Hokushu.

The volcanic range is paralleled on the west by mountains in which vulcanism plays a minor part. The Echigo Mountains and the Chokai-san volcanic range occupy a considerable part of the west side of northern Honshu. The principal mountains of the Echigo range consist of the granite and Paleozoic slate, to which the andesite is subordinated. West of the Meridional range and separated from it by a series of longitudinal depressions is the Dewa range, built of Tertiary rocks and bearing a long chain of volcanoes. North and west of the Echigo Mountains and the Dewa range a broad hill-land of folded Tertiary sediments extends almost continuously along the western coast of Honshu from the northern end of the island to its center. This Tertiary area is broken into a series of small mountain ridges, of which the highest rise to altitudes of 400 to 2,300 ft., separated by broad, low, fertile plains. The ridges generally correspond to anticlines, trending northeast-southwest, and the broad valleys to synclines. A few peaks of volcanic rocks rise here and there above the general level of the area. This area of folded Tertiary sediments has yielded oil and gas in the Prefectures of Akita and Niigata, and to a small extent also in the Prefectures of Aomori, Yamagata, and Nagano.

**FROM the Japanese standpoint it is highly unfortunate that Japan's shortage of petroleum should be made manifest just at that period of the world's history when the competition for petroleum, both mined and unmined, is keenest. The World War showed how vital a necessity is petroleum for both war and peace. Marshal Foch is quoted as saying, "A drop of gasoline is worth in war a drop of blood"; and the statement is often repeated as a truism. Modern armies fight in tanks, fly in airplanes and travel by automobiles and trucks, all consuming gasoline. Modern navies and merchant vessels are propelled in increasing numbers by engines that burn fuel oil. The machinery of modern industry requires millions of gallons of lubricating oil. This period of the world's history may well be called the Age of Petroleum.**

### Sado Divided Into Three Parts

The small Island of Sado is divided according to its relief into three parts: two parallel ranges trending northeast-southwest, of which the outer one seems to be thrust to the north, and a plain joining them north of the 38th parallel. This shows post-Tertiary sediments; the two other parts consist of Miocene and Pliocene marine limestone that is mostly overlain by volcanic formations. Only in the extreme north and east have Paleozoic beds been noted.

In the Island of Hokushu (Hokkaido or Yezo), the mountain systems of the Honshu arc and of the Kuril arc meet. The old schist and Paleozoic beds of the Abukuma and Kitakami Mountains of Honshu are continued, with Cretaceous strata, in the Hidaka range, which traverses Hokushu from Cape Yerimo north-northwestward to Cape Soya. This range is adjoined on the west by the Ishikari plain, a structural basin of folded Tertiary rocks, beyond which in the Hakodate Peninsula the folded Tertiary beds and the volcanic rocks continue the Dewa range of northwestern Honshu.

In Mount Optateshike, which towers above the central range in about the center of the island, may be found the beginning of the Kuril arc, characterized by extinct and active volcanoes, which swings northeastward toward the Kamchatka Peninsula. Eastern Hokushu is composed of Tertiary beds with much trachytic material. In the Kuril Islands, the igneous rocks almost completely obscure the sedimentary strata.

### Geology of the Oil Fields

The principal oil-yielding belts in Japan extend on the inner or western side of the Honshu arc almost parallel to the coast of the Sea of Japan, with some interruptions, from latitude 45 deg. 30 min. north southward to latitude 37 deg. north. On the southern or Pacific coast a little oil has been produced in the "Akaishi sphenoid" between Suruga and Ise bays.

Petroleum has been found in Japan only in the Miocene and Pliocene series of the upper Tertiary. These series have been studied in detail by many geologists, and it is clear that, although there are certain different peculiarities in the oil-bearing strata in the various districts, they have, on the whole, similar characteristics and are of the same geological horizon.

The oil-bearing strata consist of sandstone, tuff and fractured shale, in which oil is found associated with salt water. There are many oil-bearing formations, of which the most productive are the middle and lower divisions of the upper Tertiary, of Miocene age. In these the sandstone and tuff are the chief oil carriers, though some oil is obtained from the shale.

As regards the origin of oil in the oil fields of Japan, opinions of the Japanese geologists and chemists vary greatly, but it is accepted by all that oil is of organic origin, and had its origin in the Tertiary sedimentary rocks. The black or dark gray shales that are so widely found in the Tertiary formations, especially in the middle Tertiary, contain much organic matter, and in or near them are found bituminous substances and rich oil pools. These facts suggest that the oils originated in the black or dark gray shales.

The richer accumulations of oil occur, without exception, on anticlinal, domal, or terrace structures. The developed oil fields are all on anticlinal ridges. Clements suggests that in the future new oil fields may be developed on minor folds in some of these broad plains that lie between the ridges, but as there is no surface guide in the closely cultivated plains as to the structure of the subsoil, it may be some time before operators will venture to drill in them.

### Four Producing Districts in Japan Proper

In Japan proper there are four producing districts. Three of these are on the island of Honshu; the Echigo district, in the Prefectures of Niigata and Nagano; the Akita district, in the Prefectures of Akita and Yamagata; the Totomi district, in the Prefectures of Shizuoka and Aichi. The other is the Hokushu district, in the Prefecture of Sapporo, on the island of Hokushu (Hokkaido or Yezo).

*Echigo District*—The Echigo oil district is situated almost in the central part of western Honshu, along

the coast of the Sea of Japan. It extends from northeast to southwest for a distance of about 125 miles and covers an area of approximately 1,500 square miles.

The Tertiary formations in the Echigo hill-land are, generally speaking, simply folded; no great faults affect the general trend of the strata. The strike is generally north-northeast-south-southwest, parallel to the seacoast. The ridges generally correspond to the anticlines and the valleys to the synclines. In the southern part of the province the trend is more nearly north-south. The folds are more or less asymmetric, with the steeper dips on the western or seaward side. A few of the folds are overturned to the northwest. The folding is less intense on the eastern side of the province.

The oil-bearing strata of the Echigo oil fields belong to the Upper Tertiary, more than 10,000 ft. thick, which may be separated into four divisions:

(4) Uppermost division (Pliocene?)
Soft clay, loose sand and gravel, 1,000 ft.
Unconformity
(3) Upper division (Pliocene)
*b*. Tsukayama series. Soft clayey shale, sandstone, and conglomerate (with tuff), 3,000 ft.
*a*. Wanadzu sand, 300 to 1,800 ft.
(2) Middle division (Miocene)
*b*. Gray sandy shale, with intercalated limestone, volcanic agglomerate, and andesite sheets, 1,000 to 2,000 ft.
*a*. Kanadzu sand, 700 to 1,000 ft.
(1) Lower division (Miocene)
*b*. Shiiya series. Alternating black shale and sandstone, 600 to 2,000 ft.
*a*. Kubiki series. Black shale (with tuff and sandstone), more than 5,600 ft.
Granite and Paleozoic slate.
Unconformity

These strata are conformable marine or littoral deposits, except the uppermost division, which lies unconformably over the others, loosely deposited or crossbedded. Many writers consider it to be of Pleistocene age. Throughout the entire Tertiary, volcanic activity took place, resulting in the intrusion of liparite into the lower series and the intercalation of sheets of andesite and beds of agglomerate.

The principal accumulations of oil in the Echigo district are in the upper half or more of the Kubiki series, in the Shiiya series, and in nearly all the lower half of the sandy shale formation. Little more than shows of oil are obtained in the lower part of the Kubiki series, or in the beds overlying the sandy shale.

The oil occurs on anticlines. The greatest accumulations are found in the more gently folded beds, as at Niitsu, Higashiyama, and Nishiyama. Only small accumulations occur in steeply dipping beds. The oil is generally associated with salt water.

In the districts lying on the western side of Shinano River there are found parallel anticlines together with subordinate wrinkles, trending north-northeast-south-southwest. The westernmost or Amaze anticline extends northeastward along the shore and beneath the sea as far as Teradomari city, forming low longitudinal undulations. At its southern end is the Amaze oil fields, formerly very productive. The Oginojo anticline, lying on the east of the Amaze anticline, extends slightly west for a great distance along the crest of that range, its westerly wing being greatly disturbed, with many faults and folds. The Ojiya oil field lies along the same anticline and has regular and gentle inclinations of strata. The Higashiyama range represents an anticlinal fold, the axis of which traverses the entire range. Its western wing is greatly disturbed with numerous faults and folds, along one of which Higashiyama oil field, one of the oldest fields in Japan, is situated. To the northwest of the Higashiyama anticline lies the Omo anticline, running north and south, along the axis of which the Omo oil field is located.

The Niitsu anticline runs from north to south, forming a gentle arch, and a low undulation like a terrace structure lies on its western wing. In the southwestern part of the Echigo oil fields, in the Kubiki district, there are many anticlines, all parallel and most of them short. Some are steeply inclined, but others are only gently inclined, though all generally have steep sides on the western side. The most prominent anticline in the district runs from Gendoji to the north of Yasuzuka through Iwagami. All the oil districts scattered throughout the districts are on the anticlines, especially on those having an elongated dome structure.

### New Drilling North of the Echigo Productive Area

In an effort to extend the oil-producing area of Echigo to the north, the Murakami field in the northern part of the Prefecture of Niigata has been prospected. The Tertiary beds are folded into two anticlines and three synclines and cut by six faults, all trending north-south or north-northeast-south-southwest. In the main part of the field five wells were drilled by both cable and bamboo spring-pole systems to depths ranging from 66 to 836 ft. In the southern or Nakajo portion of the field are many dry holes, of which the deepest struck the underlying granite at a depth of 1,333 ft. In the nearby Haguro field about forty wells drilled by the cable system to depths varying between 330 and 1,351 ft. have yielded only small quantities of oil.

In density the oil won in the Echigo district ranges from less than 15 deg. to 45 deg. A.P.I. (specific gravity 0.9659 to 0.8017). The heavier oils occur in the higher strata. Oils from the Kubiki black shale, as at Kubiki and Amaze, have an average density of 40 deg. A.P.I. (specific gravity 0.8251) and those from the middle sandy shale, as at Niitsu and Ushirodani, have a density varying from 15 deg. to 20 deg. A.P.I. (specific gravity 0.8659 to 0.934). In the same field or even in the same well, oils from the lower formations are of higher grade than those from the upper, as at Miyagawa and Nagamine-Kamada. Where igneous rock has been intruded into the oil-bearing strata, the oil in many places is thick and heavy with a density less than 10 deg. A.P.I. (specific gravity 1.000).

The oils belong mainly to the naphthene series and resemble the oils of the Baku district. Some of the Echigo oils contain small percentages of the paraffine hydrocarbons. In the refineries of Niigata Prefecture the domestic crudes yield an average of 4.8 per cent gasoline, 31.4 per cent kerosene, 31.5 per cent solar oil, 13 per cent fuel oil, 17.6 per cent lubricating oils, 0.1 per cent paraffine, and 1.6 per cent pitch.

*Akita District*—In the Prefectures of Akita, Yamagata, and Aomori, in the northwest part of Honshu, the oil fields parallel the coast line for about 20 miles. The surface of the oil districts is occupied by hills or low mountains not more than 1,000 ft. in height which have a general northeasterly trend. These hills and mountain ranges usually coincide with the anticlinal

folds in Tertiary strata, and the valleys between them are mostly synclinal.

Volcanic rocks, chiefly basalt, andesite, dacite, and liparite, occur in the lower and middle divisions of the Tertiary. These rocks caused lithological changes in the character of the Tertiary sediments and in some places are believed to have had some influence on the accumulation of oil, judging from the structure of the strata which they have intruded.

Oil accumulations are found in the lower and middle divisions of the Upper Tertiary. In the lower division, the upper parts of the siliceous shale contain oil, and in the middle division, the lower parts of the gray shale contain oil. Tuffaceous sandstone and fractured parts of the siliceous shale provide rich oil-bearing zones. In the black shale formation tuff and tuffaceous sandstones are important oil-bearing strata. Oil seepages are numerous in the lower part of the middle division, but oil in commercial quantity has not been obtained. The most productive oil zones are found in the lower part of the black shale series and in the upper part of the siliceous shale series. The oil sands range in depth from 500 to 2,500 feet.

**JAPAN has never been a large producer of petroleum. Production, which began in 1875, yielded only 61,817 bbl. in 1890; about 870,548 bbl. in 1900; 1,825,098 bbl. in 1910; and 2,942,722 bbl. in 1916; but only about 1,947,000 bbl. in 1924. To the world production of crude petroleum Japan contributed only 0.2 per cent in 1924. Her total contribution to the world's production from 1875 to 1924 has been only 49,000,000 bbl., or 0.4 per cent of all oil produced in the world from 1875 to 1924. Among the countries of the Orient, Japan stands a poor fourth in production. Whereas the Dutch East Indies and Persia each export annually several million barrels of crude and refined oil, Japan must import considerable quantities of petroleum.**

The oil-bearing Upper Tertiary strata in the Akita district are divided as follows:

(4) Uppermost division.
Clay, sand and gravel unconsolidated.
Unconformity
(3) Upper division (Pliocene)
Bluish gray sandstone with thin layers of conglomerate, 660 ft.
(2) Middle division (Miocene)
*b*. Bluish gray sandy shale, 3,280 ft.
*a*. Gray shale with thin layers of tuffaceous and conglomerate sandstone in upper part, alternating sandstone and shale, 1,320 to 1,480 ft.
(1) Lower division (Miocene)
*c*. Black shale with thin layers of tuff and tuffaceous sandstone, 1,650 ft.
*b*. Brownish siliceous shale with thin layers of tuff and tuffaceous sandstone.
*a*. Green tuff with thin lignite seams.

### Oil on Anticlines or Domes

Accumulations of oil occur only on anticlinal or domal structures. The strata in most places are gently folded along north-northeast-south-southwest lines, with dips not exceeding 30 deg. The producing fields lie north and south of Akita city. The Kurokawa oil field, 9 miles north of Akita city, famous for a gusher that produced 10,000 bbl. a day, is situated on an elongated dome on which the inclination of the strata averages 20 deg. The Toyokawa oil field is on a terrace, and the oil occurs in fractured zones of the black shale. The Michikawa oil field, 5 miles north of Akita city, is in the gray shale, which forms an elongated north-trending dome.

From 2 to 20 miles south of Akita city extends the Kameda field. Here the Tertiary beds are folded and faulted along north-south lines. The principal structures of interest are the Kimiganogawa anticline; the anticline east of Uchimichikawa; the anticline near Katte; the Katsurane dome; and the anticline at Toyoiwa. Oil is produced commercially from the Uchimichikawa, Katte, and Katsurane anticlines.

Efforts to extend the Akita fields to the south and southeast by drilling have not yet been successful. In the Wada field, 6 miles southeast of the city of Akita, the Kawazoye anticline, trending north and south, is cut by two faults, one striking northeast-southwest and the other striking north-south. Four wells have been drilled in this field, two by the native bamboo spring-pole system and two by the cable system, to depths ranging from 1,340 to 1,560 ft. without success.

Northeast of the Kameda and Honjo fields in the Jinguji field the Tertiary forms two anticlines trending northeast-southwest and north-south respectively, with limbs dipping at angles of 6 deg. to 20 deg. A well drilled by the native spring-pole system on the eastern or Yamukaye anticline has reached 600 ft. without result.

In the southwest of the Prefecture of Akita, the Tertiary beds of the Honjo field dip westward at angles of 10 deg. or even 30 deg. In the eastern part of the field the lower Miocene beds are much folded, and both the lower and upper Miocene are cut by many strike faults. Since 1916 six test wells have been put down without success, three by the cable-tool system to depths of 922 to 1,145 ft. and three by the native bamboo spring-pole system to depths of 241 to 305 ft.

In the southern part of Akita Prefecture in the Yajima field five anticlines, with limbs dipping at angles of 15 to 20 deg., extend northeast-southwest. More than thirty years ago a well drilled by the native bamboo spring-pole system to a depth of 2,394 ft. obtained a small flow of oil and gas. Two test wells are now being drilled, one by the cable-tool system and one by the native bamboo spring-pole system.

A similar lack of success has so far met all efforts to extend the Akita fields to the north and northwest. On the Oga Peninsula, northwest of the city of Akita, lies the Ogashima field. The Tertiary beds dip monoclinally to the southeast at angles of 10 to 30 deg. In the northwest of the peninsula are several small anticlines, a syncline, and a fault along which the igneous rocks of the volcano Kampu have risen. From 1915 to 1917 four wells were drilled, two by the cable system and two by the native bamboo spring-pole system, to depths of 886 to 1,574 ft., without result.

In northern Akita, southeast of Noshiro, the structure in the Tertiary is more or less complicated. Six anticlines, whose flanks dip at angles of 20 to 40 deg., trend about north-northeast-south-southwest. Faults are known to occur, but are difficult to trace. Indications of petroleum occur on five of these. Three wells drilled on the Kanaoka anticline, west of Onozawa, in 1916-1919 were unsuccessful. On the Tomine anticline, a well was drilled in 1917-1919 by the cable-tool system to a depth of 1,308 ft., without result. On the

Nigorigawa anticline a well drilled in 1920 by the cable method to a depth of 582 ft. yielded 10 bbl. of oil daily. Two wells by the native bamboo spring-pole system yielded each 1 bbl. a day of asphaltic oil of 14 deg. A.P.I. density at depths of 612 and 642 ft. A well drilled by a cable rig one mile to the south gave only a small quantity of oil at a depth of 870 ft. On the Nagaomote anticline, three wells were drilled in 1919-1920 by the cable method to depths ranging 464 to 1,594 ft., but proved unsuccessful.

At Futatsui, in the Prefecture of Akita, the anticlines of the Noshiro field are continued to the northeast. About forty years ago a shallow well was dug by hand near Iwako in the village of Sawame, which yielded daily half a barrel of oil for about five years. From 1916 to 1922 five wells were drilled, four by the cable system and one by the rotary system, to depths ranging from 1,000 to 3,510 ft., but without success.

East of Futatsui in the Takanosu field there are five almost parallel anticlines in the Tertiary, running north and south, with their limbs dipping from 10 to 30 deg., rarely to 60 deg. Several strike faults have been traced. From 1916 to 1922 six wells were sunk in the villages of Ochiai, Shimo-Ono, Nanakura, and Fujikoto, two dug by hand and four by the native bamboo spring-pole system, but without result. A well is being drilled by the cable system at Shimo-Ono.

A little production (300 bbl. a year) is obtained from shallow wells in the Prefecture of Yamagata. In the Mogami field the asymmetric Kuraoka anticline extends about north-south, with flank dipping at angles of 10 to 50 deg. A well drilled several years ago at the northern end of this anticline was abandoned at a depth of 3,000 ft. because of bad drilling conditions.

At Oishida, Prefecture of Yamagata, adjoining the Mogami field on the north, the Tertiary beds are folded into seven anticlines, of which six are broken by strike-faults. The beds have an average dip of 20 deg. Drilling on the Takino-sawa dome, in the center of the field, by the Japanese spring-pole system in 1923 revealed traces of oil and gas at a depth of 364 ft.

The Shinjo field, Prefecture of Yamagata, adjoining the Mogami field on the south, is locally much folded and faulted. Six anticlines and three domes, those of Tano-sawa, Hane-zawa, and Noguchi, have been recognized. The strata on the flanks of the domes dip at angles of 5 to 30 deg., or more generally from 10 to 20 deg. The Hane-zawa dome was drilled to a depth of 1,776 ft. by the cable system, and the Tano-sawa dome to a depth of 889 ft. by the bamboo spring-pole system, without success.

### Little Oil Found in Aomori

Very little oil has been obtained in the Prefecture of Aomori. In the Daishaka field, on the Tsugaru Peninsula, Prefecture of Aomori, the Tertiary beds are folded into a series of eight anticlines, trending north-south, cut by ten strike faults. The beds dip at angles varying from 10 to 20 deg. A number of shallow wells have been drilled in the last thirty-five years down to the Pliocene without success. At Yoshinoda a well drilled by the cable and rotary systems to a depth of 3,240 ft. found slight indications of oil in the upper part of the Miocene. At Masdanome, wells drilled on the west flank of the Umanokami-yama anticline obtained only a small production of petroleum.

Although a little oil had been produced in the Akita district for several years, its sudden rise as a producer dates from the opening of the Kurokawa gusher in May, 1914, with an initial production of 12,000 bbl. daily. The discovery of the Toyokawa and Michikawa pools increased the yield of the district until in 1921 it exceeded the production of the Echigo district. In 1922 the Akita district produced 44 per cent of the total output of Japan.

### Gushers in Akita District Short Lived

A number of gushers have been struck in the Akita district, several of which yielded 10,000 to 12,000 bbl. a day when the wells were first brought in. But the gas pressure soon decreases, and after a flow of several months the well generally has to be pumped. Water is very troublesome, and difficult and expensive to control.

The crude oil of the Akita district has an asphaltic base, is dark brown in color and averages in density 22.80 deg. A.P.I. (specific gravity 0.917). It yields in the refineries little or no gasoline, 13.6 per cent kerosene, 8.9 per cent solar or gas oil, 76.5 per cent fuel oil, 0.7 per cent lubricants, and 0.1 per cent pitch.

*Totomi District*—On the western shore of Suruga Bay, in the Prefecture of Shizuoka, shallow sands in the Tertiary have been exploited by primitive methods at Sagara, about 100 miles southwest of Yokohama. The oil occurs in a bed of loose sandstone, 3.3 ft. thick, and in places in shale also. Seepages are numerous.

The beds dip steeply to the northwest and are folded into many small anticlines. It is not yet known what effect the recent earthquake may have had on the structure of the oil field.

A small production, less than 1,000 bbl. a year, has been obtained. Drilling by modern methods to a depth of 1,400 ft. has not increased the yield.

The oil has a density of 43 deg. A.P.I. (specific gravity 0.811) and yields on distillation 11.3 per cent gasoline, 40 per cent high-grade kerosene, 25.4 per cent solar or gas oil, 6.9 per cent fuel oil, 17.4 per cent lubricating oils, and 0.1 per cent pitch.

*Hokushu District*—The occurrence of petroleum in Hokushu is confined to the eastern side of the so-called "Central Depression" in the Prefecture of Sapporo. The oil belts extend southward from Noshap Peninsula at the northeast end of the former Province of Kitami, through the former Provinces of Teshio, Ishikari, Iburi, and Hidaka. The oil-bearing upper Tertiary formations differ in character on the east and west sides of the Central Depression. In the western part they contain much pyroclastic material, and in some cases it is difficult to make a comparison with those of the eastern part. In general, however, the Tertiary formations of Hokushu are divided into four groups:

(4) Uppermost Tertiary (Pliocence) sand, gravel and clay.
Unconformity
(3) Upper Tertiary
*d.* Sandstone series.
*c.* Gray shale series.
*b.* Wakkanai series. Dark gray shale.
*a.* Sandstone and conglomerate series with thin agglomerate and tuff beds.
(2) Middle Tertiary (Miocene?)
Poronai series. Black marine shale with thin sandstone and conglomerate beds.
Unconformity
(1) Lower Tertiary (Eocene-Oligocene)
Coal measures: Shale, sandstone, conglomerate, with marly and tuffaceous layers.
Unconformity
Cretaceous

Although the lower division of the Tertiary shows many signs of oil in the Provinces of Teshio and Ishikari, and the middle division contains oil in many places in the Provinces of Iburi and Ishikari, no important deposit has been found up to the present in either division. In the upper division of the Tertiary, they are especially abundant in the gray and dark gray shales. The principal oil-containing strata in Hokushu are found in them, in the Provinces of Ishikari, Kitami, and Teshio.

The Tertiary formations in Hokushu have been repeatedly subjected to severe mountain-building forces and are much folded or deformed. Consequently, from the Province of Kitami to the Province of Oshima there are many anticlines and synclines. The general direction of strike is north-northeast-south-southwest or northeast-southwest and the dips vary from place to place, from 20 to 70 deg. During the deposition of these strata, there was violent volcanic activity that caused local disturbances to the structure or changed their nature by contact of the molten lava.

**THE JAPANESE crude oils are inadequate not only in quantity but in quality. They are for the most part heavy oils with an average specific gravity of 25 deg. A.P.I. (specific gravity 0.903), deficient in gasoline and benzine. The refineries are able to maintain their output of these lighter fractions only by distilling large quantities of imported crude.**

The lower Tertiary coal measures are, in general, completely folded and faulted, showing that they had received more orogenic movement than the later Tertiary formations, which as a rule are gently folded. The lower Tertiary formation is not of importance from the point of view of possible oil production.

In the area occupied by the Upper Tertiary formations, there are many oil districts along anticlinal folds. In Ishikari Province, there are two principal anticlinal axes running almost parallel from north to south. The easternmost, called the Toshibet anticline, has an axis about 13 miles long, and dips on either side of less than 20 deg. Some of the many wells drilled along the anticline produced as much as 250 bbl. a day. The western anticline, called the Atsuta anticline, runs along the shore line of Atsuta and has a length of 6 miles. The strata, which, like those of the Toshibet anticlines, are dark gray and gray shales, dip not more than 20 deg. on either side of the axis. Several test wells were drilled on this fold, but no rich oil deposit was struck.

Two long anticlinal folds extend southward from Kitami Province to Teshio Province. The Koitoi anticline on the east has a length of 17 miles and is composed of dark gray and gray shales. The inclination on either side of the axis ranges from 10 to 20 deg. Several wells have been drilled on it, and some of them less than 1,100 ft. deep reached oil pools. The Wakkanai anticline on the west is principally composed of the Wakkanai series and is 8 miles long. The inclination on either side of the anticline does not exceed 20 deg. Two or three wells have been drilled on it, and fairly rich oil pools were found at a depth of 2,500 ft.

In addition, in the Provinces of Iburi, Hidaka, and Oshima, there are many anticlines along which test borings have been made, but as no rich oil pool was found, all were abandoned.

Petroleum was found in Hokushu in 1903, when the International Oil Co., a subsidiary of the Standard Oil Company of New Jersey, brought in a flowing well of heavy oil at Hachemancho, in the Province of Ishikari. The Nippon Oil Co. took up development work here in 1904, and the Hoden Oil Co. in 1905. The Hokushu district has been only spasmodically developed. The production has averaged only 7,000 bbl. a year.

Although statistical methods have been developed, particularly in the United States, for estimating with some degree of certainty the future production of a well, a group of wells on the same structure, or even of a tract, based on the past production and on known rate of decline, no precise method has yet been discovered to determine the amount of petroleum in an untested area, large or small. Still less has any exact method been discovered for estimating the oil content of an entire region, containing an unknown number and distribution of favorable and unfavorable structures. Such estimates at best are highly speculative, and at worst are rank guesses. Everything depends on the judgment, experience, and information of the estimator.

