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July 4, 1925

Twenty-five Cents Per Copy

ENGINEERING AND MINING JOURNAL-PRESS

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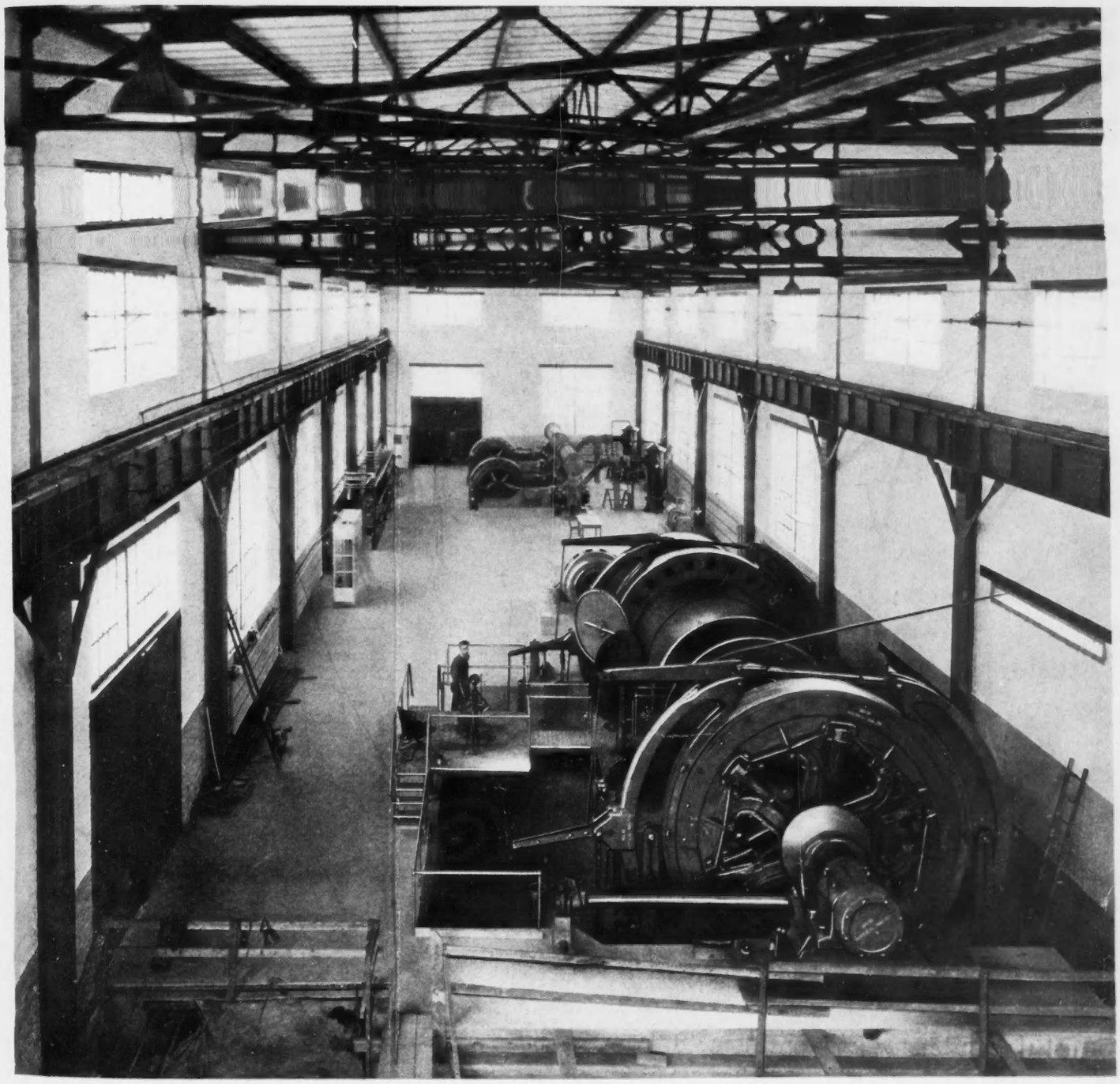

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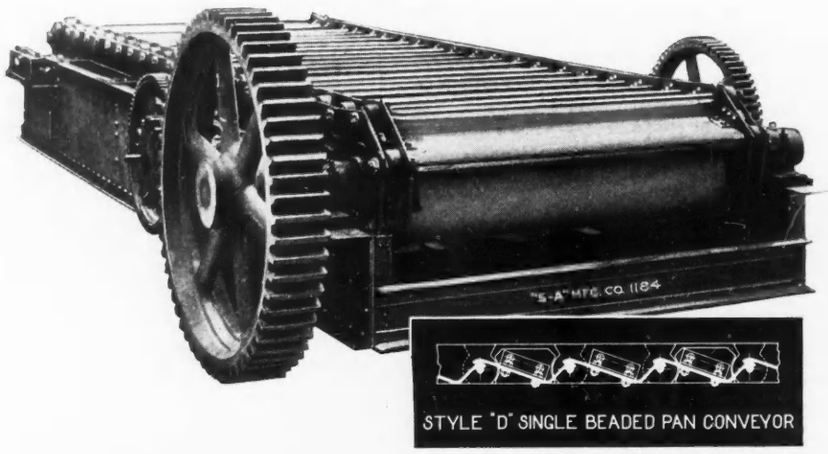

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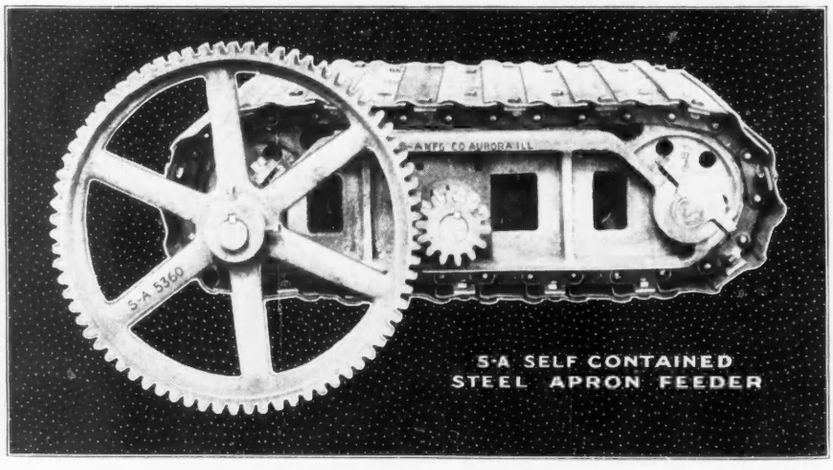

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ENGINEERING AND
MINING JOURNAL-PRESS

JOSIAH EDWARD SPURR, Editor

Volume 120 | New York, July 4, 1925 | *Number* 1

The Franco-German Ore Alliance

IT IS NEWS of the utmost importance that comes concerning the formation of a great Franco-German combination, or cartel, that will harmonize the conflicting coal and iron interests on both sides of the Franco-German boundary. In Alsace and Lorraine and other border states lie all the natural essentials for a great steel industry—abundant and cheap coal and iron ore close to each other, making possible the production of cheap steel and iron. This is naturally the steel and iron center of Europe, and second only in importance to the American Eastern coal and iron fields in the world. The unnatural line of national division has brought about commercial and political strife; endless wars, into whose vortex the world has been sucked; the development of mutually hostile nationalism and of exclusive culture. The wars have failed—the last and greatest leaves the miserable and economically abhorrent situation without improvement. Therefore the entry of business on the stage as the doctor is the only hopeful sign. The new cartel has agreed to the necessary interchange of coal and iron across the hostile boundary; and upon the basis of this commercial union will build up an efficient steel and iron business that is aimed to compete with the world, especially with the United States. It is also pointed out that the workmen employed by this great combination will unite for mutual protection against their employers; and that this will put German and French workers in common sympathy and interests.

This is not the only evidence that where politics and nationalism have hopelessly failed, business may be able to solve the problem. The German reparations question was hopelessly abandoned by the statesmen and the nationalists; plain American business men solved the problem, and not only created an avenue for general prosperity but (which is more important) fostered universal good feeling.

Since big business, an essentially twentieth century product of evolution, became prominent, the universal agreement, hitherto, has been to subordinate it to politics, as something relatively unworthy and dangerous. As big business nevertheless proved itself in many instances to be identical, almost, with national business, the plan has been for national business to depend upon the efforts of its government to push it and protect it against other national businesses. The problem of the interrelation of petroleum industries of the world is a case in point. In this way the tendency was to magnify nationalism and national animosities and foster war. But industry, whether big or small, in the end does not want war; in the end it suffers from economic anarchy. And the latest attitude of business is accordingly not to appeal so much to governmental direction, which has been found so inadequate or even disastrous; and even to solve for itself its own international problems, and if need be the political problems of the nations themselves. This attitude is shown in a general way by the oil companies, by the copper companies. It is a movement well worth watching and indulging. It is commonly believed by a certain element of the population that business makes wars. Indeed, it has been so in the past, when business has hidden behind the governments. But the new tendency is for business, abandoning the shelter of the governments, to be curative, and to be a controlling factor in internationalization and world peace. The slogan "Less government in business and more business in government" takes on an added significance.

Public Education and Private

AT THE TIME when schools and colleges are finishing their year's work, the attention of a large part of the population is temporarily centered upon them. It is universally recognized that education is the great need of the day. A highly gifted and successful New York divine recently resigned and attached himself to the executive work of a college, saying that he felt the future uplift of the race was more in the hands of the schools than of the churches. Of all education, the common school education is, of course, the most important; although the growing tendency is toward a larger proportion in the high schools, and an increasing number in the colleges. Still, only about 4 per cent of the available youth enter college, and only about 2 per cent graduate. Here is indeed a small leaven wherewith to leaven the whole lump, even if the average college graduate were prepared to take his part in the leavening process. As to that, he is, unfortunately, not so disposed, by and large, but that is another story. At any rate, the reliance of the nations must be on the character of the schools of sub-college scale; and very especially those which all must attend, according to law.

As to which school, the bulk of the population have no choice. But a small element have a choice between the public school, open to all, and the carefully organized and guarded private school. Theoretically, the balance should all be in favor of the latter, for those who can pay the price. Actually, this conclusion is open to the gravest of doubts. As to thoroughness of education, the colleges testify to the better grounding given by the average public school than by the better grade of private school. As to preparation for citizenship and the foundation of civic and moral ideals, the closing exercises of some of our public high schools and even grammar schools give astonishing evidence of the ability and devoted work of the teachers and the marvelous results obtained out of heterogeneous and hitherto inferior populations. Here is a system that lifts the lowly and those having had greater starting advantages as to environment and heredity, side by side and alike. One is impressed with the fact that the statement that the public school is the bulwark of our democracy is no hackneyed phrase, but the most vital fact with which

we have to deal; it is not only the base of our democracy but the bulwark of our aristocracy also—the aristocracy of intellect, of character, of service. The ineffectiveness of money in this country has been often pointed out by moralists: it cannot buy the air, the water, contentment, true friendship, or happiness; it also appears to be true that the best and most broadening education is that which comes free, paid for by the commonwealth, where the child of the Italian peasant stands fraternally side by side with the child of the pedigreed Anglo-Saxon, and both are taught efficiently that which they should learn.

Mining and the U. S. Chamber of Commerce

AMONG THE ORGANIZATIONS that are studying the problems of the mining industry is numbered the natural resources production division of the United States Chamber of Commerce, which maintains a permanent staff in charge of W. DuB. Brookings, whose own specialty is forestry. As the name of the division indicates, it covers all natural resources, including agriculture, forestry, petroleum, coal, and metal mining. It is natural that the problems of agriculture and forestry have engaged its attention to a very considerable extent; but among its staff is a competent specialist on coal, Mr. Starr, and another on metal mining, Mr. Winslow. During the past year or so, Mr. Winslow has made an admirable summary of the problem of mining law revision, which has been mimeographed and sent to the chambers of commerce and other constituent members of the U. S. Chamber of Commerce that are so located in centers of mining activity that the subject would be of vital interest. A conspectus of the arsenic problem is also in preparation; and it is proposed to make a similar examination of the lead problem. According to the custom of the U. S. Chamber of Commerce, the program of the division of natural resources is regulated by an advisory committee of fourteen, on which the metal-mining members are Sidney Jennings and J. E. Spurr.

The activities of the U. S. Chamber of Commerce are, of course, closely co-ordinated with those of the Department of Commerce, but are not necessarily parallel or conforming. There is the advantage over any government department or bureau of the lack of that political pressure, of that depending upon the appropriations of a heterogeneous Congress, of that likelihood of unfair attack which haunts the government official. In this respect the U. S. Chamber of Commerce shares the same advantages as the American Mining Congress, with the advantage over the latter that it does not depend upon special contributions and campaigns from groups interested in some special legislation. In other respects, of course, the government departments and the Mining Congress have their own proportional advantages and justification, which it would be superfluous to enumerate. Finally, however, in stating the case for the U. S. Chamber of Commerce, the conclusions of the natural resources production department have to be co-ordinated with the needs and views of other branches of commerce and industry, and pass the approval of the board of directors, before they can be promulgated in any way. Once promulgated, however, they may find their way through a highly organized system of member local chambers and societies, with the stamp of probable judicial investigation and conclusion; and so should be of weight. It is true that this organization is numerically small; but as a co-ordinating and interpreting group, utilizing the work of other elements in the organization of the mining industry, it does not need an extensive organization.

Inter-Ally Debts

TOTAL TAXES in the United States during 1924 amounted to 11.5 per cent of the whole national incomes, according to reports by the National Industrial Conference Board. As compared with this, the British people were taxed 23 per cent, and the French nearly 21 per cent, of their income. Moreover, Italy paid 19 per cent, and Belgium 17. The increase in America and England, as compared with pre-war days, is about double; but the increase of France is not so much, since it was 13 per cent in 1914. Should the French debt to the United States be funded on the same terms as that of Great Britain, it would mean an increase of approximately 9 per cent in the annual tax burden, bringing the total burden up to 23 per cent of the national income instead of 21, which increase would be ultimately diminished through reparation payments. It will be noted that this total tax burden of France would then be the same as that of Great Britain in 1924; and Great Britain in 1924 taxed herself less heavily than she did a few years ago.

Moreover, most of France's debt is owed to her own people, so that most of the taxation applied to paying interest on her public debt remains within the country, and does not represent a net loss of national income; although the total expenditures for interest would amount to 51 per cent of the total budget expenditures.

If we assume that not only France but the other foreign countries which owe the United States, and have not yet funded their debts, should do so, the board estimates that the burden of the American taxpayer would be reduced thereby by about 4.6 per cent annually; if the saving were applied exclusively to the federal income tax, this could be reduced annually by about 20 per cent of the total. This would mean, however, an added tax burden to the debtor countries about twice as large as the probable relief to the American taxpayer.

Responsibility of Labor

WITH THE IMPLICATIONS in one paragraph in the recent presidential address of Sir Thomas Holland before the Institution of Mining and Metallurgy in London, one may take friendly exception. He is quoted as saying:

"Civilization today depends on adequate supplies of base metal, so that every improvement in the treatment of ore adds to the actuarial value of civilized life. On the other hand, every increase in the cost of mining and metallurgical operations renders inaccessible some of the available reserves. As labor is the most important item in working costs, a trade-union meeting can undo in a morning the results of a generation's research work in ore dressing and metallurgy."

It is true that every increase in the cost of operations renders certain "ore" deposits, or portions of deposits, unprofitable for the time being. But, likewise, so does a decline in the market price of metals. These factors are purely relative, and, generally speaking, the deposits will be worked just as soon as there

are no longer enough more cheaply exploited deposits to supply the demand of industry. Nothing whatever would be subtracted from the "actuarial value of civilized life" if, for example, the cost of power in the Sudbury nickel district should suddenly be advanced to such an extent that only half the present ore reserves were of high enough grade to be profitably mined at the present market price. When society at large needed the nickel in the lower grade ore it would pay the price, and it would not suffer in the paying.

But the main objection is to the reference to a trade-union meeting. Suppose that the board of directors of a once prosperous mining company, after operating for a few years without profit to shareholders, came to the conclusion that there was no wisdom in continuing to dissipate the capital assets (the ore reserves) of the enterprise. A meeting is held and a formal vote is taken in ten seconds to suspend operations. For the time being the metal in that mine ceases to flow into industry; but the directors ought not be censured. If a group of mine workers, after experiencing a long period of comparative hardship, and possibly facing rising prices for the necessaries of life, decides that it is wasting its capital assets (the toil of their respective hands and heads), and finally votes to ask for higher wages, should it be condemned out of hand, even though the granting of the demand would prevent profitable operations?

The shutting down of no mine or mill in the world is going to undo "the results of a generation's research work in ore dressing and metallurgy." Those results will be available when the time comes to resume operations; and even if the mine should never produce again, the research work would have added, in exact proportion to its original value, to the sum total of scientific knowledge in whatever particular phase of ore treatment it concerned.

China Awakening

WHY CHINESE CUSTOMS should differ so markedly from those of the Western world, being often diametrically opposite, has always been an interesting matter for speculation, even though prolonged study leaves the student baffled and with no better answer than that the Chinese mind is different. Great changes have occurred in China in recent years: the empire has become a republic, the Chinaman has lost his queue, the beginnings of an industrial awakening in this agricultural country are apparent. How far Chinese psychology will permit the Chinese to develop industrially along Western lines or to produce a development peculiarly their own is a question for the future. Leading Chinese evidently do not regard the national psychology as a drawback to industrial development. To them such development is a matter depending on transportation, finances, natural resources, and the cessation of domestic strife.

Transportation is the country's most vital need. Industrial enterprise of all sorts is dwarfed and restricted by the lack of it. Even with labor purchasable for a song, with abundant fuel resources, the production of raw material and manufacturing are hampered or made impossible because of the primitive and costly mode of carrying freight, in which fully a quarter of the population is said to be engaged. Industrial development thus far in modern China has taken place only in the more accessible localities. At the recent meeting of the American Iron and Steel Institute in New York Dr. Chenting T. Wang presented a paper on "Industrial Progress in China." "Given 20,000 additional miles of railway," he says, "100,000 extra miles of good roads and highways, a decade of peace and order and a substantial amount of assistance from the principal treaty powers, the results attained can be increased several fold without much difficulty." Dr. Wang, in recounting his country's industrial progress, reviews as the main features the growth of the cotton industry and prosperity of the mills, the growth of iron works and dockyards, the increase in number of up-to-date factories and in the volume of Chinese exports as well as in the number and strength of modern banks. The number of mining areas that are being worked and their output have also increased. The latest available figures give the number of areas as 1,966, engineers employed 2,142, technical staff 9,308, an annual output of coal of almost 20,000,000 tons, iron ore 1,153,000, antimony 12,000, and tin 9,000 tons.

China has great mineral resources on which its industrial development might be based. Despite this, in only a few metals has it thus far attained an important position in the markets of the world. Delving into Spurr's "Political and Commercial Geology," we find that coal, antimony, tungsten, tin and lead, iron, copper, gold, and mica are the only minerals mentioned in the references to China. The country has enormous coal resources, the reserves of the better grades being surpassed by those of no country save the United States. Japan has made strong efforts to develop the country's iron deposits as well as those of Manchuria and Korea, having scant resources of her own, and production has rapidly increased. The deposits of most importance are at Han-yang in Hu-peh province. In antimony, China figures importantly, yielding more than half the world's supply, the metal coming from the central and southern provinces; the deposits of Hunan are the most exploited, 90 per cent of the total coming from the Changsha region, where the smelting industry is centered. In Hunan are ten or more lead mines, all controlled by Chinese. At Changsha also is the country's only modern lead smelter, this under Japanese control. Tungsten deposits, alluvial and vein, of eastern Asia are so important that their output will be a factor for years to come. Chinese tin comes from Yunnan province, much of it smelted locally, the metal being consumed chiefly at home. At present a few hundred tons a month comes to the United States, 2,650 tons in all in 1924.

The copper industry—chiefly in Yunnan and producing 2,000 tons a year—is regulated closely by the government, because of the country's copper currency. There is one big mine at Tungschuanfu. Deposits of gold are small and scattered. They are of low grade and worked by natives. A government-owned mine on the Island of Hainan is said to offer little promise. Lastly, near Kiao-Chau Bay there are large deposits of muscovite mica, which have not yet been developed. Prospecting for petroleum has yielded no important results.

Unrest and disorder in China, due to Soviet agitation, will no doubt quiet down again. But eventually, especially as transportation facilities are improved, the industrial devolpment of the country, now scarce begun, will transform the nation into one conscious of its strength and little disposed to submit to the encroachment of foreign powers upon its sovereign rights.