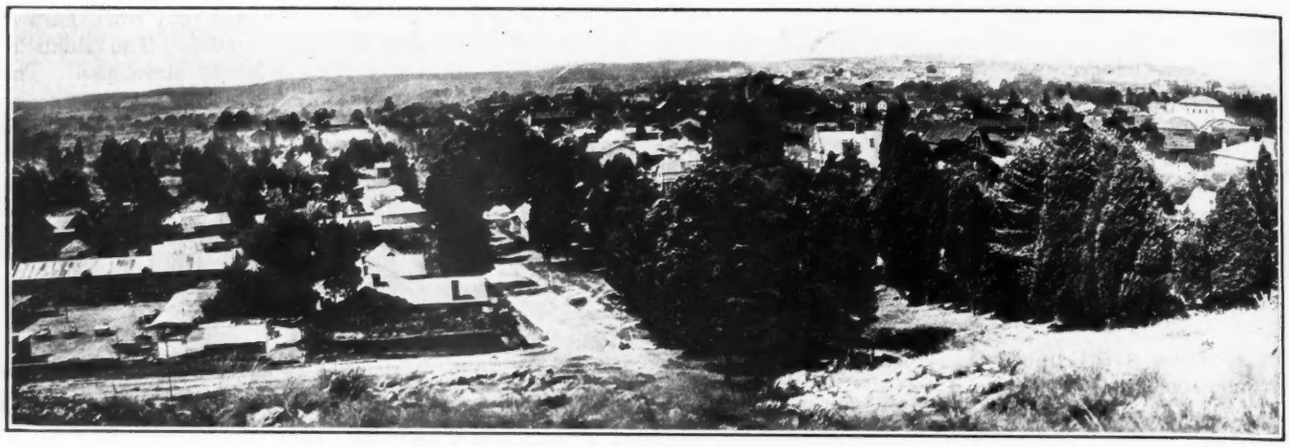
No estimate of the petroleum reserves of Japan made by a Japanese geologist is known to have been published. Not many foreign geologists have had the opportunity to examine the Japanese oil fields. Nevertheless, J. Morgan Clements, who as trade commissioner of the Bureau of Foreign and Domestic Commerce stationed in Tokyo had that opportunity, published in 1922 the following estimate of Japanese petroleum reserves under the heads of oil from "proved," "probable" and "possible" ground.

| | Bbl. |
|---|---|
| Oil from "proved" ground | 90,000,000 |
| Oil from "probable" ground | 300,000,000 |
| Oil from "possible" ground | 0 to 700,000,000 |
| | 390,000,000 to 1,090,000,000 |

Under the head of oil from "proved" ground, Clements included only that oil which he estimated would be recovered from the important producing districts some of the fields of which have been well drilled and regarding the occurrence of which definite information is available. Under oil from "probable" ground was included that oil which would probably be derived from certain rather extensive areas totally untested in the present productive districts and from other very much larger areas in which oil seeps are known and from which but small amounts of oil have so far been obtained, as for example Karafuto (Japanese Sakhalin), Hokushu and Taiwan (Formosa). Under the category of oil from "possible" ground, Clements included the estimates of oil in territory that is not definitely known to contain any oil, but in which such conditions of structure and stratigraphy exist as to warrant a geologist in assuming that oil may occur there.

Clements does not share the pessimism of the Japanese with regard to the "proved" territory. He believes that petroleum will continue to be obtained from this "proved" ground by drilling areas in the productive fields that have heretofore been untested or very poorly tested, by drilling deeper wells and by using new and improved methods of oil recovery, such as "oil pressure," "water drive," etc. He does not expect, however, that any very marked increase in production will come from it.

*To be continued*



*Looking toward the city of Johannesburg from Doornfontein*

# A Journey to South Africa—III

## *The Platinum Boom—Gold Ore Underneath a Race-Course—The City Deep Mine—Air-Blasts*

**By T. A. Rickard**

UPON our (three of us) arrival at Johannesburg in April we found that the chief topic of conversation was the boom in platinum shares—that is, in stocks issued by companies possessing, or claiming to possess, deposits of ore containing this precious metal. Platinum was selling in London at £24, and in New York at $117, per ounce. The occurrence of this comparatively rare metal in the Transvaal had been known for many years, because it had been detected in the heavy residue from the stamp-mills that crushed gold ore in several localities; for example, William Bettel in 1890 found platinum, together with osmium and iridium, in the black sand of the Klerksdorp district, and two years later he found this same group of metals in the mill residues of the Rand; indeed, he did not hesitate to urge a search for platinum in South Africa, as is proved by an article to this effect in the *South African Mining Journal* of Nov. 10, 1906. An abortive attempt to exploit alleged platinum deposits in the Kala district of the Cape Colony shortly after the end of the World War had the effect of drawing attention to the subject, but the existence of platinum in workable proportions in South Africa was not established until two years ago, when Adolph Erasmus made a discovery of rich material in the Waterberg district of the Transvaal. This was followed late in 1923 by the promotion of several companies, but only the parent enterprise—the Transvaal Platinum Co.—had achieved any promise of success when fresh zest was given to prospecting by the finding of richer deposits in the Lydenburg district in October, 1924.

The Waterberg discovery was made on a goldfield that had been "proclaimed" no less than thirty years earlier. Erasmus was seeking for gold; he was washing the loose dirt at the base of an ant-hill when he detected a heavy tail of grayish-white metallic particles below the few specks of gold his pan disclosed. The Lydenburg district likewise was the scene of gold-mining operations even before the banket of the Witwatersrand was discovered, in 1886. These two platinum districts are 150 miles apart, in the central and eastern parts of the Transvaal, but they are connected by a broad band of norite, which is the key to the regional geology. The occurrence of the metal in the Waterberg district, however, is unusual in so far as the platinum is associated directly not with an ultra-basic eruptive but with quartz in a fault-fissure traversing sandstone and felsite.[1] Some of the ore assays at the rate of ounces per ton, but the distribution of the metal is extremely irregular. Nevertheless, as has been stated, the Waterberg deposits are to be regarded as a part of an igneous complex, known as the Bushveld area, in which a magma, ultra-basic at its periphery, has broken through the sedimentary series of rocks, as is shown by the accompanying sketch, Fig. 1, borrowed from an article by Dr. Wagner.[2] A core of granite is surrounded by a band of norite, and in this norite, a variety of gabbro, is found the platinum in three types of deposit—namely, (1) in pipes or lenses of dunite, (2) in an extensive band of diallage-norite, and (3) in alluvium derived from the erosion of the primary deposits just mentioned.

It appears that A. F. Lombaard, a farmer possessed of previous experience in gold mining, was panning some dirt when he, like Erasmus, detected particles of a metal that he suspected to be platinum. He sent a sample to a geologist, Dr. Hans Merensky, at Johannesburg. The latter forthwith visited the locality—a farm known as Maandagshoek No. 148—and shortly afterward (in September, 1924) organized a syndicate to prospect the gravel deposit. Soon he traced the platinum to a mass of dark-brown dunite, and later he found small grains of platinum in a different

[1] "The Platinum Deposits in the Western Part of the Lydenburg District, Transvaal," by Percy A. Wagner, *S. A. Jour. of Ind.*, February, 1925.

[2] "Platinum in the Waterberg," by P. A. Wagner and T. G. Trevor, *S. A. Jour. of Industries*, 1923.

deposit, a peculiar mottled norite, in the form of a layer, 14 to 25 ft. wide, which since then has been traced for a distance of many miles. Here I may add that chromite had been found in this Bushveld igneous complex seventeen years ago, and traces of platinum had been detected in the chrome ore; but this association, on account of its resemblance to the characteristic deposits of the Ural, in Russia, had misled economic geologists in South Africa by causing them to concentrate their attention on the chromite, to the neglect of the other basic rocks near the chrome ore.

It was in these other rocks, as we have seen, that the rich impregnations of platinum have been discovered. How rich some of them are is indicated by the fact that, for example, one pipe of dunite, 44x75 ft., assayed 4 dwt. per ton at the surface, and 2 oz. per ton at a depth of 72 ft. Particles of crystalline platinum as big as the head of a match have been found in this ore. On the other hand, the band of mottled norite in one locality is 15 ft. thick, the uppermost 3 ft. of it assaying from a trace to 6 dwt. per ton; for 1,300 yd. it averages 3.7 dwt., and for 1,000 yd. more it assays 3 dwt. per ton.

The metal occurs in minute particles. The norite band, or seam, lies flatly inclined, the dip being from 10 to 15 deg. westward. It had been traced for about sixty miles when these data were given to me by F. A. Unger, geologist to the Anglo-American Corporation; his account of the deposits, aided by maps and specimens, was so lucid and comprehensive that there seemed no point in our visiting the locality of the prospecting operations. We had thought of going thither, but we were told that recent heavy rains had made the roads almost impassable for automobiles, and all that we could have done, by way of gaining further information, would have been to sample the ore systematically ourselves. No British company, of course, would allow three visiting American engineers to sample their prospects, because that, at the time of an excited stock market, would give the visitors information possibly of an explosive character. At that time the inflation of platinum shares had given them a market valuation of $35,000,000, and every day platinum "farms" were being floated as putative mines to an eager public. Since then a deflation has ensued, but not a collapse, for at the base of the promoter's activities are deposits of indubitable economic value.

The dunite is composed chiefly of a variety of olivine known as "hortonolite"; it is a heavy dark-brown rock, of coarse texture. The specific gravity is remarkable, being 3.752, and in the chromitic variety even as much as 3.9, according to Wagner. It is well jointed, and weathers in rectangular slabs. The crystals of platinum are cubic. Some of them are magnetic, on account of their iron content. The other type of deposit—namely, the persistent layer or sheet of mottled norite, or feldspathic pyroxenite—lies at a horizon about 1,500 ft. above the dunite deposits. It is from 3 ft. to 40 ft. thick, the platinum usually being concentrated in the uppermost portion, where the norite shows stains of both copper and iron, from the oxidation of chalcopyrite and pyrite. The deposit is traced readily by aid of the white anorthosite that constitutes the footwall of the norite.

The platiniferous rock weathers easily; it is marked by patches and streaks of bronzitite, sometimes inclosing thin streaks of chromite.[3] On weathering it acquires a dark-brown crust. The platinum occurs in particles much smaller than that of the dunite, and rarely it has a yellowish cast, owing to the presence of other metals, probably gold. Usually the bullion contains 12 per cent iron, together with 1 per cent osmium and 1 per cent ruthenium; that of the Waterberg veins contains from 20 to 40 per cent palladium, which is nearly as valuable as platinum itself. Since my visit to Johannesburg I have been informed by Mr. Unger that on the Lydenburg Platinum Co.'s prop-

[3] Wagner, *Op. cit.*

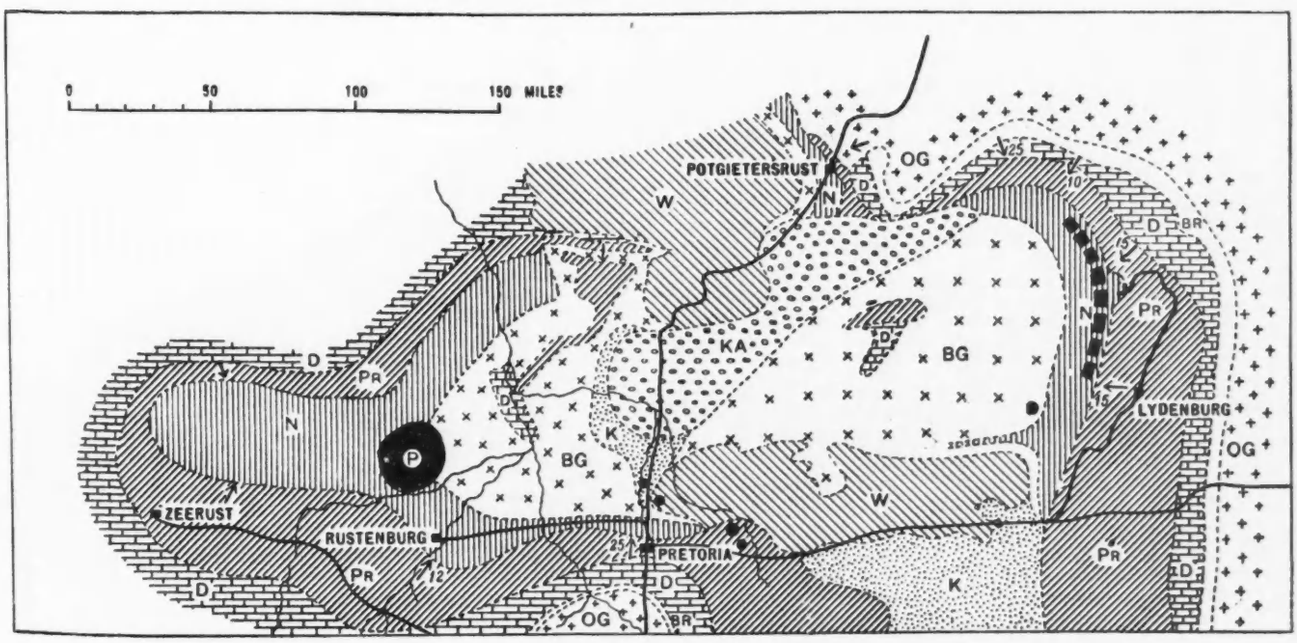



*Fig. 1—Geological sketch map of the central Transvaal, showing position of the platinum deposits in the Lydenburg district. This is indicated by the line of black squares at right*

*OG*—Old granite; *BR*—Black Reef; *D*—Dolomite; *PR*—Pretoria series; *W*—Waterberg System; *N*—Norite; *BG*—Bushveld granite; solid black circles—Nepheline rocks (*P*—Pilansberg Complex; *K*—Karroo system; *KA*—Bushveld amygdaloid.

erty a stretch of 3,000 ft. of 3.6-dwt. material has been uncovered in the norite band, and that vertical shafts show no impoverishment in depth as yet. The same company has found 30-dwt. ore in sinking a shaft to 50 ft. in a dunite kopje, or hillock. Another company, the Transvaal Consolidated Land & Exploration Co., commonly known as the T.C.L., reports 41 dwt. for a width of 10 ft. in a pipe within the dunite. It is evident therefore that these prospects promise an industry as well as a boom, a sequence by no means axiomatic.

Now comes the question, to what extent can these deposits be exploited at a profit? The mining and metallurgical operations will resemble closely those involved in the winning of gold, but the market for platinum is so restricted that any sudden increase of production would cause a collapse in the price. Platinum sells at a high figure at the present time because the chief source of the metal—the Ural Mountains—is in a country so afflicted with misrule that economic life is stifled. Before the World War no less than 95 per cent of the world's platinum came from Russia. The chief consumer is the United States; of the 86,417 oz. imported in 1923, only 423 oz. came from Russia, as against 32,278 oz. from Colombia, which has become an important source of platinum since the débâcle in Russia. In 1922 the output in the Ural and Siberia was 24,341 oz., or only 14 per cent of the output in 1913.[4] How greatly the price of platinum has risen within recent years is shown by the statistical record: in 1867 the price was only $4.40 per ounce; in 1889 it rose to $17.50, on account of the beginning of the use of platinum for electrical purposes; in 1892 the price dropped to $7; in 1900 it rose to $18.50; since then it has risen steadily:

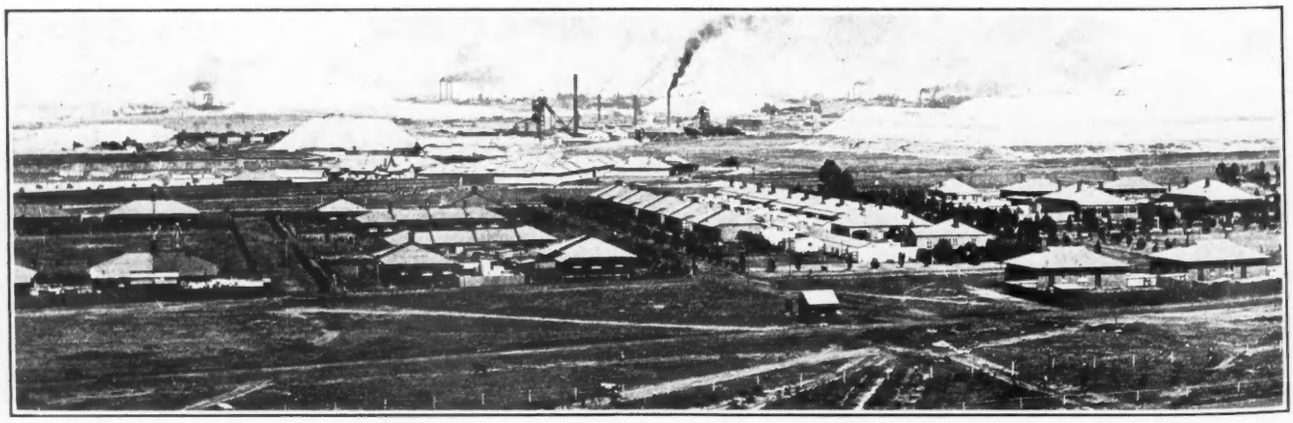
| | | | |
|---|---|---|---|
| 1907 | $28.18 | 1920 | $110.90 |
| 1913 | 32.70 | 1921 | 75.03 |
| 1915 | 47.13 | 1922 | 97.62 |
| 1916 | 83.40 | 1923 | 116.54 |

It is obvious that the war, followed by revolution and industrial chaos in Russia, was the chief cause in lifting the price of platinum from about $30 to about $125 per ounce. According to Dr. Kunz, an effort was made two years ago to revive production in Russia by the formation of a Ural Platinum Trust, but it failed on account of the lack of working capital, as might be expected in a country so deeply in the mire of bolshevism. If orderly government should be established in Russia, it is probable that production would be resumed on such a scale as to decrease the price to something like the pre-war figure. Of the consumption in the United States, the chief consumer, 4.86 per cent goes to the chemical industry, mainly for use in the manufacture of sulphuric acid by the contact process, in which the insolubility of platinum is the chief factor; next, 12.64 per cent goes to the electrical industry, in which the metal is used for the sparking points of magnetos and in the making of couples for thermo-electric pyrometers; 14.02 per cent is used in dentistry, because platinum is hard and does not oxidize; but the major use is in jewelry, which takes 65.29 per cent. Recently, however, the use of "white gold," an alloy resembling platinum, threatens to curtail its consumption except for the more expensive articles. Therefore, on the whole, the market for platinum may be said to rest on an insecure basis. Next, one must consider the effect of any sudden increase of production in consequence of the exploitation of the deposits in the Transvaal. It seems obvious that the yield of the rich, but small, pipes in the dunite will come on the market before the more extensive, but much poorer, deposits in the norite can be beneficiated; and it would seem probable that the platinum from the dunite, assaying, say, an ounce per ton, or even half an ounce, will cause such a fall in the price as to destroy the economic value of the 3-dwt. stuff in the norite. That seems to me to be a reasonable conclusion, and I give it for what it may be worth, with the hope, nevertheless, that the Transvaal may, on the basis of its richer deposits in the dunite, establish a new industry.

In reference to the chances of finding platinum elsewhere in South Africa, it may be well to mention the great dike of norite, three to four miles wide, that stretches for 300 miles in a north-northeasterly direction across southern Rhodesia. It is a remarkable geologic occurrence, and invites the search for chromium, platinum, nickel, and other metals usually found in the ultra-basic rocks. In speaking of prospecting, I must not forget to mention that the automobile is being used, the standard equipment in the Transvaal being a Ford truck carrying a compressor capable of actuating one jackhammer drill. This goes from trench to trench and drills 70 to 100 holes of 3 ft. each.[5]

[4] George F. Kunz in "Mineral Industry" for 1923.

[5] In leaving the subject of platinum in South Africa, I avail myself of the opportunity to compliment the editor of *The South African Mining and Engineering Journal* on the special issue on platinum that was published under date of March 21, 1925. I venture to say that this issue serves as a most valuable compendium on the subject, presented in excellent style.



*General view looking west from the Village Deep mine*

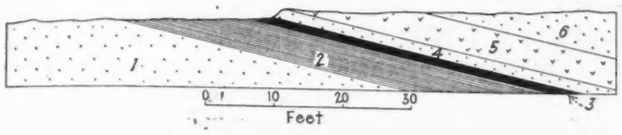



*Fig. 2—Section across upper platinum horizon in water-course 750 yd. north of southern boundary of Maandagshoek No. 148*

1. Medium-grained spotted norite. 2. Pseudoporphyritic feldspathic pyroxenite, merging upward into 3, which is a pseudoporphyritic pyroxene-rich platinum-bearing norite. 4. Light-colored spotted norite. 5. Mottled anorthosite. 6. Coarse-grained spotted norite.

Having discussed platinum, we went to the race meeting, where, besides seeing some pretty finishes, we had an opportunity of meeting many of the leaders of the mining industry. Twenty years ago or more, the chief technicians of the Rand were Americans, simply because at the start only Americans had the necessary experience in large-scale gold mining, at the El Callao, the Alaska-Treadwell, the North Bloomfield, and elsewhere in the western United States. Then came the day, shortly before the war, of the English colliery engineers; for by that time the directors had persuaded themselves, quite erroneously, that the layers of banket were like coal seams in their persistence and in some other respects. The British mining engineer had his innings, which he "closed," as they say in cricket, in order to do his duty in the war. He did it nobly, and lost his job, which during the interval was given mostly to the young Afrikanders—that is, white men, of Dutch and English stock, born in South Africa.

I was interested, and pleased, to meet such able young men—that is, much younger than myself—as P. M. Anderson and F. A. Unger. That men of domestic stock should begin to play their part effectively in the mining industry seems not only in keeping with poetic justice, but, I venture to add, of good augury for the industry, which has suffered so much in the past from the unsympathetic attitude of the Dutch element in the Union of South Africa. The mine operators of Kimberley and South Africa were leaders in the expansion northward of British dominion, and when they came in conflict with the Dutch herdsmen and farmers in the Transvaal and Orange Free State, it was natural that the old settlers should regard the mining industry as inimical to their pastoral and agricultural life. Since then, however, it has been made clear that the industrial prosperity of South Africa has been founded upon the exploitation of its mineral wealth, and that if mining were to be crippled seriously by adverse legislation, or punitive taxation, the result would be disastrous to the people of the country.

### Turffontein Course a Literal Gold Mine

The race-course of the Johannesburg Turf Club at Turffontein is the only one in the world that literally has proved a gold mine. It is underlain by the Main Reef, which is being mined at a depth of 6,500 ft. underneath the meadow over which the horses run in sportive competition. Twenty-three years ago, two holes were sunk with a diamond-drill to cut the so-called reef, or seam of gold-bearing conglomerate, at a vertical depth of nearly a mile and at a distance of a mile and a half south of the outcrop. These boreholes were placed on the northern edge of the Turf Club's property, close to the line of what is now the Village Deep mine of the Crown Mines Co.; they cut good ore, and therefore immediately gave a value to the Turf Club's property, so that proprietary shares became worth $50,000 apiece, by the sale of mineral rights.

The shafts of the City Deep and Village Deep companies, each about 6,500 ft. deep, are now giving access to the gold ore underlying the race-course. A day previous to the races we had been privileged (under the friendly guidance of W. G. Coe and R. R. Perkin) to go underground to the very bottom of the City Deep mine. First we descended through a vertical shaft to 3,100 ft.; then we walked 300 ft. along a level to an incline-shaft that extended 3,500 ft. at an angle of 43 deg., connecting with another level that led to the collar of the sub-vertical shaft, which had intersected the reef in the previous April at 6,065 ft., and disclosed 8-dwt. ore over a stoping width of 54 in. This shaft on the day of our visit had reached a depth of 6,275 ft. from surface; it starts at a point 30 ft. from the bottom of the shaft that goes to the surface. The opinion of engineers at Johannesburg is that for economic work 4,500 ft. is the limit of length for one shaft. The City Deep shaft is circular, 21 ft. in diameter; it is lined with cement bricks, or blocks, the irregular spaces behind the lining being filled with concrete. Iron rings at intervals replace the bearer sets of ordinary timbering; it is probable, however, that in the deepest shafts it will be necessary to make the cement bricking continuous, in order to check scaling of the rock. Most of our friends on the Rand consider that the circular type of shaft gives more scope for ventilation, which compensates for the apparent waste of space; they say that the circular shaft is stronger against rock pressure; it is also cheaper to sink; but when water is encountered it is awkward, because bailers cannot be used conveniently. To carry a sinking-pump equipment at great depth is impracticable. Fortunately, like other really deep mines, those of the Rand are dry, because they have penetrated below the groundwater.

At the new Modderfontein the ore is hoisted in trucks that go onto the cage; the City Deep is to be equipped similarly. The Crown Mines has skips, running on buntons and rails. The cost of the City Deep shaft is £45 per foot complete. At the bottom, where the temperature was 88 deg. F., we found forty Kaffirs and two white foremen engaged in cleaning up—that is, in removing broken or loose rock preparatory to drilling, which is done with eight machines, making fifty holes of 5 ft. each. The skip in the incline holds five tons;

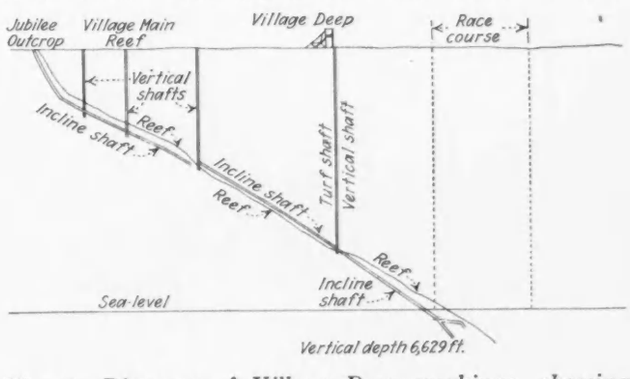



*Fig. 3—Diagram of Village Deep workings, showing main shaft sunk to depth of 1¼ miles. The dip of the reef is also indicated*

one skip being loaded in five seconds while the other is being tipped. The rails are laid on stringers of concrete. The rollers are made of hard rubber. The tonnage hoisted is 80,000 per month, this being done in three shifts over an aggregate of 23 hours. The white employees come and go from their place of work on the company's time; the natives, on their own. In 2½ hours 4,000 Kaffirs and 400 whites are lowered; at 1:30 p.m. the hoisting of men begins, and all are out of the mine at 5 p.m. The cage of the vertical shaft holds sixty, the skip of the incline only forty; so there is some waiting. Many of the Kaffirs walk up the incline; they would rather climb 1,000 ft. or more than be kept waiting half an hour. The City Deep employs 900 whites and 8,000 Kaffirs.

Each station has an ambulance equipment; the white officials have to pass an examination every three years in first-aid methods, in which many of the natives themselves have become efficient. In coming down we went along the twentieth level to the face of a foot-wall drift, which was being extended outside the banket, so as to provide a permanent way after the stopes have been drawn and allowed to collapse. At the breast we found four natives in charge of a white man; they were engaged in piecework; the white overseer was guaranteed 15s. per shift, and 3s. additional per foot driven; the "boys," as natives are called throughout South Africa, received 2s. per shift, plus a "tickey," or 3d., per hole after the first six holes, per shift. Then we went up to the seventeenth level, and saw a main drift on the reef. We noted the sties, or square cribwork, 8x8 ft., filled with waste, along the bottom of the stopes. At one time it was the custom to leave a pillar 10 or 12 ft. thick and 30 ft. long, but it has been found that this caused a sudden collapse of the ground, with the probability of air-blasts; so that it is now deemed safer to permit the hanging to settle slowly upon such temporary supports as the sties.

### An Air-Blast in the Village Deep

That reminds me that our first night's sleep in Johannesburg was broken suddenly by the sound and vibration of an explosive earthquake; it was an air-blast in the Village Deep mine. The earth tremors that are the concomitant of deep mining everywhere, not only on the Rand but in other old districts, such as the Kolar (India) and Lake Superior (Michigan), are a cause of increasing trouble. In the City Deep the lower shaft went through a bed of fine quartzite in such a state of strain that fragments of rock popped off, injuring several natives per day. In the Village Deep mine when the stopes approach from two directions, so that a pillar, say, of 100 ft. remains, the hanging begins to sag on both sides, and causes the face of rock to splinter energetically; so that the sooner the pillar is removed the better. The concussion of one of these air-blasts suffices to cause the rock in the face of a crosscut as much as 200 ft. distant to flake off.

Pillars therefore are a source of danger, which is greatest when both walls of the reef are in hard rock, unbending to the pressure. In the eastern part of the Rand, where a shale foot-wall serves as a cushion, it has become the practice to extend exploratory openings in this foot-wall, rather than in the reef itself, this being followed by diamond-drilling into the reef, for the purpose of sampling. The pressure that causes these air-blasts is the result of removing large areas of rock underground, along a flatly dipping lode, thereby entailing a heavy overhang. For example, in the Crown Mines no less than ten acres of ground, for a stoping-width of 51 in., is removed each month; this means that a square mile is excavated in five years! To safeguard the workings against this increasing pressure, it has become necessary to augment the timbering and rock-walling to such an extent that the cost has risen from 10d. per ton in 1914 to 29d. in 1919. Even after allowance is made for the rise in wages and the more expensive materials, it is safe to say that the cost of this work has more than doubled in the last decade.

Another difficulty is the increase in temperature; this is at the rate of 1 deg. per 254 ft. of depth. At the bottom of the Village Deep the air is 94 deg. F., but even this compares favorably with the St. John del Rey, in Brazil, where at 6,126 ft. the rock temperature is 114 deg. and the air temperature 109 deg. Such conditions in the bottom of a mine require the forcing of a large volume of cold air into the workings. Deeper mining is merely a question of the richness of the ore; if it contains enough gold to more than meet the increased cost, then neither heat nor pressure will prevent the mines from penetrating still farther into the bowels of the earth. Several years ago Sir Robert Kotze, the government engineer—a man of rare competence—estimated the depth of profitable operations on the Rand at 7,000 ft. The Village Deep company expects to go to its boundary at 7,500 ft. The engineers of the Simmer & Jack company, I am told, count upon ore of 20½s.—say 5 dwt. of gold per ton—at 4,000 to 6,000 ft. At the eastern end of the district the dip is flat—from 5 deg. to nothing—so that extensive downward development does not entail much depth; and in that part of the Rand the prospects of future productivity are best. For geologic reasons that we cannot stop to discuss at this writing, the question of persistence of rich ore is related to vertical depth, rather than extension on the dip. Methuselah had to die, it is true, but his crossing of the range was postponed by the gentleness of the final ascent.

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## Census of Mine Timber Used Underground, 1923

The Department of Commerce announces that, according to data collected in co-operation with the Departments of Agriculture and the Interior, 174,389,004 cu.ft. of round timber and 507,359,000 board feet of sawed timber were used underground in 1923 by 6,384 mining establishments. In 1905, the latest year for which comparable statistics are available, 165,535,900 cu.ft. of round timber and 435,944,000 board feet of sawed timber were used underground by 5,163 mines.

Summary statistics are presented in the following table. The figures for 1923 are preliminary and subject to such changes as may be found necessary upon further examination of the reports.

**Table I—Quantity of Mine Timber Used Underground, by Classes of Mines, 1923 and 1905**

| Class of Mines | Number of Establishments | | Round Timber (Cu.Ft.) | | Sawed Timber (Board Feet) | |
|---|---|---|---|---|---|---|
| | 1923 | 1905 | 1923 | 1905 | 1923 | 1905 |
| Bituminous | 5,149 | 2,940 | 110,983,610 | 91,309,700 | 227,340,000 | 140,790,000 |
| Anthracite | 156 | 216 | 41,358,607 | 43,676,000 | 69,301,000 | 101,219,000 |
| Iron | 165 | 143 | 13,123,228 | 13,484,000 | 16,685,000 | 13,929,000 |
| Other metal | 879 | 1,718 | 8,780,092 | 15,282,500 | 193,333,000 | 164,956,000 |
| Fireclay | 35 | .... | 143,467 | .... | 700,000 | .... |
| Miscellaneous | .... | 146 | .... | 1,783,700 | .... | 15,059,000 |
| Total | 6,384 | 5,163 | 174,389,004 | 165,535,900 | 507,359,000 | 435,944,000 |

# Discussion

## Forget the College Man, If You Dare!

THE EDITOR:

Sir—While all the statements derogatory to the college man quoted in your editorial of June 20 may be correct, they yet represent a deceptive view of the position of technicians in business. Is not the inquiry, "What can the college man do for industry?" more important than the reversed question, What is industry doing to college men? May not the fact that many corporations are controlled by half-educated "industrial executives," ignorant of science and its potentialities, explain the present hard lot of technicians in business as much as any practical shortcomings of the latter?

If the college graduate has acquired nothing from his engineering studies beyond a "larger outlook," it would seem that the vast sums now spent by colleges in providing elaborate laboratories and shops for the experimental study of applied science must be considered as wasted on mere fads. This larger outlook on life can be obtained as well, if not better, by the old fashioned "arts" course in the classics and humanities, so why expend millions for experimental apparatus if a line of lecture chairs, a few text books, and a reference library will achieve the same educational object?

As this is a concrete rather than an abstract problem, it is difficult to treat effectively except by one's personal experience with its objective phenomena, and this I plead as an excuse for introducing my own. When I first arrived in Butte in 1897, the "practical men" had everything their own way in the mining and metallurgy of the "richest copper camp on earth," and the possession of a technical degree was often more detrimental than advantageous in getting a job. Nearly all the mine foremen, shift bosses, and even superintendents had begun their technical studies at the business end of a muck stick; the executives in the concentrators had once been machinists, most smelter foremen were graduate pot-wheelers, while the construction engineers usually knew more about shingling roofs or adzing logs than they did about stresses and strains. Nevertheless, everything was humming and the ores thus extracted, washed and smelted under the direction of "practical" executives were flooding the world with 10c. copper.

The constant slaughtering and maiming of men in the mines, in spite of the annual consumption of forests of huge timber in the stopes, caused me to doubt the competence as executives of the graduate muckers of the Comstock lode, in the same way that I doubted the ability as statesmen of the city council who not only permitted the pollution of the town's atmosphere with tons of sulphur smoke but the debauching of the mining population with every species of open vice. Later the winter of 1899-1900, which I spent in the model mining camp of Rossland, B. C., showed me how needlessly scandalous was the "practical" sort of government in Butte. But it was not till 1904 that my eyes were opened as to the absurdity of expecting good results, even commercially speaking, from the leadership of muscle rather than mind in copper production.

My enlightenment came as the result of a season passed on the technical staff of the Semet-Solvay Coke Co. of Syracuse. There, instead of the "be guess and be gob" method of attacking problems, I found the careful, studious system of the university laboratory. Not a building or an apparatus was constructed except after the making of complete working drawings; not an article was purchased or put on the market until after it had satisfied the necessary mechanical and chemical tests of its suitability for the proposed use. By this system, if mistakes were made they arose either from the imperfection of the existing data on the subject or from the occasional mishaps that are due to human fallibility or the caprices of nature.

Many years later, in 1916, when I revisited Butte, I was both surprised and gratified to find that the technician had there come into his own. And what nests of scandal had been revealed when the "practical" crew were no longer able to cover up each other's blunders! In the "exhausted" upper levels of the mines many good orebodies had been found by applied geology that had either been missed entirely or partly caved and then forgotten during the reign of the Comstockers. In the tailing dams much payable sand had been encountered that had run to waste in the era of the machinist mill men, while in the slag piles had been uncovered masses of copper matte or rich salamanders that had been given interment there to conceal the products of muscular smelting. And yet the daily assay reports of the practical epoch, if examined in the old archives, would show none of these losses of metal. Did the assayers lie? No! but liars did the sampling.

I have said enough, I hope, to prove my contention that producers lose more by their neglect of technicians than the latter suffer from lack of appreciation. The principle of "sink or swim" carried to an extreme may develop a few American beauties from a large crop of the common variety of technicians, but it is a costly process for industry in general. In most European countries and British colonies no one can be the responsible executive of a mine except a qualified engineer. The social advantage of the European system is shown by the fact that their technical managers have a smaller accident rate in their deep old mines than have many "practical" executives in their shallow new ones. Indeed, the average specimen of the latter would be unable to direct one of the dangerous European coal mines for a week without blowing it to Kingdom-come.

Mexico City, Mexico. ROBERT BRUCE BRINSMADE.

## "Tin Lizzies" and the Labor Supply

THE EDITOR:

Sir—Scenes that I witnessed along the California State Highway recently while motoring down from Berkeley to Pasadena via the San Joaquin Valley would provide an amazing surprise to many an engineer with Latin-American experience. In particular, I have in mind those who have struggled to provide a uniform and adequate labor supply in northern Chile for

Chuquicamata and the nitrate oficinas; such efforts taking the form of *enganches*, usually; that is, recruitment of groups of contract laborers in southern Chile, and transported thence, 650 miles by sea, and over 100 miles by rail, at the employer's cost—a burdensome affair to the latter and a trying experience to the workman and his family in the process.

The glaring contrast of which I write was offered by the seasonal migration of the Mexican laborers from southern California to the San Joaquin Valley, where the fruit season and cotton picking will provide work for many weeks. Each one of them was in heavy marching kit, "*con monos y petacas*," and, as usual, traveling with the whole family, but the great difference is that they are all "on rubber" now.

It is estimating fairly close to say that once every five minutes during the day's run I met a car bound north loaded with Mexicans, which would account for 600 to 800 persons, in all. Of course, the cars were mostly small, and most were "formerly owned by a Detroit millionaire," but they were all packed to the limit, while some were open-body trucks holding a dozen or more passengers. Carrying camp equipment (of types not featured in advertisements of *Vanity Fair*), they are free of all hotel expense, and should reach their destinations easily in two days' run, or less, over one of the finest arterial routes of motor travel in this country.

If a flock of $75 second-hand "tincans" are such powerful aids to ready mobilization of Mexican farm labor, and simultaneously provide a source of constant amusement to their owners, how sincerely might the Chilean mine managers yearn for a national concrete highway, paralleling the "F.-C. Longitudinal" from Santiago to Antofagasta, with the necessary concomitants of several shiploads of second-hand lizzies, Chilean filling stations, and "hot-dog" stands!

Pasadena, Calif. DONALD F. IRVIN.

## Oil in Brazil

THE EDITOR:

Sir—Recently while strolling along Rio's Broadway, (Avenida Rio Branco) I saw "O Estado de Sao Paulo" bearing an oil company advertisement on its front page. My eyes filled with tears, my breast heaved with nostalgia! It was an advertisement of Brazil's first oil company! It is history! It bears many a sign of promotion experience. They have gas! They have oil! Eminent geologists and engineers attest it. The money (Rs.20,000:$000) asked for is divided into 200,000 shares of Rs.100$000 each. The money is to be used for:

1. Immediate acquisition of lands and necessary rights for continuance of operations.
2. A rig for drilling 1,200 meters.
3. Camp equipment, offices, etc.
4. Construction of roads, bridges, and "works of art."
5. Purchase of auto trucks, operation of the mine (well), industrially and "commercially."

My Portuguese is quite sketchy, so the foregoing rough translation may lack the delicate shades of meaning necessary to an understanding of the promoters' language.

The location of the oil-well property is in the municipality of Sao Pedro, State of Sao Paulo. Municipalities, in Brazil, usually include much territory about a city, and nearly correspond to our counties.

This oil enterprise may be one of great merit. The promoters' language was what caused my homesickness. The advertising article is worth translating as an evidence of the way to attract public attention in Sao Paulo. Brazil, at present, is sore about the lessened consumption of Brazilian coffee in the U. S. A., and some think we have been boycotting it. The oil advertisement states "Brazil, which up to now has been a tributary of the U. S. A., buying from that great country nearly all the petroleum and gasoline needed for its consumption, will be able, *without doubt*, to dispense with this importation," etc., etc.

From the pictures, a Keystone drill is at work, and at another place gas is issuing, struck at 350 meters.

These remarks may sound like poking fun at the advertisement, but are not so intended. I know nothing of the merits of the enterprise, nor do I know anyone connected with it, nor have I ever heard of the well or its people.

It is the thought that Brazil has the oil-well fever ahead of it, that it can buy oil-well stock, hope, dream, fight, and die for oil as we cold-blooded(?) Yankees have done, that arouses my imagination.

I hope Brazilians will be let alone to work out their oil-well problems, but I fear that will never be realized. Foreigners will always be buzzing around, grabbing off, or trying to, pieces of the "great natural resources" that we are always talking about. W. H. STAVER.

Rio de Janeiro, Brazil.

## Strain-Line Banding

THE EDITOR:

Sir—Is all so-called cross-bedding due to sedimentation? A discussion of this question may be of some interest to those interested in geologic structures.

In a dirty white sandstone (Coconino) at the head of the trail going down into Cataract Canyon (a branch canyon of the Grand Canyon) there is a fine example of so-called cross-bedding, said to be due to sedimentation. I don't believe this so-called cross-bedding is due to sedimentation. I believe it to be an excellent example of what I call strain-line banding, due to great pressure and a slight movement in the sandstone. The nature of the banding at this particular point, on account of being on such a gigantic scale and being so complicated, is not so easily seen, but further down the canyon in a red sandstone (Supai) the banding is simpler and its cause more evident. Near by is found some indication of how these lines were produced. Due to movement in the sandstone, there has been formed soft horizontal layers, from 1 to 5 ft. thick, of ground-up material. I think the lines indicate the beginning of such a movement. It does not seem at all likely the uprightness of the lines could have had a sedimentary origin. To those visiting the Grand Canyon there will soon be given an opportunity to observe this particular example of strain-line banding. The government is soon going to build a road from El Tovar down into Cataract.

In the Jerome district I have seen many good examples of strain-line banding in the sandstone. Doubtless, one can find examples nearly everywhere sandstone is found.

The thing that seems to make strain-line banding difficult to understand is the regularity of the lines. Such regularity we have nearly always associated with sedimentation. WILLIAM CROCKER.

Prescott, Ariz.

## Cost of Producing Copper

THE EDITOR:

Sir—It was with real interest that I read Arthur Notman's article, "The Cost of Producing Copper," in the Aug. 1 issue of the *Mining Journal-Press*. Mr. Notman's occasional analyses are always instructive and are based on just the sort of data that we are all glad to have worked out for us and presented in tabloid form.

Naturally enough, I am pleased to see that his data and conclusions with regard to the present and past cost of producing copper are in direct agreement with my own views that were published in the *Mining Journal-Press* of May 16, 1925, under the heading "The Price and Value of Copper." Nevertheless, all of my conclusions are not in agreement with Mr. Notman's ideas, and with regard to this article he says, "I have read it with great interest and find myself in entire accord with his views on the present cost of producing copper, . . . however, I am not in accord with his estimate of the future." Inasmuch as we are not in accord with regard to the probable future price of copper, I feel that both of our analyses are worthy of a little further comment and comparison.

My own conclusions regarding the probable future price of copper during the coming decade, as presented in the article previously referred to, are quite at variance with Mr. Notman's expectation of 15c., or even 16c. if the correction which I apply to his data is used. I have had the temerity to suggest that 10c. per pound may be the selling price of copper in future years. This estimate is based on the fact that during the last twenty years the value of copper in terms of commodity value has been steadily decreasing, and assuming that this decrease continues and that there is also a gradual decline in the cost of living, we are most certainly going to have lower copper prices, and in the years to come an average selling price of 10c. does seem to be well within the realm of the possible.

Mr. Notman's analysis takes a different course and he has very ingeniously demonstrated to us a bisection of price into two elements, cost and margin of profit. He furnishes this data for four periods, pre-war, war, post-war, and present (1924), the results being based on 60 per cent of the world's supply, and arrives at the conclusion that in the future both cost and margin will advance. For ease in reference I am tabulating his estimates of past costs and past margins below.

| | Pre-war 1911–1915, Cents | War 1916–1920, Cents | Post-war 1921–1923, Cents | Present 1924, Cents |
|---|---|---|---|---|
| Average cost | 11.61 | 16.11 | 10.74 | 9.68 |
| Average margin | 3.76 | 7.24 | 2.94 | 3.34 |
| Average price | 15.37 | 23.35 | 13.68 | 13.02 |

These figures are most interesting, and while certain limitations apply to the calculated costs, as Mr. Notman has indicated, the entire summary does constitute a twelve-figure analysis of past copper markets that is hard to beat. However, I cannot resist the opportunity to convert his figures to cents of a dollar of fixed purchasing power, which will give results in terms of their relative value. By using Dun's wholesale price indices for each of the periods the following values are secured:

| | | | | |
|---|---|---|---|---|
| Dun's average | 122.1 | 212.2 | 177.6 | 189.3 |
| Average cost | 9.51 | 7.59 | 6.05 | 5.11 |
| Average margin | 3.08 | 3.41 | 1.66 | 1.77 |
| Average price | 12.59 | 11.00 | 7.71 | 6.88 |

The general trend throughout all four periods is most striking and the consistent decline in cost value and also in price value seems almost prognostic. In the case of margin, however, something does seem to be amiss, and I will mention this again further on.

With regard to costs Mr. Notman says, " . . . the history of the industry does furnish a mass of indisputable evidence on the question, all of which indicates that costs are now substantially lower than in pre-war times; in other words, intelligent management has succeeded, with the aid of greatly increased capital investment in plant, in offsetting the handicaps of rising wages, dearer material, and lower-grade ores." Yet for the future Mr. Notman believes that higher costs will be the rule and mentions the higher wages and higher taxes that are probably coming for South American producers. Now, mines are wasting assets; they are finite in extent and incapable of reproduction, as he points out, but remember this: technical knowledge and technical skill are still far from finite; they are ever growing and appreciating assets which by their very nature tend to increase and multiply.

No, I cannot believe that we have approached the ultimate in costs for handling and treating copper ores. There may be pauses in the rate of our accomplishment, and temporary economic ills may upset sustained advances and improvements, but to believe that we cannot do better is to belittle the aspirations and efforts of all technicians.

With regard to the other elements of price, the margin of profit: Mr. Notman believes that the pre-war margin in terms of purchasing power should be restored and supports this with an estimate of the relationship that may occur between supply and demand by 1935—namely, that a 9 per cent shortage in supply will exist. His final conclusion is that to restore the pre-war margin and enough more to make up for the loss in purchasing power of the dollar, we must have a selling price of from 14.75 to 15.25c. per pound.

It would seem to me that Mr. Notman has made a slight error in his calculations and that he has not done full justice to his logic. Instead of anticipating a 15c. price, he should be prepared for a 16c. price or even higher. In converting the 1924 distributable margin of 3.17c. to its value in pre-war cents, he has used a factor of 154 and secured a result of 2.06c. Now, if we use this same index and convert his estimate of the pre-war margin, 3.75 to 4.25c., to cents of the 1924 dollar, the results are 5.78 and 6.55c. Subtracting from these amounts the 1924 distribution margin of 3.17c. leaves 2.61 and 3.38c. as the quantities to be added to the 1924 price of 13.02c., in order to restore the equivalent of pre-war earnings to the current price. Adding these quantities we secure sums of 15.63 and 16.40, and to this we must still add something to cover the expected increase in costs, so that in my opinion Mr. Notman's final estimate should be above 16c. instead of about 15c.

Right here I would like to point out most emphatically that the price of copper is not necessarily a measure of the prosperity of the copper industry. In some instances it is, but not always, and it is conceivable that higher prices may sometimes reflect only higher costs, and possibly a shrinking margin of profit, whereas lower prices that result from lower commodity values may result in an increasing profit margin in that costs will probably decline more rapidly than price. If the reader will refer to the first tabulation he will see that the average producer in 1924 with a price of only 13.02c. was better off as regards profit margin than the

average producer in the post-war period with an average price of 13.68c. So those who view with alarm the prospect of lower prices, and even any mention of this possibility, may allay some of their fears, and, if I may again be permitted to quote Mr. Notman, the following statement, written some two years ago, will bear repeating: "Those companies that can maintain their relative ability to compete with average costs of the industry should not be unduly elated over the prospect of a period of high prices or unduly depressed over one of low prices." The profit margin will largely determine the general prosperity of the copper producers, and for those whose interest is the probable future earnings of investments in the industry, I recommend an analysis of this element of price.

In commodity values we see that the war-time earnings were but little in excess of the pre-war earnings, the value for the former being 3.41 and for the latter 3.08. However, the post-war earnings are very much lower, being only 1.66, and the 1924 earnings are but little better, being only 1.77. The natural reaction to these low values for earnings during the last five years is to anticipate higher earnings for the future.

Various methods for calculating the probable amount of future profit margins have been suggested; some are percentage rates computed on the gross income or price, others are based on a percentage of the costs and still others on the invested capital. Some form of the latter method appeals to me more than the others. An industry is entitled to return in proportion to the capital invested therein *and the risk entailed.* An analysis that will furnish dependable figures for the capital invested, risk rate, and earnings for each year of a period of the past will make it possible to more accurately judge the position of the producer of today and the probable position of the producer of tomorrow.

One thing we may be sure of is that whether copper sells for 16c. per Notman's Forecast, or for 10c. by Black's Value Trend, the general prosperity of the copper industry will not be affected. Individual producers will come and go, but the industry as a whole is now inseparable from modern civilization, and its position will always be in accord with the economic service that it renders.

WILLIAM SPENCE BLACK.

Boston, Mass.

# Consultation

## Divining Rods and Electrical Prospecting

**Can you give me the address of the manufacturers of an instrument for locating gold ore—the same instruments, I presume, that they use for finding buried treasures? I saw one over in Oregon last year, but do not know if it would work on a gold lode.**

We cannot recommend any of the instruments or divining rods used for locating ore or buried treasure. The consensus of educated opinion seems to be that they are fakes. Of course, magnetic methods are used in some instances where the ore to be tested is magnetic, and there are electrical methods of prospecting, but these require the services of an expert. If you are interested you can obtain particulars from Sherwin F. Kelly, University of Toronto, Canada, American representative for the Schlumberger method, or from Allen H. Rogers, 42 Broadway, New York, general manager for the Swedish-American Prospecting Corporation, which controls the use of the Lundberg method in America.

## Dry Drills and Silicosis

**"I shall appreciate it if you can tell me what is the minimum length of time a man would have to work with a dry drill to inhale enough dust to develop silicosis, or 'miners' T.B.'"**

An authority on the subject says that the average length of time for a man to develop silicosis in South Africa, where the men are examined previous to employment and only those physically fit are given a certificate for employment, is seven and a half years. The shortest time recorded there is about two and a half years for a man to develop simple silicosis—that is, without being complicated by tuberculosis. The shortest time in which a normal man physically fit could develop silicosis has not been determined. It is probably less than the above time. In New Zealand, the law states that a man must have been employed in gold mining (hard rock mining) for two years before he can apply for compensation for silicosis.

The same authority says that it is possible to cause changes in the lungs of guinea pigs after a few months' exposure to very high concentrations of dust, far higher than usually occurs in mines. The Bureau of Mines is now engaged in making such a study and further details will appear in Technical Paper 372.

## Buyers of Silver-lead Prospects

**I have a claim on which a good vein of rich lead-silver ore is opened. I need money for further development. Can you advise me as to the best method of proceeding?**

A large number of people write us, asking us to find buyers for their prospects, but we can do no more than suggest the names of the principal mining and exploration companies, or some of the professional engineers whose names are given in the Professional Directory in the back of each issue of the *Mining Journal-Press.* There you will find that some of them make a business of examining mines with an idea of financing those that appear to be worth it.

Another way to awaken interest is to put an advertisement in the "Searchlight" section of our publication. Good silver-lead deposits are in considerable demand right now, owing to the shortage of lead, and you are likely to get some favorable replies from an ad inserted in this section of our paper.

## Foreign Zinc Ore Buyers

**Will you kindly send me the names and address of zinc-silver ore buyers in France, Belgium, and Germany that would be interested in purchasing an ore of the following composition: zinc, 60 per cent; silver, 200 oz. The ore contains about 4 per cent lead and iron and is sulphide. The mine is in Central America.**

In looking for a foreign outlet for your zinc-silver ore, we suggest that you write to the concerns listed below. Some of these have operating plants and others are brokers:

M. Lissauer & Cie., Köln, Germany.

Société Générale des Minerais, 31 Rue du Marais, Brussels, Belgium.

Cie. des Métaux Overpelt Lommel, Overpelt, Belgium.

Soc. Anon. de la Vieille Montagne, Viviez, Aveyron, France.

Siegfried Pels, 26-28 Neuerwall, Hamburg, Germany.

Louis Benzian, Hohe Bleichem 35, Hamburg, Germany.

Ore & Chemical Corporation, 40 Rector St., New York City, (representing the Metallgesellschaft).

# News of the Week

The Mining News of ENGINEERING AND MINING JOURNAL-PRESS is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

## Summary

*OLD properties in Arizona being opened—Much new development planned—Fire at Old Dominion—Copper Queen closes C. & C. shaft—Rotary drill used for prospecting.*

*Tungsten miners ask 50 per cent increase in tariff in order that they may successfully operate their mines.*

*Hollinger Consolidated conducts extensive development with a present daily income of $50,000.*

*New York-Chicago telephone cable recently completed, required 10,682 tons of lead and 5,678 tons of copper.*

*The reclamation plant of the Calumet & Hecla produces 900,000 lb. of copper per month.*

*Proposal to place Bureau of Mines and Bureau of Standards under same director not meeting approval of the mining industry.*

*European buyers seeking Joplin-Miami zinc. Competition strong. Lead deposits reported from Camden County, Mo.*

*Regrinding at Mohawk mine, Michigan, materially increases production.*

*Gogebic iron ore shipments 17 per cent ahead of last year.*

*Tailing launders in Ontario not subject to municipal tax.*

### Fire in Mine of Old Dominion Copper Co.

A small fire broke out near the 2,212 winze of the Old Dominion Copper Co. about 2 o'clock on the morning of Aug. 15, but was extinguished after several hours' hard work on the part of the Globe-Miami rescue crew. Several sets of timber within a radius of 20 ft. of the blaze were attacked by the flames before they were subdued. Work in the mine, however, did not cease during the progress of the fire. Another unit will be added to the mill, increasing its capacity to 1,500 tons a day.

### Purchases of Arizona Products by Mining Companies Increase Over 1924

Reports received by the Arizona Industrial Congress indicate that purchases of Arizona products by mining companies for resale and for consumption purposes are materially increasing. Taking, for example, the Phelps Dodge Corporation, the purchases made by this corporation for the first half of 1925 amounted to $471,170.52, as against $429,275.46 for a simlar period during 1924. Similarly, the United Verde Copper Co., during the three months period covering April, May, and June, spent $217,681 on Arizona products as against $200,396 for the same three months of 1924. During the same period, the Ray Consolidated Copper Co.'s purchases were $45,000 higher than those of last year, while the Miami Copper Co. and Old Dominion also show large increases. Other companies show similar increases.

### Big Blast Set Off at United Verde Copper Pit

A GREAT BLAST of 125 tons of black powder, with five tons of dynamite used for priming, was successfully fired at the United Verde Copper Co.'s steam-shovel pit on the afternoon of Aug. 11. The development work, preparatory to the blast, in opening the recesses for depositing the powder in the most advantageous locations, was carefully planned by W. Ellis and Joe Rice, of the Hercules Powder Co., in conjunction with the organization of the United Verde Copper Co. The blast dislodged an area of ground 350 ft. long, 275 ft. wide, and 100 ft. high, and will furnish ample broken material for some months.

### White Properties on Hassayampa River Reported Sold for $150,000

According to an announcement recently made in Prescott, Ariz., C. G. Body, representing a group of Eastern capitalists, has purchased the White mine properties, on the Hassayampa River, 11 miles from Wickenburg, for $150,000.

The new owners plan to install machinery and to build a plant for the development of hydro-electric power at a cost of $65,000. The property consists of six patented and four located claims. It is reported that the Tonopah Belmont Development Co. has secured options on a group of silver-gold claims 14 miles from the old Vulture mine.