Mining Engineers of Note

Arthur J. Bensusan

Manager Ouro Preto Gold Mines of Brazil

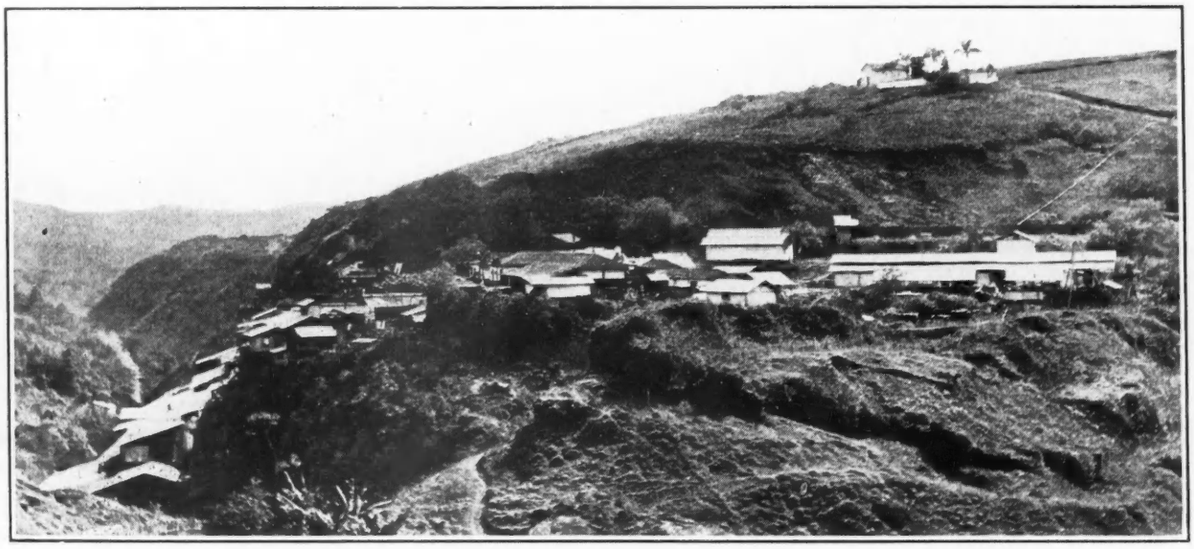
HAVING had a varied and creditable career of engineering accomplishment in three continents, Arthur J. Bensusan, manager of the Ouro Preto Gold Mines of Brazil, may be accepted as typical of the many soldiers of industry of the front line serving well the British Empire in its wide-flung battlefront for world business. He was born in Sydney, New South Wales, and after several years of practical mining experience in the Australian districts he completed the mining and metallurgical courses at the Royal School of Mines of London. Following this came more Australian mining experiments and then responsible mine management in West Africa and in the Transvaal. Then a course of topographical surveying at the Royal Geographical Society of London and subsequently the management of the Ouro Preto gold mines at Passagem, in the State of Minas Geraes, Brazil, which position has engaged his principal efforts since 1905.

During his long period of active engineering work Mr. Bensusan has found time and occasion for extensive world travel, chiefly for the definite purpose of studying ore deposits and mining methods so as to bring to his own work the experience of other engineers and of other countries. In this connection Mr. Bensusan has made several trips in recent years to the principal North American mining districts, visiting Arizona, California, Colorado, Utah, Michigan, and Ontario.

In accordance with the very wise policy of the large British mining operators, these front-line representatives are permitted and in fact required to spend several months every two or three years in London, for their own improvement of mind and morale partly, but chiefly to establish a close personal and business contact between the man at the mine and the home office and the shareholders. This policy of a sort of Sabbatical period for the engineer and manager of the British mine companies is one that could be well emulated by the American companies operating in foreign lands.

Mr. Bensusan has found in the old mines at Passagem a full opportunity for the application of his wide experience and knowledge in both mining and metallurgy, and after many difficulties, not the least of which was the gymnastics of Brazilian exchange due to world and local causes during a long period, he has established these important undertakings on a sound profit basis for the patient and persistent British shareholders who have long backed the business because of their confidence in John A. Taylor & Sons, of London, the consulting engineers for the company, and their belief in the engineering skill and executive ability of Mr. Bensusan.

During recent years a number of American engineer-scouts have had occasion to spend some time in the Ouro Preto region of Brazil examining iron, manganese, or gold, and they all are in accord in acknowledging the hospitality and material help that has been fully extended to them in this out-of-the-way corner of the world by Mr. Bensusan and by Mrs. Bensusan, who is also a "front liner" for the cause of the Empire.



Cyanide plant at the Passagem mine of the Ouro Preto company

Raising Tank-House Efficiency in the British America Nickel Refinery

Many Improvements Made in Operating Details of Hybinette Process Are Suggestive to Other Electrolytic Refiners

By Frank E. Lathe
Metallurgist, Aylmer East, Quebec

F. E. Lathe

ONLY three companies have produced electrolytic nickel on a large scale. The International Nickel Co., at its Port Colborne refinery in Ontario, makes high-grade cathodes for special purposes, by the electrolysis of anodes of fire-refined nickel. The Kristianssands Nikkelraffineringsverk, in Norway, for some years produced a considerable quantity of nickel by the Hybinette process, using an anode containing 20 to 30 per cent of copper. This plant has been closed for some years, but has been kept in readiness for operation under more favorable conditions. The British America Nickel Corporation built a refinery at Deschenes, Quebec, and operated it for about two years, using Hybinette's process. Although this plant was shut down when the company went into the hands of a receiver in July, 1924, its process may be of interest to other electrolytic refiners, particularly the methods adopted there to increase current efficiency in the nickel tank-house.

Copper and Nickel Refining Compared

In copper refineries there is a continuous effort to raise the current efficiency, or, if it be already high, to maintain it. Current efficiency is important, not only on account of the cost of power, but also because of its effect on the capacity of a plant and the tie-up of metals in process. When the refinery of the B. A. N. C. commenced operations, a flat rate was paid for power, and the quantity of matte received from the company's smelter was well below the capacity of the refinery to treat. Under such conditions it was natural that the question of current efficiency should not receive so much attention as other technical problems. Later, with the plant operating at full capacity, it became imperative to obtain the greatest efficiency possible.

The copper refiner, accustomed to 90 to 93 per cent efficiency in his own plant, will think that the 85 per cent averaged by the B. A. N. C. during its last few months of operation bespeaks poor management. As a matter of fact, very considerable effort was necessary to reach that figure. The following considerations will make clear why:

(1) *Operation with a green crew.* In starting a nickel refinery at Deschenes, Quebec, it was necessary to employ unskilled labor, and considerable time was required to select capable men and train them in their new duties.

(2) *The position of nickel in the electrochemical series.* The rank is as follows: Cu, H, Pb, Ni, Co, Fe, when electrolyzing with a sulphate electrolyte, as we did. From this it is evident that, although copper is deposited in preference to hydrogen, the opposite is true of nickel. In fact, the deposition of nickel is successful only because in electrolysis its ions are present in far greater concentration than those of hydrogen. By reducing the hydrogen ions almost to zero, as in malleable nickel practice, the efficiency rises very close to 100 per cent, whereas in solutions as acid as a copper electrolyte, no nickel at all would be deposited under ordinary conditions. The presence of some acid (0.2 to 0.3 gram per liter) is necessary to prevent the deposition of basic salts on the cathode, but as the acidity increases with current density, owing to a falling off in anodic efficiency, it is evident that the difficulty is accentuated under conditions where maximum output is required. In a normal Hybinette electrolyte, containing 1.0 g.p.l. of sulphuric acid, the liberation of hydrogen at the cathode reduces the current efficiency by 5 to 8 per cent. With much sulphur in the anodes, and consequently a large amount of adherent slime, the loss may be more than 10 per cent. To be sure, much of the hydrogen is retained by the nickel instead of being liberated as gas, but this fact is of little practical importance, owing to the low equivalent weight of hydrogen. It may be noted, too, that all the deposited hydrogen will be expelled if the cathode nickel be converted into ingots or shot.

(3) *High voltage.* The voltage is about ten times as high as in copper refining, and the leaks to ground, through the solution pipes, etc., are correspondingly increased.

(4) *Treeing.* More treeing occurs with the same current density. The reasons for not reducing this by means of increased circulation will be seen later. The use of addition agents is not effective.

(5) *Flaking.* The flaking of deposited nickel, caused by an interruption of the current or otherwise, is more serious than the curling of starting sheets in a well-regulated copper refinery.

However, nickel refining, using cathode frames, has the advantage over copper that there is less trouble due to careless spacing, cathodes cannot touch the lead lining of the tanks, and falling anode scrap is less likely to cause short-circuits.

Outline of Hybinette Process

The solution flow-sheet shown in Fig. 1 will make clear the circulation of the electrolyte. In addition, a brief description of the principal features of the tank-house will be given.

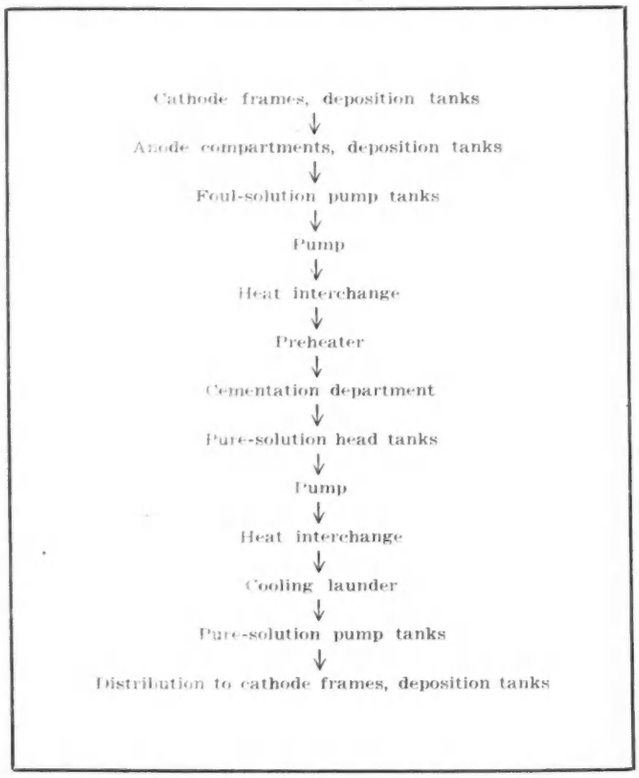


Fig. 1—Solution flow-sheet, Hybinette process

There were 168 deposition tanks in use, each 24 ft. 6¾ in. long, 2 ft. 7¾ in. wide and 4 ft. 2½ in. deep, inside measurements. These were arranged in two electrical series circuits of eighty-four tanks each. A third circuit was provided for in the construction of the building, but was never completed. All tanks were made of wood, and lead-lined. They were built in pairs, with insulation provided for as in copper refineries.

Each tank contained thirty-five cathodes and thirty-six anodes, the cathodes being made of rolled iron plate, and the anodes, cast in the electric furnace department, containing about 65 per cent nickel, 29 per cent copper and 5 per cent sulphur. Each cathode was suspended in a wooden frame with canvas sides, a small hydrostatic head being maintained by means of purified electrolyte received through ¼-in. rubber tubing, the flow being controlled by pinchcocks. This hydrostatic head caused a flow of solution from cathode to anode compartment and prevented the copper-bearing anolyte from having access to the cathode. The arrangement described was patented by V. Hybinette.

The circulation lines and pumps were of hard lead. Vertical pumps were first installed to handle solutions, but as these proved insufficient they were replaced by horizontal centrifugal pumps direct-connected to 15-hp. motors. These gave good satisfaction.

The heat interchange, designed by the refinery manager, R. L. Peek, was of lead-lined concrete, 17 by 17 ft. in horizontal section and 13 ft. deep. Through this the hot pure and cold foul solutions passed in countercurrent flow, the former entering at the top through numerous lead pipes, while the cold solution was fed at the bottom, and surrounded the pipes. The foul solution was thus heated from about 50 to 65 deg. C. on its way to the cementation department. With an average circulation of 100 cu.m. per hour, it will be seen that this represents a very large saving in steam.

The foul solution for cementation first passed through a preheater. This consisted of a lead-lined tank containing lead pipes for low-pressure steam. The temperature was here raised to 85 or 90 deg. C., though with low-copper anodes there was no difficulty in removing all the copper even at 70 to 80 deg. C. Provision for heating by steam was also made in the cementation tanks.

The cementation department contained four circuits of four to six tanks each, arranged in series. These were partly filled with granulated matte, and the solution was circulated slowly through it, metallic copper cementing out while the metallic nickel of the matte went into solution. About half of whatever iron was in the matte dissolved here also. The free acid was partly neutralized by the matte, especially when the latter was fresh. This was usually an advantage, for reasons already given. The cementation cycle for matte was similar to that used in copper leaching, metallic nickel being the principal solute and copper sulphate solution the solvent.

For some time after the plant was put into operation in the spring of 1923 (after a shut-down of two years) the question of current efficiency was of secondary importance, as explained above. The actual efficiency over a period of ten months averaged 74 per cent. However, when low efficiency became the limiting factor in the production of cathode nickel, corrective measures were applied.

The composition of the electrolyte could not be varied over a wide range, being largely governed by the steam required for heating the solution, the amount of water used in washing, and the current density. Other things being equal, it is an advantage to have the nickel content of the solution fairly high—about 50 g.p.l. This was effected by installing the preheater and passing the condensate to waste instead of admitting a large quantity of live steam to the solution in the cementation tanks. The control of the free acid was still more diffi-

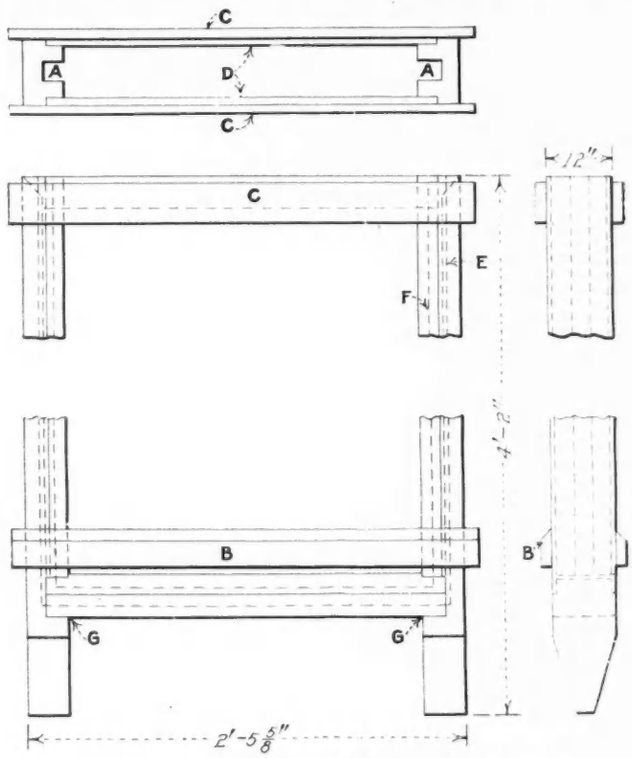


Fig. 2—Improved cathode frame, or "bag."

cult. Analyses showed that whatever the acid in the solution feed might be, all samples taken from the cathode frames showed the catholyte to be nearly neutral. It was clear that if the flow of solution could be lowered, less acid would be introduced in the feed, although this would be partly balanced by a higher acid content of the foul solution. Any reduction in flow would also save steam required for cementation. On the other hand, if too little circulation were given, basic salts might be deposited on the cathodes.

New Cathode Frame Designed

To reduce the flow of solution it was necessary to design a new cathode frame, or "bag," as it was locally called. The old frames were constructed of wooden strips fastened together by dowels or copper spikes. The result was a strong frame, which, however, contained numerous small cracks through which solution might leak. The canvas, dyed in quebracho, could not readily be made more resistant to the passage of solution. After trying out about twenty frames of different design, one was finally adopted in which cracks in the wood were practically eliminated by using heavy posts for the sides and grooving these for the admission of the cathode, as shown in Fig. 2.

This frame was designed for double canvas sides, but single canvas was found satisfactory. The grooves *AA* in the side posts not only centered the cathode but prevented excessive growth of trees along the sides, otherwise caused by high current density. The same protection was afforded at the bottom by *B*. One edge of the latter was beveled to prevent the accumulation of slime. Pieces *CC* at the top held the side posts together, centered the anodes, centered the frame in the tank, and afforded a rest for a metal cover for the frame (not shown), used when lifting anodes, to prevent foul anolyte and slime from falling into the frame. *B* and *C* were fastened to the side posts with wooden dowels. *D* was a narrow strip for the attachment of the canvas at the top and to prevent the entrance of anolyte under the cover when lifting anodes. *E* was a groove for outer canvas—not ordinarily used; *F*, a groove for inner canvas. *G* was the only place where leakage through the frame was possible. The joint here was painted with sodium silicate containing "Duro" cement. The bottoms of the side posts were tapered to fit into grooves in the bottom boards in the tank. The frame as a whole possessed many advantages over the one previously used, and cost less than half as much.

It was also found (on the suggestion of T. F. Torell, general superintendent) that by dipping the canvas in weak sodium silicate solution and afterward in dilute acid the pores in the canvas could be filled with gelatinous silica to any desired extent. One thickness of canvas was then sufficient, whereas previously two had been used. Besides decreasing the flow of solution, the adoption of the new frames reduced by more than 50 per cent each the cost of timber, labor, and canvas, and lowered the percentage of copper in the nickel deposited.

Speed of Ionic Migration a Factor

Another, and unexpected, difficulty was met, however. A good hydrostatic head was being maintained in the new frames, and the solution feed was cut down until there was an occasional greenish cathode deposit, when it was discovered that the speed of flow had in some instances been reduced below the opposing speed of ionic migration, so that copper was finding its way to the cathode. Corrective steps were applied before the trouble became serious. In this connection it is worth noting that as the speed of ionic migration increases with the current density, the flow obtainable must be made to exceed the maximum velocity of the ions over the full range of current likely to be used.

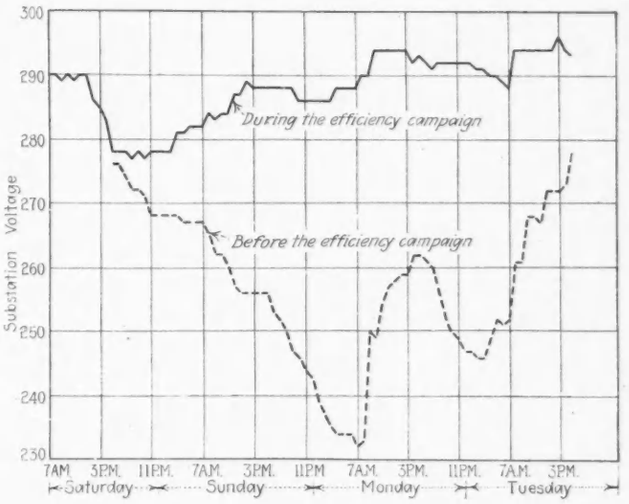


Fig. 3—How voltage variation over week-ends was improved.

Nickel sulphate does not ionize well, this fact partly accounting for the high power requirements of the process. The conductivity of the solution can be increased appreciably by the addition of normal sulphates of other metals, but whether it would pay was not definitely determined during the operation of the plant.

Electrical Methods of Increasing Efficiency

The greatest increase in efficiency was undoubtedly due to the steps taken to prevent short-circuits in the tanks, as shown by hot contacts and lowered voltage. The work of the individual "strippers" responsible for the care of the tanks was checked up by having voltage readings taken at frequent intervals and marked in a conspicuous position on the tanks. Orders were given that voltage maintenance was to receive first consideration. Information as to the condition of the tank-house as a whole was obtained by consulting the sub-station records, where the line voltage of the two circuits was recorded every hour. Previously the greatest trouble had been in getting work done on the tanks at night and on Sundays. Crews were increased somewhat and orders were given that so far as possible the highest weekday voltages were to be maintained.

The success of this work (and of the other corrective measures also, to some extent) may be estimated by a reference to Fig. 3, which shows the variation in substation voltage over two week-ends, these being before and after the beginning of the efficiency campaign, respectively. The current was not constant during these periods, but voltages have been calculated to a uniform current of 3,500 amp. per circuit—8.3 amp. per square foot of cathode surface. The dotted line in the figure shows that under previous conditions the voltage began to fall as soon as the day shift went off duty on Saturday afternoon, and that it continued to drop at a gradually increasing rate until Monday morning, when the day shift came to work again. Voltage then rose rapidly, reaching a maximum at 5 p.m., when a secondary drop took place, lasting until the early

morning hours. Not until about 5 p.m. on Tuesday did the voltage rise to the figure at which it stood at the corresponding hour on Saturday. The maximum drop of 44 volts represented a temporary loss in efficiency of close to 30 per cent. Looking at the continuous line in the figure, a record of voltage taken only a few weeks later, it is evident that it was everywhere higher than before. The only drop of importance, 13 volts, was a regular occurrence on Saturday afternoons, accounted for by the men stopping work on the tanks for the weekly clean-up, the results being not only increased shorts in the tanks but also a slight loss due to leakage to ground, all the tanks and floors being wet from the steam and water used in cleaning. Instead of there being a further drop, the loss of Saturday afternoon was made up at night and on Sunday. Each morning during the week the voltage increased somewhat, owing both to the additional number of men then on the tanks and to the fact that many cathode plates were removed at that time for stripping—scattered plates and not whole tanks, as in copper refining. Over the period shown in Fig. 3 the continuous line indicates an efficiency of 15 to 20 per cent more than that of the dotted line.

When strippers were having difficulty in finding the cause of low voltage on their tanks—and especially at low current densities when hot contacts were rare—voltmeters were used to determine the particular cathode and anodes giving trouble. This work seldom required more than a few minutes per tank.

Measuring Current Leakage to Ground

It was suspected that considerable leakage of current occurred from the tanks and busbars to ground throughout the tank-house. Measurements were therefore made, (*a*) of the resistance to ground, and (*b*) of the current flowing in the lead circulation lines.

For (*a*), a voltmeter, ammeter and suitable resistance were required. Voltage readings were first taken between the busbar and the grounded circulation lines from well-distributed points in the tank-house. In each case the chosen resistance was then connected across the same circuit and the voltage and current both measured. A typical set of readings was: no current, 42 volts; 6.6 amp., 39 volts. This drop of 3 volts when the current was passing was evidently caused by the resistance of the conductors completing the "leakage circuit." As the current was 6.6 amp., the unknown resistance was $R = E \div I = 3 \div 6.6 = 0.45$ ohm. If it be assumed (though it is only approximately true) that the voltage between bus and ground averaged 90 and that half the tanks were affected, an average current loss is found of $90 \div 0.45 = 200$ amp. on half the tanks, or 100 amp. out of a total of 3,500 amp. on all the tanks, producing a drop in current efficiency of 2.9 per cent. It may have been somewhat less than this, but was nevertheless of importance.