### Old Blaine Mine, Yuma County, Ariz., to Be Reopened

The Blaine mine, 40 miles north of Yuma, Ariz., was one of the silver producers of Yuma County during the early history of mining operations along the Colorado River. The mine is being taken over by C. Henry Thompson, of Los Angeles. Mr. Thompson's engineers estimate that 144,000 tons of good commercial ore is blocked out, ready for extraction, while at the old millsite, 40,000 tons of tailings, assaying 11 oz. silver and $1.55 in gold, are ready for re-treatment. The Black Rock mill has been purchased, and the ferry right and site on the Colorado River, it being the intention to stretch a cable across the river, and establish a ferry-boat service for private use, which will greatly shorten the distance between the mine and Los Angeles.

The Eureka mine, near Pichaco, in Yuma County, has been acquired by J. M. Whitney and J. L. Griffith, of Los Angeles. Considerable underground work is planned.

### Copper Queen Closes Down Its C. & C. Shaft

Announcement was recently made that the C. & C. shaft of the Copper Queen branch of the Phelps Dodge Corporation has been closed down. The twenty-five men employed at this shaft will be transferred to other shafts, with the exception of a few who will make some necessary repairs. The striking of additional water, in quantities too great for the pumps to handle, was given as the reason for closing the shaft.

## Small Mines in Cochise County, Ariz., Active

James Malley, Deputy State Mine Inspector of Arizona, reports fair activity among the smaller producers of Cochise County. The property of the Golden Slope Mining Co., which has been involved in litigation for a number of years, has recently been reopened under the management of W. A. Bourdurant. The mine is 20 miles southeast of Wilcox. It is well supplied with timber and water. The company has built twelve dwellings for housing its twenty-two employees and has built five miles of road to improve its communication with Wilcox. A 100-ton mill has just been completed. Power is supplied by three 60-hp. oil engines. The R. E. D. Mining Co. is again operating after several weeks of enforced idleness, which was caused by a shortage of water. Another property in the Dos Cabezas region which shows promise of becoming a producer is the old Peterson mine. This property, which has been idle since 1918, is being unwatered by a group of Colorado mining men. It is said to have considerable tonnages of lead and zinc ores blocked out.

The combined shipments of several producers at Gleason are averaging about five cars of silver-lead ore per week. Most of this is coming from the Mystery and Tejon mines.

## Denn Mine, Near Bisbee, Will Be Reopened

The Denn mine, near Bisbee, Ariz., which has been closed down since December, 1920, will be reopened and ready for resumption of operations within the next two months, according to an announcement recently made by T. O. McGrath, general manager of the Shattuck Arizona Mining Company. A force of workmen has been employed continuously since last February in reconditioning and reopening the mine.

The Denn for a number of years ranked as one of the best producing mines in the district, and was the principal holding of the Denn-Arizona Mining Co. The latter company recently merged with the Shattuck-Arizona company by action of the boards of directors of both organizations. Only the formal ratification by the stockholders is needed for the merger to become complete.

## Van Dyke Copper Prospects With Rotary Drill

The Van Dyke Copper Co. has erected a steel derrick 120 ft. high near Miami, Ariz., at which location a rotary drill will be operated to a depth of 3,000 or 4,000 ft. The rig is equipped with a No. 5 "Ideal" rotary table, draw works, and mud pumps. Both fishtail and disk bits will be used. The former bit has been used with success in drilling operations in this district before, but the disk bit has not previously been tried in Arizona.

The Van Dyke property lies adjacent to the territory which has been explored by the Miami Copper Co. on its 2,600 level. This exploration was an effort to find the faulted segment of the Miami Copper orebody, which supposedly lies on the east side of the Miami fault. Miami Copper's main orebody lies against the west side of the fault. The last-named company recently abandoned operations on its 2,600 level after receiving an opinion by a leading geologist that the enrichment of the Miami orebody had occurred subsequent to the faulting. The Van Dyke company, however, is evidently more optimistic about this area than its neighbor, for it is not only putting down the rotary drill hole but is sinking a two-compartment shaft.

## Hoover Disclaims Connection With Proposed Coal Merger

THE REPORT that Secretary Hoover is to head a gigantic merger of coal-producing companies is hard to down. It keeps bobbing up, with the aggregate of capital involved having shown a progressive increase over the last rumor. This led Mr. Hoover on Aug. 20 to make a public denial in sweeping form. He declared that he knows nothing of such a merger; that he never has been approached with any proposition to take a place with any coal company, and that if he had been tendered such a position he would have declined it.

Having gone thus positively on record, Mr. Hoover hopes that this convinces anyone interested that the report is without foundation.

## Highway Copper Claims Taken Over by Nevada Operator

E. H. Meade, of Reno, Nev., who is operating the Sombrero Butte property, near Mammoth, Ariz., has arranged to develop the Highway properties on the main road between Florence and Tucson, about 30 miles south of Florence, on the state road. Recent tests of the narrow strip along the highway at a depth of 35 ft. have produced 2 per cent copper as well as 2 oz. of silver to the ton.

## European Markets Seeking Joplin-Miami Zinc

Much interest has been aroused in the Joplin-Miami district by the entrance of European concerns in competition with American smelters in buying local zinc ores. The Hirschler Metals Co., of New York, has been the principal purchaser of zinc ores to date, having taken more than 15,000 tons since E. H. Wolff, district representative, entered the market at Joplin. The Associated Metals & Minerals Co., a subsidiary of B. Lissaur & Co., a German concern, has entered the field.

Some weeks ago the Associated company purchased about 2,000 tons of ore in this field, but has encountered difficulty in buying ore since, because it lacked a local agent. It has appointed Robert Green, who was formerly connected with the Arkansas Zinc Smelting Co., at Van Buren, Ark., as agent.

## Mining Claim in Globe District Reported to Be "Without a Home"

Assessment of a strip of mining ground separating the properties of the Arizona Commercial and Iron Cap Copper companies has recently been under discussion by the Arizona Tax Commission. Because of the peculiar conditions surrounding the strip of land, it has been officially dubbed "No Man's Land" by the commission. In making the assessments for this year, this particular strip was assessed to the Arizona Commercial Company. Officials of this company, however, declare that the strip should not be assessed against them, for the reason that no ore is being extracted, because of litigation which has tied it up. The strip has been the basis of a number of suits between the two companies, and it is reported that the Iron Cap company has been enjoined by the courts from entering the strip and removing ore from the claim. Neither of the companies desires to be assessed for the strip. The question of assessment was therefore taken under advisement by the State Tax Commission.

## Prospecting and Development Active in Joplin Zinc Fields

Considerable drill prospect work is being done in the area immediately around Joplin, in the Joplin-Miami field. The Dorothy Bill Mining Co. has taken a lease on the 400-acre tract of St. Louis-Joplin land, just west of Chitwood, and has a number of drill rigs at work. Practically all the land northwest of Joplin, extending from near the city limits to the Kansas-Missouri state line, is now under lease, with many drills at work. The Grasselli Chemical Co. has several thousand acres of land under lease in this territory, and good strikes have been reported at different points.

A small concentrator is to be built by the Cavern Lead & Zinc Co., on a lease in the Crestline section of the Joplin-Miami district. The lease was formerly owned by F. E. Burton and N. J. Detchmendy, who had trouble developing it, on account of the heavy water encountered. In recent months the Eagle-Picher Lead Co. has carried on extensive draining work, and the Cavern company has been able to get into the ground in good condition.

## Reported Lead Deposit in Camden County, Mo.

Hunter Bros., who have been prospecting for several years, are reported to have discovered lead on the Hopkins land 4 miles east of Linn Creek, Mo. The lease on this tract has been purchased by Thompson & Nixon, of Boonville. There are six shallow pits in ore, which occurs from 5 to 35 ft. below the surface. About 200 tons of high-grade ore has been taken out. Plans are being drawn for the erection of a mill. The ground will be tested deeper by means of drills.

## Regrinding Increases Production at Mohawk Mine, Michigan

Due to better ore in No. 6 shaft and operation of regrinding units in the stamp mill, Mohawk obtained a yield of 24 lb. of copper per ton of rock treated in July. Heavy copper rock and considerable mass characterize the vein at depth in No. 6, which is contributing 50 per cent of production. No. 4 rock averages about 21 lb. to the ton and No. 1 returns about 17 lb. No. 1 is furnishing less than 10 per cent of the rock going to the mill. Two stamp heads in the mill are equipped with regrinding units, which are in commission and saving better than a pound of copper per ton of tailings reground. The two remaining heads will be equipped as rapidly as possible without interfering with the regular operation of the plant. At the present rate of recovery, the installation should easily pay for itself in two years. Mohawk is shipping an average of 2,300 tons of rock to the mill daily.

## Gogebic Shipments 17 per Cent Ahead of Last Year

Shipping of ore on the Gogebic range has been going on at a better rate than early in the season, when many mines curtailed operations. Actual mining operations have not been increased to any great extent, but the deficiency in daily hoist has been made up from stockpiles. Although this has not been a boom year, as was predicted last winter, the season's shipments so far have been about 17 per cent greater than those of last year, more than three and a half million tons having been shipped from this Michigan range up to the middle of August.

## Lake Copper in Demand

Lake Superior copper is in demand at Mid-West points. Present shipments, especially to Detroit and Chicago, are the heaviest in months. Foreign demand for Lake metal also has increased. and Europe now is taking 30 per cent of shipments.

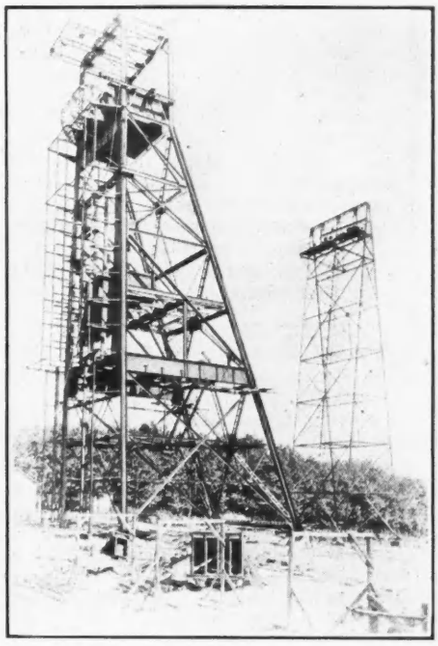
## Gratifying Results Obtained From C. & H. Reclamation Plant

A yield exceeding expectations is being obtained from the new reclamation plant of Calumet & Hecla Consolidated, in the Michigan copper district. Present rate of production is 900,000 lb. per month. The Calumet plant also is obtaining a higher yield than usual, production now being at the rate of 2,000,000 lb. per month, the largest in its history. This does not mean, however, that this high yield will continue. The respective dredges happen to be operating in sand bed areas rich in copper, and the yield will vary as the dredges are moved.

Two steamers recently arrived at the Calumet & Hecla dock at Lake Linden, with cargoes of flint pebbles for use in the regrinding mills. The pebbles, harder than can be procured in this country, are obtained in Denmark, where they occur in large quantities.

## New Headframe for Geneva Mine, Ironwood, Mich.

The new headframe recently erected by the American Bridge Co. for the Oliver Iron Mining Co., at that company's Geneva mine, near Ironwood, is shown in the accompanying illustration. The headframe has a stockpile floor 35 ft. and sheaves 93 ft. above the collar. Independent ore pockets will be built later when the shaft starts producing. Sinking was suspended May 30 at a depth of 2,154 ft., but will be resumed as soon as the shafthouse can be completed.



*Steel headframe, Geneva mine, Ironwood, Mich.*

## Construction of Pine Creek Railroad in Abeyance

Decision regarding the construction of a branch railroad up Pine Creek, in the Cœur d'Alene mining district, Idaho, by the O.-W. R. & N. company, still awaits the report on the ore tonnage in sight by Chas. A. Boyle, chief geologist for the Union Pacific system. Pine Creek operators have become restive on account of delay. They feel confident that Dr. Boyle's report will more than confirm their representations to the railroad company.

Three mines are now productive on Pine Creek, and others are waiting in the hope that 9-mile railroad transportation will be provided.

## California Zinc Files Amended Articles of Incorporation

Amended articles of incorporation were filed with the County Clerk of Shasta County, California, on July 25 by the California Zinc Co., which operates the Bully Hill mine and smelter, at Winthrop, and the Afterthought mine, at Ingot. The California Zinc Co. is incorporated under the laws of Delaware, with its principal office at Cleveland, Ohio.

## Small Mines in Butte District More Active

According to semi-official information, the North Butte Mining Co. and the Tuolumne Copper Co., operating in Montana, are planning an arrangement whereby the former company will assist the latter financially in its development program at the Main Range property in the eastern area of the Butte district where there is commercial copper ore on the 2,000 level, east of the Continental fault.

The management of the Liberty-Montana Mines Co. reports that the company is now on a paying basis and that steps are being taken to enlarge operations. The company is operating the Mammoth mine, on South Boulder Creek, about 20 miles south of Jefferson Island. At present the flotation plant is handling about fifty tons per day. An additional ball mill is being installed to increase mill capacity. The company has its own hydro-electric plant.

The Butte & Western Mining Co. has completed an exhaustive series of metallurgical tests, in its pilot plant at the Forest Rose mine, near Jens. These tests have been conducted under the supervision of Raymond E. Tower. The plant will be enlarged to a capacity of 75 tons per day, and a contract for additional machinery has been given to the Butte Machinery Co. The mill will turn out high-grade zinc and lead concentrates.

C. L. Hewett and associates are treating 150 tons per day from the old tailing pile at Corbin. A modified flotation process is being used. Mr. Hewett is considering the installation of an additional plant at the lower end of the tailing pile.

Jib Consolidated is milling about 160 tons of ore from the Katie and East Katie properties at Basin. About 150 feet northeast of present workings a new shaft is being sunk in country rock and will go to a depth of 500 ft., according to present program. The new shaft is being equipped with a 45-ft. gallows frame, a 112-hp. electric hoist, and an electric compressor plant.

The latest development in the western part of the Butte district is the encountering of a fair grade of ore in the Montana claim of the Butte & Burlington Mining Co. The Butte & Burlington group comprises the Montana, Tiger and Black Warrior claims, and operations are being financed by Butte and Bozeman investors.

## Idaho Copper Corporation vs. Stewart Campbell

Judge F. S. Deitrich, of the United States court for the district of Idaho, has overruled the demurrer by defendant in the action filed by the Idaho Copper Corporation against Stewart Campbell, State Mine Inspector for Idaho. The overruling of the demurrer means that the case will be heard on its merits in due course. The legitimate mining interests of Idaho are back of Campbell in his efforts to free the state of fraudulent corporation practices and questionable promotions.

## Utah Majestic Mines Co. Secures Lease at Quartzburg, Idaho

Operations have been started at the Gold Hill and Iowa mines, at Quartzburg, Idaho, by the Utah Majestic Mines Co., which has taken a bond and lease on the property. The mine has been unwatered, and drifts on the 500 and the 600 level have been cleaned up. The mill is being put into condition to treat ore exposed in the old workings. The company is pushing a crosscut on the 600 level to reach the Rhyolite vein, which was productive from the 500 up to the 200 levels.

## Nevada Rand Mine Planning Additional Development

F. Lynwood Garrison, geologist and engineer, recently made an examination of the Nevada Rand mine at Rand, Nev. While his report is not yet completed, it is understood that Mr. Garrison is substantially in accord with the former report made by J. C. Jones, of the Mackay School of Mines. The Nevada Rand has been a consistent shipper of high-grade ore. Reports indicate a substantial tonnage of milling ore that cannot be shipped as high grade. In 1924 the company made twelve shipments of ore, the net smelter receipts being $27,686.48. On July 27, 1925, a shipment of 49 tons assaying $27.69 per ton was made to the Western Ore Purchasing Co., at Hazen, Nev. Another shipment of 40 tons is now in transit to Millers mill, of the Tonopah Mining Co.

## Prince Consolidated Developing Recent Ore Discovery

Developments on the 835 level of the Prince Consolidated Mining Co.'s property at Pioche, Nev., checks conclusively the geological theories that caused the company to undertake the expensive and difficult work of unwatering the shaft to prospect for the faulted orebodies located by the Godbe management by diamond drilling almost a decade ago.

The north drift on the 835 level, which recently reached its objective, drill hole No. 3, has exposed solid ore for a distance of 60 ft. One part of the bed is a carbonate assaying approximately 30 oz. of silver and 3 per cent lead, and the other a sulphide assaying 17 oz. of silver to the ton, 12 per cent lead, and 21 per cent zinc. Several carloads of ore of this character have been won from development work, for shipment to a Salt Lake valley smelter.

Two other headings are being run on the 835 level. Pumping equipment with a capacity of 1,200 gal. per minute has been installed to provide against an emergency water condition that may arise in exploring this new territory.

The net operating profit of the Utah Apex, Bingham, Utah, for the second quarter, was $298,760. During the first quarter of the year, Utah Apex earned $446,808. The disparity in earnings reflects the lower price of lead prevailing during the second quarter. In the six months to June 30, 1925, the company earned an operating net profit of $745,568, or $1.41 a share. During its entire fiscal year ended Aug. 31, 1924, Utah Apex reported operating profits of $430,717.

Control of the Utah Lead & Copper Co. through purchase of outstanding stock and bonds has been acquired by the Utah Apex company. This property consists of 102 acres adjoining the Utah Apex. The company likewise acquired the adjacent Bingham & Eastern Mines Co. and also the Pine Canyon & Bingham tunnel, at Tooele, during recent months. The latter is chiefly valuable for a tailing-pond site and water facilities. The Utah Apex Mining Co. has in cash, Liberty bonds, and metal in transit, $1,200,000.

## New York-Chicago Telephone Cable Required 10,682 Tons of Lead

The use of stormproof telephone and telegraph cables portends an expanded market for lead, as indicated by the recent installation of the New York-Chicago cable. The heavy lead-sheathed cables, with great tensile strength, have been known to lie upon the ground for miles, blown down in severe storms, and still carry on the simultaneous telephone and telegraph connections.

The 861 miles of cable weighs approximatelly 34,750,000 lb.; the sheathing 21,365,000 lb.; the copper wire 11,356,000 lb., and the paper insulation about 2,400,000 lb. The erection of 35,700 poles was necessary to carry the new cable across the country. The cable carries 258 separate telephone circuits and 260 telegraph circuits.

## Phosphate Plants at Mount Pleasant, Tenn., Resume Full-Time Operations

The Hoover and Mason phosphate mines at Mount Pleasant have resumed operations, making ten plants in all that are on a production basis. According to prominent phosphate men of the section, every indication points to a resumption of rock shipments on a large scale that is indicative of better business conditions in the entire country and especially among farmers. The Armour plant, near Columbia, is continuing to run full time, with prospects in the phosphate field never brighter for all companies.

## Lead Production in Canada, 1924

Lead production in Canada during 1924 amounted to 175,485,499 lb., of the value of $14,221,343, as compared with the previous high record in 1923 of 111,234,486 lb. and a value of $7,985,522, an increase of 57.7 per cent in quantity and 78.2 per cent in value. This phenomenal increase was brought about by the high prices for lead, which caused many of the British Columbian mines to augment their output and allowed others, which had been dormant for some time, to operate again on a margin of profit.

## Ore Shipments from American Fork

Properties in the American Fork district, Utah, are enjoying an active summer. Shipments from the properties operated by the American Leasing Co. —the Live Yankee and the Silver Wave —are averaging 40 tons daily. The ore is chalcopyrite carrying gold ranging in value from $40 to $50 net.

A shipment of high-grade galena is being got out by the Mary Ellen Mining Co., adjoining the American Leasing Co. At the Pacific important work is being done and some good ore mined. A contract for driving the Whirlwind tunnel another 40 feet has been awarded.

## Anaconda Copper Bonds Lucky Four Group

The Anaconda Copper Mining Co. has bonded the Lucky Four group of 15 claims, near the summit of the Cheam Range mountains, in the New Westminster division of British Columbia. The discovery of rich chalcopyrite float on this property was made some years ago, and in 1918 an effort was made to locate the deposit by a series of diamond drill bores through the glacier that is thought to cover the main body of ore. Stripping and trenching were then done on the south side of the mountain, and one trench exposed a 20-ft. body of ore that assayed 7.6 per cent of copper and 2 oz. of gold per ton. The inaccessibility of the property, at an elevation of 6,000 ft. and fourteen miles from the nearest railway, at Laidlaw, on the Canadian National, together with the unsatisfactory condition of the copper market, has deterred exploiting the deposit until now.

## Allenby Mill Ready for Operation

J. T. Crabbs, president of the Granby Consolidated Mining, Smelting & Power Co., who has been spending some weeks at the company's several properties in British Columbia, announced before leaving Vancouver for New York that the Allenby mill would be put into operation on Aug. 15. Several additions and improvements have been made to the mill. These will have to be tried out and it probably will be the middle of October before the mill is operating at full capacity of 2,000 to 2,500 tons per day. The copper department at the Trail smelter, which has been closed since the Consolidated Mining & Smelting Company of Canada's Rossland mines were closed, has been thoroughly overhauled during the last few weeks and is now ready to treat the Allenby concentrate, which will be smelted. The resulting blister will be refined and rolled into rods and bars at Trail.

## Victoria Syndicate, Ltd., Utilizing Electricity in Prospecting

The Victoria Syndicate, Ltd., operating at Rouyn, Quebec, in prospecting its property adjoining the Horne mine has made use of the Elbof electric method, which is said to have been in use in Europe for a number of years.

## The Chance Syndicate Sampling Orebodies in Quebec

The Chance syndicate, comprising a number of Montreal and Toronto business men, owning about 1,000 acres in Boischatel Township, in northwestern Quebec, has been quietly doing assessment work for two years, disclosing the occurrence of extensive bodies of metallic sulphides — consisting chiefly of pyrrhotite, pyrite, chalcopyrite sphalerite, and galena. These deposits are from 75 to 100 ft. wide and from 150 to 1,000 ft. in length, and are probably the largest orebodies of their kind so far discovered in northwestern Quebec. Some sampling has been done, showing that zinc sulphide is present through all the deposits, sometimes massive and in other cases associated with chalcopyrite, pyrrohtite, and pyrite, and in one or two instances associated with magnetite. Gold and silver are also associated with this aggregate of minerals, and the few samples already taken indicate the occurrence of commercial orebodies of great value and length. After systematic sampling has been completed, diamond drilling on a large scale will be undertaken.

## Hollinger Consolidated Conducting Extensive Development Work —Daily Income $50,000

The progress now being made with the development plans of the Hollinger Consolidated at Porcupine, in northern Ontario, is the most rapid in the history of the mine. About 3,000 men and 180 rock drills are at work in addition to a number of diamond-drilling machines. The central shaft has now reached a depth of 2,425 ft., and work on it has been discontinued for the present, the management turning its attention to a campaign of development through the new shaft on the Schumacher side of the property now down between 1,200 and 1,300 ft. The plans for an increase of the output to 8,000 or 9,000 tons daily will mature gradually. The construction plans are well in hand and could be carried out within a few months, but additional time will be required to put the mine in the necessary condition. The work on the Schumacher shaft has this end in view, by providing an outlet for the necessary ore. Meanwhile, the mill is operating at an average rate of about 5,400 tons of ore daily. The income is not far under $50,000 daily, with a net profit sufficient to gradually increase the treasury surplus in addition to providing for increased dividend requirements. Plans for work below about 3,000 ft. involve the installation of a complete mining plant in a huge excavation made at about that horizon which will probably be located some distance east of the bottom of the present central shaft.

The deep work already accomplished has given access to new levels from which a supply of ore may be drawn for many years. At the present rate of production, about $15,000,000 annually, it requires approximately one year to work out an average of 100 feet in depth, according to the data supplied by operations on the first few hundred feet.

Only a comparatively small volume of ore has been drawn from below the 1,000 level and scarcely any from below the 1,550 level, so that 1,000 ft. of virgin ground between the latter horizon and the present depths assures a long life for the mine.

## Tonopah (of Ontario) Planning Mill

THE Tonopah is planning the erection of a mill on its properties in the Gowganda silver area of northern Ontario, and two shipments of ore of six tons each have been sent to be tested at the Timiskaming laboratories at Cobalt, to determine the process best suited for the treatment of the ore. Unofficial estimates of the ore already in sight on the Walsh property vary from 200,000 to 500,000 oz. of silver and the recent discovery on the Morrison claim promises to add substantially to this reserve. The shaft on the Walsh is being continued from the 350 level for another 150 ft.

## Blue Bell Mine Resumes Shipments to Trail

The Blue Bell mine, at Riondel, at one time the principal producer of silver-lead ore in the Ainsworth district of British Columbia, is again on the Trail smelter shipping list. The mine is owned by a French company, but now is being operated under lease and option by S. S. Fowler and associates, who, during the last nine months, have unwatered the mine and put it in condition for production, and have completely remodeled the 300-ton mill. The mine was closed in 1921, because there was no available cash market for its output, as the Consolidated Mining & Smelting Co. of Canada at that time was giving only warehouse receipts for ores received.

## Regulations Relating to Nipigon Forest Reserve Hinder Assessment Work

The new Beardmore gold area, lying north of Port Arthur, in northern Ontario, being within the limits of the Nipigon Forest Reserve, is subject to restrictions which at present prevent claim-owners from proceeding with development. It is announced that the restrictions will be removed on Oct. 1, after which date assessment work may be undertaken. Representatives of the Dome mines, Nipissing, Huronian Belt, and other large companies who have returned from making investigations of properties in the Beardmore district, say that nothing of outstanding interest has so far been discovered, and that none of the properties examined commend themselves to the companies which carried on the investigations.

## Tailing Launders in Ontario Not Subject to Municipal Tax

A decision of considerable interest to the gold mining companies of Ontario was recently handed down by the judge of the District Court. This decision was to the effect that tailing launders are a necessary part of the milling equipment and are therefore not subject to municipal taxation. Under the Mining Tax Act of Ontario, concentrators are not subject to taxation by the municipalities.

In 1920 the Township of Tisdale endeavored to assess the mills of the gold mining companies, claiming that gold mills were not concentrators. This contention was upheld by the Court of Revision, but upon the matter being brought into court, the judge found that gold mills were concentrators within the meaning of the Mining Tax Act. The mining companies have now established the ruling that tailing launders are part of the mills and therefore free from municipal taxation.

## Dunn Resigns as President of Barry-Hollinger Mine

James Dunn has resigned as president of the Barry-Hollinger mine and has been succeeded by H. C. Crowe. At the annual meeting in Toronto a few days ago, the president stated that a new vein had been found on the 500 level, the preliminary assays of which show $98 across a width of 68 inches. The mill is treating about 1,000 tons a month.

The new Beardmore section near Fort William, Ont., regarding which there was considerable excitement lately, appears to be somewhat disappointing and does not confirm the optimistic reports sent out. Free gold was found in a number of places, but channel sampling across the veins yielded only very low results. A large number of scouts went in to see the discoveries, but they have all left.

## British Canadian Mines to Construct Mill

Preparations are being made by the British Canadian Mines, which controls the Cobalt Contact and other adjoining properties in Cobalt, to construct a concentrator, having a daily capacity of about 60 tons. It is hoped to have this new plant in operation next year. The same company controls the Foley gold mine in western Ontario, where a 150-ton mill is to be constructed.

A new company known as the British Sulphide Smelting Co., Ltd., in which French and Belgian capital is largely interested, proposes to carry on extensive development at the Casey Ridge section, about sixteen miles north of Cobalt. It is proposed to drive a tunnel into the ridge from a point north of the old Casey silver mines. The district is largely covered with overburden, so that it is difficult to prospect, but there is a large area of the sedimentary formation in which the silver of the Cobalt district is largely found. Production from this section has amounted to several million ounces, most of which came from the Casey silver mine.

# News From Washington

By PAUL WOOTON
Special Correspondent

## Mining Industry Has Opportunity to Centralize Federal Activities

### Proposal to Place Bureau of Mines and Bureau of Standards Under Same Director Not Meeting Approval of Mining Industry

AMONG the proposals that are being made for readjustment in the Department of Commerce to enable it to serve the mining industry best is one to the effect that the work of the Bureau of Mines and the Bureau of Standards be directed by the same executive. This suggestion does not appeal to many of those interested in the mining side of the work of the Bureau of Mines. The Bureau of Standards is a laboratory engaged largely in experiments of a physical or a chemical character. Some of these experiments have a very direct application to mining, but they are by no means the controlling activities of the Bureau.

While the organization changes in the Department of Commerce are matters of great interest in bureaucratic circles in Washington, there is no evidence that the mining industry is giving the matter much thought. This is deplored in many quarters where it is believed this readjustment is one of the most important matters in public relations with which the industry has been called upon to deal in a long time.

An opportunity now exists to centralize the mining activities of the federal government where there is a good chance to establish a grand division of a department, with recognition of mining in the department's title.

The industry, many feel, should make it clear that it will have very little patience with bureau rivalry or personal ambitions. There seems to be general confidence that Secretary Hoover and his associates will plan the future work solely with reference to the best service that can be given the industry, and there is every reason to believe that they are not going to be influenced by those who feel that they have a vested interest in the present form of organization.

Now that it is settled that the Bureau of Mines is to be under the jurisdiction of a friendly Secretary, it is felt that the industry has everything to gain and nothing to lose by strengthening and building up its service.

Small producers particularly and the industry generally have little disposition to master the complexity of federal organization. There can be little doubt that the producers of minerals prefer having all their dealings with one agency. They hardly can be expected to carry in mind the fact that they should deal with the Geological Survey in matters pertaining to analysis and sampling; with the Federal Trade Commission on figures of cost; with the Bureau of Foreign and Domestic Commerce on export market matters; with the Bureau of Standards on the utilization of certain products; with the Bureau of the Census on certain statistics of production, but with the Bureau of Mines on certain other figures of production and on statistics of accidents. Were there to be an under-secretary of mines in the department, most of these questions could be handled under one administrative authority and a closer contact built up between the personnel of the industry and the government.

### Hess Collection of Rare Minerals Turned Over to Smithsonian Institution

More than 4,000 specimens of the minerals of rarer metals gathered by Frank L. Hess during eighteen years service with the U. S. Geological Survey have been turned over to the Smithsonian Institution. These specimens will be added to the study collection of that agency.

The policy of the Smithsonian Institution is to place in the national museum unusual or spectacular specimens. Others of interest to students only are assembled in study collections. The unusual specimens which are secured by the Survey's geologists usually are turned over at once for exhibit in the museum. They thus are held together and so displayed as to make them available to all interested in the rarer metals, other than the precious metals.

### Magnesite Industry and the Tariff

Such difficulties confront the Tariff Commission in establishing foreign costs in the production of magnesite that none will be surprised if the finding in the magnesite case is delayed indefinitely. In the meantime the domestic industry has great difficulty in meeting the competition of the foreign product in the territory east of Chicago.

There is increasing evidence of lack of prosperity among domestic producers. They had been encouraged greatly by the precedent established in the gold leaf case which apparently paved the way for the inclusion of transportation charges as a part of cost in the magnesite investigation as well. Since they are not in a position to establish the exact costs of their foreign competitors, and as the commission itself seems to be able to make no headway, it is feared that no ruling may be forthcoming.

### New Venezuela Mining Law

The new mining law of Venezuela has been made to harmonize with the new constitution, and a new petroleum law places approval of concessions in the hands of a cabinet officer.

### Fifty per Cent Increase in Tariff Asked by Tungsten Miners

Application has been made to the U. S. Tariff Commission on behalf of owners of domestic tungsten properties for the 50 per cent increase in the duty which the President could grant under the flexible provisions of the act.

The present duty on tungsten is equivalent to $7.14 a unit. The domestic producers contend that this will not allow them to operate. They will be able to point out that two domestic producers during the last year have made determined efforts to operate, but were forced to close their mines. The average price of tungsten at that time was around $10. If the increased duty were granted it probably would insure a price of $15, under present conditions.

War-time stocks have now been depleted to the point where tungsten again is being imported in quantity. The June imports were at a rate equal to one-half of the requirements of the United States, which now are estimated to be about 5,000 tons per annum.

The domestic producers feel that this is an opportune time to secure an increase in duty.

It is true that one domestic property is operating under the present duty, but this is declared to be possible because of a favorable lease which does not allow any amortization of the large capital expenditures in equipping and developing the property.

### Organization of Division of Mineral Resources and Statistics

In connection with the organization of the Division of Mineral Resources and Statistics of the U. S. Bureau of Mines, under the direction of F. J. Katz, engineer in charge, W. W. Adams has been designated as executive assistant to the engineer in charge. Mr. Katz, in addition to his general administrative duties, will supervise the collection of statistics relating to metals and non-metals (except fuels). F. G. Tryon will be in charge of the coal and coke section. The petroleum and natural gas section will be under the direction of G. R. Hopkins; mine accidents will be under W. W. Adams; and foreign mineral reserves under B. L. Johnson.

### Steel Pipe Transported Over Mountains by Airplane

Fifty-nine tons of 10-, 15-, and 20-in. steel pipe, total length 6,000 ft., is being transported by airplane from Rivulet, Mont., to the Independence Placer Mining Co.'s property, in the old Moose City district of Idaho. The load for each of the 150 trips is from 700 to 800 lb. The distance in the air from Rivulet to the mine is 24 miles.

The pipe is in 4-ft. lengths and is loaded in the pit between the pilot and the engine. Some of it is lashed to the plane. The plane carries the cargo over the 6,000-ft. range of the Bitter Root Mountains. Were it not for the plane, which makes the round trip in less than an hour, the freight would have to be taken in by mule pack train, which takes two days to make the trip one way.

# London Letter

By W. A. Doman

*Special Correspondence*

**London, Aug. 11.**—Many mining engineers are still skeptical as to the platinum position in South Africa. Owing to the efforts being made to stimulate interest in the share market, the topic is one that cannot be avoided. As I mentioned recently, the fact that finance houses have options over platinum companies' shares is not conclusive evidence of success or of belief in the properties concerned. Such companies exercise their options and sell shares if the news of developments is good enough. If it is not, the options may be allowed to lapse. As against the views held here are others of a favorable nature expressed by well-known experts at Johannesburg. In a way the latter seem to have no doubts, and talk about thousands of square miles of formation containing platinum. Though in London doubts are entertained as to the practicability of profitable extraction from the lodes, a report comes from the other side that in a given test 90 per cent of the content was recovered. Of course the mining engineers on this side do not say that a satisfactory process will not be evolved, but that they are not aware of one at the moment. That even the experts on the spot are a little doubtful, now that the time is approaching for results, may be inferred from the announcement that "the South African Association of Assayers has inaugurated a campaign of research to establish a reliable method of determining the platinoid metals." The various suggestions put forward are to be coordinated with the idea of arriving at a satisfactory standardized method. A usually level-headed journalist visiting the fields expresses the view that share prices discount prospects a long way ahead, but that in six months' time the shares may stand higher! It seems to be a case of wanting to create "a platinum Rand" in a hurry. Curiously enough, the investing public in Great Britain has not so far been charmed into buying shares.

The Press Bureau of the Embassy of the Union of Soviet Socialist Republics in its Bulletin No. 20, dated July 30, states that an important concession has been granted to the Union Corporation, Ltd., for gold prospecting and mining in the Okhot County of the Kamchatka province. The only Union Corporation known in London is the successful finance house largely concerned with the Rand, Mexico and other metal-producing districts and countries. Sir Henry Strakosch, the chairman, on having his attenion drawn to the statement, has given it an unqualified denial. As regards the mining concessions that have been nationalized, it is stated by a Russian official that new concessions will be granted, because the Soviet authorities cannot find the money to work them. A somewhat similar statement is made in connection with oil properties. Those of the latter that are already equipped and in operation the Soviet government will keep, and continue to work; it will let only new oil ground that has yet to be proved and that needs the expenditure of capital!

J. Coggin Brown, of the geological staff of the Indian government, will soon return to resume his official duties. He has been engaged on government business in England. He tells me that the Indian manganese industry was never more prosperous. He is of the opinion, however, that, owing to the grant of a Russian concession to the Harriman group, on which I understand $1,000,000 deposit has been paid, competition must be expected in the future.

## July Production of Burma Corporation, Ltd.

Cable advices from India state that during July, 1925, 30,669 tons of lead ore was mined, including 2,344 tons of high-grade ore; 26,400 tons of ore was milled in the treatment plant, producing 11,075 tons of lead concentrates, and 12,054 tons of lead-bearing material, including 2,305 tons of high-grade ore, was smelted in the blast furnaces, producing 4,337 tons hard lead for treatment in the refinery. Refinery products were 3,704 tons of refined lead and 385,012 oz. of refined silver.

## French Iron-Ore Production

As a result of the acquisition of the Saar district and Lorraine, the French iron-ore industry is bound to export up to 50 per cent of its production. The output in France and the colonies is increasing from month to month. According to a report just published by the Comité des Forges de France, the production in 1924 amounted to 28,992,200 metric tons. The following table shows the production during the last few years:

| | Tons |
|---|---|
| 1913 | 43,054,000 |
| 1921 | 14,200,000 |
| 1922 | 21,106,000 |
| 1923 | 23,356,000 |
| 1924 | 28,992,200 |

Production in the colonies in 1924:

| | |
|---|---|
| Algiers | 1,800,000 |
| Tunis | 771,000 |

## Increased Mineral Production in Mexico

According to dispatches to the Department of Commerce the mineral production of Mexico during the first six months of 1925 was heavier than during the last six months of 1924, although accurate figures are not available for either period. The increase in production has been attributed largely to the completion of a concentration mill at Parral for the treatment of low-grade zinc ore. A mill for the treatment of low-grade lead and zinc ores has also been completed in the Santa Eulalia district, and started operations in the latter part of May. It is reported that operations are to be resumed in the old Santa Maria mine, in the Cusihuiriachic district, and mine owners in the Naica district, which has been inactive for many years, are also preparing to resume operations, as a result of the high prices for lead, silver, and zinc.

# Johannesburg Letter

By John Watson

*Special Correspondence*

**Johannesburg, July 21.**—The South African Association of Assayers held a meeting on July 11, to initiate a campaign of research with a view to establishing reliable methods of determining the platinoid metals. Professor Stanley disclosed data he has already obtained in this direction, and Dr. J. McCrae, the government analyst, made some pertinent criticism. A committee has been formed to lay down a definite plan to co-ordinate the various suggestions brought forward, with the idea of arriving at a satisfactory standardized method. F. G. Green, chief assayer to the National Bank in Johannesburg, is the president of the association and is largely responsible for this undertaking. During the past week three more platinum companies have been offering shares to the investing public.

The Lydenburg United Platinums, Ltd.'s properties cover an area of approximately 7,000 morgen (15,190 acres), in the Lydenburg district. On one of its farms, assays of 2½ dwt. platinoids have been obtained. Carolina-Lydenburg Platinum & Minerals, Ltd., has just received news from the Lydenburg district that its representatives have struck the reef on Brackfontein, No. 84, where sinking is in progress. The South African Platinum Exploration Co., Ltd., has a nominal capital of £65,000, of which 120,000 shares of 5s. each are now offered to the public. This company is planning to operate on eighteen farms, lying to the northeast of Potjietessrust. Numerous samples from near the surface have been assayed, and in several cases high values for platinoids were obtained.

The discovery of phosphates, over an area seven miles long by seven miles wide, is reported from the Malmesbury division of the Cape Province. A party of engineers, including L. Lowe, had been prospecting for oil. At a farm house where tea was served one of the engineers noticed that the walls were built of a peculiar stone which was identified as petrified guano. It is estimated that there are 7,500,000 tons of deposit, which occurs about four miles from Mamre mission station.

## Southwestern Exploration Co. Installs Hoist and Pumps

Edward Thornton, president of the Southwestern Exploration Co., has just returned from a visit to the property at Santa Barbara, Chihuahua, Mexico. The new equipment, including hoist and pumps, is now at the station ready to be installed. A road has been completed from the railroad switch to the collar of the new shaft and an average of 10 per cent grade has been maintained. This will allow all machinery and supplies to be hauled the short distance with little expense. The new shaft on the south end of the property has been connected to the first level and the timbering has been completed to this point.

# Societies, Addresses, and Reports

## Activities of Geological Surveys in Southern States

By W. G. Burroughs
Geologist, Berea, Kentucky

NUMEROUS investigations in economic geology and geologic mapping are being carried on during the field season of 1925 by State Geological Surveys of Southern States. A brief account of the work is here given. In addition considerable geological work in connection with coal and oil structure is in hand.

*Alabama*—A revision of the large-scale geological map of the state is being made. Bulletin No. 9, Index to the Mineral Resources of the state, is also being revised. Bulletins on mica and rock asphalt are among the latest publications. Statistical reports of the mineral production of Alabama including 1922 have been published and the report for 1923 is in the press. Eugene A. Smith, state geologist, makes his headquarters at University, Ala.

### Sand, Gravel and Clay

*Florida*—A study of the sands and gravels of Florida is to be made. The current report dealing with limestones and marls is by S. Mossom. The one previous to that described the clays. Herman Gunter, state geologist, has his office at Tallahassee.

*Georgia*—S. W. McCallie, state geologist, Atlanta, says that the main work carried on by his department during the present field season is the mapping of the Suwanee quadrangle, the area in which is included the great Georgia marble industry. The survey is being made by W. S. Bayley, R. H. Haseltine, and Charles Milton. "Physical Geography of Georgia" by McCallie, LaForge, Cooke, Keith and Campbell, has just been published.

*Kentucky*—A new geological map of the state is being prepared in the field. Detail county maps with a scale of 1 in. to the mile, are being made for the counties of Barren, Carter, Clinton, Fleming, Fulton, Grayson, Hart, Oldham, Taylor, Trigg, Wayne. H. Ries has revised his report on "The Clays of Kentucky." Field work is being done for a report on "The Vein Deposits of Kentucky," by L. W. Currier; and on "The Cement Materials of Kentucky," by C. H. Richardson. The regional geographic studies of Kentucky are now completed and will soon be published. There are a total of fifty men working on the Kentucky Geological Survey this field season.

In the press are reports on "Mineral Resources of Kentucky," W. R. Jillson; "Geography of the Kentucky Knobs," W. G. Burroughs; "Oil Shales of Kentucky," Thiessen, White, and Crouse; "Geography of the Bluegrass," D. H. Davis; "Geography of the Pennyroyal," C. O. Sauer; "Geology of the Cave-in Rock Quadrangle," S. Weller; "Mineralogy of Kentucky," C. H. Richardson; "Geology of Edmondson County," Weller and Jackson; "Molding Sands of Kentucky," C. H. Richardson; "Topography of Kentucky," W. R. Jillson. The survey office is at Frankfort, where W. R. Jillson is state geologist.

*Mississippi*—Investigation and mapping of the water power of the state have been undertaken. Soil surveys of the counties have been continued. A study of the clays of Mississippi is under way. The state geologist is E. N. Lowe, whose office is at University, Miss.

*Missouri*—At present the Missouri survey, according to H. A. Buehler, state geologist, Rolla, is working on the underground water supply, clay resources, lead and zinc deposits, areal geology of Perry, Cape Girardeau, and other counties, determining the stream flow of various rivers, and co-operating with water-power projects.

*North Carolina*—A report on the clay shales of the state is under way. The map, field, and laboratory study of the pyrophyllite deposits will be completed. A study is being made of certain carbonaceous shales to determine their value as oil shales. Investigations of the building stones of the state, and further work on the revision and preparation of a new geological map of North Carolina are included in the year's program. J. L. Stuckey is geologist for the Division of Mineral Resources of the Department of Conservation and Development of North Carolina. His office is at Raleigh.

*South Carolina*—An investigation of the sedimentary kaolins of the state is under way, the State University co-operating with the geological survey. The state geologist is Stephen Taber, of Columbia.

### Investigate Bauxite and Ocher

*Tennessee*—Plans for field work during the summer of 1925 are as follows: A traverse map of Gibson County by I. M. Streeter; mapping of the Tertiary deposits of West Tennessee by J. K. Roberts and R. Collins to ascertain if bauxite and other minerals can be found in economic quantities. An investigation of possible ocher deposits in western Tennessee will also be carried on. A soil map of Hardin County will be made. Topographic mapping will be done in co-operation with the U. S. Geological Survey for the southern half of Thompkinsville, Gainsboro, Decherd, Nutbush, Keeling, Vildo, Moscow, and possibly Erin, quadrangles. A report on the gold bearing deposits and slates of the state is contemplated.

Reports will soon be published on "The Chattanooga Black Shale"; "Brown Iron Ores of the Western Highland Rim"; "Water Resources of Tennessee"; "Adjustment of Industry to Natural Environment in the Valley of East Tennessee"; "Geography and Possibilities of the Industrial Development of the Nashville Basin." Additional reports which should be ready for publication during this year are: "Geology of the Middle Tennessee Basin," R. S. Bassler; "Phosphate Industry in Tennessee," R. W. Smith; "Geology, and Phosphate Deposits of the Franklin Quadrangle," Bassler and Smith; "Structural Geology and Economic Possibilities of the Hollow Springs Quadrangle," Bassler; "Molding Sands of Tennessee," J. H. Martens; "Sediments of West Tennessee, and Their Economic Value"; "Granite of East Tennessee," G. F. Laughlin. The office of the survey is at Nashville. Wilbur Nelson is state geologist.

### Geologic Mapping in Texas

*Texas*—The following work is in progress: Preparation of report and map of the geology and mineral resources of Denton County; a similar report on Stonewall County; field work and preparation of a special report, with geological map, on the Midway formation of Texas; study of the character of the altered volcanic rock from which oil is being obtained in the Lockhart field of Caldwell County; study of the underground position of the Cretaceous formation in the Coastal Plains of Texas. Publications in preparation or in the press include reports on the geology of Ford County and on the San Angelo formation. This information was furnished by E. H. Sellards, chief geologist of the Bureau of Economic Geology and Technology, Austin, Texas. J. A. Udden is director of the bureau.

*Virginia*—Field work on the Lower Cambrian belt east of the Blue Ridge in the Piedmont section of Virginia being carried on by A. S. Furcron, D. H. Cardwell, Jr., J. D. Burfoot, Jr., and E. R. Woolfolk. The economic resources of this area are marble, graphite, and manganese. Dr. Pegau will complete his work on the pegmatites of the Piedmont of Virginia, and Professor Steidtmann will continue mapping the areal geology of Rockbridge County west of the Blue Ridge. The Virginia Geological Survey will continue its co-operative policy with the U. S. Geological Survey in respect to topographic mapping. At present topographers are working in western Franklin and Henry Counties, and in eastern Floyd and Patrick Counties in the southern Piedmont.

Reports just published or in process of completion are as follows: Ries and Nevin have sent in their report on "The Sand and Gravel Deposits of Virginia." Dr. Roberts is finishing his Virginia Triassic report. Professor Holden is expected to complete soon a report on "Iron Ores of Western Virginia." The geology of the gold-pyrite belt of Louisa and Spotsylvania Counties and of the area to the north of this belt will be the subject of a report by J. T. Lonsdale. "Slate Deposits of Virginia," by Grasty and Cline, is under way. "Physical Features of the Coastal Plain of Virginia," by W. T. Lee was recently completed. Albert W. Giles, Charlottesville, Va., is acting state geologist.

# Men You Should Know About

F. Gibbs, of the Arizona Silver Co., Humboldt, Ariz., is in New York.

W. L. Honnold, who now resides in Los Angeles, was in San Francisco for a few days in August.

Fred Hellmann, consulting engineer to Guggenheim Brothers, is making a visit in San Francisco.

Milnor Roberts, professor of mining in the University of Washington, was in San Francisco recently.

C. Minot Weld, of Weld & Liddell, has been elected chairman of the New York section of the A.I.M.E.

L. R. Robins, superintendent of the Tonopah Belmont Development Co. at Tonopah, Nev., is in Los Angeles.

F. C. Ninnis, mill superintendent for the West End Consolidated Mining Co. at Tonopah, Nev., is in San Francisco.

Oscar H. Hershey, consulting engineer and geologist of San Francisco, has been in Jarbidge, Nev., on professional work.

O. B. Perry, general manager for the Yukon Gold Co., has been in Jarbidge, Nev., inspecting operations of the Elkoro Mines Co., a subsidiary company.

J. B. Johnson, chief engineer of the Clarkdale smelter of the United Verde Copper Co., has resigned from the company to engage in consulting practice on the Pacific Coast.

**Copley Amory, of New York, has been retained by the U. S. Bureau of Reclamation as a specialist in reclamation economics. Mr. Amory is regarded as an authority on Western development.**

F. H. Brownell, of New York, president of the Federal Mining & Smelting Co., arrived in Wallace, Idaho, on Aug. 13. He visited the Morning mine, at Mullan, the company's largest single producer.

D. H. Fairchild, of Fairchild & Fairchild, Chicago, has just returned from a motor trip through the Southwest, the West Coast, the Northwest States and British Columbia, on professional business.

Colonel D. G. Stivers, attorney for the Anaconda Copper Mining Co., and Major C. R. Wraith, consulting engineer for the same company, have been inspecting the property of the Cananea Consolidated Copper Co., at Cananea, Sonora, Mexico.

George Dawe, formerly chief clerk of the Calumet & Arizona smelter at Douglas, Ariz., has been promoted to be smelter superintendent, taking H. A. Clark's place. I. B. Waid, formerly assistant chief clerk, assumes charge of the accounting department.

Roland B. Day, of Washington, D. C., a nephew of the late Dr. David T. Day, who devoted his latter years to a study of the oil-shale industry, will continue the research work in which his uncle was engaged and also specialize in general petroleum consulting.

Walter W. Scott, of Houston, Tex., superintendent of drilling for the Hamilton Oil Corporation, has been appointed superintendent of the Bartlesville, Okla., petroleum experimental station of the U. S. Bureau of Mines. Mr. Scott succeeds Roscoe A. Cattell.

George W. Nicolson, superintendent of the Yellow Aster mine at Randsburg, Calif., has resigned to become manager of a copper property on the Island of Cyprus. T. J. Fitzgerald, formerly of Tonopah, Nev., has succeeded to the superintendency of the Yellow Aster.

F. W. Bradley, of San Francisco, president of the Bunker Hill & Sullivan Mining & Concentrating Co., recently visited Kellogg, Idaho, the home of the company's extensive mining and smelting operations. He timed his visit to attend the annual miners' and smelter-men's celebration on Aug. 15 and 16.

*F. W. Bradley*

J. A. Bancroft, professor of geology at McGill University, is spending the summer vacation at Anyox, B. C., continuing the work of several previous summers in studying the structural geology of the Granby Consolidated Mining, Smelting & Power Co.'s Hidden Creek ore deposits, with a view to extending the company's ore reserve.

William Archibald, manager of the Trail, B. C., smelter of the Consolidated Mining & Smelting Co., has returned from making a thorough examination of the Flin Flon copper mine at Athapapuskow Lake, in The Pas district of Manitoba. He was accompanied by other engineers of the company, which has under consideration the purchase of the Flin Flon from the Mining Corporation of Canada.

D. M. Folsom, mining engineer, of San Francisco, who has been selected as one of the board of advisers to confer with Herbert Hoover on the reorganization of the U. S. Bureau of Mines, is a graduate of Stanford University and is now assistant to the president of the General Petroleum Corporation. He was federal oil director for the Pacific Coast under the oil division of the U. S. Fuel Administration in 1918

H. B. Lumsden, development engineer for the western division of the Canadian Pacific Ry., with headquarters at Winnipeg, is making a reconnaissance tour of the British Columbia mining districts. He recently was at Trail, where he conferred with the research department of the Consolidated Mining & Smelting Co. of Canada. He advocates the application of more attention to the non-metallic minerals of western Canada.

E. E. Hunt, who has been associated in the management of many conventions, conferences and committee meetings, has written a book on the conduct of such gatherings. Since assemblies of this nature require large aggregate outlays of money, Mr. Hunt, who is an assistant to Herbert Hoover, Secretary of Commerce, feels that he is doing a public service by pointing out the procedure which long experience has shown to be the most effective.

J. E. Lanning has been appointed chief mechanical engineer for the United Verde Copper Co., and will assume his new duties at Clarkdale about Sept. 1. As chief engineer for H. Kenyon Burch on the Phelps Dodge and New Cornelia concentrators, and previously as assistant engineer at the El Paso smelting works, Mr. Lanning has been associated with some of the most important metallurgical construction in the Southwest during the past eight years.

Frank L. Hess, a geologist who has served twenty-three years on the staff of the U. S. Geological Survey, has resigned to be come chief mineral technologist for the Bureau of Mines. Heretofore, this work, as well as that of the chief chemist, has been performed by one man. With the resignation of Dr. S. C. Lind some months ago, it was decided to have a chief mineral technologist, as well as a chief chemist. For a number of years Mr. Hess has specialized in the rarer metals for the Geological Survey. Prior to that he was engaged in Alaskan work. He made geological examinations in the Nome, Fairbanks, Eagle, Rampart, Lost River, Buck Creek, and Cape Prince of Wales regions. In addition to his work for the government, Mr. Hess has been devoting considerable time to the committee of the National Research Council, which is engaged in a study of the relationship of geologic age to atomic disintegration.

## Obituary

J. J. Braaton, a Norwegian, aged twenty-three, was killed in an accident at the Hollinger Consolidated mine of Porcupine, in northern Ontario, on Aug. 15. He was riding in the cage when some steels caught in the timbers of the shaft, ripping out the floor of the cage and dropping it several hundred feet to the bottom of the shaft. Another man sustained injuries, but it is expected that he will recover.

# Recent Technical Publications

Reviews, Abstracts, and References

## An Outstanding Work on Mechanical Loaders

**Mechanical Underground Loading in Metal Mines.** By Charles E. van Barneveld. Published by the School of Mines and Metallurgy, Rolla, Mo. This book, although confining itself closely to the subject designated by the title, is however far broader than those words indicate, for it covers not only the problems involved in loading ore into cars, but seeks to show the fundamental unity of the whole mining operation up to the point where the ore is brought to the surface of the ground. Dividing mining into three major subdivisions — breaking, mucking or loading, and transportation—the author clearly brings out their interdependence and demonstrates conclusively that good management means above all things co-ordination; the proper execution of a well-planned operation by the efficient use of men, materials, and power. It is shown likewise that the cost of mining cannot be separated into a number of unrelated units, but that improvement in one class of operation can often have a beneficial effect on another. The effect on the whole operation, of the diversity of conditions under which orebodies are found to occur, once the limit of surface mining has been passed, is well brought out, and it is made clear that although a great advance has been made in the application of mechanical power to underground loading, success can be achieved only by a careful consideration of the circumstances surrounding each individual case.

In the presentation of the subject the author has divided it into four divisions. Part I is a general consideration of the problem and of the equipment so far evolved for loading ore mechanically in mines. This discussion of equipment covers not only the actual loading devices themselves, but the accessories, such as cars and track, haulage motors, and the adaptability of different forms of power to underground use. Many of the points of design in the building of machinery are discussed in the light of the special requirements that must be met in underground use. Here, also, is outlined how the subject will be presented, and standard definitions and forms permitting the comparison of different operations are explained. This section closes with a summary of the various considerations that should govern the introduction of mechanical loading appliances.

Part II traces the development of mechanical shovels for underground use and describes those designs that seem likely to survive.

Part III is a complete description of ore handling by scraping, explaining the equipment, scrapers, hoists, and accessories in detail, and giving many examples of their application to varying conditions.