(*b*) By means of a millivoltmeter, the voltage drop on short sections of the lead solution lines was measured, and from the conductivity of lead the actual number of amperes flowing was calculated. The current on branch lines in different parts of the tank-house varied from 0 to 180 amp.

The original plans for the tank-house called for the installation of short lengths of hard-rubber pipe in the main solution lines, but for some reason these had not been put in. As soon as the leakage was found to be considerable, a length of this pipe was installed in each of the twelve branch circulation lines. This procedure greatly reduced the current in the lead pipe and increased the resistance of the leakage circuits to approximately 10 ohms, at which figure the loss in current efficiency was negligible.

Current leakage from the tanks to the cellar floor through crystals which had formed in places over the insulation was reduced to a minimum by having such crystals removed at frequent intervals.

Mechanical Conditions Also Improved

In copper refining, actual contact between anode and cathode is common, owing to the curling of starting sheets, but the Hybinette process of nickel refining has an advantage in a cathode that will not curl appreciably, and of actual separation by means of the cathode frame, Fig. 2. This frame made short-circuits impossible except through the formation of accretions or trees on the cathode, or in some similar way.

Slime was collected in coarse bags surrounding and attached to the anodes. Some fine slime passed through these, and occasionally bags were torn, so there was a gradual accumulation of fine slime, pieces of broken anode, etc., in the bottoms of the tanks. A regular system of cleaning tanks was therefore adopted.

In acid solution, nickel gives a rougher deposit than copper, and in spite of the forced separation of cathode and anode just mentioned the growth of trees had constantly to be guarded against. A smooth surface on which to deposit the nickel is a prime requisite. Formerly all smooth plates were painted with graphite before being placed in the tanks, but a dip in sodium sulphide solution was found to result in easier stripping and smoother deposits. Frequently, however, patches of nickel were hard to detach, and when the cathodes were replaced in the tanks, trees grew around their edges. If dipped in sodium sulphide, these patches became permanent, or nearly so, and graphite was therefore applied in its place on the iron surface, being omitted on the nickel patch. This latter then usually came off with the next deposit. An effort was made to clean the plates well each time they were stripped, and when this was possible, sodium sulphide was the proper surfacing material.

Experiments With Aluminum Plates as Cathodes

It may occur to the reader that this problem could have been solved either by the use of a nickel starting sheet, as at the International's refinery, or by substituting aluminum plates for the cathodes, as in zinc electrolysis. In so acid an electrolyte, however, internal stresses were set up in the nickel which made the sheets curl on being stripped and rendered them unsuitable for use as starting sheets. This could have been overcome by putting in a separate circulation and cementation system for a starting-sheet section, and using boric acid in the electrolyte, but such a complication was not considered worth while. Aluminum plates were experimented with at length, and at first every one was enthusiastic about them. The difficulty was in making the plates just rough enough to strip easily without having the deposit flake off in the tanks. The proper surface was approximately secured by light sand-blasting, but this had to be repeated at frequent intervals to keep the plates in condition. Experiments were still under way when the plant was closed down.

The actual results secured by educational work are difficult to determine, though it is believed that educa-

tion was one of the chief factors in raising the nickel tank-house efficiency, as well as greatly improving operations in other ways.

In the foremen's office was kept a continuous record of the power-house voltage on each circuit, as plotted in Fig. 3. The voltage line for each foreman was of a distinctive color, so that all the men could see at a glance which shift was doing the best work. At the end of each month a statement was prepared showing the average voltage gained or lost by each foreman. All of them paid such close attention to voltage that a drop of any consequence, even on a single shift, was rare, without a satisfactory reason for it.

Use was also made of other charts than those for voltage. Thus current efficiency and total cathode production were plotted from month to month, and the desire was very keen to keep the curves on the upward grade.

The strippers' interest was maintained in several ways. The very fact that the voltage of their tanks was written where all could see it was an inducement to good work. An additional incentive was provided in a statement posted daily of the weight of nickel cathodes stripped by each pair of men on the previous day and the cumulative total for the month. At the beginning of the first month of the efficiency campaign a competition was announced, and boxes of cigars were promised those who obtained the highest current efficiency during the month on their section of the tank-house. To be sure, very few of the men knew what current efficiency was, but all could see the daily record sheet, and this was in the long run almost its equivalent. Undoubtedly the men worked more faithfully that month than they ever had before, and the management was so well satisfied with the success of the scheme that eight cash prizes were offered by the company for the second and third months. After three months the results had been such that consent was readily obtained to a bonus scheme by which every pair making 85 per cent efficiency would receive $5 each and those reaching 90 per cent would get $10. Unfortunately, the plant was shut down at the end of three weeks, but the efficiency for that length of time—at somewhat reduced current density—was 90.5 per cent, another new record for the tank-house. It is true that when the prizes were being awarded to only four pairs of strippers some men were disappointed, but these usually tried harder during the succeeding month, and with better success. The bonus system is no doubt the best, for it gives every one a chance.

Educating the Strippers in Proper Method of Taking Care of Tanks

The contest was the cause of a great number of questions by the strippers as to the proper method of taking care of the tanks, and an excellent opportunity was thus afforded of discussing the various points with men who were not only willing but anxious to learn. The strippers were frequently called together for an hour on Saturday afternoon (on company time) and the principles of the process were explained to them, in English and French. Each pair of strippers was also provided with a typewritten sheet (in either language) giving in detail the procedure to be adopted in stripping nickel and caring for the tanks. There was then no excuse for ignorance or forgetfulness. The same was done for the men responsible for the circulation of solution in the tanks.

Not only did the monthly competition furnish an incentive to good work on the part of the strippers but it also served a most useful purpose in showing who were the efficient men. Those at the bottom of the list had in the first month of the contest an efficiency about 20 per cent lower than that of the leaders. Naturally such men did not remain long as strippers unless they showed marked signs of improvement. By the third month the work had become much more nearly uniform. It will be seen that a lot of work was required to weigh and record separately the nickel stripped by twenty pairs of men, keep up the charts, and calculate the current efficiency. This took three or four hours a day, but the work was worth while.

Summary

The Hybinette process consists in the electrolysis of a slightly acid nickel sulphate solution supplied to diaphragm cells with iron cathodes. The soluble anodes contain copper as well as nickel, the copper being dissolved in the anolyte and cemented out by percolation through granulated matte, the electrolyte being thus purified and renewed in nickel content.

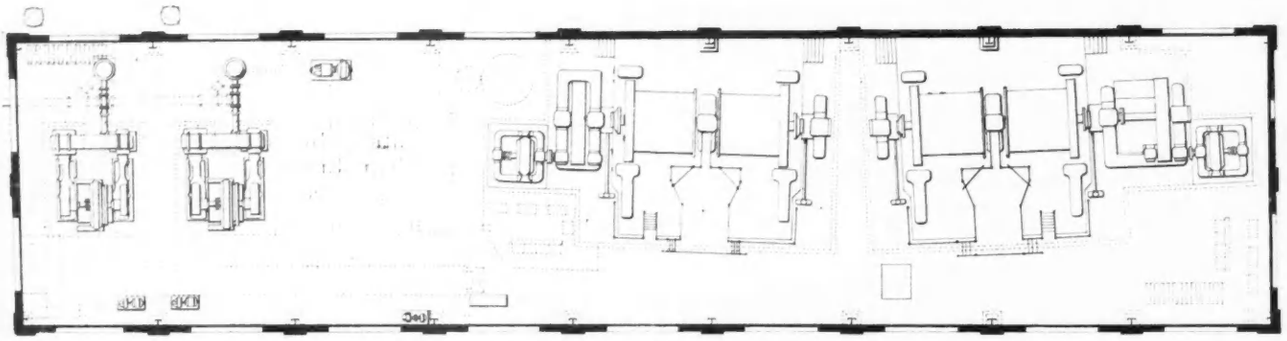
The current efficiency obtained in refining nickel by this process is lower than that usual in copper refining, chiefly owing to the unfavorable position of nickel in the electrochemical series. Hydrogen is liberated more easily than nickel, so the efficiency decreases as the free acid goes up, the loss due to this cause alone sometimes reaching 10 per cent.

The current efficiency in the Deschenes refinery of the British America Nickel Corporation was raised 10 to 12 per cent by an efficiency campaign in which the chief improvements were:

1. Increased attention to the voltage on the tanks, particularly at night and on Sundays.
2. Installation of hard-rubber pipes in circulation lines.
3. Design of a new cathode frame which resulted in a more accurate spacing of cathode and anode and slower circulation.
4. An intensive educational program, each workman receiving not only verbal but detailed written instructions.
5. The daily posting of the weight of nickel stripped by each pair of men.
6. The awarding of prizes and bonuses based on the monthly current efficiency obtained.

Shortly before closing down, the company began changes in other departments which would have materially reduced the sulphur and copper in the anodes. This would have improved operations in the nickel tank-house by decreasing the quantity of slime formed and hence the acidity of the electrolyte, owing to improved anode efficiency. There would also have been less copper to cement out, so that a lower cementation temperature would have sufficed.

I wish, in conclusion, to express my appreciation of the services of Messrs. Aikins, Digby, DiPaul, Johnston, and Kirby, the foremen directly responsible for the carrying out of the work of the tank-house. In spite of certain changes in the staff and a program filled with experiments, which involved much additional work on their part, they gave excellent service throughout and co-operated heartily in every effort to increase efficiency and in the simultaneous campaign to reduce costs. The workmen, too, responded splendidly to the demand for more and better service.



Plan of Montreal Mining Co.'s No. 5 engine house, showing equipment installed

The Montreal Mine's New Engine House

An Interesting Example of Up-to-Date Construction and Layout in the Lake Superior Iron Country

By L. D. Stewart

Oglebay, Norton & Co., Ironwood, Mich.

A NEW ENGINE HOUSE has been recently completed at No. 5 shaft of the Montreal mine at Montreal, Wis., on the Gogebic iron range. This mine is operated by the Montreal Mining Co., Oglebay, Norton & Co., agents. The design of the engine house was prepared by the engineers of the Montreal Mining Co., and the building was erected and incidental engineering work done by the Wordon-Allen Co.

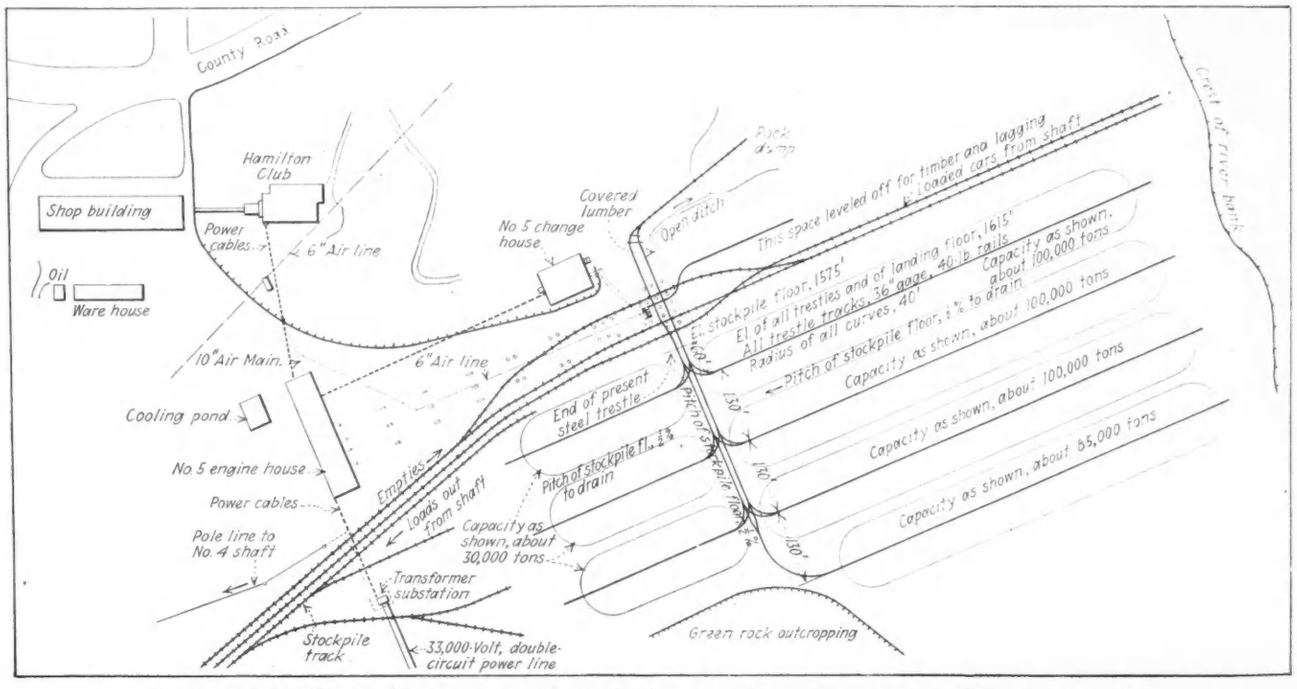
The building, of fireproof construction, is 50 ft. by 212 ft. 9 in. and consists of a steel frame, supporting a 40-ton traveling crane in addition to the roof. Curtain walls of Chicago common-brick laid up in chocolate-colored mortar inclose the building. The roof is of gypsum, laid on tee rails, and covered with a built-up, fireproof roof. The sash and doors are of steel. Factory-hammered glass fills the sash. Each lower sash is equipped with an individual mechanism for ventilation and the upper sash is fitted with gang operators.

The basement floor is of concrete and the main floor of concrete placed over steel beams and reinforcement. A stairway leads to the basement from the main floor at each end of the building.

In addition to other machinery, the building contains two double-drum hoists of Nordberg Manufacturing Co. make. Each is equipped with cast-iron double drums 10x10 ft., and accommodates on each drum 4,500 ft. of $1\frac{3}{8}$-in. cable in two layers. The hoists are furnished with axial plate clutches, which, like the brakes, are operated by pressure from an oil accumulator located in the basement of the building. Lilly safety stops are attached to each drum and the skip hoist is equipped with a Johnson recording system.

These hoists are designed to carry a load of 6 long tons in addition to the weight of the skip, rope, etc. Each hoist weighs approximately 400,000 lb.

The skip hoist is at present being driven by a 600-hp. induction motor, geared to the hoist to operate at a rope



Layout of buildings, shaft, proposed stockpile grounds, and track for ultimate operation

speed of 1,000 ft. per minute. The installation of the gear drive is so arranged that it can be removed very quickly and a first motion motor installed should production increase sufficiently to warrant. The control on the original installation is magnetic. That of the first motion motor when installed will be Ward-Leonard.

The cage hoist is a second motion hoist, driven by a 600-hp. motor, geared to move the drums at a rope speed of 1,000 ft. per minute with the cage in balance. This hoist has magnetic control.

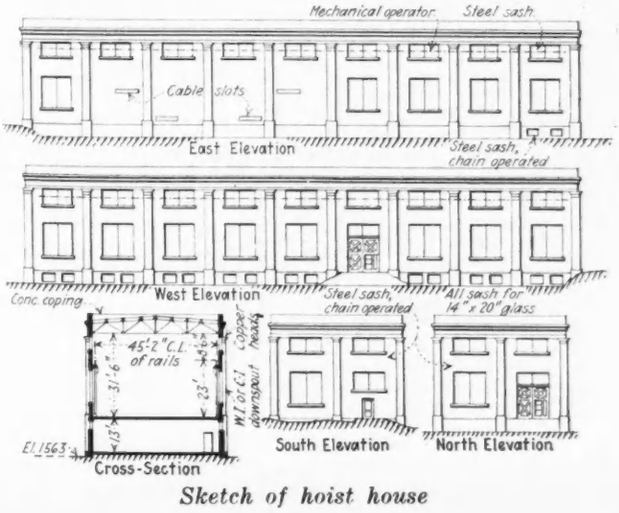
Two Air Compressors Installed

The engine house also contains two air compressors driven each by a 450-hp. motor at 180 r.p.m. The motors are equipped with separate exciters. Circulating water for cooling purposes is supplied the compressors by two centrifugal pumps, drawing 250 gal. of water per minute from a cooling pond outside the building. The compressors are fitted with recording temperature gages and low-water alarms. Each compressor has an aftercooler. A receiver, 300 ft. from the building and housed in an underground vault, takes the air from the compressors. From the receiver the air is delivered to the three shafts of the property through both surface and underground connections.

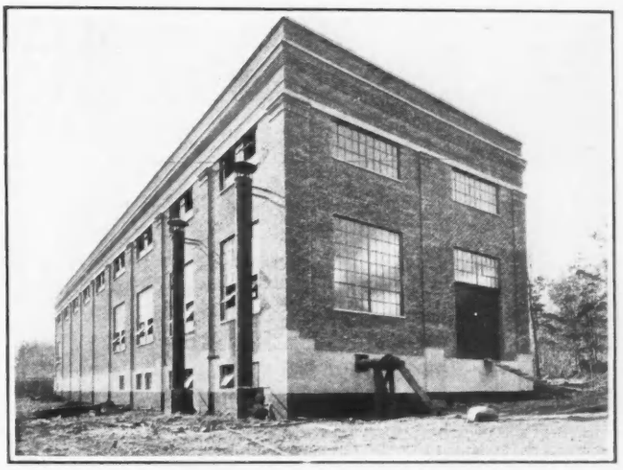
A switchboard of eighteen panels controls all the equipment in the building and the outside service lines. It is located on the main floor of the engine house with the electricially operated switches and cell structure in the basement. The various panels control battery charging, two incoming trunk lines, two motor generator sets, a flywheel set, two compressors, pumps, and auxiliaries. The switchboard is also equipped with suitable instruments to give the operator complete control of his equipment at all times. Each service has a meter so that the proper distribution of separate operations for cost purposes may be determined.

The cell structure is in the basement and houses busbars, transformers, circuit breakers, or switches for control of equipment. All switches are solenoid operated. Each switch is in an independent cell in the structure. The whole switchboard is operated by a storage battery located in the storage-battery room at the end of the cell structure. The storage battery is kept charged by a motor-generator set on the main floor. The voltage on the switchboard is approximately 110 volts direct current.

Current for underground use is carried from the engine house through submarine cables, as are all other



Sketch of hoist house



Completed building as viewed from the Northeast corner

power lines originating in the engine house. Duplicate submarine cables furnish power to the engine house from the substation across the railroad tracks.

There is installed in the engine house a 100-station automatic telephone switchboard which serves the entire property. An auto call system in connection with the telephones permits code calling. The system is also equipped with a watchman's signaling device, so that, by using outside phones, the watchman can record his visits to different parts of the property.

Heat is supplied to the building from wall radiators, which obtain steam from the boiler plant in the nearby dry. Two 500-watt lamps suspended from each roof beam of the building by suitable fixtures furnish ample light to the engine house. Toilet and locker facilities are located in the basement.

German Metal Demand Poor Except for Aluminum

Generally speaking, the German consumption of the important non-ferrous metals is a little more than one-third of pre-war, with the exception of aluminum, which is one-third again as much as in 1913.

The German importation of the more important non-ferrous metals increased considerably in 1924 over that of the preceding year—attributable to the partial recovery of industrial consumption, with the abandonment of passive resistance and the resumption of operations in the occupied Ruhr and Rhineland. Imports of raw copper in 1924 averaged about 9,200 tons monthly, against only 7,000 in 1923; lead, 4,300 tons against 2,900; zinc, 3,600 tons against 2,800; and tin, 730 tons against 470. Compared with the corresponding imports of 1913, however, entrances of these metals were relatively deficient. Imports of raw copper during 1924 were only 49 per cent of the 1913 receipts; of lead, 62; zinc, 78; tin, 60; aluminum, 33; and nickel, 40 per cent. The following table shows imports of the more important non-ferrous metals in 1923 and 1924, compared with 1913.

German Imports of Non-Ferrous Metals

Products	1913 Metric Tons	1923 Metric Tons	1924 Metric Tons
Copper	225,392	83,501	110,290
Lead	83,781	34,770	52,160
Zinc	55,964	34,676	43,641
Tin	14,261	5,564	8,799
Aluminum	15,323	5,447	5,471
Antimony		1,330	1,539
Nickel	3,315	1,398	1,445
Silver	553	9	41

Mechanics of Clastic Dike Intrusion

Laboratory Experiment With Clays Under Pressure Duplicates Structure, Indicating Possible Mode of Origin

By Olaf P. Jenkins

Department of Conservation and Development, Pullman, Wash.

IN A RECENT PAPER, appearing in the *American Journal of Science*, I described several different kinds of clastic dikes occurring in the eastern part of the State of Washington. In the majority of these cases, the dikes were found to be stratified—not horizontally, however, but more nearly in a vertical attitude. The strata, in fact, follow the walls of the dikes in their ramifying course through the materials intruded. The most striking examples of this type of dike occur near Walla Walla in the Touchet sand pit, where dust and sand dikes intrude Pleistocene alluvial materials, cross-bedded sands and gravels of basaltic origin, largely. In the Electric Point and Gladstone mines, there are limonitic clay dikes which have the same structural characteristic and some of the laminations are very thin and regular.

I have been somewhat puzzled over these interesting and peculiar dikes, not so much as to the origin of the fissures which they occupy or as to the source of the materials of which they are composed, but as to their mode of formation. Why should the dikes be so laminated, with the layers running parallel to their walls, no matter how narrow or branching the dike? They have the appearance of being injected and compressed into form.

It recently occurred to me that, through a very simple experiment, the same structure might be duplicated in the laboratory. A letter press was used, two blocks of wood, and several pieces of molding clay of different colors. Flat layers of the clay were laid, one on top of the other, over both blocks, which were placed side by side, but a small crack was left between the blocks under the clay layers. This affair was placed under the letter press, which was then screwed down on the clay, squeezing a part of it into the crack and flattening the rest. The result was interesting. A laminated clay dike was formed with the layers running parallel to the walls of the crack. Not only were all the layers which were placed at first on the wood blocks present in the crack, but they were duplicated. The strata were forced into the crack in the following manner: First, the lowest layer, then the next, and so on, until, as a result, the uppermost layer stood as a center sheet with the other beds arranged in regular order on either side, thus doubling their number. When a smaller crack was used, the layers were thinner.

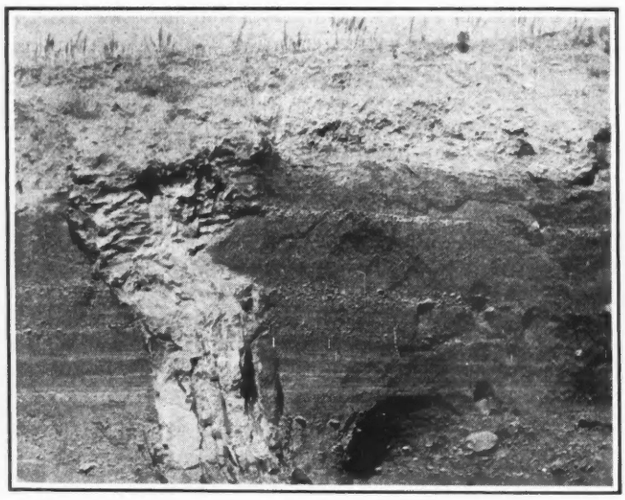


Fig. 1—Clastic dike of dust and sand intruding an alluvial deposit, near Walla Walla, Wash. The overlying layer is of dust

The same experiment was carried on with clays of different plasticity. A very fluid clay on top or between layers got up greater speed than the others in being thus squeezed into a crack and broke out through the other stiffer clays, advancing or squirting to a point beyond. Bunches of powdered material were put inside of balls of clay, and then placed in the press. All were injected by the press into the crack between the wood blocks and came out finally in layered form—not intermixed at all, but in separate and distinct sheets, some of them being quite thin, indeed.

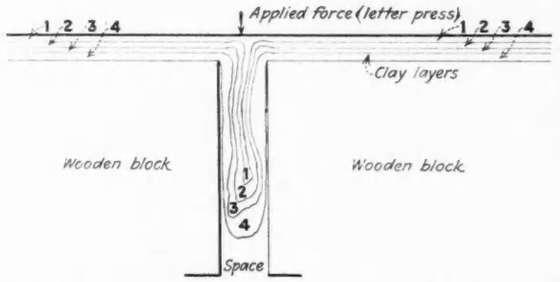


Fig. 2—Diagram showing how horizontal clay layers, one above the other, are squeezed in a crack when pressure is applied evenly from above. This demonstrates how clastic dikes may be formed

Apparently, then, these layers in the clastic dikes are strata-injected, not re-sorted from a mixture. In the Walla Walla cases described they were injected from above, but how? I have attributed the force of gravity of overlying sedimentary beds to the formation of the dikes in the Walla Walla region, and have suggested that the action took place while the sediments were under water. The action must have followed the formation of cracks, and the cracks may have been formed through earthquake disturbances.

Reflecting upon the results obtained with this molding clay and letter press, a question arises. Are not other dikes (igneous dikes or veindikes) formed in much the same manner? Could not the different layers, sometimes found in such dikes, be simply the compressed and injected masses which were previously differentiated in the original magma? Could not the little basic dikes, which are so common in many mining districts, be formed by the "squirting" out from the main magma of the more fluid portions of the parent mass?

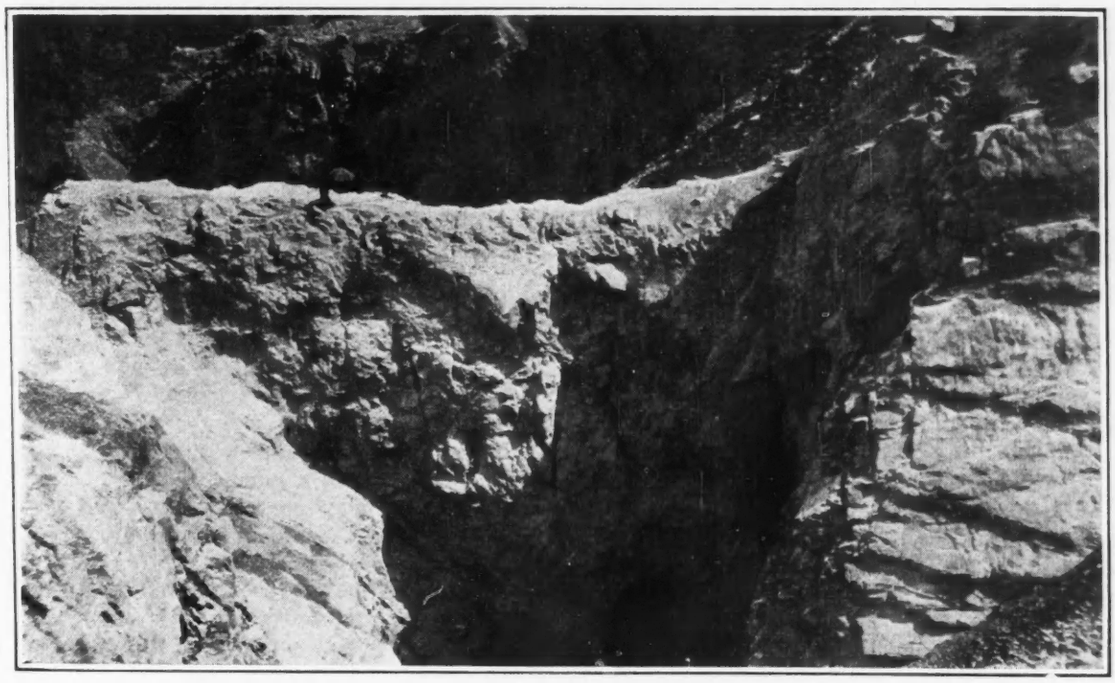
Quarrying Limestone by Glory Holes

Methods Used at Auburn, Calif., by the Pacific Portland Cement Co.—Output 1,500 Tons per Day—Systematic Operation

By George J. Young
Associate Editor

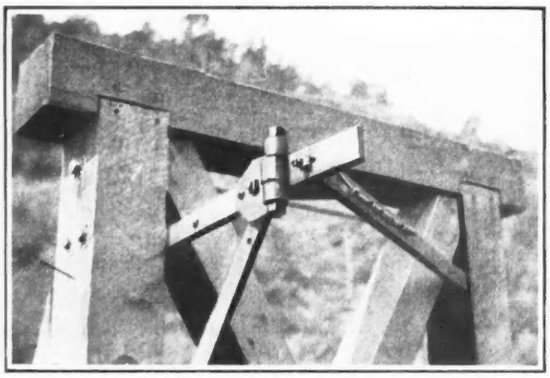
THE LIMESTONE QUARRY of the Pacific Portland Cement Co., near Auburn, Calif., is on the south side of the Middle Fork of the American River, four miles from Auburn. The deposit is in a small area of the Calaveras formation inclosed in amphibolite schist. It is practically vertical and cuts across the river in a north and south direction. On the south side it extends up a steep hill about 700 ft. above the river. It is tapped by an adit tunnel 14 ft. wide by 10 ft. high, which penetrates the hillside at a point about 70 ft. above the river. Vertical raises 8x8 ft. in dimension have been extended up to the surface at intervals of 500 ft. along the adit, and from these glory holes have been opened out. Three pits have been worked, No. 1, No. 2 and No. 3; and of these No. 1 has been worked out, and Nos. 2 and 3 are being worked. A raise midway between No. 2 and No. 3 has just been completed, and preparations are soon to be made to work the hogback between No. 2 and No. 3 pits. The adit is 1,800 ft. in length, the first 1,200 ft. being served by double 36-in. gage tracks and a rope-haulage system. Pits No. 1 and No. 2 are served by chute raises slightly offset from the center line of the adit, and No. 3 by a raise offset on the west side of the adit. The adit is equipped with electric lights, telephone service, compressed air under 105-lb. pressure and water under 300-lb. pressure. A 28-in. galvanized-iron ventilating pipe is suspended from the roof. A multivane fan, driven by a 30-hp. motor, exhausts from this pipe, the inlets being placed close to each chute. A drain ditch is provided between the tracks.

The haulage system consists of an endless wire rope, ¾ in. in diameter, placed between the tracks and supported on rollers at 30-ft. intervals. A 35-hp. motor operates the system. The 6-ton steel cars are attached to the cable by a grip that is operated either by a hand lever or by an automatic tripper. At each loading chute the track grades are designed so as to return the empty car from the incoming track to the loading track by gravity. A tripper frees the incoming car from the cable where the grade is reversed. The car traverses the downgrade to the switch and at this point a sharp upgrade arrests the car and returns it to the crossover switch. This arrangement is placed at each loading chute and is practically automatic in operation.



View looking down into No. 3 pit; hogback between No. 2 and No. 3 pits

The cars are of the end-dumping type, the door at the end of the car being held by a locking lever that is automatically tripped when dumping. The equipment consists of eleven cars. At the unloading point, a car is automatically detached from the main cable and a cable is attached by means of which the car is hauled up to either one of a pair of steep curved inclines over the dumping pits, where the limestone falls into wide open chutes leading into the throat of a No. 9 McCully gyratory rock crusher. At this point a small amount of bulldozing is necessary, and this is done on the receiving floor, several hand-held air drills being pro-

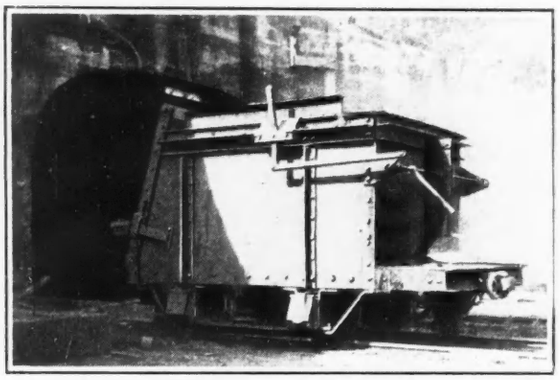


Automatic tripper for releasing cable grips on wire-rope haulage system

vided for the work. Hauling the cars up the incline to the dumping pit is accomplished by two single-drum hoists operated through clutches and belt drives from a common shaft. The dumping of the cars is in charge of one man, who operates the hoists from a central position well above the gyratory and between the dumping pits. A series of signal switches is provided at this point for controlling the operation of the crushers and motors in the crushing plant. A Sirroco fan exhausts the air from the discharge chute of the crusher.

The 8-in. product from the first gyratory is discharged into a 5x10-ft. trommel, 3-in. holes, equipped with an outer screen surface with ½-in. holes. A stream of water is turned into the trommel for the purpose of washing adhering clay and dirt from the rock. This is discharged through the outer screen to waste. The 2½-in. rock is discharged into a chute leading to a 24-in. belt conveyor by which it is carried to a 120-ton loading bin. The washed oversize is discharged into a 4x12-ft. trommel, 4-in. round holes, and the oversize from this trommel is discharged into a chute and from this into cars. Three sizes are made: 2½ in., which is sent to Cement for use in cement manufacture; +2½ —4 in., for smelter use, and +4 in. —8 in., for sugar refinery use.

Bypasses are provided so that the trommel oversize can be sent to two No. 6 McCully gyratory crushers to be reduced to 2½-in. size and then sent to the belt conveyor. A swinging gate is also interposed between the two trommels in series so that all of the oversize from the first trommel can be discharged into a bin feeding the smaller gyratories. The arrangement is such that three sizes can be produced, or all of the limestone reduced to 2½-in. size for use at the cement plant. Chutes are lined with rails and are provided with checks consisting of short lengths of heavy chains and finger bars. Arc gates are used on the coarse limestone chutes and bottom-discharge arc gates in pairs on the bin holding the 2½-in. rock. The cars are spotted beneath the bin on the track scales. In the loading yard the cars are moved by a wire rope, which is operated from a "gypsy" head driven through gears by a motor. The loading, transportation and crushing are done on the night shift so as to avoid interference with quarry operations in the daytime. The output, amounting to about 1,500 tons per day, is loaded into



Adit portal, concrete construction; type of car used for haulage

60-ton railroad cars and hauled over the company's standard-gage track a distance of 7 miles on a 3 per cent grade, 16-deg. curves, to the Southern Pacific Railroad. Two heavy locomotives are used for this service.

Machine, engine-repair and blacksmith shops are grouped close to the crushing plant. Motor controls are arranged in a switchboard room and operation is controlled by a system of signals. Two Sullivan, 16x10x

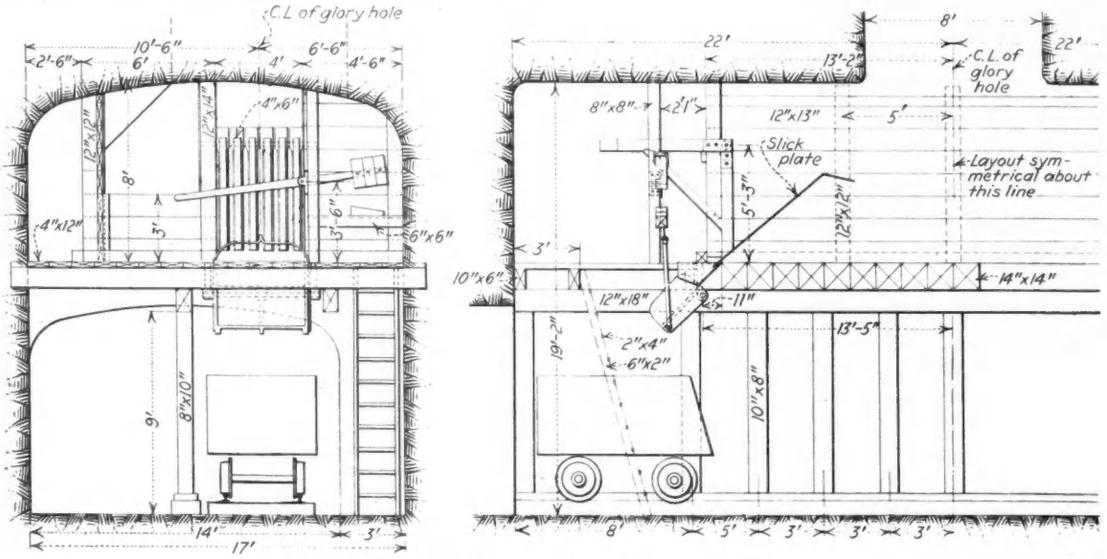


Fig. 1—First type of chute construction

14-in. Class WJ compressors, belt driven by 100-hp. motors, are placed in the switchboard room and supply compressed air to the adit, crusher plant and also to the quarry.

Two designs of chutes are in use in the adit. The first is shown in Fig. 1 and is of timber construction. This gives two loading points above the loading track at each raise or rock transfer. Finger bars are used for the principal control of the flow of rock. A heavy check beam, 12x12 in., with the upper, front and lower sides protected by T rails, is placed in front of and above the finger bars. The chute is provided with heavy bottom and side plates and a pan is swung at the lip. This is lifted up on an arc by a lever to stop the flow. Side plates on the upper part of the car prevent spillage. Weights at the end of the finger bars were discarded and the finger bars are operated by hand.

Chute No. 3 is designed for loading the cars at the side and is shown in Fig. 2. The bottom of the chute is lined with a ¾-in. steel plate, which terminates under the raise. As in the other type, finger bars are used

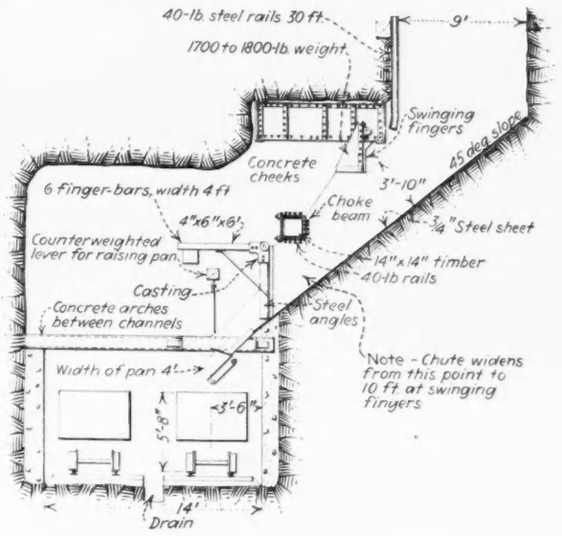


Fig. 2—Latest type of chute construction —steel and concrete

for stoppage of the flow and a swinging pan at the tip to cut off the flow into the cars. In addition, a heavy check bar is placed across the chute just above the finger bars. Close to the connection with the raise, a number of fingers constructed of steel and each loaded with cast-iron weights to a total of 1,700 to 1,800 lb. weight are suspended from a steel girder spanning the opening. The ends of the fingers project into the rock stream and serve to check its flow. The side of the raise above the chute is lined with T rails to a point 30 ft. above the upper steel fingers. Water under high pressure is piped to a position back of the rails and is used to lubricate the rock and facilitate its downward movement. Water is also used on the sole plates. Reinforced concrete is used for the construction. No. 3 chute is the fastest loader and has proved to be satisfactory for loading coarse rock. Each chute is provided with small drills, compressed-air outlets, and water under high pressure, and the loading room above the staging is connected with the ventilating pipe. The rate of loading and handling the 6-ton cars is forty to forty-two per hour. This is done by a crew of five men, who receive, load, and dispatch the cars to the crusher. The haulage speed is about 3 miles per hour.

On the upper quarry level, two additional compressors are placed, one a direct motor-driven Ingersoll-Rand compressor and the other a belt-driven two-stage Chicago Pneumatic, the motors being 264 and 125 hp. respectively. In addition, a drill-sharpening shop is available on this level. This is equipped with a Sullivan and also an Ingersoll-Rand sharpening machine. Supplementary powder storage is provided in a shed, and closer to the quarry is a shelter constructed of heavy timbers for protection against flying rocks. A number of such shelters are placed at suitable points. All are of heavy construction, 6x12-in. timbers, and each is equipped with a telephone. At a lower level two magazines of concrete construction are placed close to the hillside. One provides storage for powder and the other for caps and fuse. A California cap crimper and fuse cutter is used in the preparation of primers. A special shed is used for this purpose.

The quarry cuts directly into and across a high steep ridge. The surface overburden is removed by a Marion No. 36 steam shovel (1¾-cu.yd. bucket) mounted on caterpillar tractors. This shovel is also used in cutting out the top of the deposit in preparation for the glory-hole work. The glory holes are started by bringing the raise up to the level established by the shovel operations. The raise is extended to within 8 ft. of the top and a long drill hole is put through to mark the position of the raise. Connection with the raise is established from the quarry level above by drilling and blasting out the top. In the meantime the raise has been stripped and prepared for use as a rock pass. The pit is opened out by rows of holes drilled concentrically about the raise. These holes are 20 ft. in depth, 6 ft. back from the face and spaced 5 to 6 ft. apart. They are drilled vertically and blasted in groups of four or five at one time. The holes are generally charged to within 3 ft. of the top and 14-ft. electric exploders are used. In solid ground the primer is placed approximately 6 ft. from the bottom of a 20-ft. hole and proportionally in holes of lesser depth. In broken ground two primers are used and are separated a few feet for safety. Stemming is tamped to the top of the holes. A 120-volt current is used from a line for exploding the blasts. Only powder men handle powder, and group blasts are shot by the powder foreman.