Part IV takes up by the case method examples of mechanical shovel installations, showing the use of such equipment in metallic and non-metallic mines and a variety of tunneling operations. In all examples of practice both for scraping and shoveling, the object sought and the conditions under which the work was done are clearly set out. The ore occurrence and mining method are described as far as necessary and the results are given plainly. Many valuable cost data both of installation and operation are given, and many comparisons between handwork and mechanical loading are shown. The value of a standard form for reporting time studies and operating results is most evident. By these examples the wide range of conditions to which mechanical loading has been successfully applied is brought out. It is shown in connection with many different forms of stoping, and many cases of its application to development work are cited.

The very wealth of material presented makes any attempt to select examples difficult, but if the author is right in his conclusions, the underground miner has at his disposal new tools that should be of great help in meeting the problems that face him, and I quote just two sentences: "Mechanical loading has come to stay and is destined to be increasingly important in the fuller utilization and the more economical exploitation of ore deposits now being forced by the constantly widening demand for the base metals and the non-metallic minerals." "There are now available enough reliable mechanical loading appliances to satisfy the entire range of requirements in the mining of metallic and non-metallic minerals."

At intervals during the past ten years the technical press has presented articles dealing with the development of mechanical loading, but not until now has a comprehensive treatment of the subject been presented. It seems to me that this work, made possible by the studies undertaken under the auspices of the Bureau of Mines and published by the University of Missouri, is a timely and valuable one that should be of interest to all mine operators and manufacturers of mining equipment. It is evident that a vast amount of painstaking observation has been most carefully analyzed by the author and presented in a clear and intelligible manner. It is a new evidence of the broadmindedness of management in the mining industry, for it is apparent that the co-operation sought was freely granted, and the result should certainly prove the wisdom of that policy. It is hoped that response will be made to the invitation extended by the author to individuals engaged in such work to carry forward what he has started. Although much has evidently been accomplished, there is surely much advance still to come, and it should be made known as it is accomplished.

B. B. GOTTSBERGER.

**South Australia Mining** —The Mining Review for the half year ended Dec. 31, 1924, has been issued by the South Australia Department of Mines, Adelaide, from which it may be obtained free of charge. The report includes a 12-page description of the lead smelter and refinery of the Broken Hill Associated Smelters Proprietary, Limited.

**Petroleum in Alaska**—U. S. Geological Survey Bulletin 773-D is devoted to the occurrences of petroleum on the Alaska peninsula, and contains papers by Kirtley F. Mather, Walter R. Smith, and George C. Martin. This 54-page bulletin may be obtained on request from the Survey, Washington, D. C.

**Mine Dust** — "The Engineering-Hygienic Aspects of Dust Elimination in Mines," by Daniel Harrington, has been reprinted from the May issue of the *Journal of Industrial Hygiene*, and copies are obtainable from the author at 507 Newhouse Bldg., Salt Lake City, Utah.

**Mine Pumps**—The *Mining Magazine* for July (London; price 1s.) contains the concluding installment of an article on mine pumps, begun in the June issue, by F. J. Garland. Various types of pumps are discussed and their application in various mines is described.

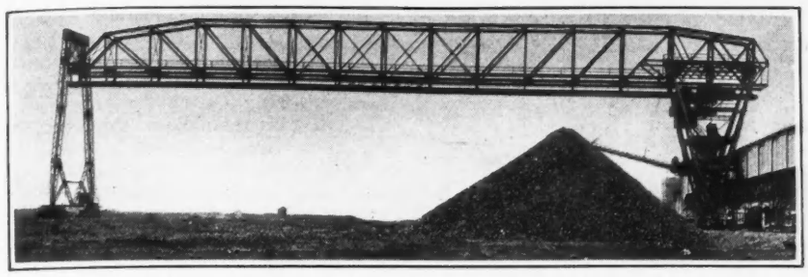
**South African Gold Reduction** — "Notes on the Operation of the Reduction Plant at West Springs, Ltd.," is the title of a paper by Carl R. Davis, J. L. Willey, and S. E. T. Ewing in the *Journal* of the South African Institution of Engineers, for June. (Johannesburg; price 2s.) This paper supplements that prepared for the A. I. M. E. last winter, reviewing the technical results and detailed costs obtained at the West Springs plant, which has a capacity of between 40,000 and 50,000 tons per month.

**Garnet**—U. S. Bureau of Mines *Reports of Investigations*, Serial No. 2,691, 11 pp., discusses "Recent Developments in the Production and Consumption of Abrasive Garnet," by W. M. Myers and C. O. Anderson. The industry seems to be flourishing, having been considerably expanded in 1924. Brief descriptions of operating plants are given, together with much information on the economics of the industry, which will be valuable to present and prospective producers. Obtainable on request from the U. S. Bureau of Mines, Washington, D. C.

**Limestone Precipitation**—"A Critical and Experimental Study of Drew's Bacterial Hypothesis on Calcium Carbonate Precipitation in the Sea," by Charles B. Lipman, has been published as a bulletin of 10 pp., obtainable from the author, University of California, Berkeley, Calif. His bulletins on "Bacteriological Studies on Rose Islet Soils," and "Studies on the Origin and Composition of the Soil of Rose Islet," are also available.

**Electrolytic Copper Refining** — Last winter *Mining Journal-Press* published a description of the smelter and refinery of the Nichols Copper Co., at New York City. This has been supplemented by a paper by M. H. Merriss on "Improvements in the Series System of Electrolytic Copper Refining Recently Developed by the Nichols Copper Co.," recently published by the American Institute of Mining and Metallurgical Engineers, 29 W. 39th St., New York City.

# New Machinery and Inventions



*5½-ton coal bridge, provided with safety stops, built for Bethlehem Steel Corporation's Lackawanna plant, Buffalo, N. Y.*

## Safety Stops Used to Stabilize Traveling Structures

Owners and operators of large traveling structures such as ore and coal handling bridges, gantry cranes, etc., have long realized the necessity of reliable means for holding such structures during high winds. To meet the need for such protection and its wide field of application, the Wellman-Seaver-Morgan Co., Cleveland, Ohio, has developed an arrangement of bridge safety stops designed to meet the severe conditions under which they must be effective.

An installation of these safety stops has been in service for a continued period on a large coal storage bridge at Buffalo, N. Y. This bridge is in a very unfavorable location on the open lake front, being exposed to violent winds from all directions. On completion the equipment was subjected to a series of very severe tests, and has since safely held the bridge in all kinds of storm and weather conditions. Another installation is now being built for application to a ten-ton ore handling bridge operated by the U. S. Steel Corporation.

The safety stop equipment consists of a system of multiple wedges, or stops, automatically placed on the runway rails adjacent to the outermost wheels under each bridge sill. While the bridge is stationary each wedge is securely held on its rail by means of a clamping mechanism which is integral with the wedge. Each stop is operated by its own independent counterweight. While the bridge is traveling, the safety stops are withdrawn from the wheels and rails by electrically operated lifting devices placed on the bridge sills.

The illustrations show that the principle of the wedge placed between a wheel and rail is used in the safety stop arrangement. The wedge is the most efficient means of stopping forward motion of a wheel on its rail and very little holding effort is necessary to prevent the movement of such a wedge along the rail.

With the safety wedges locked to the rails, excessive wind pressure on the bridge tends to roll the wheels up the incline of the wedge. In this position the wheels naturally tend to return down this incline, presenting a great resistance to the force of the wind. In addition to the above factor, great resistance against movement of the bridge is caused by the friction of the wedges on the top of the rails when the wheels have rolled upon the wedges.

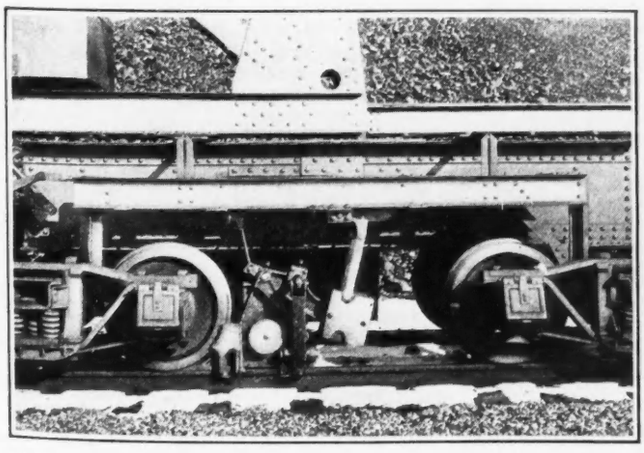
As the stops (wedges) are placed under the outside wheels, at the extreme end of the sills, the pressure on the wedges increases proportionately with the wind velocity, thus automatically increasing the friction on top of the rail and the resisting power of the stops.

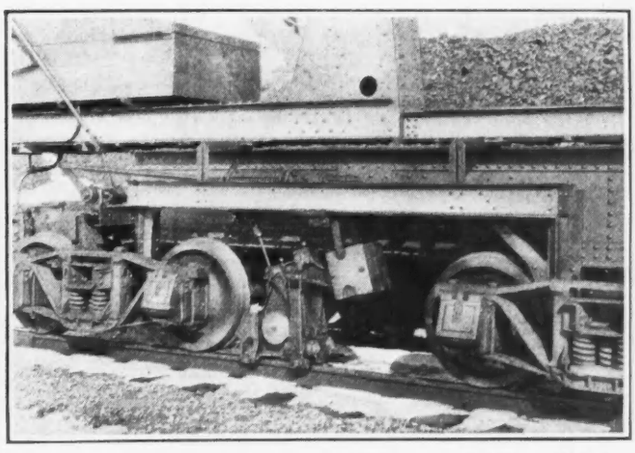
The releasing and setting of the safety stops is controlled by the operator stepping on or off a platform in front of the bridge controller wherever it may be located. In this way the operator quickly releases the stops when he wishes to move the bridge and they are automatically applied when through traveling, by his leaving the controller platform. The wedges, however, are not suddenly clamped to the rails.

Each stop consists of a cast steel frame to which the wedge portion is bolted. The lower portion of the main casting also forms a support for clamp levers arranged to grip the sides of the rail head with only moderate pressure to prevent horizontal movement of the wedge along the rail. The upper ends of the clamp levers are connected by means of adjustable toggle thrust members to a counterweight lever which is also supported in the upper part of the main stop casting.

When in its engaged position, the stop rests entirely on the runway rail to which it is clamped by the action of its counterweight at which time the stop has no rigid connection to the bridge. Three slotted links connect each stop to the bridge sill for the purpose of suspending the stop when out of operation while the bridge is traveling. All the stops under each bridge sill are connected by rigid operating connections to the common lifting device supported on that sill.

With ordinary types of automatic rail clamps, the operators are inclined to render them inoperative on account of the slow release, and this "killing" of the clamps is serious as it leaves the structure entirely unprotected. One of the features claimed for the safety stops described is the short time necessary to release the stops when it is desired to move the bridge. This interval is so short that the operator does not hesitate to start bridging after he has stepped on the platform. The setting of the stops, on the other hand, involves quite a time interval so that the bridge is not stopped too suddenly. This period of time is adjustable and is fixed when once adjusted. It is uniform in all weather conditions due





*Left—Side view of wedge unit in normal set position, counterweight down, showing truck wheel rolling onto wedge. Right—Wedge unit suspended on links in released position, clear of rail, counterweight up to allow bridge to travel*

to the special liquid used in the long stroke dash pot on each lifting mechanism. The stops and lifting mechanisms are fully operative in extreme winter conditions.

The braking load applied to the bridge by the stops is taken into the bridge through the truck connection which is fully capable of taking these loads. No heavy separate structure is required.

## Traction Thickener Available in Smaller Sizes

The Dorr Company, New York, has recently placed on the market an improved type of thickener, known as the Dorr traction thickener. The action of the thickener is similar to that of the standard Dorr machine, but the mechanism of the new type is equipped with peripheral drive and is simple in operation and of extremely rugged construction. The traction type has been thoroughly demonstrated for some time in several large installations, but is now available in the smaller sizes as well as the large for application to thickening and de-watering problems.

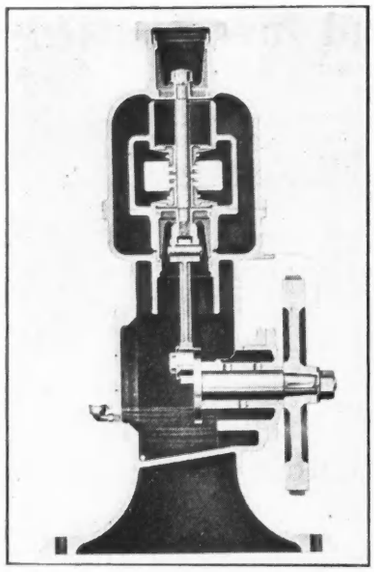
The traction thickener will be on exhibition at the Dorr Company booth in the forthcoming Chemical Exposition at Grand Central Palace, New York.

## Large Pumps for Pipe Line Work

The Prescott Company, Milwaukee, Wis., recently closed a contract with the Andian National Corporation, Ltd., of Toronto, Canada, for ten big pipeline pumps each having a capacity of 30,000 bbl. per day for the new pipe line the company is building in Colombia, South America. The company is also building for the same interests four 60,000-bbl. pumps to be located at the Port of Cartagena and used for loading oil tankers.

## Small Priming Pump Introduced

The development of a new and smaller vacuum pump for priming centrifugal pumps has been announced by Barrett.



*Cross section of pump intended for priming centrifugal pumps*

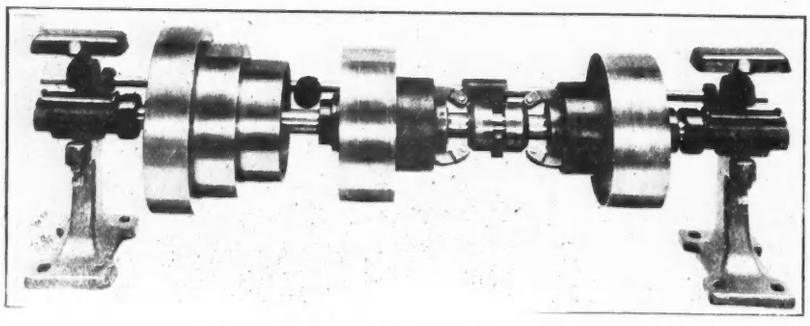
Haentjens & Co., Hazleton, Pa. This smaller primer has been added to the company's line of priming pumps because of the increasing use of this means of priming centrifugal pumps, and because of the demand for a priming pump of small size which could be used with the smaller centrifugals.

The pump is of the dry type and is used in conjunction with a vacuum breaker which prevents water from entering the pump. As the pump does not handle water, it requires but little power, the cylinders and pistons are not subject to corrosion, and operating strains are reduced to a minimum.

The pump is a compact unit requiring little floor space or head room. Automatic lubrication of all moving parts conserves oil and reduces attention necessary. No inlet valves are used, but, instead, air enters the pump through parts which are alternately uncovered by the piston. Both exhaust valves are located at the cylinder ends, seated by a single spring, and are always visible.

## A Multiple Friction Disk Countershaft

A new countershaft is so designed that the shock of reversing is absorbed by the hardened steel plates which make up the clutch. The clutch closely resembles a common form of automobile clutch. It is claimed that the operator finds it easier to manipulate, as the rolls in the operating fingers take the wedge better. The cushion effect of the multiple disk clutch lessens the shock and the roller bearings in the pulleys reduce the friction to a minimum. This countershaft is made by the Warner & Swasey Co., Cleveland, Ohio.



*Multiple friction disk countershaft*

## Improved Section Insulator Designed

Long life, double insulation, bronze arcing tips and renewable underrun are the outstanding features of the new design of section insulator manufactured by Westinghouse Electric & Manufacturing Co.

In section insulators the chief requirements are to break a motor-load current up to 750 amps. and 650 volts under all conditions without holding the arc, and to insulate trolley lines from each other and from the ground, between 0 and 750 volts, without noticeable current leaks, under all weather conditions. This new design of section insulator meets these requirements through the use of double insulation, a hickory runner and two air gaps. It has 8 in. of minimum runner insulation. This hickory runner is very suitable for the use to which it is put, and, in addition, is able to withstand severe weather conditions due to the special treatment that it undergoes in construction. The additional insulation in the form of air gaps is particularly valuable, due to the fact that it has bronze arcing tips of high tin content on both sides, an entirely new feature in air gap insulation. These skewed air gaps will break a current under all weather conditions, and have ample blow-out surface.

Long life of the insulator is assured due to its sturdy construction. The main body of the insulator is made of such material that it will last indefinitely. End castings are made of high-grade malleable iron, thoroughly cleaned, treated and zinc flooded. All bolts and studs are made of phosphor bronze, while end clamps and arcing tips are of bronze with a high tin content.

## Catalogs

**Clutch**—The Hoerl friction clutch is described in a leaflet recently by the Wolf Co., Chambersburg, Pa.

**Wire, Cable.** The Hazard Manufacturing Co., Wilkes-Barre, Pa., has just issued a catalog on its spiralweave tree wire and another on the uses of Hazard Parkway cable.

**Patents**—Bulletin No. 37 of the Pittsburgh Testing Laboratory, Pittsburgh, Pa., describes the service the company is prepared to render patent attorneys, business executives, and others interested in securing technical data and advice on patentable processes and products.

**Lightning Arrester**—Circular 1,737 of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., covers the Autovalve lightning arrester.

**Mine and Mill Equipment**—The Colorado Iron Works Co., Denver, Colo., has issued a pamphlet describing its new manufacturing facilities. A number of interior views of its shops are included.

**Stokers**—The Advance stoker is described in a bulletin issued by the Advance Machinery & Supply Co., Railroad Building, Denver, Colo. Reciprocating grate bars and horizontal air passages are used in its construction.

# The Market Report

## Daily Prices of Metals

| Aug. | Copper N. Y. net refinery* | Tin | | Lead | | Zinc |
|---|---|---|---|---|---|---|
| | Electrolytic | 99 Per Cent | Straits | N. Y. | St. L. | St. L. |
| 20 | 14.625@14.675 | 56.125 | 57.75 | 9.50 | 9.40@9.85 | 7.625@7.65 |
| 21 | 14.625@14.70 | 56.25 | 58.00 | 9.40 | 9.50 | 7.625@7.65 |
| 22 | 14.625 | 56.25 | 58.00 | 9.40 | 9.50 | 7.65 |
| 24 | 14.625 | 56.125 | 57.75 | 9.50 | 9.40@9.80 | 7.65@7.675 |
| 25 | 14.50@14.625 | 56.125 | 57.50@57.75 | 9.55 | 9.60 | 7.625@7.65 |
| 26 | 14.50 | 56.00 | 57.50 | 9.55 | 9.65 | 7.625 |
| Av. | 14.604 | 56.146 | 57.771 | 9.483 | 9.579 | 7.642 |

*The prices correspond to the following quotations for copper delivered: Aug. 20th, 14.875@14.925c.; Aug. 21st, 14.875@14.95c.; Aug. 22d, 14.875c.; Aug. 24th, 14.875c.; Aug. 25th, 14.75c.@14.875c.; Aug. 26th, 14.75c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

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

Quotations for zinc are for ordinary Prime Western brands. Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

The quotations are arrived at by a committee consisting of the market editors of *Mining Journal-Press* and a special representative of the Bureau of Mines and the Bureau of Foreign and Domestic Commerce.

## London

| Aug. | Copper | | | Tin | | Lead | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|
| | Standard | | Electrolytic | | | | | | |
| | Spot | 3M | | Spot | 3M | Spot | 3M | Spot | 3M |
| 20 | 63 | 63 7/8 | 69 | 256 1/8 | 259 5/8 | 38 7/8 | 37 1/8 | 36 15/16 | 36 7/16 |
| 21 | 63 1/4 | 64 1/8 | 69 1/4 | 257 3/4 | 260 3/8 | 39 | 37 1/16 | 37 1/8 | 36 9/16 |
| 24 | 63 1/8 | 64 | 69 1/4 | 257 | 260 1/8 | 39 1/8 | 37 3/16 | 37 1/16 | 36 9/16 |
| 25 | 62 1/2 | 63 1/2 | 68 3/4 | 256 3/4 | 259 3/4 | 39 3/8 | 37 3/8 | 36 1/8 | 36 1/2 |
| 26 | 62 1/4 | 63 1/4 | 68 1/8 | 256 1/4 | 259 1/4 | 39 7/8 | 37 5/8 | 36 13/16 | 36 1/2 |

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

## Silver, Gold, and Sterling Exchange

| Aug. | Sterling Exchange "Checks" | Silver | | Gold London | Aug. | Sterling Exchange "Checks" | Silver | | Gold London |
|---|---|---|---|---|---|---|---|---|---|
| | | New York | London | | | | New York | London | |
| 20 | 4.85 1/4 | 70 3/8 | 32 5/16 | 84s11½d | 24 | 4.85 1/4 | 70 1/2 | 32 1/4 | 84s11½d |
| 21 | 4.85 1/4 | 70 1/2 | 32 5/16 | 84s11½d | 25 | 4.85 1/4 | 70 5/8 | 32 5/16 | 84s11½d |
| 22 | 4.85 1/4 | 70 1/2 | 32 3/8 | .... | 26 | 4.85 1/4 | 70 7/8 | 32 7/16 | 84s11½d |

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

# Metal Markets Quiet, but Price Declines Small

**New York, Aug. 26, 1925.**—Although business for the week ending today was slack in each of the non-ferrous metal markets except lead, prices held remarkably well. Domestic sales were smaller, and producers on this side did virtually nothing in foreign markets, both copper and zinc being below domestic parity. Copper did not quite reach 15c. delivered, and has now eased to 14.75c. Demand for spot lead at premium prices is not so strong as it has been, but there are ample inquiries for September. Zinc sales have been only fair, but the price has been very steady at 7.625c. to 7.675c. The tin market is described as dead, though here again the price has not suffered materially. Silver has repeated the performance of last week, establishing another new high for the year at 70⅞c. today.

### Copper Fails to Reach 15c.

The copper market missed scaling the 15c. barrier by a narrow margin. Assisted by the July statistics issued last Thursday, which showed a further decline of 3,318 tons in refined stocks during the month, sales were made by producers at 14.95c. in the East and at 15c. in the West on last Friday. However, purchasers were scarce at that figure, and with the weakening in the London market sellers have had to come down to do business on Monday and subsequent days. The July statistics showed a decline in foreign takings against an increase here, so that some interests look to Europe for increased activity. The total volume of sales was nearly the same as last week, being only about 40 per cent of the recent high week—that ending on Aug. 5. However, producers are quite comfortable, being generally well sold for August and early September and they are not worrying.

### Lead Market Still Leader

Lead still leads the market. The America Smelting & Refining Co. advanced its official contract price from 9.40c. to 9.50c. on Wednesday, Aug. 26. Not so much is heard of fancy prices up to 10.25c. for small spot lots. However, some large sales made in Chicago during the week brought well above the price of the leading Middle West producer to its regular customers. This is reflected in the St. Louis quotations. The leading factor also is selling on a basis of one-third at 9.40c. and two-thirds at the average quotation. In New York there is also substantial business at a premium over the A. S. & R. price. The demand is good in all lines of consumption, particularly cable makers for September-October shipment. While freer offerings are being made for September, the metal is still scarce and the taking of foreign ore lead from the European markets is a possibility. In London the spread between prompt and three-months' lead is increasing. This may be only because of the approach of the end of the month, or, it may be in anticipation of an easier market. Corroding grades continue to demand a $2 premium.

### Zinc Unusually Steady

Though the volume of business in zinc has not been exceptionally large, demand is regular and the price has been unusually steady. Some galvanizers complain of slow business, but continue to buy. High-grade is in good demand at 8¾c. and an increase in price would not be surprising. Brass special commands a premium of 10 to 12½ points.

### Tin Very Quiet

The quietness in the tin market has not affected the price seriously. London is waiting for developments on this side before any activity is to be anticipated. Spot metal is off 12½ to 25 points from the future price.

### Silver Still Advancing

New York and London silver prices have advanced moderately but steadily

during the last week. China continues the chief factor, although purchases by the Indian bazaars in London have added to the strength of that market. Bazaar rates are still below the New York level. The quotation of 70⅞c. on the Aug. 26 establishes a new high for the year in New York.

**Mexican Dollars:** Aug. 20th, 54⅛c.; 21st, 22d, and 24th, 54¼c.; 25th, 54⅜c.; 26th, 54½c.

## Exchanges Make Net Gain

The principal foreign exchanges improved somewhat during the week, though francs have been weaker in the last day or two. Closing cable quotations on Tuesday, Aug. 25 were as follows: Francs 4.69c.; lire, 3.72c.; and marks 23.8c.; Canadian dollars command a premium of 0.0208 per cent.

## Other Metals

Quotations cover large wholesale lots unless otherwise specified.

**Aluminum**—99 per cent grade, 28c. per lb.; 98 per cent, 27c. London, £118 @ £120 per long ton for 98 per cent.

**Antimony**—

Chinese brands, spot, 17@17¼c. per lb.; September, 16½@16¾c.

Cookson's "C" grade, spot, 19⅝c.

Needle and oxide nominally unchanged from quotations in the Aug. 8 issue.

**Bismuth**—$2.65@$2.70 per lb., in ton lots. London, 10s.

**Cadmium**—60c. per lb. London, 2s. 3d.

**Iridium**—$400 per oz. for 98@99 per cent. Nominal. London, £75.

**Nickel**—Ingot 33@34c.; shot, 34@35c.; electrolytic, 38c.; London, £170@£175 per long ton.

**Palladium**—$78@$83 per oz. Crude, $65. London, £16 10s. nominal.

**Platinum**—$120 per oz. refined officially quoted. Sales also at $115@$118. Crude, $113@$113.50. London, £25 per oz. for refined; crude £23.

**Quicksilver** — $81.75@$82 per 75-lb. flask. San Francisco wires $82.17, steady. London, £13 10s.@£13 18s. Market very dull.

The prices of **Cobalt, Germanium Oxide, Lithium, Magnesium, Molybdenum, Monel Metal, Osmiridium, Osmium, Radium, Rhodium, Ruthenium, Selenium, Tantalum, Tellurium, Thallium, Tungsten** and **Zirconium** are unchanged from the Aug. 8 issue.

## Metallic Ores

**Manganese Ore**—Per long ton unit of Mn, c.i.f. North Atlantic ports:

Brazilian, 42@44c.

Indian, 44c.

Caucasian (unwashed), 42c.

Caucasian (washed), 44c.

**Tungsten Ore**—Per unit of $WO_3$, N.Y.:

High-grade wolframite, $12@$12.50. Ordinary quality, $11.75. Market fairly active for forward shipment on account of unsettled conditions in China.

High-grade Western scheelite, $12.50 @$13, nominal.

**Chrome, Galena** and **Pyrite Radio Crystals, Iron Ore, Molybdenum, Tantalum,** and **Vanadium Ores** are unchanged from quotations in the Aug. 8 issue.

## Zinc Blende and Lead Ore Unchanged

**Joplin, Mo., Aug. 22, 1925**

Zinc Blende

| | Per Ton |
|---|---|
| High | $57.90 |
| Premium, basis 60 per cent zinc | $55.00@$56.00 |
| Prime Western, 60 per cent zinc | $53.00 |
| Fines and slimes, 60 per cent zinc | $52.00@$49.00 |
| Average settling price, all | $53.46 |

Lead Ore

| | |
|---|---|
| High | $133.65 |
| Basis 80 per cent lead | $130.00 |
| Average settling price, all | $126.46 |

Shipments for the week: Blende, 12,500; lead, 2,502 tons. Value, all ores the week, $984,380.