Starting drill bits are 2 in. in diameter, the last

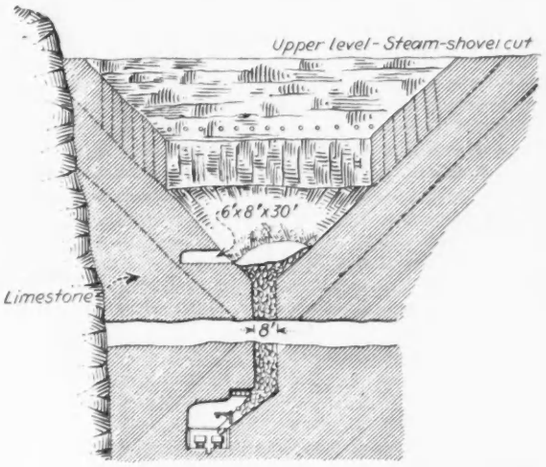
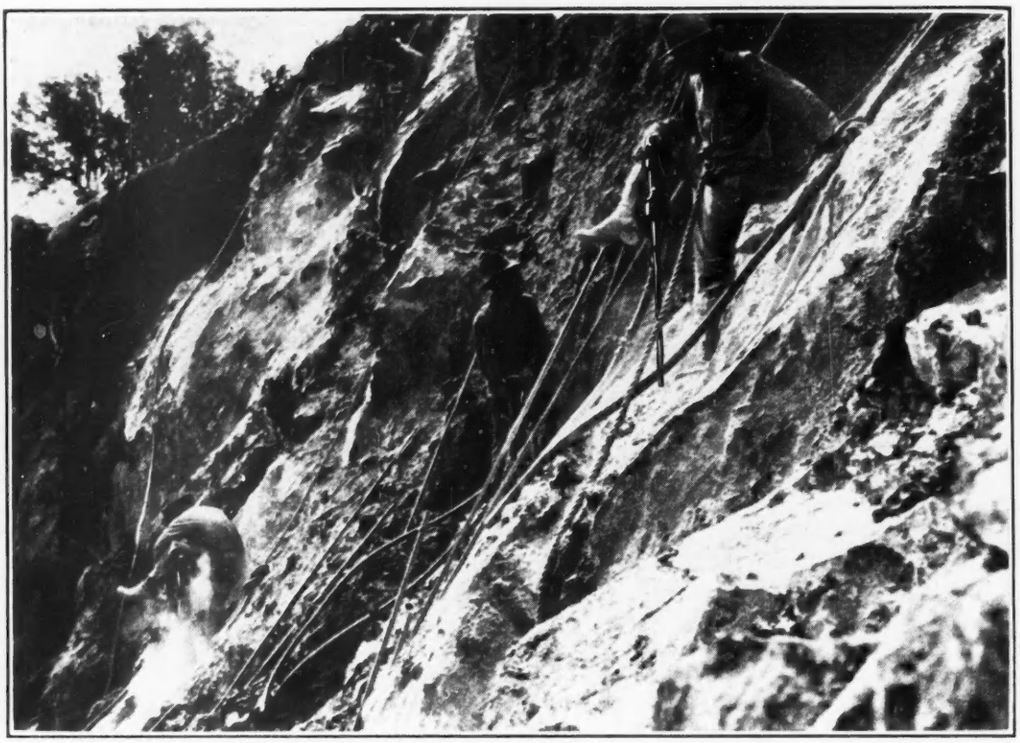


Fig. 3—Generalized sketch of glory-hole system



Drilling under difficulties

The men who work on the pit walls are provided with ropes which they tie about their waists. The slope of the pit walls ranges from 40 to 45 deg., the pits reaching a depth of about 300 ft. A workman who watches the pit operations is stationed on the hogback between No. 2 and No. 3 pits and has at hand a compressed-air whistle. From this position he can keep all of the men in view and warn them of danger.

drill 1⅜ in. in diameter; powder 1¼ in. in diameter; drill changes from 2 to 3 ft., and bit reduction 1/16 in. Drills are provided with collared shanks and are of 1-in. hexagon steel. The 6-point or rose bit is used on all drills. The limestone drills readily, a 20-ft. hole requiring about 1½ hours to complete and the drillers averaging about 50 ft. of hole per shift. Sullivan hand-held air drills, DP-32 and DP-33 (also DP-321 and 322), are used. Trojan powder, 40 per cent, and 35 per cent Hercules are used, the lower grade explosive being used in blockholing.

Blockholing is done in the bottom of the pits, the larger pieces being drilled and blasted. A system of whistles operated by compressed air is provided to warn the men in the pit in case rock falls occur, and also for blasting signals. Blasting is done in two stages: first, boulders are blasted in the pit, and when this has been completed and the men are out of the way, a group of holes is blasted. When the blasting signal is given, all of the workers except those in the bottom of the pit go to the nearest shelters. When the men in the pit bottom spit their fuses, they retire to the shelter of a short drift which extends into the solid rock close to the bottom of the pit. This drift is 6 ft. wide, 8 ft. high and 25 to 30 ft. in length. As the pit is deepened other drifts are cut into the walls. The blockholing men count their holes, and the main blasts above are held until all of the charges in the bottom have been accounted for. As soon as the main blasts have been exploded, the drillers descend and bar down all loose rock before drilling is resumed.

The compressed-air pipes are extended to serve the top level and a number of branches connect with the main transmission pipe. A 3-in. hose in 100-ft. lengths is used to bring the air down into the pits, and this terminates in a manifold from which ¾-in. hose extends to the drills. Seven or eight drills are served from one manifold. Two-inch hose is also used for air distribution. In all, twenty-two drilling machines are operated in the pits and steam-shovel bench. The steam-shovel benches vary in height depending upon the contour of the ground. The limestone is loaded into Koppel side-dump cars and hauled by a 7-ton Plymouth gasoline locomotive to a dumping point above No. 2 pit.

The raise at No. 3 pit was extended to a height of 600 ft. above the adit. The bottom of the pit is now 300 ft. above the chute. These dimensions are of interest in showing the limitations of the system. The successful operation of these long raises depends partly upon reducing oversize material before it enters the raise. Hangups have occurred and these have been removed by placing a powder charge upon long poles or pipe and exploding it in contact with the rock.

Handling of explosives has been reduced to a definite system. The two principal magazines are in charge of the head foreman, who alone has keys to them. A locked, wooden box, covered with sheet iron, is maintained on the quarry level in a shed. Keys to this are in possession of the foreman and shift boss. In another shed at some little distance from the first the supply of primers is kept in a locked box, the keys of which are in charge of the powdermen and foremen.

The total number of men employed in this operation is 140, of whom seventy are in the quarry and seventy in the adit, crusher, shops, office, and rooming and boarding quarters. The overall tons-output ratio is about 12 per man-shift. The explosives ratio is 3 tons to 1 lb. of explosive. The power ratio is 2.96 kw.-hr. per ton of rock produced.

Quarry operations have been systematially organized and developed since the quarry was opened in 1910. The foreman, J. Ringwood, and his assistants have developed a smoothly running system which maintains production and which, by attention to minor but important details, is carried out with a high degree of safety. R. L. Hollingsworth is in charge of the operations. I take pleasure in acknowledging his courtesy when I visited the quarry.

Shooting an Oil Well With Dynamite

Details of a Method Developed to Get Maximum Production When Drilling in Porous Limestone Formations in Kentucky

By S. H. Brockunier
Mining Engineer, Lowell, Mass.

IN THAT PORTION of Kentucky where petroleum is found in the limestones it is usually desirable, and often imperative, to shoot the wells so as to get maximum production. The Mississippian and Devonian limestones, which contain the oil, are frequently porous or even cavernous; an extreme case of this is in the Mammoth Cave section, where these large caverns extend to a known depth of more than 300 ft. Between these sections the limestone may be dense and nonporous.

Thus a well, piercing the porous or cavernous part of the rock and finding there an accumulation of oil and gas, may be a "gusher" and need no shooting. On the other hand, a bore hole that reaches the oil horizon and obtains only a rainbow of oil in the sand pumpings should not be lightly condemned; practical experience in Kentucky has proved that such wells should be shot and shot hard—that is, with at least 20 to 120 qt. of nitro-glycerine, the amount depending upon size of bore hole, thickness and porosity of the sand. It has even been found advisable to shoot small wells of natural flow, so as to open up the rock and make a larger hole at the oil horizon. It can be seen that a hole enlarged to 2 ft. diameter exposes more pores in the rock and will therefore yield more oil per day than a hole 6 in. in diameter. This counts greatly where the rock is slightly porous; in addition there is always the possibility of breaking through the tight formation and into a more open one. So shooting has become an accepted practice in Kentucky.

At first all of the shooting was done with nitroglycerine, and it remains today the best agent for that purpose, but the exorbitant price charged for it, the difficulty of getting good shooters—a careless shooter can ruin a well—the low price of oil, and the smallness of many wells have caused the operators to look for a more economical explosive. In this search they naturally turned to dynamite.

For wells requiring light shots, dynamite has proved quite effective, when properly handled. Sixty per cent dynamite should always be used when obtainable, but even 40 per cent has yielded good results.

The method that we worked for shooting can best be illustrated by the following typical example:

Size of bore hole at bottom	6 in.
Depth to top of pay	500 ft.
Thickness of coarse sand	6 ft.
Thickness of tight sand	4 ft.
Thickness of medium sand	12 ft.
Pocket below sand	10 ft.
Bottom of well	532 ft.

It was decided to shoot the top sand lightly, the hard parting heavily, and the bottom sand less heavily.

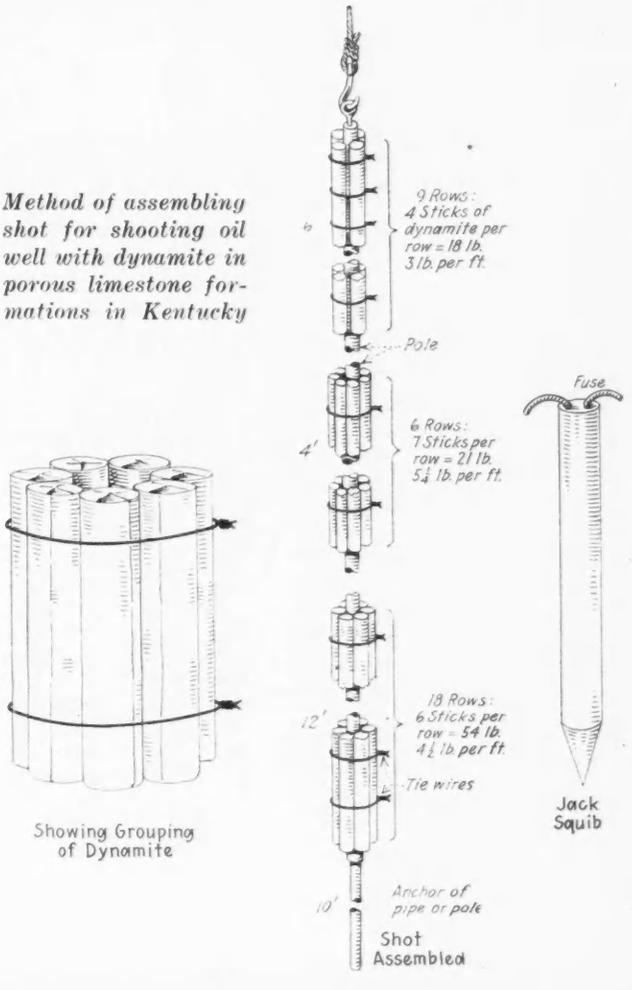
The material used consisted of three tin cases for jack squibs, with which to explode the dynamite. These were made by a local tinsmith and were tin cylinders, 3½ in. inside diameter by 4 ft. long, closed at one end with a torpedo or cone point. One hundred pounds of 40 per cent dynamite, the only strength obtainable; three 8-ft. poles of round or flat lumber, not exceeding 1½ in. across (for use as stiffeners or cores in the charge); 100 ft. of heavy galvanized wire; six blasting caps, and 20 ft. of fuse were the only other things required.

The top of the sand was 10 ft. above the bottom of the hole, so an anchor 10 ft. long was made out of an old piece of 1-in. pipe. The top of the pipe was drilled and a 20-ft. length of the wire looped through it. The two lengths of this wire were twisted around one of the 8-ft. poles in long spirals and made into a loop at the top.

With this unit of the shot lying flat on the ground, the thawed dynamite was taken and assembled around the pole. For the lower part of the shot a group of six sticks of dynamite was placed about the pole and tied there with two tie wires; above these six other sticks were similarly placed and fastened, and so on, until the pole had been surrounded with dynamite for its full length. This pole was now suspended in the hole and held there by a bar thrust under the wire loop.

The second pole was prepared by winding a length of doubled wire spirally about it, making a loop in the wires at top and bottom. Groups of six sticks of dynamite were then placed around the pole for the bottom 4 ft. and groups of seven sticks of dynamite placed about it for the top 4 ft. of its length. This charge was now hoisted by the sand line, upon the end of which had been placed a hook, so constructed that it would swing clear of the loop in the wire of the pole when the load was grounded on the bottom, thus enabling us

Method of assembling shot for shooting oil well with dynamite in porous limestone formations in Kentucky



to leave the charge at the bottom of the well and withdraw our sand line. The second unit of dynamite was lowered and wired to the first unit hanging in the well. The two poles were then lowered to the collar of the hole and there suspended by a bar through the top wire, the hook on the sand line immediately releasing, thus proving that the hook worked all right.

The third pole was cut to 6 ft., wired in the same manner and loaded with groups of four sticks of dynamite for its full length. It was then hung on the sand line, wired to the other two poles and the whole charge lowered to the casinghead.

The jack squib was next prepared by filling the bottom with sand or sand pumpings, placing therein two or three sticks of dynamite, each containing an exploder and 3 ft. of fuse, properly waterproofed with soap. The squib was then filled with sand and the top of the tin case crimped in so as to hold the sand and charge firmly in place, the fuses of course protruding.

The main shot was now lowered to the bottom and was there supported at its proper place by the anchor. The sand line was released and withdrawn from the hole. The bailer was then carefully run to see if the fluid—water and oil—which was in the hole was at least 100 ft. below the bottom of the casing. For tamping purposes in dry holes, water is previously run in to the desired depth; in wet holes that are filling up fast, the fluid is bailed down below the required depth. The bailer is run after the shot is placed so as to see that the fluid is at least 100 ft. below the casing. We never drew a string of casing before shooting, even when shooting with 100 qt. of nitroglycerine, and never had our casing even loosened when we made sure that the fluid was 100 ft. below the casing. If the well had filled up, it was now carefully bailed down to the proper depth. Careless shooters do not run the bailer after placing their shot, or else are afraid to bail out with the shot in the hole; this practice often results in collapsed or loosened casing—in fact, they sometimes shoot the casing out of the hole, sometimes ruining the well, sometimes the casing, always causing extra expense.

Some operators keep the casing in the hole and fill it to the very top with water; they claim that this prevents the shot from loosening it. Other operators pull all of their casing before shooting. The cheapest, quickest and safest way is the one that we describe.

Everything being cleared for the shot, the stem and bit are placed on the floor of the rig leaning against the mast (of a drilling machine) to protect them from the explosion. The fuses on the jack squib are then spit and as soon as the fire runs well down in the fuse the squib is dropped in the well. If everything is all right, the explosion occurs in a few minutes and the hole cleans itself of the shot, fluid and many rocks.

This is the time for the geologist to obtain his samples from the bottom of the well. Many pieces of rock as big as one's fist are often thrown out and frequently these contain perfect fossils, which give the geologist a better knowledge of the sub-surface geology.

Sometimes the first squib fails to explode and a second or third is necessary before the shot is fired. We once saw a shooter use four squibs before he could explode 100 qt. of nitroglycerine. We wondered how much of that glycerine, at $3.50 per quart, was water!

The total cost of the shot described was $30, and the results were as good as a 20-qt. shot of nitroglycerine, which would have cost $92.

Asbestos in Canada in 1924

Finally revised statistics on the production of asbestos in Canada during 1924, as reported by the Dominion Bureau of Statistics at Ottawa, under the authority of Thomas A. Low, show that the sales amounted to 225,744 tons valued at $6,710,830 as compared with 231,482 tons at $7,522,506 in 1923. It is noteworthy that this year's production of asbestos in Canada is the second highest ever reported. The average value per ton received by the operator was $29.73, while in 1923 the average was $32.50.

Exports of asbestos other than sand and waste decreased 30,000 tons in 1924, to a total of 107,200 tons, and the exports of sand and waste increased approximately 17,000 tons to 95,019 tons. The decrease in the former grade was no doubt due to the consumption of this material at the new asbestos manufacturing plant located at Asbestos, Quebec.

Output and Shipments of Asbestos in Canada in 1924

Classification	Total Output (Tons)	Sold or Shipped: Quantity (Tons)	Sold or Shipped: Total Sales Value at Mill	Sold or Shipped: Average Value per Ton
Crude No. 1	995	980	$403,304	$411.54
Crude No. 2	2,805	3,808	162,166	200.15
Liberized crude	190	71	12,080	170.14
Spinning stocks	8,623	10,205	1,112,796	109.04
Shingle stocks	15,734	19,292	903,775	46.85
Mill board stocks	12,667	11,753	355,772	30.27
Paper stocks	60,615	58,634	1,852,926	31.60
Paper fillers	64,866	61,451	914,931	14.88
Byproducts (asbestos sand, finish, floats)	59,974	59,550	393,080	6.60
Total	226,469	225,744	$6,710,830	$29.73

Lower prices also prevailed for Rhodesian asbestos in 1924, as the quantity produced during the year was about 6,000 tons higher than in 1923, while the total value decreased 3.7 per cent.

Iron and Steel in Canada in May

A report just issued by the Dominion Bureau of Statistics states that during May the production of pig iron in Canada was 63,204 long tons. This exceeded the 60,065 tons of April by 5 per cent and with the exception of the 63,932 tons of March this year was the greatest tonnage recorded since May, 1924. During the month no foundry or malleable iron was produced, the entire output consisting of basic pig iron made for the further use of the reporting firms. For the five months ending May the cumulative production was 245,009 tons, as compared with 370,142 tons in the same period last year. The year's output to date has consisted of 213,791 tons basic iron; 18,621 tons foundry iron, and 2,597 tons malleable iron.

Blast furnace charges in May consisted of 2,340 long tons Canadian ore, 114,396 long tons of imported ore, and 69,107 short tons of coke and 36,057 short tons of limestone.

Five furnaces were in blast at the end of the month located as follows: Two at Sydney, N. S.; two at Sault Ste. Marie, Ont., and one at Hamilton, Ont. The daily capacity of the active furnaces was 2,075 tons, or about 41 per cent of the possible daily output of all the blast furnaces in the dominion.

Ferro-alloys at 2,293 tons marked a slight increase over the 2,262 tons of April and consisted mostly of the grade containing 80 per cent manganese. A small quantity of ferrosilicon was also produced.

Carnotite Discovered Near Aguila, Ariz.*

By D. F. Hewett
U. S. Geological Survey

CARNOTITE recently has been discovered near Aguila, Maricopa County, Ariz., and although commercial deposits have not yet been found, development may reveal larger quantities. The material was discovered by Milton Ray, of Aguila, who is the owner of the claims.

Aguila is a town on the Atchison, Topeka & Santa Fe Ry., 27 miles west of Wickenburg. It lies near the center of a broad, flat, alluvial valley above which rise several rugged though not high mountain ranges, the Harcouvar Mountains on the north, the Harquahala, Bighorn, and Vulture mountains on the south. Carnotite has been found on the west slope of the hills that make up the west end of the Vulture Mountains, about 9 miles direct and 12 miles by road southeast of Aguila. Since I visited Aguila, similar specimens containing carnotite have been sent to the Survey by Thomas Treloar, of Aguila, who reports that they came from his claims which are situated about 5 miles northeast of Aguila.

The greater part of each of the mountain ranges is pre-Cambrian granite and schist, but here and there the bordering hills are made up of tuffs, breccias, and flows of Tertiary volcanic rocks. These are generally inclined, and a hasty examination indicates that since mid-Tertiary time they have been intricately broken and tilted.

The Vulture Mountains terminate westward in two ridges that trend west and are less than a mile apart. The northern ridge culminates in two hills that rise about 300 ft. above the plain. They were not visited, but appear to be volcanic flows resting on granite. The southern ridge contains at least three hills, the eastern of which rises about 700 ft. above the plain and is the most conspicuous in a large area southeast of Aguila. This ridge is capped by a flow of vesicular basalt several hundred feet thick, which overlies 200 ft. or more of thin-bedded drab tuff in which there are a few thin beds of gypsum. The tuffs are now largely bentonitic clay and contain traces of fresh-water shells and bone. A few sporadic lenticular black grains as much as ¼ in. in diameter were proven by blowpipe tests to be largely manganese oxides. It is not clear whether a fault follows the valley which lies between the two ridges. Along the northwest end of the south ridge, outcrops of reddish andesite indicate the presence of a dike intrusive in the tuffs, and it is possible that it follows a fault.

Where exposed in several trenches in a belt 4,000 ft. long, the trend of the tuffs ranges from N. 50 deg. E. to S. 80 deg. E., and the dip is uniformly south at 10 to 25 deg. As the basalt flow trends east and dips south at 20 deg., it appears to lie conformably on the tuffs. Without doubt, both have been tilted southward about 20 deg. since the time when they were deposited.

The local geologic record indicates (1) deposition of tuffs in local fresh-water lakes; (2) extrusion of basalt flows; (3) local faulting and tilting of ridges, accompanying or following; (4) intrusion of dikes; (5) weathering.

The carnotite has been found in the tuffs only. It forms brilliant lemon-yellow patches, rarely more than ¼ in. in diameter on minor fractures in the tuffs. In detail, the carnotite appears to replace the clay into which the tuffs have been altered. Viewed with a glass it has a waxy rather than crystalline appearance. Under the microscope, however, the powder is made up of many minute yellow scales whose lowest index of refraction exceeds 1.75. Qualitative chemical tests show the presence of vanadium, and tests with the radioscope by R. C. Wells, of the U. S. Geological Survey, show that it is radioactive. As the material does not melt at low redness before the blowpipe, the chance that it may be the calcium urano-vanadate, tyuyamunite, seems to be eliminated. The tentative conclusion is that the yellow scales are carnotite, potassium urano-vanadate.

Thus far, carnotite has been found at two pits, the first about 1,200 ft. southeast of Ray's camp and the second 800 ft. southwest of camp. They are about 1,600 ft. apart. At the first pit, which is a trench 30 ft. long and 5 ft. deep at the face, small patches of carnotite were found in nearly every square foot of the deepest part. Generally, close search is necessary to find a patch of carnotite, but in an area of several square feet along one horizon, several pounds of fragments of tuff were quickly collected, each of which showed one or more patches of carnotite. Only rarely are they on bedding planes; most are on poorly defined crosscutting fractures. To me this relation indicates that the mineral has been deposited recently by circulating ground water. The size of the patches, intensity of color, and their distribution on fractures resemble those I have seen near Sloan, Nev.

At the second pit, a trench 6 ft. long and 6 ft. deep, carnotite is sporadically distributed through the tuff, but in smaller quantity than at the first.

Origin of the Carnotite Obscure

The sources of the vanadium and uranium which, with potash, make up the carnotite are obscure. Acting on the suggestion of the owner of the claims, that certain reddish brown rocks near the camp contained vanadium, a sample was collected for analysis. There were two varieties of such rocks, (1) a weathered vesicular andesitic rock that may be a dike and (2) near-by bedded gypsum rock—probably once impregnated with pyrite but now weathered dark reddish brown. An analysis of the latter material by R. C. Wells showed the presence of 0.04 per cent of vanadic oxide. This is sufficient to account for the quantity of carnotite noted in the sediments, but it occurs 500 ft. distant from the nearest carnotite known.

Although the principal commercial source of carnotite is still the deposits in the La Plata sandstone, in Colorado and Utah, where it largely replaces wood and other plant remains, small quantities have been found from time to time in several Western states in rocks of diverse type and age. According to F. L. Hess, who has studied many of these occurrences, the carnotite has been formed by supergene processes.

No commercial importance is to be attached to the occurrences of carnotite near Aguila at present, but, with increased knowledge of its distribution, important discoveries may yet be made.

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Discussion

Sillimanite and Andalusite

THE EDITOR:

Sir—The editorial on sillimanite, in your issue of June 6, 1925, calls to mind the use of andalusite by the Champion Porcelain Co. in the manufacture of the cores of spark plugs for automobiles. As is well known, andalusite, sillimanite, and cyanite are silicates of alumina of identical chemical composition. For the following remarks I am indebted to a paper by W. M. Myers, of the Bureau of Mines, and to an article by Albert E. Peck, of the University of Michigan, published in the *American Mineralogist*.

In the first place, it seems, from the researches of Bowen and Greig, that the so-called "artificial sillimanite" in ceramic ware has the composition $3Al_2O_3.2SiO_2$ instead of the formula $Al_2O_3SiO_2$ corresponding to the natural mineral.

For years andalusite has been familiar as a useless mineral occurring in crystals or small scattered masses. Last summer, however, about 70 tons per week was mined from what is apparently the only commercial occurrence known. This deposit is at an elevation of 10,000 ft. on the southwestern slope of White Mountain, in Mono County, California. White Mountain is the highest peak of the White Mountains, which are the northern extension of the Inyo Range. The andalusite rock is mostly coarsely granular, with a gray or light pinkish brown color. The exact size of the deposit is unknown, but it is probably enormous.

The andalusite is sacked and packed on mules over a 4½-mile trail and is then hauled three miles farther to the railroad and shipped to Detroit. The developments, both in the field and in the factory, have resulted from patient and thorough research. GORDON SURR.

San Bernardino, Calif.

Consultation

Uses of Mica

A sample of fine brownish earth containing many small particles of mica was submitted by a correspondent who thought that by air separation the mica might be recovered as a commercial product, suitable for wall paper.

Examination of the sample was made by the Non-Metallic Minerals Station of the U. S. Bureau of Mines, New Brunswick, N. J., at the request of the *Mining Journal-Press*. It reports that the material is composed of small flakes of muscovite mica, badly stained with iron. Doubt is expressed as to whether it has any commercial value, as it is not in a form suitable for industrial use. Ground mica, which is being used at present for a filler in rubber and similar substances, and also in the manufacture of prepared roofing and wall paper, is produced by grinding the scrap that is left after sheet mica has been manufactured in the electrical and other industries. This scrap mica is very pure and permits the production of a high-class ground product. The station does not believe that the material submitted as taken from the ground could be treated in any manner so that it could compete in this market. A chemical analysis would be of practically no value in determining the suitability of mica for industrial use, as the physical properties of the mineral are much more important than the chemical composition.

The Market for Lithium Minerals

What is the possibility of marketing a large quantity of lepidolite and spodumene? Is the demand limited or not and what price per ton would the ore bring, running about 6½ per cent lithia, 30 per cent alumina and 7 per cent potash?

Fairly large deposits of amblygonite, spodumene, and lepidolite are known in the United States and other countries, though these minerals are not widely distributed. The use of these minerals is limited, and Herbert Insley, of the U. S. Geological Survey, writing in 1919, said: "The known deposits of lithium minerals in the United States should be ample to supply all the demands of the manufacturers in this country for a long time to come, even if unexpected uses should be discovered."

The principal uses of lithium minerals and compounds are in the manufacture of glass, a certain type of storage battery, and for lithia water, though the last-named outlet is no longer of importance. Lithium compounds also have a few minor uses in photography and in the manufacture of colored lights.

Most of the lithium minerals produced are said to be taken by the Maywood Chemical Works, Maywood, N. J., and by B. F. Drakenfeld & Co., Wheeling, W. Va. Other chemical manufacturers, such as the Mallinckrodt Chemical Works, St. Louis, Mo., are probably small purchasers. The Foote Mineral Co., Philadelphia, Pa., is a dealer.

Prices depend upon the purity (freedom from tourmaline, quartz, and iron minerals) and on the lithium oxide content. Any mineral containing less than 6 per cent lithia is undesirable. Nominal prices for your product, delivered to the consumer, might be around $25 per ton, though you can best find this out by direct negotiation.

The following references are given: "The Marketing of Metals and Minerals" (McGraw-Hill Book Co., New York; $6), chapter on lithium minerals; "Non-Metallic Minerals," by Ladoo (McGraw-Hill; $6), chapters on spodumene, lepidolite, and lithium minerals; and "Mineral Resources of the United States, 1919" (U. S. Geological Survey, Washington, D. C.), chapter on lithium minerals.

Producers of 99.90 Per Cent Zinc

If you have on file, please advise names and addresses, in Belgium, France and Germany, of producers of zinc, 99.90 per cent pure.

Names and addresses in Belgium, France and Germany of producers of 99.90 per cent pure zinc are as follows: Soc. Min. et Metallurgique de Peñarroya, Pierrefitte, France; Soc. Anon. de la Vieille Montagne, Viviez, Aveyron, France; and Brunner Mond & Co., Winnington, Cheshire, England.

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

LISTING OF SHARES of the Newmont Mining Corporation, a holding company for mine securities, patterned after British companies, marks a new departure in mine finance in this country.

Building of new roads in British Columbia is being undertaken by the provincial government.

Lower production costs are expected by the Quincy Mining Co. as a consequence of the installation of new equipment.

United Verde Copper Co. is using electric automobile trucks to serve the steam shovels in its open-pit operations at Jerome, Ariz.

Production of zinc and lead in the Joplin-Miami district will be curtailed as usual during early July.

The Keystone Mining Co., operating at Park City, has joined the ranks of Utah dividend payers.

Los Angeles, through the Chamber of Commerce, is making a bid for a copper-refining industry in southern California.

The supreme court of Minnesota has denied damages to property owners in the "South Forty" at Hibbing.

Many associations seek to advise Secretary Hoover on the Bureau of Mines reorganization.

Federal officials in Mexico City have composed the difficulties between the mining companies and the Guanajuato state authorities.

The government geologist of New South Wales sees a brighter outlook for mining in the Broken Hill district.

Work Proves Possibilities of Calico Silver-Lead District

Two Development Enterprises Have Proved Large Deposits of Low-Grade Ore—Mill Planned

Two mining projects in the old Calico district near Daggett, Calif., are creating some interest. The Empire Lead Co. started the erection of a mill for the purpose of treating surface ores carrying lead and silver. The company expended, according to local report, about $40,000, but did not get further than putting in an ore bin, excavating for the mill foundations, building a road about ¼ mile long from the mine to the mill site and constructing a pipe line about ½ mile long from a new well bored to a depth of 250 ft. About the time the pumping plant was being put in, the company split up and steps are now being taken to refinance the project. It is stated that plans for the mill have been completed, but construction will be deferred until September. The deposit is a low-grade dissemination of silver and galena in a tuff.

An extension of this deposit has been found in what is called the East Calico district. This area was mined a number of years ago by shallow pits and tunnels. The deposit is said to be larger than the area under control of the Empire company and has possibilities. The outcrop is 300 to 500 ft. in width and extends to a depth of 25 to 30 ft. indicating a large tonnage, but sampling in detail has not been done. R. B. Moore represents the holding company, and an experimental mill of 100 tons capacity is to be erected for the purpose of experimentation. H. D. Mead is superintendent and engineer. It is believed as a result of preliminary tests that a good recovery can be made of both lead and silver by the use of concentrating tables.

Propose Second Unit for New Granby Concentrator

C. W. TANDY, of the engineering staff of the Utah Copper Co., is at Anyox, B. C., where he is getting out plans for a second unit of the concentrator of the Granby Consolidated Copper Co. The first unit, which was designed to treat 1,000 tons per day and is treating from 1,250 to 1,400 tons, is giving excellent satisfaction on second-grade ore that cannot profitably be smelted directly.

Park City M. & S. Builds Tram

The Park City Mining & Smelting Co. has started construction on an aërial tram to operate between the Judge mill, in Empire canyon, and the Ontario loading station at Park City, Utah. The tram, about one mile long, will eliminate all heavy hauling by teams and permit ore haulage during the bad weather when roads are impassible. It will be of the latest modern construction. N. O. Friendly, superintendent, intends to have the tram in operation before winter sets in.

Stratton Mines Co. Buys Panhandle Group in Idaho

Both Controlled by Hercules Interests —New Shaft if Developments Prove Satisfactory

The Stratton Mines Co., of Wallace, Idaho, controlled by the Hercules Mining Co., has purchased the Panhandle group of seven claims lying east of and joining the Stratton, and presumably on the same vein. The purchase price was $60,000, of which $10,000 was paid in cash about April 1, when agreement was reached, and $50,000 on June 15. Controlling interest in the Panhandle was owned by William M. Runley, of Chicago. The Pittsburgh Lead Co., of Pittsburgh, was also a beneficiary, as were also several Kellogg people, including Stanly A. Easton, manager of the Bunker Hill & Sullivan Co., who acted as trustee for the Pittsburgh interests. The Stratton and Panhandle groups will be operated as one property. The Stratton oreshoot has been proved in the main tunnel 500 ft. in length and an incline shaft following the ore has just been completed to a depth of 250 ft. Drifting on the ore at the new level is now in progress, and assuming that this will prove satisfactory, it is understood that a new and permanent operating shaft will be started for the development and operation of the combined properties. The Stratton is the mine that was promoted by the sale of Stratton $10 options, and it has the distinction of having paid its way from the proceeds of ore shipments. The Hercules interest gained control by purchases of shares in the open market.

Quincy Expects Lower Operating Costs in Copper Country

New Equipment Increases Efficiency—Power Cost Cut by Introducing Waste-Steam Turbines

In the Michigan copper district, improvements and innovations in methods and equipment at mine, mill, and smelter should have their effect in a reduction of Quincy costs this year. Practically all of the changes were introduced last year, but the results will be more fully reflected in the 1925 operations, it is expected.

Hoisting capacity in No. 2 shaft, the largest producing unit, has been increased between one and two hours a day through the installation of an electrical bell and light signal system, which overcomes time lost in transmitting signals by the old pull bell system. Efficiency in the bailing of water has been increased in both No. 2 and No. 6 shafts through installation of two new large water skips in No. 6, increasing bailing capacity 50 per cent, and by placing two water skips in tandem in No. 2 shaft, making two hoisting on each skipway. Old drilling machines that had become obsolete have been replaced with higher powered machines, fifty-one in number. Drilling practice has been improved through the replacing of the water-tank air pressure system of furnishing water to the machines by a combined tank and pipe system piping the water direct to each machine, and by the replacing of underground compressed-air pipe lines in many levels by a greater capacity new 4-in. pipe line, reducing friction and giving increased air pressure at the machines.

The exhaust-steam turbo-generating plant at the stamp mill affords cheap power through utilization of the waste steam from the stamp heads. It provides power and light for all purposes at the mill and also an excess for use in the shops at the mine, the current being transmitted over a new line a distance of six miles. Reduction in consumption of coal due to the operation of the turbo-generating plant and power line is fully up to expectations. At the stamp mill, minor installations have been made that should result in an increased production of silver.

Frank Childress Accumulates Interests in Joplin-Miami Field

Frank Childress, of Joplin, and J. W. Perry, of Kansas City, have taken up their option on the Northern mine, in the Kansas section of the Joplin-Miami district, and will proceed to full development. The mine was formerly known as the Crescent. It was idle for some time, until taken over a few months ago by Harry Neff and R. W. Cole, of Joplin, who located a good mineralized area.

The new owners of the Northern also operate the Commonwealth, in the Oklahoma field. Childress has once more brought his holdings up to a point equal to what they were a year ago, when he sold his interest in six important properties in this section to the Federal Mining & Smelting Co.

Usual Fourth of July Curtailment for Joplin-Miami

MIDSUMMER in the Joplin-Miami district finds approximately 150 mines operating, a total stock of zinc ore in bins of about 27,000 tons, of which 17,000 tons has been sold, and about 9,950 tons of lead ore in bins. Twenty-three mines are working overtime, or double shift.

It is expected the yearly curtailment acompanying the Fourth of July holiday will be even greater than usual this year. Operators have become convinced that holding down the output helps ore prices. Every mine in the field will be down for two or three days around July 4. Many will be down a full week. A number will be down for two weeks, and some will be down for three or four weeks. In ten days it is believed production will be cut at least 15,000 tons.

General Henry Mine, 60 Years Old, Produces Once Again

Operators who have a lease and bond on the old General Henry mine at Lone Mountain, just west of Tonopah, Nev., made a 30-ton shipment of silver-lead concentrate recently to the smelter at Midvale, Utah. This is their second shipment. The first shipment brought returns of $91.25 per ton and the present one is expected to equal the first. The General Henry is one of the oldest mines in Nevada and has an interesting history. It was a big producer sixty years ago, when the ore was hauled to Sacramento and Austin by mules and oxen and rock that assayed less than $100 per ton went to the waste pile.

Lucky Jim Operating Two Shifts at Rosebery Mill

The Kaslo-Nakusp branch of the Canadian Pacific Railway, which has been out of commission since the early spring on account of a heavy landslide, is again in operation, and the Lucky Jim Lead & Zinc Co., which depends on this branch to transfer ore from its mine at Zincton to the Rosebery mill, which it purchased recently, is now running the mill on two shifts per day. About 2,000 tons of high-grade milling ore has been broken in the mine since the cessation of shipping. The mine is showing up exceedingly well under development, and promises to become a large producer.

A raise has been put up on No. 3 level for 160 ft. alongside the Big Fracture; a crosscut from the top of the raise passed through 15 ft. of ore, assaying 25 oz. of silver per ton, 25 per cent of lead, and 20 per cent of zinc, which is practically the same grade of ore as was opened on No. 3 level; another crosscut at 120 ft. up the raise penetrated 15 ft. of ore, assaying 45 oz. of silver per ton, 33 per cent of lead, and 19 per cent of zinc. There is 300 ft. of virgin ground from the top of the raise to the surface. The company is driving on No. 4 and No. 5 levels for the same shoot.

British Columbia Will Build Roads to Mining Districts

Government Co-operates With Development Companies—Activity in Portland Canal

Consequent upon the visit of William Sloan, Provincial Minister of Mines, to the Portland Canal district and to Alice Arm, in British Columbia, road construction will be authorized by the Mines Department that will very materially benefit mining operations in those two active districts. It is proposed to construct a wagon road up the Marmot River from Tidewater to the Forks, a distance of about five miles. This will afford transportation facilities to the Porter Idaho Marmot Metals Co., the Sterling, Patricia, Montana and other groups, on all of which development is under way. So far shipments have been small, owing to the lack of transportation facilities. Many improvements will be made to the Bear River trail, a large section of which will be diverted by new wagon roads that will give access to the territory in which are located the Dunwell, L and L Glacier and other promising properties in the district.

At Alice Arm the Dolly Varden Railway, running for seventeen miles up the Kitsault River, was inspected by the Minister. The government will make substantial improvements to the road bed and the Minister announced that the government will permit those developing properties along the river to utilize the railway. The road to the Toric mine, operated by the Consolidated Homestake Mining & Development Co., will be improved.

In view of the marked increase in mining activity all over British Columbia, the Department of Mines is besieged with applications for the construction of roads and trails. In the past seven years the government has expended more than $1,000,000 on such work, in many cases the property to be benefited being called upon to contribute a substantial amount of the outlay required. At the next session of the Provincial Legislature, the vote hitherto annually made for this purpose will be very substantially increased.

Sidney Mining Co. Has Ore Blocked in Pine Creek

According to Fred W. Callaway, consulting engineer, more than 100,000 tons of ore with an average content of 8 per cent lead, 15 per cent zinc, and 4 oz. silver to the ton has been developed on the Sidney Mining Co.'s property in the Pine Creek district of the Coeur d'Alene region.

While a lessee at the property, Mr. Callaway developed a body of ore in the south vein. At a point 200 ft. north of this vein he has disclosed 18 ft. of ore containing a little more lead than zinc.

An aërial tramway 17,000 ft. long would deliver the ore to the Bunker Hill mill at Sweeny. This will be erected if the railroad is not built at once. Shipments of zinc concentrates will be made to the Veille Montagne smelter in Belgium.

Electric Automobile Trucks Serve United Verde Steam Shovel

A NOVEL FORM of mining has been adopted at the big steam-shovel pit of the United Verde Copper Co., in Jerome, Ariz. This involves the use of automobile trucks to take the place of railroad tracks and cars for a short haul.

An initial fleet of four Bucyrus electric trucks has been put to work, and the results are declared to be satisfactory and such as to lead to the certainty that other machines of the same kind will be installed shortly.

A 1¾-yd. shovel is working on the south end of the big pit not far from the old glory hole, and side-dumping trucks, each of 4-yd. capacity, are used to haul the rock to the mine raise nearest to the point of loading. The longest haul is not more than 500 ft. and the experiment is proving a great success, eliminating, as it does, all the costly track laying and switching operations. The trucks handle their loads with ease and speed and the four keep the shovel operating at very close to its maximum capacity.

Selective Flotation Helps Clear Creek County Mines

Clear Creek County, Colo., after years of mining depression, is showing some life. The ores are complex, occurring in veins of limited producing possibilities, and each has individual features to be considered in separation or concentration. The treatment problems have been the subject of much discussion, resulting in intensive technical research. Several old productive properties have been reopened following the advance recently made in selective flotation, till this old region, from Idaho Springs to Silver Plume, has taken on an early-day aspect. The ore-testing plant of the State School of Mines at Golden is the hub of this recent development.

Keystone, Park City Producer, Joins Utah's Dividend Payers

Another Utah silver-lead producer has entered the dividend class with the posting of an initial dividend of 7½c. per share by the Keystone Mining Co., which operates in the Park City district. Payment will be made on Aug. 26. The dividend will amount to approximately $67,500, with the stock outstanding amounting to about 900,000 shares.

The company's financial condition is good. At present it has approximately $450,000 in the treasury, while earnings are running between $20,000 and $25,000 per month.

Most of the company's tonnage is now being mined from the 500 level. According to latest advices, the ore has "bedded" and from appearances is about 25 ft. wide and should extend about 85 ft. from the fissure where the strike was made.

Public Launching of Newmont Corporation Marks New Departure in American Mine Finance

Shares in Holding Corporation, Headed by Colonel W. B. Thompson, Listed on Curb—Participant Through Stock Ownership in Various Mining Industries

By A. B. Parsons
Assistant Editor

COPPER, sulphur, petroleum, gold, diamonds, and coal mines are among the baskets in which the eggs of the Newmont Mining Corporation, headed by William Boyce Thompson, are carefully deposited. The existence of this company, first organized in 1916, came to public attention on June 25, when the shares were admitted to trading on the New York Curb Market. It is said that they will be listed on the Big Exchange soon.

Col. William Boyce Thompson

The corporation is principally a holding company, similar in many respects to the large London houses that distribute their investments in many enterprises through the purchase of shares in operating companies. While Anaconda, Kennecott, American Smelting & Refining, and other large American interests hold securities in other companies, they usually control them as subsidiaries. Moreover, they are primarily operating rather than holding companies. In fact, the Newmont corporation has charted for itself a course little if ever traveled in American mine finance.

Colonel Thompson, who is generally recognized as being the dominating figure in the company, is said to have devised the name by combining and then abridging New York and Montana. He was born in Virginia City, Mont., and started on the way to wealth at Butte. Now, many times a millionaire, he lives in New York, but still remembers Montana, it would seem. Associated with Colonel Thompson are Charles F. Ayer, president of the Magma Copper Co.; Stephen Birch, president of Kennecott; Albert H. Wiggin, chairman of the Chase National Bank; D. E. Thomas; and Henry E. Dodge. A. J. McNab, vice-president of the Magma company; Henry Krumb, of Salt Lake City, consulting engineer for most of the porphyry coppers at one time or another; and Fred Searls, Jr., geologist of San Francisco, are among the engineers on the directorate. Mr. Searls is to be in active charge of development of mining properties that may be acquired. This is an imposing array of financial and technical talent.

The company was reorganized in 1921 as the Newmont Corporation, and on June 3, 1925, changed its name to the Newmont Mining Corporation. It now has an authorized capital of $8,000,000 common stock, consisting of 800,000 shares of $10 par, of which 430,000 shares are outstanding. A block of preferred shares was originally issued, but it has been exchanged for common and retired.

The present holdings in dividend-paying securities are valued at current prices at more than $17,500,000, giving the outstanding shares a value of more than $40 per share, which is said to be the price at which 130,000 shares were sold privately between Feb. 13 and June 1, 1925. There were only 137 share-holders at the time of listing and there are no bonds or preferred stock. A dividend of $1 per share was paid on Jan. 15, when only 300,000 shares were outstanding.