Very little business had been transacted in zinc at 5 o'clock today, buyers holding firm on above offerings, and sellers holding equally firm in declining to accept them. Buyers contend that the price of slab zinc is such now that to force it higher would jeopardize business, that in reality business cannot stand a permanent market of over 7c., while sellers are holding their ore in contemplation of an 8c. market. Buying and shipments have dropped heavily and stocks are mounting up, with an output around 16,000 tons.

Sellers were expecting a further advance in lead prices, but as a large tonnage was sold last week on the current basis, the need of buyers is less acute.

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**Platteville, Wis., Aug. 22, 1925**

Zinc Blende

| | Per Ton |
|---|---|
| Blende, basis 60 per cent zinc | $55.50 |

Lead Ore

| | |
|---|---|
| Lead, basis 80 per cent lead | $130 |

Shipments for the week: Blende, 832 tons; lead, 48 tons. Shipments for the year: Blende, 30,635; lead, 1,356 tons. Shipments for the week to separating plants, 1,872 tons blende.

## Non-Metallic Minerals

**Amblygonite, Andalusite, Asbestos, Barytes, Bauxite, Beryl, Borax, Celestite, Chalk, China Clay, Diatomaceous Earth, Emery, Feldspar, Fluorspar, Fuller's Earth, Garnet, Gilsonite, Graphite, Greensand, Gypsum, Ilmenite, Iron Oxide, Lepidolite, Limestone, Magnesite, Manjak, Mica, Monazite, Ocher, Phosphate, Potash, Pumice, Pyrites, Quartz Rock Crystals, Rutile, Silica, Spodumene, Sulphur, Talc, Tripoli,** and **Zircon** are unchanged from prices in the Aug. 8 issue.

## Mineral Products

**Arsenious Oxide** (White arsenic)—3.75@4c. per lb.

**Copper Sulphate, Sodium Nitrate, Sodium Sulphate,** and **Zinc Oxide** are unchanged from prices in the Aug. 8 issue.

## Ferro-Alloys

**Ferrotungsten**—$1.125@$1.15 per lb. contained W.

**Ferrocerium, Ferrochrome, Ferromanganese, Ferromolybdenum, Ferrosilicon, Ferrotitanium, Ferro-uranium** and **Ferrovanadium** are unchanged from the prices in the Aug. 8 issue.

## Metal Products

**Rolled Copper** — Sheets, 22¾c.; wire, 16½c. per lb.

**Nickel Silver**—29¼c. per lb. for 18 per cent nickel Grade A sheets.

**Yellow (Muntz) Metal**—Sheets, 20⅛c. per lb.; rods, 17⅛c.

**Lead Sheets** unchanged from prices in Aug. 8 issue.

**Zinc Sheets**—10½c. per lb. f.o.b. works.

## Refractories

**Chrome Brick, Firebrick, Magnesite Brick, Silica Brick,** and **Zirkite** are unchanged from prices in the Aug. 8 issue.

## Steel Buying Increases—Pig Iron Dull—Coke Active

**Pittsburgh, Aug. 25, 1925.**

The volume of steel buying continues to increase, the pace being moderate but well sustained. Prospects are for reasonably good business in steel for several months, possibly through the first quarter of the new year.

Buying is good in practically all consuming quarters except the freight-car industry. Fabricated structural steel lettings in June and July were the heaviest for any two consecutive months since February and March, 1920. Agricultural implement factories are running at a good rate, and the automobile trade is doing even better than was expected for this time of year.

Prices are very firm in some lines and reasonably firm in all. A gradual weakening in plates makes that market quotable down $1 a ton, at $1.80c. to $1.90c., making $2 a ton decline spread over nearly two months. Sheet prices show a slight further firming up tendency. Some mills will make contracts over fourth-quarter at present prices, others accept only actual orders.

Steel production in August promises to be fully 5 per cent above July production, and the upward trend is likely to continue, leaving July as the low month of the year, and by no means a particularly low month at that.

**Pig Iron**—The market remains rather dull, with prices well maintained, but recent predictions that there might be an advance for fourth quarter are not borne out in the fact that a sale of 5,000 tons of basic over the last four months of the year has been made at the regular price. Bessemer, $19; basic, $18; foundry, $18.50, f.o.b. Valley furnaces.

**Connellsville Coke**—The active market of week before last, which sent furnace coke prices up, has been followed by a dull period, with the market well sustained. Two fourth-quarter contracts were recently made, by eastern furnaces, at $3.50 and $3.75 respectively. Spot furnace, $3.25; spot foundry, $3.75@$4.25.

# Company Reports

## New York & Honduras Rosario Mining Co.

**Silver, Gold; Honduras**

The report of the New York & Honduras Rosario Mining Co. for 1924 shows that the year was one of the most satisfactory in the history of the company. Production showed an increase over the next highest record (1923) of 151,692.84 oz. The following covers some of the important items of operations, with a comparison for the preceding year:

### Production and Profits

| | 1924 | 1923 |
|---|---|---|
| Dry tons treated | 75,710 | 87,900 |
| Ounces silver produced (smelter's final returns) | 2,189,903.69 | 2,038,210.85 |
| Ounces gold produced (smelter's final returns) | 4,339.234 | 4,681.21 |
| Bars Doré bullion | 1,455 | 1,338 |
| Drums precipitates | 4 | ..... |
| Average silver recovery at mine, per cent | 90.68 | 89.39 |
| Average gold recovery at mine, per cent | 94.61 | 92.64 |
| Average ounces silver recovered at mine, per ton | 28.886 | 23.146 |
| Average ounces gold recovered at mine, per ton | 0.0585 | 0.0532 |
| Value of silver recovered, per ton | $19.7452 | $15.0756 |
| Cost of silver recovered, per ton | 10.1643 | 8.2181 |
| Cost of silver recovered, per ounce | 0.35140 | 0.35442 |
| Net profit on silver recovered, per ton | 9.5809 | 6.8575 |
| Net profit on silver recovered, per ounce | 0.33120 | 0.29573 |

| | | |
|---|---|---|
| Net operating income for the year was | | $1,514,554.06 |
| Less operating expense | | 737,394.67 |
| Operating profit | | $777,159.39 |
| Less New York administrative expenses | | 51,783.15 |
| Net income from operations | | $725,376.24 |
| Miscellaneous income | | 92,840.34 |
| | | $818,216.58 |
| Less miscellaneous expense | | 46,151.72 |
| Net profit for year | | $772,064.86 |
| Less appropriated for reserves | | 211,532.50 |
| Net profit before taxes | | $560,532.36 |
| Less federal income tax | | 68,718.30 |
| Net earnings for year | | $491,814.06 |
| Applied to dividends | | 350,000.00 |
| Applicable to surplus | | $141,814.06 |
| Additional credits to surplus | | 18,863.46 |
| Carried to surplus | | $160,677.52 |

### Current Assets, Dec. 31, 1924

| | | |
|---|---|---|
| Cash | $115,978.03 | |
| Loans receivable, plus accrued interest | 30,320.00 | |
| Bullion at smelters and in transit | 261,416.04 | |
| Broken ore in stopes and mill bin | 107,375.29 | |
| Materials and supplies at cost | 235,033.00 | |
| U.S. Liberty Bonds at market, plus accrued interest | 466,562.69 | |
| Marketable securities, plus accrued interest | 927,848.74 | |
| Total | | $2,144,533.70 |

### Appropriations for Reserves

| | |
|---|---|
| Mine fire insurance | $5,577.59 |
| Transit insurance | 2,920.19 |
| Ore depletion | 203,034.72 |
| | $211,532.50 |

### Current Liabilities, Dec. 31, 1924

| | |
|---|---|
| Current liabilities including $192,020.29 to cover federal income and profits taxes for the years 1918, 1919, 1920 and 1924 | $262,560.55 |

### Summary of Ore Reserves

| | Tons of Ore and Waste | Oz. Silver per Ton | Oz. Gold per Ton | Total Oz. Silver | Total Oz. Gold |
|---|---|---|---|---|---|
| Calculated ore, at 13 cu.ft. | 234,800 | 26.382 | 0.0490 | 6,194,500 | 11,528 |
| Estimated ore, at 13 cu.ft. | 43,000 | 12.840 | 0.0609 | 552,500 | 2,620 |
| Estimated stope filling, at 17 cu.ft. | 10,000 | 10.000 | 0.0355 | 100,000 | 355 |
| Broken ore in stopes, at 21 cu.ft. | 20,360 | 20.000 | 0.0404 | 407,200 | 814 |
| Totals | 308,160 | 23.540 | 0.0497 | 7,254,200 | 15,317 |

No new veins were found during 1924, but new ore discoveries in existing veins more than kept pace with ore withdrawals to the mill, both in tonnage and in value, with the result that the positive ore reserves as of Jan. 1, 1925, exceed those as of Jan. 1, 1924, by 25,907 tons, 1,394,740 oz. silver and 1,978 oz. gold.

The per ton average of 23.540 oz. of silver and 0.0497 oz. gold, as compared with 20.759 oz. silver and 0.0472 oz. gold for the year previous, is based on a milling rate of between 8,000 and 9,000 tons per month, 92 per cent silver recovery and silver price of 67c. per ounce.

## Chief Consolidated Mining Co.

**Lead, Silver; Utah**

The report of the Chief Consolidated Mining Co. for the second quarter of 1925 says that the earnings of the past quarter have been poor because of the falling off of the values in the product and the losses incidental to the changes and adjustments in the new mill which have not yet reached the conclusive stage. This has prevented the payment of the dividend usual at this time. The grade of ore has shown pronounced improvement recently and if this continues dividends can be resumed in November, according to the officials. The total shipments of ore were 39,790 tons, dry, yielding after smelting, transportation, sampling and all operating charges $19,207.08.

### Metal Contents of Ore

| | |
|---|---|
| Gold, oz | 4,955 |
| Silver, oz | 692,785 |
| Lead in lead ores, lb | 5,142,319 |
| Copper in copper ores, lb | 327,512 |

### Assay Values of Ore

| | |
|---|---|
| Gold, oz | .1245 |
| Silver, oz | 17.411 |
| Lead in lead ores, per cent | 12.32 |
| Copper in copper ores, per cent | 1.99 |
| Average gross value per ton | $25.92 |
| Smelting, freight and sampling per ton | 12.09 |
| Average net value | $13.83 |

### Balance Sheet, June 30, 1925

**Assets**

| | | |
|---|---|---|
| Property | | $4,233,686.48 |
| Mine investments | | 655,170.28 |
| Current assets | | |
| Accounts and bills receivable | | $108,187.09 |
| Subsidiary companies' balances | | 135,836.64 |
| Inventories | | 27,154.83 |
| Miscellaneous | | 17,806.43 |
| Cash | $36,103.20 | 325,088.19 |
| | | $5,213,944.95 |

**Liabilities**

| | | |
|---|---|---|
| Capital stock | | |
| 1,500,000 shares @ $1 | $1,500,000.00 | |
| Less stock in treasury | 496,776.00 | |
| | | $1,003,224.00 |
| First mortgage bonds | | 750,000.00 |
| Stock premium | $226,309.82 | |
| Less bond discount and expense | 46,696.51 | |
| | | 179,613.31 |
| Surplus Dec. 31, 1924 | $2,730,758.50 | |
| Profits | | |
| Gross receipts from sales of ore, lime products, etc. | $1,363,087.29 | |
| Less operating costs and for reserves for taxes but exclusive of depletion charges | 1,211,075.06 | |
| Operating profit | $152,012.23 | |
| Interest on investments and deposits | 8,792.20 | |
| | $160,804.43 | |
| Less accrued interest on first mortgage bonds and other items | 14,399.04 | |
| | $146,405.39 | |
| Less dividend No. 41 | 100,322.40 | |
| | 46,082.99 | 2,776,841.49 |
| Current liabilities | | 114,420.11 |
| Reserve accounts | | |
| Taxes | 89,713.46 | |
| Depreciation | 286,123.20 | |
| Hospital fees | 894.01 | |
| Accrued interest on first-mortgage bonds | 13,115.37 | |
| | | 389,846.04 |
| | | $5,213,944.95 |

## Shattuck Arizona Copper Co.

Report of the Shattuck Arizona Copper Co. for the quarter ended June 30, 1925, states that the grade of concentrates produced in the mill, which had been down for four years, was equal to or higher than heretofore, and the recoveries of gold, silver, and lead were equal to those obtained by tabling and flotation. Flotation only is used in the present flow sheet. The concentration cost per ton of

ore milled was slightly less than obtained on double the tonnage put through the mill heretofore. With the present flotation equipment, 4,500 to 5,000 tons per month is the limit of the flotation capacity, although the remainder of the plant equipment, except filters for flotation concentrates, has a capacity of at least 10,000 tons per month.

**Production and Costs for the Quarter**

| | Copper | Direct Lead | Mill Lead | Copper Silica |
|---|---|---|---|---|
| Dry tons mined | 4,606.97 | 1,586.36 | 9,760.86 | 292.28 |
| Dry tons treated | 4,590.40 | 3,035.32 | 970.47 | 437.68 |
| Pounds copper recovered | 419,683. | 22,169. | 4,438. | 951. |
| Pounds lead recovered | ..... | 206,096. | 544,418. | ..... |
| Ounces silver recovered | 9,786. | 11,747. | 24,662. | 1,181. |
| Ounces gold recovered | 303.84 | 295.18 | 436.19 | 201.57 |
| Net operating cost per pound | 13.51c. | 11.44c. | 10.11c. | ..... |

The net operating cost is the delivered cost of metal after credit for precious metal byproducts, and includes the expense of repairing the concentrator to mill lead ores. The labor conditions are, if anything, less satisfactory than heretofore.

**Earnings for the Quarter**

| | | |
|---|---|---|
| Refined copper at 14½ c. per pound | | $60,854.04 |
| Gold and silver (copper ores) | | 11,948.40 |
| Gross value direct lead | | 37,739.82 |
| Gross value mill lead | | 70,164.93 |
| Gross value silica ore | | 4,929.86 |
| Interest | | 8,560.51 |
| Dividends | | 510.00 |
| | | $194,707.56 |
| Operating expense, copper | $68,656.23 | |
| Operating expense, direct lead | 44,966.32 | |
| Operating expense, mill lead | 81,000.68 | |
| Operating expense, silica ore | 4,629.54 | |
| Administrative expense | 5,236.33 | 204,489.10 |
| Net loss, before depletion and deferred development charges | | $9,781.54 |

The results on lead ore are actual smelter settlements. The production of copper for the quarter is inventoried at 14½c. per pound, silver at 60c. per ounce, and gold at $20 per ounce.

## India's Gold Requirements Probably Anticipated

The report for the fiscal year 1924-1925 of the Controller of the Indian Currency deals with gold as follows:

"The net import of gold during the year amounted to 73.78 crores—i.e., very nearly double the net import in 1922-23, the previous record year. This extraordinary increase in the absorption of gold by India was due mainly to the agricultural prosperity following on four good harvests, to the high price of the commodities in which the agriculturist usually spends his surplus, and to the low price of gold. At the beginning of the year the price of gold in Bombay was about rupees 26-4 per tola. There was a drop of rupees 4-7-0 per tola, or 16.9 per cent in the price of gold, in the course of the year, and during the latter part of the year the price was about rupees 2 per tola (or 8.3 per cent) below its pre-war level. In the same period general prices were about 70 per cent and the price of piece goods about 170 per cent above the pre-war level. In these circumstances, it was not unnatural that, in a country where the tendency to invest savings in bullion has always been strong, the surplus money in the hands of the people should to a very much larger extent than usual have been put into gold.

"The natural effect of the decrease in the price was increased by the uncertainty as to whether gold would continue to be so cheap. Exchange was two pence higher than it had been for many years previous to the war, and there was considerable doubt as to whether it would remain at 1s. 6d. or return to the pre-war figure. Moreover, there was also the possibility of a reaction in the dollar-sterling exchange. As a result there was a general belief that the price of gold could not go much lower and might go higher, and this belief undoubtedly contributed very largely to the demand for the metal.

"From reports received from various parts of India it appears that most people who had surplus cash invested it in gold and that almost every family in which marriages were likely to occur during the next year or two took the opportunity to lay in the necessary store of gold while it was cheap. It is probable, therefore, that India's requirements for gold for the next year or two have to a large extent been anticipated, and, if the price of gold remains at its present level, the normal annual import will probably be considerably smaller than the import during the year under review."

## July Lead Output Increases

Figures of the American Bureau of Metal Statistics show (in tons of 2,000 lb.) the monthly output of pig lead by the following important countries, which in 1923 furnished about 78 per cent of the world's total, and in 1924 about 79 per cent.

| | March | April | May | June | July | Jan.-July |
|---|---|---|---|---|---|---|
| United States (a) | 49,635 | 46,209 | 47,316 | 48,775 | 47,957 | 329,220 |
| Mexico | 17,860 | 18,425 | 17,468 | 16,776 | 16,545 | 118,331 |
| Canada | 11,875 | 10,138 | 9,211 | 8,736 | 9,783 | 71,844 |
| Total North America (d) | 79,370 | 74,772 | 73,995 | 74,287 | 74,285 | 519,395 |
| Spain and Tunis (c) | 11,825 | 11,243 | 12,363 | 10,807 | 9,216 | 75,419 |
| Italy | 570 | 304 | 603 | 457 | 2,346 (b) | 5,406 |
| Australia | 12,291 | 11,894 | 12,683 | 12,576 | 14,465 | 88,056 |
| Burma | 4,090 | 4,090 | 4,089 | 4,092 | 4,260 | 30,204 |
| Rhodesia | ..... | ..... | ..... | 339 | 680 | 1,547 |
| Transvaal | 15 | 198 | 284 | 274 | 300 (b) | 1,102 |
| Total | 108,161 | 102,501 | 104,017 | 102,832 | 105,552 | 721,129 |

(a) Crude lead; includes only production reported by smelters who are members of this Bureau. Pig lead produced from Canadian and Mexican ores has been deducted and credited to its country of origin. (b) Estimated or partly estimated. (c) Partial. (d) The total for North America is a correct statement of the aggregate production of crude lead by the smelters of the several countries, but the distribution according to countries is not precise, particularly as between the United States and Canada, an accurate allocation by months being at present impossible.

## Quarterly Dividends Show Little Change —Some Newcomers

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

| Companies in the United States | Situation | Per Share | Total |
|---|---|---|---|
| American Smelting & Refining (com) | Various | 1.50 Q | $914,970 |
| Anaconda Copper Mining | Various | 0.75 Q | 2,250,000 |
| Bunker Hill & Sullivan, l, s, z | Idaho | 0.75 M | 245,250 |
| Colorado Fuel & Iron, pfd | Various | 2.00 Q | 40,000 |
| General Development | Various | 0.25 Q | 30,000 |
| Homestake Mining, g | S. D. | 0.50 M | 125,580 |
| International Nickel, pfd., n, c | W. Va., Ont. | 1.50 Q | 133,689 |
| Keystone Mining, l, s | Utah | 0.075 Q | 67,500 |
| Miami Copper | Ariz. | 0.25 Q | 186,778 |
| New Cornelia Copper | Ariz. | 0.25 Q | 450,000 |
| New Jersey Zinc | Various | 2.00 Q | 981,682 |
| Rand Mines (American shares), g | Various | 1.52 I | 3,,402 |
| U. S. Steel, pfd | Various | 1.75 Q | 6,304,919 |
| United Gold Mines, g | Colorado | 0.01 I | 48,000 |
| United Verde Extension, c | Ariz. | 0.50 Q | 525,000 |
| Vanadium Corporation of America | Peru, Colo. | 0.50 Q | 186,667 |
| Companies in other countries | | | |
| Amparo Mining, g, s | Jalisco | 0.02 Q | 40,000 |
| Asbestos Corporation | Quebec | 1.00 Q | 30,000 |
| Cerro de Pasco, c, s | Peru | 1.00 Q | 1,122,662 |
| Hollinger Consolidated Gold | Ont. | 0.05 4 weeks | 393,600 |
| Lucky Tiger-Combination Gold | Sonora | 0.07 M | 50,074 |
| Total | | | $13,987,773 |

l, lead; s, silver; z, zinc; c, copper; g, gold; n, nickel; Q, quarterly; M, monthly; I, irregularly; A, annually.

Dividends paid in August were somewhat less in the aggregate than those of three months ago. However, they exceed by $3,000,000 the total for August 1924. The decrease from May is accounted for by the absence of St. Mary's Mineral Land Copper Range, whose present policy is to make annual disbursements. Chief Consolidated has again passed its current dividend as a consequence of the lower grade of ore mined and the difficulty experienced in operating its new reduction plant. If the Mammoth Mining Co., of Utah, paid a dividend, we have no report of it.

Hollinger Consolidated, Ontario, with a disbursement of 8c. per share as compared with 5c. in May, accounted for an increase of $147,600. The United Gold Mines, Colorado, paid 1c. per share, or $48,000, and the Keystone Mining Co., Utah, contributed 7½c. per share, or a total of $67,500. This is a newcomer in the ranks of Utah dividend payers. Rand Mines (American shares) issued on a block of the British Rand Mines stock held in trust in New York, paid $31,402, at the rate of $1.52 per share, and the Vanadium Corporation of America contributed $186,667 to the total. These are the companies in the above group that were absent in the list for the corresponding quarter in May. Anaconda did not appear a year ago and the Cerro de Pasco dividend was $225,000 less in 1924 than the current one.

# Current Prices of Mine Materials and Supplies

## Rise and Fall of the Market

The price trend is upward in such materials as steel sheets, track bolts, c.-i. pipe, structural timbers, linseed oil, flotation oil and chemicals. Declines occurred during the month in steel structurals, nails and lime. There is considerable fluctuation in clay products and rope.

**SHEETS**—Quotations are per 100 lb. in various cities from warehouse also the base quotations from mill:

| Blue Annealed | Pittsburgh, Large Mill Lots | St. Louis | Chicago | San Francisco | New York |
|---|---|---|---|---|---|
| No. 10 | $2.30@2.40 | $3.60 | $3.50 | $3.70 | $3.89 |
| Black | | | | | |
| No. 28 | 3.15@3.20 | 4.50 | 4.00 | 4.65 | 4.35 |
| Galvanized | | | | | |
| No. 28 | 4.20@4.25 | 5.65 | 5.00 | 5.75 | 5.35 |

**STEEL RAILS**—The following quotations are per ton f.o.b. Pittsburgh and Chicago for carload or larger lots:

| | Pittsburgh Current | Pittsburgh One Year Ago | Birmingham | Chicago |
|---|---|---|---|---|
| Standard bessemer rails | $43.00 | $43.00 | $43.00 | $43.00 |
| Standard openhearth rails | 43.00 | 43.00 | 43.00 | 43.00 |

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

| | Pittsburgh Current | Pittsburgh One Year Ago | Chicago | St. Louis | San Francisco | Birmingham |
|---|---|---|---|---|---|---|
| Standard spikes, ⅝-in. and larger | $2.80 | $2.90@3.00 | $3.55 | $3.65 | $4.35 | $2.90 |
| Track bolts | 3.90@4.15 | 3.75@4.25 | 4.55 | 4.65 | 5.85 | 3.90 |
| Standard section angle bars | 2.75 | 2.75 | 3.30 | 3.40 | 4.00 | 3.85 |

**STRUCTURAL MATERIAL**—Following are base prices f.o.b. mill, Pittsburgh and Birmingham together with quotations per 100 lb. from warehouses at places named:

| | Pittsburgh, Mill | Birmingham Mill | New York | Dallas | St. Louis | Chicago | San Francisco |
|---|---|---|---|---|---|---|---|
| Beams, 3 to 15 in. | $1.80@2.00 | $2.05 | $3.34 | $4.15 | $3.25 | $3.10 | $3.30 |
| Channel, 3 to 15 in. | 1.80@2.00 | 2.10 | 3.34 | 4.15 | 3.25 | 3.10 | 3.30 |
| Angles, 3 to 6 in., ¼ in. thick | 1.80@2.00 | 2.10 | 3.34 | 4.15 | 3.25 | 3.10 | 3.30 |
| Tees, 3 in. and larger | 1.80@2.00 | 2.10 | 3.34 | 4.15 | 3.35 | 3.10 | 3.30 |
| Plates | 1.80@2.00 | 2.00 | 3.34 | 4.15 | 3.25 | 3.10 | 3.30 |

**WIRE ROPE**—Discounts from list price, f.o.b. New York and east of Missouri River, on regular grades of bright and galvanized are as follows:

| | |
|---|---|
| Cast steel round strand rope | 20% |
| Galvanized steel rigging and guy rope | 7½% |
| Round strand iron and iron tiller | 5% |
| Plow steel round strand rope | 35% |
| Special steel round strand rope | 30% |
| Galvanized iron rigging and guy rope | +12½% |

| | New York | Cleveland | Chicago |
|---|---|---|---|
| **Drill Rod** (from list) | 60% | 55% | 60% |

**WROUGHT PIPE**—The following discounts are to jobbers for carload lots at Pittsburgh mill:

| | Steel Inches | Steel Black | Steel Galv. | Iron Inches | Iron Black | Iron Galv. |
|---|---|---|---|---|---|---|
| BUTT WELD— | ..1 to 3 | 62 | 50½ | 1 to 1¼ | 30 | 13 |
| LAP WELD— | 2½ to 6 | 59 | 47½ | 3 to 6 | 28 | 13 |

**STEEL PIPE**—From warehouses at the places named the following discounts hold for steel pipe:

| | Black New York | Black Chicago | Black St. Louis |
|---|---|---|---|
| 3½ to 6 in. lap welded | 48% | 51% | 46% |

**CAST-IRON PIPE**—The following are prices per net ton for carload lots:

| | New York Current | New York One Year Ago | Birmingham | Chicago | St. Louis | San Francisco |
|---|---|---|---|---|---|---|
| 6 in. and over | $50.60–51.60 | $60.60–61.60 | $40.00 base | $50.20 | $47.60 | $52.00 |

**NUTS**—Semi-finished, ½x¼-in., 2c. each. Discount 70% for ⅝-in. and smaller; 65% for ¾-in. and larger. Case hardened, 6c. each, less 50%.

**HOLLOW TILE**—Price per block in carload lots to contractor for hollow building tile.

| | New York Current on Trucks | New York One Year Ago | Chicago | Philadelphia | St. Louis | San Francisco | Perth Amboy N. J., Factory |
|---|---|---|---|---|---|---|---|
| 4x12x12 | $0.1162 | $0.1162 | $0.075 | $0.12 | $0.078 | $0.108 | ..... |
| 6x12x12 | .1743 | .1743 | .0963 | ..... | .102 | .156 | $0.252* |
| 8x12x12 | .2179 | .2179 | .135 | .22 | .14 | .244 | .312† |

* 10x12x12; † 12x12x12.

**MACHINE BOLTS**—½x1½-in., per 100, $1.70. Discount at New York warehouses on all sizes up to 1x30-in., 40%.

**LUMBER**—Prices of rough Douglas Fir No. 1 common, in carload lots to dealers at yards in San Francisco. To contractors, $2 per M. ft. additional.

| | 6-8 and 12 Ft. | 10-16-18 and 20 Ft. | 22 and 24 Ft. | 25 to 32 Ft. |
|---|---|---|---|---|
| 3x3 and 4 | $26.00 | $27.00 | $28.00 | $31.00 |
| 3x6 and 8 | 26.00 | 27.00 | 28.00 | 31.00 |
| 4x4-6 and 8 | 26.00 | 27.00 | 28.00 | 31.00 |

Wholesale prices to dealers of long leaf yellow pine. To contractors in New York City, delivered from lighters or cars to job, $5 additional.

| | New York 20 Ft. and Under | New York 22-24 Ft. | Chicago 20 Ft. and Under | Chicago 22-24 Ft. |
|---|---|---|---|---|
| 3x4 to 8x8 | $45.00 | $46.00 | $36.00 | $37.00 |
| 3x10 to 10x10 | 49.00 | 50.00 | 39.00 | 40.00 |
| 3x12 to 12x12 | 54.00 | 55.00 | 43.00 | 44.00 |

| Other Cities | 8 x8-In. x 20 Ft. and Under Pine | Fir* | Hemlock | Spruce | 12 x 12-In. 20 Ft. and Under Pine | Fir* |
|---|---|---|---|---|---|---|
| Boston | $50.00 | $48.00† | $50.00 | $50.00 | $60.00 | $58.00† |
| Cincinnati | 37.00 | 73.00 | 73.00 | 85.00 | 48.00 | 77.00 |
| Denver | ..... | 37.25 | 37.25 | 37.25 | ..... | 37.75 |
| Minneapolis | 43.00 | 38.75 | 35.00 | ..... | 44.50 | 38.75 |
| Kansas City, Mo. | 39.00 | ..... | ..... | ..... | 50.00 | ..... |
| Philadelphia | 54.00 | 34.00 | 37.00 | 40.00 | 62.00 | 34.00 |

* Douglas fir. † Prime.

**NAILS**—The following quotations are per keg from warehouse:

| | Pittsburgh, Mill | Chicago | San Francisco | Dallas | St. Louis | Montreal |
|---|---|---|---|---|---|---|
| Wire | $2.65 | $3.15 | $3.50 | $4.20 | $3.33 | $4.95 |
| Cut | 2.90 | ..... | 5.00 | 5.00 | 3.58 | 5.00 |

**PORTLAND CEMENT**—Prices to contractors per bbl. in carload lots *without bags*. Cash discount not deducted.

| | Current | One Month Ago | One Year Ago |
|---|---|---|---|
| NewYork, del. by truck | $2.50@2.60 | $2.50@2.60 | $2.50@2.60 |
| Chicago, f.o.b. | 2.20 | 2.20 | 2.20 |
| Cleveland, f.o.b. | 2.39 | 2.39 | 2.39 |

**LIME**—Warehouse prices:

| | Hydrated, per Ton Finishing | Hydrated, per Ton Common | Lump, per Barrel Finishing | 280-lb. net Common |
|---|---|---|---|---|
| New York | $18.20 | $12.@13.10 | $3.50 | $2.25@$2.75 |
| Chicago | 20.00 | 18.00 | 1.45 (180-lb. net) | 1.30 |

**LINSEED OIL**—These prices are per gallon:

| | New York Current | New York One Year Ago | Chicago Current | Chicago One Year Ago |
|---|---|---|---|---|
| Raw in barrel (5 bbl. lots) | $1.08 | $1.07 | $1.03 | $1.05 |

**WHITE AND RED LEAD**—In 100-lb. kegs, base price in cents per pound:

| | Dry Current | Dry 1 Yr. Ago | In Oil Current | In Oil 1 Yr. Ago |
|---|---|---|---|---|
| Red | 15.75 | 14.75 | 17.25 | 16.25 |
| White | 15.75 | 14.75 | 15.75 | 14.75 |

**HOSE**—Quotations at New York warehouses:

Fire Protection — Underwriters' 2½-in. coupled, single jacket ..... 50-Ft. Lengths 65c per ft.

Air—Best Grade

| | 3 ply | 4 ply |
|---|---|---|
| ¾-in., per ft. | $0.36 | $0.44 |

Steam—Discounts from List

| First grade | Second grade | Third grade |
|---|---|---|
| 40% | 40–5% | 40–10% |

**RUBBER BELTING**—List price 6-in., 6 ply, $1.83 per lin.ft. for rubber transmission belting.

Best grade ..... 50–5% Second grade ..... 50–10–5%

**LEATHER BELTING**—List price, 24c. per lin.ft. per inch of width for single ply at New York warehouses:

| Grade | Discount from list |
|---|---|
| Medium | 40% |
| Heavy | 30–10% |

**RAWHIDE LACING**—For cut, best grade, 50%, 2nd grade, 60%. For laces in sides, best, 41c. per sq.ft.; 2nd, 37c. Semi-tanned: cut, 50%; sides, 41c. per sq.ft.

**PACKING**—Prices per pound:

| | |
|---|---|
| Rubber and duck for low-pressure steam, ½ in. | $0.90 |
| Rubber sheet | .45 |
| Rubber sheet, wire insertion | .70 |

**MANILA ROPE**—Per lb., ¾-in. and larger, 1,200-ft. coils.

| | | | |
|---|---|---|---|
| Atlanta | $0.30 | New Orleans | $0.24½ |
| New York | .27 | Seattle | .24 |
| Chicago | .24 | San Francisco | .24 |

**EXPLOSIVES**—Prices per pound of dynamite in small lots:

| | Gelatin 40% | Gelatin 60% |
|---|---|---|
| New York | $0.27 | $0.295 |
| Minneapolis | .1917 | .2123 |
| Denver | .2025 | .2275 |
| Seattle | .165 | .19 |
| Cincinnati | .22 | .245 |
| New Orleans | .233 | .26 |
| San Francisco | .1625 | .1925 |

**FLOTATION OIL**—

Pine tar, 50 gal. bbl., gross weight 500 lb., f.o.b. New York, carload lots, per gal. ..... $0.35

**CHEMICALS**—

| | |
|---|---|
| Zinc dust, 550 lb. casks, f.o.b. Palmerton, Pa., per lb. | $0.09½ |
| Litharge, f.o.b. New York, kegs, per 100 lb. | 15.75 |
| Sodium cyanide, 220 lb. single case lots, f.o.b. works, per lb. | .18@.22 |

# Mining Stocks—Week Ended August 22, 1925

| Stock | Exch. | High | Low | Last | | Last Div. |
|---|---|---|---|---|---|---|
| **COPPER** | | | | | | |
| Anaconda | New York | 43⅜ | 42¼ | 43⅜ | Jy.18, Au.24, Q | 0.75 |
| Arcadian Consol. | Boston | 1½ | 1 1/16 | 1½ | | |
| Ariz. Com'l. | Boston | 12½ | 11 | 12¼ | Jy.21, Jy 31 SA | 0.50 |
| Calaveras | N. Y. Curb | | | 1½ | | |
| Calumet & Arizona | New York | 51 | 49½ | 51 | Se.4, Se.21 Q | 1.00 |
| Calumet & Hecla | Boston | 15⅜ | 15⅛ | 15⅜ | Au.31, Se.15 Q | 0.50 |
| Canario Copper | N. Y. Curb | 8 | 7⅞ | 7⅞ | | |
| Cerro de Pasco | New York | 54⅜ | 52½ | 54 | Au.21, Se.1, Q | 1.75 |
| Chile Copper | New York | 35⅛ | 33⅜ | 35 | Sep. 2, Sep. 28, Q | 0.62½ |
| Chino | New York | 24½ | 24½ | 24½ | Sept., 1920 | 0.37½ |
| Con. Copperminea | N. Y. Curb | 2⅛ | 2 | 2⅛ | | |
| Copper Range | Boston | 22 | 21 | 21½ | Ap.9, My.4 | 1.00 |
| Crystal Copper | Boston Curb | *42 | *40 | *41 | | |
| East Butte | Boston | 4¼ | 3½ | 4¼ | Dec., 1919 | 0.50 |
| First National | Boston Curb | *15 | *10 | *15 | Feb., 1919 | 0.15 |
| Franklin | Boston | 1½ | 1 | 1 1/16 | | |
| Granby Consol. | New York | 19⅜ | 17 | 19⅜ | May, 1919 | 1.25 |
| Greene-Cananea | New York | 14½ | 14¼ | 14½ | Nov., 1920 | 0.50 |
| Hancock | Boston | | | *76 | | |
| HoweSound,new,r t.c. | New York | 23⅞ | 23⅜ | 23⅞ | April, 1924 | 0.05 |
| Inspiration Consl. | New York | 28⅜ | 26½ | 28⅜ | Jn.18, Jy 6, Q | 0.50 |
| Iron Cap | Boston Curb | 2¼ | 1⅞ | 1⅞ | May, 1923 | 0.15 |
| Isle Royale | Boston | 14 | 12½ | 14 | Sept., 1923 | 0.50 |
| Jerome Verde Dev. | N. Y. Curb | *95 | *92 | *92 | | |
| Kennecott | New York | 56¼ | 54⅛ | 56 | Jn.5, Jy.1, Q | 0.75 |
| Lake Copper | Boston | 14⅛ | 14⅛ | 14⅛ | Jn.1, Jn.15 Q | 0.50 |
| Magma Copper | NewYork | 43⅞ | 41½ | 43⅛ | Jn. 15, Jy. 15, | 0.75 |
| Mason Valley | N. Y. Curb | 2 | 2 | 2 | | |
| Mass Consolidated | Boston | 1 | *70 | *70 | Nov., 1917 | 1.00 |
| Miami Copper | New York | 10⅜ | 9⅞ | 10⅜ | Au.1 Au.15 Q | 0.25 |
| Mohawk | Boston | 34 | 31⅞ | 32⅛ | Aug. 1, Sept. 2 | 1.00 |
| Mother Lode Coa. | New York | 8 | 7⅞ | 7⅞ | Jn. 12, Jn. 30 | 0.37½ |
| Nevada Consol. | New York | 13⅜ | 13⅛ | 13⅜ | Sept., 1920 | 0.25 |
| New Cornelia | Boston | 20½ | 19⅜ | 20½ | Aug. 7 Aug. 24 | 0.25 |
| North Butte | Boston | 1⅜ | 1 | 1⅜ | Oct., 1918 | 0.25 |
| Ohio Copper | N. Y. Curb | *80 | *74 | *78 | No.14, De.2 | 0.05 |
| Old Dominion | Boston | 19⅜ | 18½ | 19¼ | Dec., 1918 | 1.00 |
| Phelps Dodge | Open Mar. | †112 | †109 | | Jn 20, Jy.2 Q | 1.00 |
| Quincy | Boston | 26½ | 24 | 25⅝ | Mar., 1920 | 1.00 |
| Ray Consolidated | New York | 15 | 14¼ | 14¼ | Dec., 1920 | 0.25 |
| Ray Hercules | N. Y. Curb | | | 14 | | |
| St. Mary's Min. Ld. | Boston | 36½ | 34½ | 36½ | Ap. 20, My.20, | 3.00 |
| Shannon | Boston | | | *60 | Nov., 1917 | 0.25 |
| Shattuck Arizona | New York | 7 | 6 | 6½ | Jan., 1920 | 0.25 |
| Superior & Boston | Boston | 1⅜ | 1¼ | 1⅜ | | |
| Tenn. C. & C. | New York | 11⅛ | 10⅜ | 10⅞ | De.31, Ja.15, Q | 0.25 |
| United Verde Ex. | N. Y. Curb | 23 | 22½ | 22½ | Jy. 6, Aug. 1 | 0.50 |
| Utah Copper | New York | 100⅛ | 99½ | 100⅛ | Mh.20, Mh 31, Q | 1.00 |
| Utah Metal & T. | Boston | *55 | *45 | *45 | Dec., 1917 | 0.30 |
| Victoria | Boston | *25 | *25 | *25 | | |
| **Walker Mining** | Salt Lake | 2.30 | 2.20 | 2.27½ | | |
| **NICKEL-COPPER** | | | | | | |
| Internat. Nickel | New York | 35 | 31 | 34⅞ | March, 1919 | 0.50 |
| Internat. Nickel pfd. | New York | 100 | 99¾ | 100 | Jy.16, Au.1, Q | 1.50 |
| **LEAD** | | | | | | |
| Carnegie Lead & Zinc | Pittsburgh | 7 | 6⅞ | 6⅞ | | |
| Glad-stone M. M. Co. | Spokane | *24½ | *22½ | *24½ | Jy. 1, Jy. 10 | 0.01½ |
| National Lead | New York | 164⅜ | 151½ | 162 | Sep.11, Sep.30 | 2.00 |
| National Lead pfd. | New York | 118½ | 118¼ | 118½ | Aug.21, Sep.15 | 1.75 |
| St. Joseph Lead | New York | 43⅜ | 41½ | 42¾ | Jn.9, Jn.22, | 0.50 |
| **ZINC** | | | | | | |
| Am. Z. L. & S. | New York | 8⅛ | 7⅞ | 8⅛ | May, 1920 | 1.00 |
| Am. Z. L. & S. pfd. | New York | 33½ | 29 | 33 | Nov., 1920 | 1.50 |
| Butte C. & Z. | New York | 6½ | 6⅛ | 6¼ | De.10, De.24 | 0.50 |
| Butte & Superior | New York | 11⅞ | 10¾ | 11⅝ | Mh.19, Mh.31 | 0.50 |
| Callahan Zn-Ld. | New York | 3⅛ | 2⅞ | 3⅛ | Dec., 1920 | 0.50 |
| New Jersey Zn. | N. Y. Curb | 205½ | 191½ | 205½ | Jn.20, Jy. 10 Ex. | 2.00 |
| United Zinc | N. Y. Curb | | | *35 | | |
| Yellow Pine | Los Angeles | *71½ | *71½ | *71½ | De.10, De.15 Q | 0.04 |
| **GOLD** | | | | | | |
| Alaska Juneau | New York | 1¾ | 1⅝ | 1¾ | | |
| Argonaut | Toronto | *29 | *25½ | *29 | | |
| Barry-Hollinger | Toronto | *40 | *38 | *38 | | |
| Carson Hill | Boston | *30 | *25 | *30 | | |
| Consol. W. Dome L. | Toronto | *14 | *13 | *13⅜ | | |
| Cresson Consol. G. | N. Y. Curb | 3 | 3 | 3 | Mh.31, Ap.10 Q | 0.10 |
| Crown Reserve | Toronto | *16½ | *16 | *16 | Jan. 1917 | 0.05 |
| Dome Mines | New York | 14⅜ | 14 | 14 | Mh.31, Ap.20, Q | 0.50 |
| Golden Cycle | Colo. Springs | 1.51 | 1.50 | 1.51 | Dec.11, 1924 | 0.03 |
| Hollinger Consol. | Toronto | 14.90 | 14.80 | 14.90 | Au.24, Se.9 | 0.08 |
| Homestake Mining | New York | 45½ | 44⅜ | 44⅜ | Au.20, Au.25 M | 0.50 |
| Kirkland Lake | Toronto | *46 | *43½ | *46 | | |
| Lake Shore | Toronto | 6.45 | 6 30 | 6.45 | Mh.2, Mh.16, | 0.05 |
| McIntyre-Porcupine | New York | 19⅛ | 18½ | 19⅛ | Aug.1, Sept.1 | 0.25 |
| Newray | Toronto | *25½ | *22 | *25½ | | |
| Night Hawk Pen. | Toronto | | | *20 | | |
| Portland | Colo. Springs | *47 | *42 | *42 | Oct., 1920 | 0.01 |
| Rand Mines | New York | | | 39½ | Au.17, Au.25 | 1.52 |
| Teck-Hughes | Toronto | 1.69 | 1.67 | 1.68 | | |
| Tom Reed | Los Angeles | *55 | *45 | *55 | Dec., 1919 | 0.02 |
| Tough-Oakes | Toronto | *35 | *31 | *35 | | |
| United Eastern | N. Y. Curb | | | *47 | July, 1924 | 0.05 |
| Vipond Cons. | Toronto | 1.20 | 1.16 | 1.18 | | |
| Wright-Hargreaves | Toronto | 5.15 | 5.10 | 5.10 | Jn.15, Jy.1 | 5.00 |
| **GOLD AND SILVER** | | | | | | |
| Black Oak | N. Y. Curb | | | *81 | | |
| Con. Cortez | N. Y. Curb | *8 | *8 | *8 | | |
| Con. Virginia | San Francisco | 6½ | 5½ | 5½ | | |
| Continental Mines | N. Y. Curb | | | 1⅛ | | |
| Dolores Esperanza | N. Y. Curb | | | *50 | July, 1923 | 0.05 |
| Premier Gold | N. Y. Curb | 2⅜ | 2⅛ | 2⅛ | Jn.18, Jy.1, | 0.08 |
| Tonopah Belmont | N. Y. Curb | *87 | *75 | *86 | Sep. 15, Oct. 1, | 0.05 |
| Tonopah Divide | N. Y. Curb | | | *23 | Oct., 1923 | 0.10 |
| Tonopah Extension | N. Y. Curb | 1 1/16 | 1⅛ | 1⅛ | Mh.11, Ap.1, Q | 0.05 |
| Tonopah Mining | N. Y. Curb | 5¼ | 4⅝ | 5⅛ | Mh.31, Ap.21, | 0.07½ |
| Unity Gold | N. Y. Curb | *85 | *80 | *85 | | |
| West End Consol. | N. Y. Curb | | | *50 | Mar., 1923 | 0.05 |
| Yukon Gold | N. Y. Curb | *26 | *26 | *26 | June, 1918 | 0.02 |

| Stock | Exch. | High | Low | Last | | Last Div |
|---|---|---|---|---|---|---|
| **SILVER** | | | | | | |
| Alvarado | Boston Curb | †1 | †*25 | | Oct. 1920 | 0.50 |
| Beaver Consol. | Toronto | *33½ | *31 | *33½ | May, 1920 | 0.03 |
| Castle-Trethewey | Toronto | 1.10 | *93½ | 1.10 | | |
| Coniagas | Toronto | 1.55 | 1.55 | 1.55 | May, 1924 | 0.12½ |
| Keeley | Toronto | 1.81 | 1.77 | 1.77 | Au.31, Se.15 RX | 0.12 |
| Kerr Lake | N. Y. Curb | 1⅛ | 1⅛ | 1⅛ | Ap.1, Ap.15, Q | 0.12½ |
| La Rose | Toronto | *42½ | *40½ | *42 | Apr., 1922 | 0.10½ |
| Lorrain Trout Lake | Toronto | | | *93 | Jy. 2, Jy.15 | 0.05 |
| McKinley-Dar.-Sav. | Toronto | *23½ | *21 | *23½ | Oct., 1920 | 0.03 |
| Mining Corp. Can. | Toronto | 2.58 | 2.56 | 2.58 | Jy.1, Jy.15 | 0.12½ |
| Nipissing | N. Y. Curb | 4⅞ | 4½ | 4⅞ | Jn.30, Jy.20, Q | 0.15 |
| Ontario Silver | New York | | | 6¾ | Jan., 1919 | 0.50 |
| Temiskaming | Toronto | | | *16 | Jan., 1920 | 0.40 |
| **SILVER-LEAD** | | | | | | |
| Ahumada | New York | 11½ | 10⅜ | 11½ | Jn.15, Jy.2, OEx | 0.25 |
| Bingham Mines | Boston | 36½ | 31 | 34 | Jn.20, Jn.30 Q | 0.50 |
| Cardiff M. & M. | Salt Lake | 1.50 | 1.45 | 1.50 | De.16, No.18 | 0.10 |
| Chief Consol. | Salt Lake | 2.65 | 2.40 | 2.40 | Ap 10, My. 1 | 0.10 |
| Columbus Rexall | Salt Lake | *8½ | *8 | *8 | Aug., 1923 | 0.05 |
| Erupcion | Boston Curb | 2⅜ | 2⅛ | 2⅛ | Jn.15, Jy.2, QEx | 0.25 |
| Federal M. & S. | New York | 10½ | 10¼ | 10⅜ | Fe.26, Mh.15 Q | 1.75 |
| Federal M. & S. pfd. | New York | 61⅜ | 59⅛ | 60⅜ | Au.25, Se.15, | 1.75 |
| Hecla Mining | N. Y. Curb | 16⅜ | 16⅛ | 16⅜ | Au.15, Se.15 Q | 0.50 |
| Iron Blossom Con. | Salt Lake | | | *39 | Oc.25, 1924 | 0.01½ |
| Iron King Mining | Salt Lake | *51 | *50 | *50 | | |
| Keystone Mining | Salt Lake | *75 | *67 | *75 | Au.12, Au.26 | 0.07½ |
| Mammoth Mining | Salt Lake | 2.75 | 2.40 | 2.75 | My.15 Mv.25 | 0.10 |
| Marsh Mines | N. Y. Curb | | | *4 | June, 1921 | 0.02½ |
| Park City | Salt Lake | 5.85 | 5.80 | 5.85 | Jn.15, Jy.1 Q | 0.15 |
| Park Utah | Salt Lake | 5.90 | 5.80 | 5.90 | April, 1924 | 0.15 |
| Prince Consol. | Salt Lake | *44 | *37 | *44 | | |
| Silver King Coal | Salt Lake | 8.75 | 8.50 | 8.60 | Jn.20, Jy 1, Q | 0.25 |
| Silversmith | Spokane | *23 | *19¾ | *22¾ | Jy.1, Jy.10 | 0.01 |
| Tamarack-Custer | Spokane | *70 | *60 | *70 | Sept, 1924 | 0.25 |
| Tintic Standard | Salt Lake | 12.25 | 11.62½ | 12.25 | Jn.24, Jn.29 Q | 0.40 |
| Utah-Apex | Boston | 6½ | 6½ | 6¾ | Jy.3, Jy.15, Q | 0.35 |
| Western Utah Copper | N. Y. Curb | | | *11 | | |
| **IRON** | | | | | | |
| Bethlehem Steel | New York | 42⅜ | 41 | 42 | July, 1924 | 1.25 |
| Char. Iron | Detroit | | | *20 | | |
| Char. Iron pfd. | Detroit | | | *85 | | |
| Colorado Fuel & Iron | New York | 41⅜ | 39½ | 40½ | May, 1921 | 0.75 |
| Gt. North'n Iron Ore | New York | 29½ | 27 | 28⅜ | Ap.11, Ap.30 | 1.00 |
| Inland Steel | New York | 43⅞ | 41 | 43⅞ | Au.14 Sep.1, Q | 0.62½ |
| Mesabi Iron | N. Y. Curb | 2 | 2 | 2 | | |
| Replogle Steel | New York | 15⅜ | 14½ | 15⅜ | | |
| Republic I. & S. | New York | 50⅞ | 48 | 50 | May, 1921 | 1.50 |
| Republic I. & S. pfd. | New York | 90⅞ | 90 | 90⅜ | Se.15, Oc.1, Q | 1.75 |
| Sloss-Sheffield S. & I. | New York | 104½ | 97½ | 104 | Jn.10, Jn.20 Q | 1.50 |
| Sloss-Shef. S.&I. pfd. | New York | | | 97½ | Jn.20, Jy.1, Q | 1.75 |
| U. S. Steel | New York | 124⅞ | 121½ | 124⅝ | Au.29, Au.31 Q Ex | 1.75 |
| U. S. Steel pfd. | New York | 124¾ | 124¼ | 124½ | Aug. 3, Aug. 29, Q | 1.75 |
| Virginia I. C. & C. | New York | 33 | 33 | 33 | Jan., 1924 | 1.50 |
| Virginia I.C.&C.pfd. | New York | | | 73 | Jn.20, Jy.2, | 2.50 |
| **VANADIUM** | | | | | | |
| Vanadium Corp. | New York | 31½ | 29 | 30¾ | Aug.1, Aug.15 | 0.50 |
| **ASBESTOS** | | | | | | |
| Asbestos Corp. | Montreal | 71 | 70 | 71 | My.1, My.15 Q | 1.00 |
| Asbestos Corp., pfd. | Montreal | 102 | 98½ | 102 | Ap. 1, Ap. 15, Q | 1.50 |
| **SULPHUR** | | | | | | |
| Freeport Texas | New York | 17⅞ | 16½ | 16¾ | Nov., 1919 | 1.00 |
| Texas Gulf | New York | 115 | 111½ | 111½ | Au.31, Se.15, Q | 2.00 |
| **DIAMONDS** | | | | | | |
| De Beers Consol. | New York | 25⅛ | 15⅛ | 25⅛ | Jy.27, Au.30 | 0.97 |
| **PLATINUM** | | | | | | |
| So. Am. Gold & P. | N. Y. Curb | 2⅞ | 2⅜ | 2⅜ | | |
| **MINING, SMELTING, REFINING AND GENERAL** | | | | | | |
| Amer. Metal | New York | 53 | 49½ | 52¾ | Aug. 20, Sep. 1, Q | 0.75 |
| Amer. Metal pfd. | New York | | | 115 | Aug. 21, Sep. 1, Q | 1.75 |
| Amer. Sm. & Ref. | New York | 112½ | 106⅞ | 112½ | Jy.10, Au.1, Q | 1.50 |
| Amer.Sm.&Ref.pfd. | New York | 111½ | 110½ | 111¼ | Au.7, Se.1, Q | 1.75 |
| Consol. M. & S. | Montreal | 120½ | 118½ | 120 | Jn.30, Jy.15 | 0.75 |
| Federated Metals | N. Y. Curb | 27 | 25½ | 27 | | |
| Newmont Mining | N. Y. Curb | | | 44⅜ | | |
| Southwest Metals | N. Y. Curb | | | 1 | | |
| U. S. Sm. R. & M. | New York | 43¾ | 38½ | 39 | Jy.6, Jy.15 Q | 0.75 |
| U.S. Sm. R.&M.pfd. | New York | 46½ | 46½ | 46½ | Jy.6, Jy.15 Q | 0.87½ |

* Cents per share. † Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. K, Irregular. I, Initial. X, Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

Boston quotations courtesy Boston Stock Exchange; Toronto quotations those of the Standard Stock Exchange of Toronto, by courtesy of Arthur E. Moysey & Co.; Spokane, Pohlman Investment Co.; Salt Lake, Stock and Mining Exchange and George H. Watson & Co.; Colorado Springs, Colorado Springs Stock Exchange.

## LONDON QUOTATIONS, WEEK ENDED AUG. 15, 1925

| | High | Low | Last | Date | Per Cent |
|---|---|---|---|---|---|
| Aramayo Mines (25 frs.) | 77/6 | 75/— | 75/— | Aug. 1925 | 5(c) |
| British Platinum | 8/3 | 7/7½ | 8/— | Feb. 1925 | 2½ |
| Bwana M'Kubwa | 6/6 | 5/10½ | 6/4½ | | |
| Camp Bird | 2/— | 1/1½ | 2/— | | |
| El Oro | 5/3 | 4/6 | 4/10½ | Nov. 1924 | 2½* |
| Esperanza | —/10½ | —/8½ | —/10½ | | |
| Frontino & Bolivia | 11/6 | 11/3 | 11/6 | July 1925 | 3¾ |
| Mexican Corporation | 13/3 | 12/6 | 13/3 | | |
| Mexico Mines of El Oro | 37/6 | 35/— | 37/6 | June 1925 | 10* |
| Nechi (pref. 10s.) | 1/3 | 1/— | 1/3 | 1921–22 | 25 |
| Oroville Dredging | 6/3 | 5/9 | 6/3 | Dec. 1923 | 3¾ |
| Ouro Preto | 4/6 | 4/4½ | 4/6 | May 1925 | 2½ |
| St. John del Rey | 15/7½ | 15/4½ | 15/6 | June 1925 | 6½ |
| San Francisco Mines | 25/6 | 24/9 | 25/— | June 1925 | 15 |
| Santa Gertrudis | 9/— | 8/7½ | 9/— | July 1920 | 5 |
| Selukwe (2s. 6d.) | 10/3 | 8/3 | 10/3 | April 1917 | 6¾ |
| S. American Copper | 7/10½ | 7/3 | 7/9 | Nov. 1917 | 75 |
| Tanganyika | 45/6 | 40/— | 41/10½ | Sept. 1925 | 5 |
| Tomboy | 4/9 | 4/6 | 4/6 | Sept. 1925 | 5 |
| Union Minière du Haut-Katanga (Brussels) 100 Fr | 6.650 | 6.630 | 6.630 | July 1925 | 150(b) |

* Free of British income tax. (b) Belgian francs. (c) Swiss francs.