Listed in the assets of the company are more than 80,000 shares each of Kennecott Copper Corporation and Texas Gulf Sulphur, each the leader in its own particular industry, and both favorites of Colonel Thompson. There are also "large blocks" of shares of the Anglo-American Corporation of South Africa, Ltd.; Continental Oil, Pacific Oil, Utah Copper, Magma Copper, Inspiration, Chile Copper, and other stocks.

It is through the ownership of Anglo-American shares that Newmont participates in gold, diamond, and coal mining. The Anglo-American Corporation is a British holding company with large interests in South African

Balance Sheet of the Newmont Mining Corporation as of June 10, 1925

Assets		Liabilities	
Cash	$1,798,666	Accounts payable	13,730
Stocks of dividend-paying corporations	9,247,892	Profit and loss	834,706
Miscellaneous stocks and other undertakings	1,725,496	Earned surplus	3,738,962
Other assets	15,343	Capital surplus	3,900,000
		Capital stock — 800,000 shares issued..$8,000,000	
		Less: In treasury 3,700,000	4,300,000
Total	$12,787,398	Total	$12,787,398

enterprises. Recently it purchased 20,000 shares of Rhodesian Congo Border Concessions, the company that has 52,000 square miles of territory in the Congo-Rhodesia copper belt to prospect. Several discoveries that appear to be important have been made during the past year. Though in a rather roundabout manner, the Newmont company has a small finger in the great South African copper pie.

Earnings prior to 1921 are given as $1,883,062. In 1921 and the three years following, the successive annual earnings were $260,453, $754,934, $599,194, and $541,316. No segregation of the sources of income has been made public for these years, but the profit and loss statement from Jan. 1 to June 10, 1925, shows:

Earnings	
Interest	$13,624
Dividends	221,722
Profits	662,421
Total	$897,767
Expenses	
Interest paid	11,155
Administrative, office expense and taxes	51,906
Net profit	$834,706

The item of "Profits, $662,421," as the company does not yet operate any mines of its own, is doubtless money realized in trading in shares. If properly engineered, there are quite as ample earnings in market operations as in mine operations; and Colonel Thompson and his associates are not novices in either activity.

With the shares listed, the outside public can now show its appreciation of an opportunity to participate in a strictly American mine-holding corporation.

A criticism sometimes made of the British holding corporations is that those of the inside group who sit on the board of directors frequently make use of the company to further their own interests rather than that of the shareholders. This, of course, does not apply to all of them and the advantage is obvious of diversifying sources of income among various kinds of mining as well as various companies mining the same metal.

The first day's trading in Newmont amounted to 14,300 shares, closing at 46, and the second, 4,400, closing at 46⅛. If the American public is like the British public, and it probably is, Newmont will be in good demand.

Small New Mill Near Olancha

Nace Rossiter, of Los Angeles, and H. A. Curry, of San Francisco, have completed the construction of an arrastra mill of 60-ton daily capacity near the Upper Haiwee reservoir of the Los Angeles aqueduct, about eight miles southeast of Olancha, Calif. It will treat ore from their Rainbow mine in the Coso Mountains, five miles from the plant. Mr. Curry, the manager, states that the mill will be placed in operation within the next week and that 200 tons of ore has been broken in the mine and is now being hauled to the plant by motor trucks. Two veins are being developed at the Rainbow Mine, one by a shaft now down 65 ft. and the other by a tunnel 300 ft. long. The pay shoots average, he says, 1 ft. of $25 ore.

Los Angeles Wants to Refine Arizona Copper

THE INDUSTRIAL DEPARTMENT of the Los Angeles Chamber of Commerce has completed surveys on the Pacific Coast situation in copper and has reached the conclusion that Los Angeles is a logical point for refining and distributing copper produced in Arizona. Freight rates via Los Angeles harbor range from $12 to $14 per ton to the north Atlantic seaboard, as against the rate of $12.50 per net ton to New York harbor refineries under the refining-in-transit privilege, which places the refined metal in Connecticut manufacturing centers at through rates in excess of $14 per ton. The European rates via Gulf ports, with refining at New York, total $17.50 per ton, as against available rates of $13 per ton in Los Angeles.

The survey made by the Chamber indicates a local or southern California market that absorbed 42,000,000 lb. of copper in 1923. The expansion programs of hydropower companies will require 37,000,000 lb. annually by 1933. Estimates indicate a potential market in southern California that will absorb about 100,000,000 lb. per year within nine years. Los Angeles offers a low power rate and cheap gas and oil fuel with climatic advantages and a favorable labor supply.

Utah Company Leases Gold Hill and Iowa Properties

Operations are to be started at the Gold Hill and Iowa mines, situated in the Boise Basin district, near Boise, Idaho, by the Utah Majestic Mines Co., which has taken a lease and option to purchase these properties.

The Gold Hill and Iowa mines, including the Pioneer group, constitute the best gold-quartz mines in the Boise Basin district, according to geologists who have examined them.

Above the 600 level, the three groups of claims are credited with a production ranging from $6,000,000 to $8,000,000. Good exposures of ore exist on the lower levels. Sinking of a shaft to develop the veins at greater depth is to begin at once.

The property is well equipped with modern machinery, a stamp mill, machine and blacksmith's shop, sawmill, store, office equipment, boarding house, bunkhouse, and several cottages.

Gold Hunter Outlook Better Than Ever, Say Officials

The charter of the Gold Hunter Mining & Smelting Co., producing lead-silver ore at Mullan, Idaho, in the Coeur d'Alene district, having expired, it has been succeeded by a new corporation called the Gold Hunter Mines, Inc. The old company was incorporated under the laws of the State of Minnesota on Jan. 31, 1887, and the new company is also incorporated in that state. After almost forty years of practically continuous production, the outlook is said to be better than for many years.

The present source of ore supply is from the old upper workings, ore that was left in the early days because it was either too low grade to pay with the crude milling methods of that time or possessed complex qualities that would not respond to the then known ore-dressing processes. The development of the flotation process has made it possible to handle these heretofore worthless ores profitably. The Gold Hunter company has mined to a depth of 1,200 ft. below the main tunnel and is now preparing to extend the shaft with the expectation of developing new orebodies. C. L. Herrick is manager.

Hanna Company Operates Two 300-Ton Shovels at Buhl

The 300-ton electric shovel moved by the M. A. Hanna Co. from the LaRue mine, at Nashwauk, to the Wanless property, at Buhl, Minn., last winter, is now operating as a drag line and stripping the Wanless surface. A start has been made at the west edge of that portion not mined out by underground methods and work is progressing toward the east. At the Wabigon mine belonging to this company stripping continues with the 300-ton electric shovel and three electric locomotives, while the ore is being moved with a steam shovel and steam locomotives. When stripping is far enough advanced, the pit will require the electric equipment only and the mine will regain its title of the only pit on the Mesabi range that is completely electrified.

Mining continues to slacken on the range, as the Stevenson mine of the McKinney Steel Co. has been closed down, the LaRue mine and the Hawkins mines at Nashwauk have reduced to one shift, and other properties have reduced ore shipments.

Snyder-Christensen Process Works Well at Bauer, Utah

From 150 to 200 tons of ore daily is being treated at the Combined Metals Reduction Co.'s plant at Bauer, Utah. Results are satisfactory, although ironing out of mechanical difficulties in the refining stage of the Snyder-Christensen process have somewhat hampered progress. Finances for the Combined Metals enterprise have been advanced by the National Lead Co.

The process eliminates roasting of sulphide ores prior to leaching. A feature that operates for economy is the fact that instead of using iron or electrolysis for precipitation, the lead is recovered by merely cooling the solution. The process is applicable to ores containing zinc and lead as well as ores containing silver, lead, zinc, and copper for separating the lead and silver from the zinc and copper.

Availability of cheap salt and acid used in making the brines for leaching and the existence of large tonnages of sulphide ores and mixed sulphide and carbonate ores not amenable to flotation processes give the Combined Metals Reduction Co. a wide field.

Copper-Gold Ore in Poorman Mine Excites Baker, Ore.

Robert M. Betts, manager of the Cornucopia mine, in Oregon, states that disclosures in the Poorman mine, located between Baker and Cornucopia, are the basis of the copper excitement in that region.

The ore includes chalcocite, with some gold and silver; native copper has also been revealed. Ore containing 7 to 10 per cent and $3 in gold has been penetrated for 25 ft. Ore containing 2 per cent copper and $1.25 in gold has been exposed for 180 ft. from the showing in the crosscut, according to Mr. Betts.

Rock Candy Fluorspar Will Supply Ontario Steel Plants

The Consolidated Mining & Smelting Co. of Canada is recabling the tramway between its Rock Candy mine and mill, on Granby Creek, in the Grand Forks division of British Columbia, and putting the plant at mine and mill into condition preparatory to resuming operations. The mine when previously operated shipped the bulk of the output to Gary, Ind., where the fluorspar concentrate was used as a flux in the open-hearth furnaces, the remainder being sent to Trail to make electrolyte for the lead refinery. The Fordney tariff effectively put an end to the Gary business and was the cause of the closing of the mine. It is understood that a contract has been made with Ontario steel manufacturers to take the output of the mine, which amounts to between 5,000 and 6,000 tons of spar concentrate per year.

Vacation of Iron Lands "in Public Interest," Says Court

A decision by the Supreme Court of Minnesota in regard to the "north forty" at Hibbing, was given out June 19. The decisions of the lower courts were upheld on all points. Vacation of the streets of this tract of mining property is authorized and property owners residing in the adjoining tract south of the vacated property are denied the right of compensation or damages. This north forty contains more than 33,000,000 tons of ore and the higher court finds it is to the advantage and interest of the inhabitants of the village, the public generally, and of the state and nation that the ore in the forty and the adjacent slopes be mined and removed.

Canadian Arsenic Production Off

Owing to the lessened demand for calcium arsenate last year due to the fact that the menace of the boll weevil did not prove as serious as was expected, the Canadian production of arsenic has fallen off considerably. Revised figures of the Dominion Bureau of Statistics for 1924 show an output of 4,621,567 lb., as against 6,421,587 lb. in 1923. Of this total 3,596,165 lb. was white arsenic recovered as a by-product in the treatment of Cobalt silver ores, and the remainder in the form of concentrates of arsenical pyrites and similar ores of British Columbia and Nova Scotia.

News From Washington

By PAUL WOOTON
Special Correspondent

America Supplies Most of Austria's Copper

Domestic Production 3,908 Tons—Consumption 14,000 Tons in 1924—Increase Expected

ALTHOUGH copper is not mined in large quantities in the Austrian Republic, minor deposits are found in many parts of the Austrian Alps. There is only one important deposit now under operation, however; this is the so-called Mitterberger; it is situated south of Salzburg, one of the oldest copper mines in Europe. The copper content of the crude ore found there is in general 2.4 per cent, but at times runs as high as 10 per cent.

It has been estimated that there is 74,096 metric tons of copper in this mountain, according to R. W. Heingartner, consul at Vienna.

In the territory of the present Republic of Austria, 2,779 tons of metallic copper was produced in 1913, as compared with 3,908 tons from 84,598 tons of ore in 1924. This is an increase of 40.6 per cent over the last peace year. Although the industry is believed capable of greater development, it will probably never meet the country's requirements. At present the production of copper is comparatively expensive and the Austrian mines and plants are pressed by foreign competition. There were five copper mines in operation in 1924.

There are three copper smelting plants in Austria: one government plant in Tyrol, which is of minor importance; one in the former Vienna Arsenal, with an annual capacity of 3,600 tons of cathode copper, now out of operation; and the largest one in Salzburg, belonging to the Mitterberger Kupfer A. G. In 1923 the smelting plant of this company produced 4,630 tons of electrolytic copper, or more than 96 per cent of Austria's total production in that year. In 1924 this plant was hampered by enlargement and reconstruction operations and had a decreased output.

Foreign producers, chiefly American, have gained a sound footing on the Austrian market. An estimate of the republic's approximate average consumption can be obtained by adding net imports to the domestic production, which shows that consumption has increased from 4,592 tons in 1920 to 13,767 in 1924. The official statistics, however, include scrap copper to an unknown extent in both imports and exports.

In 1924, when Austria's industries worked on the average at only about 50 per cent of capacity, the national demand for copper was about 14,000 tons. If industry had been operating at full capacity, the requirement would have been approximately twice as much. Since the domestic output probably could not be raised by more than about 50 per cent or 2,200 tons on the average, foreign producers could supply an additional requirement of about 12,000 tons.

It appears that in general the Austrian consumers prefer to buy from agents of American companies, who maintain stocks on hand, rather than from dealers, because by so doing they can get the copper cheaper. The agent can do business on a narrower margin of profit than the dealer, owing to lower overhead expenses, less risk and less need of capital. Most American copper imported into Austria comes by way of Trieste by the Italian line, which maintains a regular service between Trieste and New York. Although there are some shipments via Hamburg and Rotterdam, the Trieste route appears to be the most popular. As a rule American copper exporters sell only against cash in New York. This is one of the factors that are said to hinder the development of direct sales of American copper in Austria. Many other foreign copper importers, especially German and English, grant credits up to six months without a bank guarantee.

Too Much Air Used With Producer Gas—Stone

HEAT losses at the furnaces of the New Jersey Zinc Co., where producer gas is used, have been found to be due chiefly to an excess of air, an excess of moisture in the gas, and inadequate generators. George C. Stone, of the technical staff of that company, in a letter to the Bureau of Mines expresses the opinion that usually an excess of air is used with producer gas. He commended the report of William E. Rice, of the bureau's Pittsburgh station staff, on the "Relative Value of Carbon Monoxide and Hydrogen as Constituents of Producer Gas."

Lawrie and Jenison See Great Importance of Metal Statistics

With all the uncertainties surrounding the international trade movement of silver, H. N. Lawrie, who assisted in the conduct of the work on gold and silver for the Senate commission, is strongly of the opinion that the producers must pay close attention to the statistical position of the metal.

Statistics never before have been so important, Mr. Lawrie thinks. A profound influence on price is being exerted by factors which cannot be interpreted as accurately as was done before the war.

Completion of the statistical studies of copper, lead, zinc, gold, and silver, begun by the Senate Commission of Gold and

Silver Inquiry, probably will have to await the pleasure of the Senate when it convenes in December. Very complete figures have been gathered covering such important matters as costs of production, marketing and milling, rates of production and rates of depletion over the ten-year period from 1913 to 1923. The work is 75 per cent complete.

The figures were gathered under the personal supervision of H. A. C. Jenison. The suggestion has been made that since there is objection to the completion of the figures under a committee representative of the industry it would be desirable to put Jenison on the payroll of the Bureau of Mines and have the work completed under the supervision of that bureau. Since no appropriation is available to cover the expense involved, the money probably would have to be furnished by the industry.

Status of Bureau of Mines Reorganization Still Uncertain

Many Groups Would Like Places on Hoover's Committee

Organization of the committee that is to study the work of the Bureau of Mines is awaiting instructions from Secretary Hoover. As this is written no reply has been received from the telegram sent Mr. Hoover suggesting that additional organizations be represented on the committee.

In the meantime other organizations have communicated with the department suggesting that they too should have representation on the committee. In each instance it has been shown where the organization is deeply concerned with the work of the bureau. This has raised the question as to where the line can be drawn. If all associations interested in some phase of the bureau's work are represented, the committee will be unwieldy.

Some question has been raised as to the wisdom of transferring the coal and minerals divisions from the Bureau of Foreign and Domestic Commerce to the Bureau of Mines. The preponderence of opinion, however, continues to favor such a transfer and the consolidation with those divisions of the work on mineral resources which has been performed by the Geological Survey. If the coal and minerals divisions are transferred, the iron and steel and chemical divisions also should be transferred, some argue, as their principal functions deal with domestic problems, closely related to work which the Bureau of Mines has been doing. On the other hand it is contended that the Bureau of Foreign and Domestic Commerce is the department's selling organization, and should continue to handle its industrial relations. It is becoming increasingly apparent that such questions can be resolved better by the committee than by those who have been closely associated with the activities of the agencies concerned. The hope is expressed very generally that the committee can begin its work as quickly as possible so as to have its recommendations ready to present to Secretary Hoover shortly after his return from California.

Trade Association Appeal Does Not Question Legal Principles

Matters of Fact to Be Determined—Claim Statistics Were Used to Maintain Prices

In announcing his intention to file petitions for rehearings in the Maple Flooring and Cement Manufacturers' Protective Association cases, the Attorney-General made it clear that he is in no way challenging the principles laid down by the court, but is simply attempting to show that there was violation of law in these particular instances. The Attorney-General's statement follows:

"Petitions for rehearing in these cases are in course of preparation and will be presented to the Solicitor-General within a few days. Leave was granted by the Supreme Court on June 8 to file petitions within thirty days.

"The object of the petitions will not be to obtain a reconsideration of the principles of law annunciated by the Supreme Court in its recent decisions, but to point out that the evidence in these cases brings them within prior decisions of the Supreme Court, the authority of which has not been questioned. In other words, the government will not take the position that the Supreme Court erred in holding that the mere collection and dissemination of trade statistics is in itself unlawful, but will endeavor to point out that the evidence in the records shows that both the Maple Flooring association and the Cement association were co-operating in the use of such information for the purpose of maintaining prices.

"The whole effort will be to show that the evidence leads irresistibly to the conclusion that the defendants, through their associations, had agreed to maintain prices and otherwise restrain trade within the prior decisions of the Supreme Court in the Hardwood Lumber and Linseed Oil cases."

Permit for Diamond Creek Project May Be Granted

Recent reports, apparently from reliable sources, are to the effect that the Federal Power Commission has expressed its intention to grant a permit for the construction of the Diamond Creek power dam, and that definite action will be taken, possibly in September of this year. James B. Girand located this site, made the preliminary surveys, and completely financed the project ten years ago, since which time the work has been held up for one cause or another.

The Diamond Creek dam is purely a power proposition, and interferes in no way with the building of the proposed storage dams at Glen Canyon above it, or at Boulder Canyon below it. The Diamond Creek project has been recognized as feasible by the federal government, by the state, and by every engineer who has looked into it. The power produced would find a ready market not only in the towns but in the mining camps. A number of prominent mining men, including L. D. Ricketts and John C. Greenway, are interested in its construction.

Melbourne Letter

By Peter G. Tait

Special Correspondent

Official Geologist Sees Good Outlook for Broken Hill

Large New Orebody in North Mine—Commissioner Sees Chance for Big Improvement

Melbourne, May 23—E. C. Andrews, government geologist of New South Wales, in reporting on a recent visit states that mining developments of a most encouraging nature were noted along the main Broken Hill line of lode.

During the period 1910-1915 anxiety was displayed as to the depletion of the ore reserves, and it is interesting therefore to note that, although 15,000,000 to 16,000,000 tons of ore has been removed since 1910, the actual ore reserves known are greater today than ever before in the history of the mines, being in excess of 13,000,000 tons, to which may be added approximately 7,000,000 tons which there is a high probability of winning.

Mr. Andrews says that in the North mine the great orebody recently developed on the 1,550 level is 191 ft. wide in the main shaft section. The work of winzing, driving, and crosscutting on this new level gives promise of developing an orebody approximately as large here as it was at the 1,400 level. The average grade of the ore proved between these two levels is apparently equal to the average run of mine ore to date. There is also high expectation of a great additional tonnage beneath the 1,550 level, although the pitch may flatten considerably below this level.

In the British mine the thirteenth level is being opened up, and on this a body of ore, comparable in size with that of the twelfth level, 100 ft. above, has been exposed. The prospecting and development work indicates the possibility that the orebody in the Thompson shaft section may undulate in pitch as traced toward the northern end of the leases. Such undulation in pitch, if existent, would be a most promising sign.

The South mine is opening up a very large body of ore, the back or trough of which rises southward on a pitch from the 1,170 level to a point lying above the 700 level near the boundary of the Zinc Corporation. This body is forming a magnificent addition to the ore reserves of the mine.

In the Zinc Corporation mine the main drive on the No. 8 level has been extended southward to M.L.5, with encouraging prospects. A crosscut 121 ft. in length has been put across the orebody on the No. 10 level under the South mine boundary. The whole of the crosscutting is in ore of high grade. Very considerable additions to the ore reserves, over and above the present rate of depletion, are being made.

Encouraging results are also being obtained from the Broken Hill Proprietary, the Junction, the Junction North, the Block 14, and the Pinnacles properties along the lode.

London Letter

By W. A. Doman
Special Correspondent

Value of Italian's Tin Salvaging Process Doubted

Dewhurst Criticises Direction of Nigerian Tin Industry—Reform Badly Needed

London, June 16—It is reported that Dr. Tito Rondelli, an Italian chemist, has perfected an invention for the recovery of tin from waste. For a long time past the Germans have carried on detinning operations, and during the war the scarcity of the metal led to the adoption of similar methods here. The process, however, was cumbersome and very expensive, and could not be regarded as a commercial success. It is claimed for the new invention that the plant is not costly, and that the process eliminates all the disadvantages previously encountered. An English company is said to be working the invention on a commercial scale with satisfactory results. From inquiries made in the highest quarters, however, I am unable to find that the matter is seriously regarded or that any great increase in the available supplies of the metal can be anticipated.

In connection with this matter of tin winning, J. H. Dewhurst has been at some pains to explain that Nigeria, which produces 4 per cent of the tin output of the world, is a good field in bad hands. He points out that the mines have no control over the native labor, and that out of a total native population of 18,365,630 only about 19,000 are employed in the mines. The native, he says, works a week or a day, as he pleases, and leaves without warning, and he advocates the adoption of the pass system, which is general in South Africa and which would yield a large revenue for the extension of railways, roads, waterworks, etc. Tin has been mined by the natives from time immemorial and it is all alluvial. The country, however, is rotten with diseases, both human and animal, and the quality of the white labor is below that of most mining fields, there being many incompetent men—misfits from other countries—in control of properties. The Mines Office and Survey Office are both understaffed, there is no organization, and no newspaper is published. A strong Chamber of Mines is advocated, a drastic cutting down of railway rates, and, above all, concerted action by the companies interested in order to obtain the necessary reforms for the rapid and profitable development of the country.

While on the subject of tin, I may point out that the Ranga Tin Syndicate, which has secured options over very large areas in what was formerly German Southwest Africa and to which I referred in my last letter, held its statutory meeting a day or two ago. Although no very definite information was imparted to shareholders, I am in a position to state that W. H. Trewartha James holds a very high opinion of the properties, on which tin lodes have been traced for many miles. This well-known engineer has been on the properties since April last, and on the Thelma mine 6 to 10 per cent tin ore has been proved. The engineer has inspected the German plant, which is operating successfully, and three new mills (not two, as previously stated) have been ordered. Water is plentiful, and the property being near the coast, costs are likely to be low. There is apparently scope for the formation of half a dozen subsidiaries.

I hear that J. W. Newbury, who was at one time connected with the Burma Corporation and who formerly spent a good many years on the Tarkwa field of West Africa, is now in London in connection with a tin property in Burma.

Burma Mines Output: 3,501 Tons Lead, 372,034 Oz. Silver

At the Bawdwin mines of the Burma Corporation during the month of May 25,859 tons of ore was mined, including 3,196 tons of high-grade ore. Of this 19,000 tons of ore was milled in the treatment plant, producing 6,859 tons of leady concentrates; also 11,207 tons of lead bearing material, including 3,680 tons of high-grade ore, was smelted in the blast furnaces, producing 3,717 tons hard lead for treatment in the refinery. Refinery products were 3,501 tons refined lead and 372,034 oz. refined silver. Of silver production 29,975 oz. was recovered from the treatment of copper matte. The experimental zinc plant produced 1,160 tons zinc concentrates, assaying 16.9 oz. silver, 7.9 per cent lead and 42.5 per cent zinc.

In addition to the above 700 tons copper matte was produced from the treatment of accumulated smelter by-products and 3,276 tons of copper ore. The tonnage of lead bearing material smelted also includes 669 tons of old Chinese slag recovered from Sterne River. Included in the tonnage of refined lead is 330 tons recovered from the smelting of copper ore.

Cable advices dated June 11 state: "New line of barricades completed at all levels and area between the two lines examined. With exception of a very small section between No. 5 and No. 6 levels at about co-ordinate 1,226 ft. south, which is warm and cannot yet be thoroughly examined, the fire is out in the area between the two lines of barricades, and the repair work necessary to permit of stoping being resumed in the area recovered has been started."

Moore Mine Changes Hands

A controlling interest in the Moore Mining Co., of Jackson, Calif., has been purchased by F. H. Rindge, of Stockton, Calif., for a reported price of $150,000. The mine has been a producer from time to time, but faults have caused the loss of the vein, and financing for further work has been on an assessment basis. It is stated that the faulted vein has been found, and it is expected that the new financing will enable the mine to reach the producing stage again.

Mexico City Letter

By W. L. Vail
Special Correspondent

Federal Authorities Settle Difficulties to Guanajuato Mines

Thereby Avert Shutdown of Several State Officials Exceeded Their Authority

Mexico City, June 22—The troubles between several of the mining companies in Guanajuato and the state authorities over new mining regulations and taxation, which threatened to bring about a shutdown of very important mines, throwing several thousand men out of employment, has been averted.

The federal government took a hand in the matter and arranged the differences in a manner satisfactory to the mine operators. It appears that the local and state officials had overstepped their authority and encroached on federal rights. The attitude of the central government in this case will be heartening to the mining interests throughout the republic.

Reports from Chihuahua state that operations on the Mosqueteros group of properties since the management was taken over by E. F. Knotts, former owner of the Ahumada Lead Co. and Erupcion Mining Co., have been highly satisfactory. On the first of June all debts of the company had been paid off from the shipments of ore for the three preceding months and at this writing about 10 tons of ore averaging 25 per cent lead and 3 oz. of silver is being shipped daily to the smelter in El Paso.

The Mosqueteros was taken under option in the summer of 1894 by the Peñoles company, one of the subsidiaries of the American Metals Co. Considerable work was done at the time and some ore was shipped, but indications did not look particularly promising and the option was given up. Later work has shown that as depth is being reached the values both in lead and silver have increased and the property gives promise of being a producer.

A résumé of the mining situation at the close of the fiscal year shows that production has remained nearly normal. Gold, silver, and lead outputs have been maintained despite certain unfavorable conditions, and copper has fallen off only slightly.

Agents' fees for denouncements have been raised to 45 pesos for the first ten pertenencias with a fee of 2 pesos per pertenencia up to fifty. The fee for publication of denouncements in official publications has been abolished. Also the mining department has canceled several thousand titles of properties for failure to pay taxes, and a list of these is being prepared.

According to reports in the local press, the American Smelting & Refining Co. has reconsidered its intention of reopening the mines in the district of Angangueo. No reason is set forth beyond the statement that the time is not considered propitious. The Angangueo camp in normal times employs several thousand workmen.

Societies, Addresses, and Reports

The Engineer in the Community

Under Him Can Greater Efficiency and Economy Be Obtained Than Under Administration of the Inexact, Says P. N. Moore

"For many generations the engineer, beginning as a military officer charged with construction of fortifications, has served his country unadvertised," said Philip N. Moore in an address delivered to students of the Missouri School of Mines earlier in the year, which has just been published in leaflet form. "Each period has witnessed increase in the range of his duties from construction of stationary to moving materials and in recent years to service as executive, operating the structures and machines he builds. No time has seen greater appreciation of his value to the community; never before has he appeared in current story so prominently. But in the face of all this, the community at foundation regards him as a glorified hired man, and rarely thinks of him as a civic head or political administrator.

"In face of the fact that the administration of our cities is three-fourths, and that of the state and nation at least one-half, engineering, whoever thinks of an engineer as Mayor, Governor, or President?

"Given like heredity and culture, there is no inherent reason why an engineer should react differently from any other citizen to the patriotic call or civic responsibility. But, unfortunately, things have combined to leave him too often unwanted and uncalled. What are these things?

"First, lack of local attachments. With few exceptions, the engineer's tasks are scattered countrywide, or worldwide, and mostly are those of construction, which completed, he goes his way to build again. . . Without local responsibilities a man feels little sense of civic duty and finds less opportunity for participation in national questions.

"Second, a large proportion of the total body of engineers serve the great business consolidations, many of which have interests adverse to the public, or by their very size induce criticism and political attack. In self-defense they think they must hold their staffs to strict neutrality on all public questions.

"Third, the engineer's training has failed to teach that the greatest task of all is the ability to persuade men; and unwillingness or incapacity to enter public discussions, either through modesty or lack or readiness, has held him back. False professional pride, and the same indifference which holds back many high-class men through unwillingness to mingle with and rub shoulders against the great majority, have also deterred him.

"Fourth, the past habit of the great societies which the engineer forms (and which voice his profession) to hold themselves aloof from political affairs as collectively unethical.

"The engineer does not advertise. A blessed rule of his ethical code forbids, holding that while a man may advertise his goods, he must not advertise himself. The engineer, due to his training in accuracy of thought, is intellectually honest. The man who is morally honest will not knowingly deceive others; he who is intellectually honest will not deceive himself. A man may be morally honest and yet far from intellectually so, because he fails logically and clearly to reason his problems back to fundamentals. . . . Intellectual honesty is often not pleasant to exercise. Its conclusions are not what people like to face, and the man who forces them upon the public is unwelcome and draws a very small vote at the primary.

"In his place, the smooth-tongued lawyer, whose duty to his client leads him to develop half truths most of the time, can easily present one side, the agreeable one, to the public, and be acclaimed as their champion.

"If there be any one thing which is needed in our political affairs today it is the dominant counsel of those who can apply quantitative thinking to economics. This is not interesting, and a difficult subject wherewith to attract the average voter, but with our political eyes turning more and more intensely upon economic affairs, it is of the highest importance that accuracy should by some means be conveyed to the average man—not that he will, as a rule, appreciate to apply it, but if clearly transmitted, there will always be some clear-thinking intellects among the mass who will retain and repeat to their fellows. . . .

"This very matter of quantitative thinking is a thing that the average politician, and he is usually a lawyer, is incapable of exercising. . . . We claim the engineer's training should enable safe judgment to be formed in administrative affairs. For them we believe the engineer to be more qualified than men of any other calling.

"You will please note also that no engineers are mingled with the scandals of maladministration which smell to heaven from Washington. So I bid you all, gentlemen, hold in your vision the idea that the engineer should be an administrator of city, state and national affairs. Should the opportunity come to you, hold not back, have no modesty in accepting, but do the task which it may be your lot to secure.

"The engineer has dealt so long with matter that he has failed to consider his fitness and even his duty to deal with mankind. In him your speaker believes lies a great unused force which, given opportunity and responsibility, could bring about greater efficiency and economy than can exist under the administration of the inexact.

"But, aside from the unused opportunity to serve, as vocation or life task, there lie unexercised great fields of unpaid work, to which citizenly duty demands that the engineer should give some of his time and talent. For, after all, the unpaid work which a man does in this world is that which, as he looks back, gives him the most unalloyed satisfaction. . . .

"Engineers seek at the present a wider recognition on the part of the public that the training of the engineer fits him for public service; that he should be recognized as a thinker and a leader instead of as a glorified mechanic who by his skill puts into material form the dreams of others. The engineer must be a dreamer, for without the vision of the structure long before it takes form, and without knowledge to formulate the dream into plan and to put the plan into being, nothing results. . . ."

Michigan as a Future Producer of Copper

The future of the Michigan copper district will be the same as the future of the Michigan iron ranges after the Mesabi field was opened, in the opinion of Prof. F. W. Sperr, of the department of mining engineering at the Michigan College of Mines, Houghton.

"When I came to the Michigan copper district thirty years ago," he said, "there were fewer copper mines operating here than at present. Copper will continue to be produced here for many years to come. Thirty years ago the Mesabi iron range was opened up and all the Michigan iron mines were doomed, it was believed, because of the low cost of production of Mesabi ores. The prediction was correct at that time, but low-priced Mesabi ores created an unusually large demand for iron and steel, and as a result, Michigan ores moved rapidly."

Discovery of Iron in Minnesota Will Be Celebrated

A Golden Jubilee week to celebrate the discovery in 1875 of the large deposits of iron ore in St. Louis County, Minnesota, is being planned at Duluth in conjunction with the 1925 Exposition of Progress that has been arranged for the week of July 20. During the corresponding week in July, 1875, Prof. Albert Chester and R. H. Lee uncovered the first deposits of iron ore on what is now the Vermillion Range and in the same year George R. Stuntz and G. C. Stone brought out specimens of ore from the Mesabi range. Exhibits and educational displays will be provided to help visualize the progress of construction and expansion since then.

Texas School Graduates Nine

The tenth annual commencement of the Texas School of Mines was held recently. The address was delivered by Major F. H. Lyons. Nine men were graduated.

The class in field geology will spend September at the Santa Juliana mines of Rodolfo Cruz in the Sabinal Mountains, in northern Chihuahua. Prof. W. H. Seamon will be in charge, assisted by Prof. H. E. Quinn.

Dallas for Next Oil Meeting

The American Association of Petroleum Geologists will hold its next annual meeting in Dallas, Tex., in March, 1926, according to a recent announcement by President E. DeGoyler.

Men You Should Know About

A. Law Voge has returned to New York after spending six months inspecting antimony deposits in Bolivia.

F. E. Calkins has returned from southern Sonora and is now examining some mines in the State of Jalisco, Mexico.

Sherwin F. Kelly was in New York recently, and will be engaged in electrical prospecting work in the Southwest this summer.

E. M. Hamilton, metallurgical engineer, of San Francisco, sailed for Europe May 30 and will be absent from his office until October.

Kirby Thomas has been examining the placer in the Hassayampa River in Arizona, and mining properties at Columbia, in the Humbug mining district, South Bradshaw Mountain region.

A. E. Brugger, mining engineer, who has been for two years in the diamond fields of the Belgian Congo, passed through New York recently on his way to his home in Oklahoma.

John R. Suman, of Houston, Tex., manager of the Rio Bravo Oil Co., a Southern Pacific subsidiary, has been elected vice-president to fill the place of Edwin T. Dumble, who retired recently.

R. I. Rutherford, of the geological department of the University of Alberta, and party will make a survey of the McLeod River, starting from Bliss, on the Canadian National Railway, and working eastward.

E. S. Boalich, for the last three years senior valuation engineer in the engineering division of the Income Tax Unit, Washington, D. C., has resigned and resumed private practice at 3953 Utah St., San Diego, Calif.

Clyde E. Williams, superintendent of the U. S. Bureau of Mines station at Seattle, Wash., has returned to Seattle from his trip to South America, where he assisted H. Foster Bain in his studies for the Argentine Government.

John Borg, of New York, president of the Callahan Zinc-Lead Co., arrived in Wallace, Idaho, June 23, accompanied by his family. Mr. Borg will remain in the Coeur d'Alene district several weeks looking after the interests of the company and enjoying a vacation.

J. M. Iles, at one time general manager of the Rayfield (Nigeria) Tin Fields and who has spent much time in West Africa, has been appointed joint managing director of the company with St. John Winne, who has had considerable experience as a director of mining companies.

Walter E. Cameron, at one time deputy chief government geologist in Queensland, Australia, afterward for a term of years in the service of the Malay States Government, and later for a while in England, was in April last on his way back to Australia from London.

Thomas J. Ryder and **E. DeGolyer,** president and vice-president, respectively, of the Rycade Oil Corporation, were in Houston, Tex., recently. They are making a tour of inspection of the company's holdings in the Gulf coastal territory. The Rycade is a subsidiary of the Dutch Shell.

Alan A. Davidson, who has been in West Africa superintending the tin properties of the Keffi Consolidated, has returned to England, and **W. G. Perkins,** whose mineral separation process is to be used at the Bwana M'Kubwa mine, is also back in this country from Rhodesia.

John V. W. Reynders, of New York City, president of the American Institute of Mining and Metallurgical Engineers and consultant on steel properties, was given the degree of Doctor of Engineering at the commencement of the Rensselaer Polytechnic Institute of Troy, N. Y. Later he delivered the commencement address, in which he stressed the growing dependence upon engineers in the social and economic sphere of the world's progress.

J. V. M. Reynders

Bancroft Gore, of Rapid City, S. D., sailed from New York June 20 on the "Southern Cross" for an examination of the lead mines in the Famatina district, Province of Rioja, Argentina. These are under development by Argentine capital affiliated with the Bank of the Nation of Buenos Aires.

W. E. Cockfield, of the Canadian Geological Survey, has left Vancouver for Atlin with a party of geological students from the University of British Columbia. He will make a reconnaissance survey of the extreme northwestern part of British Columbia, about which at present little is known.

D. I. Hayes has been appointed manager of the mine and mill of the Silver Dyke Mining Co., Neihart, Mont., in place of **W. E. Wampler,** resigned. **H. I. Young,** manager of mines for the American Zinc, Lead & Smelting Co., the controlling interest, is at Neihart for two weeks, after a short visit in Japan.

Olaf P. Jenkins has resigned as associate professor of economic geology in the State College of Washington and sailed on June 25 on the "Empress of Russia" for Batavia, Dutch East Indies, where he will be in the employ of the Nederlandsche Koloniale Petroleum Maatschappij, in Sluisburg, Weltevreden.

Campbell Miles, mining prospector, who discovered the Mount Isa silver-lead field in Queensland, Australia, was camped in December last, with a prospecting outfit, twenty miles further inland than Mount Isa. He has resumed the prospecting tour toward the Northern Territory in which he was engaged when he found the big Mount Isa outcrops.

Harry Clark, general manager of the Calumet & Arizona Mining Co., his assistant, **Eugene Whiteley,** and **Michael Curley,** general manager of the New Cornelia Copper Co., are visiting the main offices of the companies in Calumet, Mich. They were recently promoted to these positions, following the resignation of **General John C. Greenway,** who was general manager for both concerns.

R. S. Taylor, mining engineer, of the Flat River Lead Mines, Missouri, was in Queensland, Australia, in December, and about the middle of that month left Brisbane to visit the Mount Isa silver-lead deposits in that state, his object being to ascertain whether they are likely to rank among the world's greatest producers of silver, lead, and zinc. It is stated in Australia that there is a desire on the part of American capitalists to invest in Mount Isa mining enterprises. Mr. Taylor was afterward to visit the Chillagoe mineral field, in the far north of Queensland.

G. C. Riddell, chief of the Minerals Division of the Bureau of Foreign and Domestic Commerce, has tendered his resignation to acting Director O. P. Hopkins, effective July 1. He will shortly leave for the West to examine the plants and properties of an oil company with which he will be associated in an advisory capacity. After a month's reconnaisance of the California, Utah, and Wyoming properties of the company, Mr. Riddell will locate in New York as consulting engineer for the Alaska Pacific Coal Co., which has under development an anthracite property in the Bering River field of Alaska.

Obituary

William Foster Word, mining engineer and Montana representative of the American Mining Congress, died of cerebral hemorrhage on June 2 in his home in Helena. Mr. Word was born in Oregon, Mo., on Dec. 29, 1861, and was graduated as a mining engineer in 1885 from the University of Michigan, after taking the classical course there. He was chief engineer at the Gagnon mine in Butte for five years and had been a technical witness in many of the important mining suits in the intervening years. For the last twenty years he had made his home in Helena.

Recent Technical Publications

Reviews, Abstracts, and References

The many users of Richards' "Textbook of Ore Dressing" will be glad to know that a new thoroughly revised edition of the book will be published in a few weeks.

In glancing over our contemporaries we note: "A widely circulated mining publication in the United States makes this remark: 'If you own a promising silver mine and desire to make the most of it, you might do well to pick out a native of Utah.'" We thank the *Western Canada Mining News* for the ad, veiled though it is.

"Kelley, Anaconda Head, Is Optimistic on Outlook for Copper Business," says a headline in the *Daily Metal Reporter*. "He is of the opinion that the surplus is being gradually worked off and is now not much in excess of two months' supply." When a dog bites a man it is not news but when a man bites a dog it *is* news. When Messrs. Kelley and Ryan can see no hope for the copper industry, and when Messrs. Schwab and Gary think the steel business is going to the dogs, we shall get out a special edition of the *Mining Journal-Press*.

According to a poem by Dorothy Parker in the New York *World*, "His eyes were hard as porphyry," which, as any hard rock miner knows, is certainly not more than medium hard.

Proceedings of the Empire Mining and Metallurgical Congress. Edited by the General Secretaries and G. F. Bird and Percy Strzelecki. In five volumes. Published by Empire Mining and Metallurgical Congress, Cleveland House, 225, City Road, London, E. C. 1. Price £2 2s. for the five volumes, or 10s. 6d. for Vols. 1, 3, 4 and 5, and £1 1s. for Vol. 2.

These volumes contain all of the many papers prepared for the Congress in London last year, and the whole forms a valuable reference work covering mineral resources, mine development and operation, and metallurgy. Part 1 is devoted to a report of the proceedings, the inaugural address, the paper by Graham on the "Mines and Mineral Deposits of Canada," "An Outline of Mining and Metallurgical Practice in Australasia," and "Mining and Metallurgical Practice in South Africa." Part 2 is principally devoted to mining, including papers on "The Economics of Metalliferous Mining," by Louis and Marriott; several papers on coal mining; "Physiological Problems in Mining," by Haldane; "Miners' Nystagmus: Its Prevention and Cure," by Llewellyn; "The Ventilation of Mines," by Hay and Clive; "The Rhymney Valley Compressed Air Installation," by Hann; a paper on the mining and metallurgy at the Sullivan Mine, B. C.; "Treatment of Gold-Bearing Quartz of the Kolar Gold Field," by Kendall and Hosking; and "Tin Mining in Malaya," by Attenborough. Part 3 is entirely devoted to petroleum, the papers covering economics, geology, drilling methods, resources, oil-shale refining, transport, and distribution. Part 4 is taken up with papers on iron and steel, and Part 5 with non-ferrous metallurgy, the following five papers forming the volume: "Light Alloys of Aluminium," by Rosenhain and Archbutt; "The Economics of the Copper, Brass, and Nickel-Silver Industries, 1924," by Mullins; "Metallurgical Education of University Rank in Great Britain," by Carpenter; "Metallurgical Research in Government Laboratories," by Haughton; and "The Work of the British Non-Ferrous Metals Research Association," by Hutton.

Many of these papers have been chronicled in these columns as they have appeared. Their collection and publication in more permanent form is well justified, for the papers have been prepared with great care, and a large amount of discussion is appended to most of them, often omitted when the papers were published elsewhere.

Le Radium et les Radio-éléments. By Maurice Curie. Published by Librairie J.-B. Baillière et Fils, 19, Rue Hautefeuille, Paris (VI) France. Price, 44 francs in paper covers, postpaid, or 55 fr. in flexible binding.

This is the most complete book on radium that we have seen. The first chapter is introductory, and discusses the theoretical aspects of the element. The second chapter deals with the measurement of radioactivity. Deposits of radium minerals and methods of mining are covered in the third chapter, followed by a detailed account of methods of treatment and recovery used. The remainder of the book covers the use of radio elements in therapeutics, in the manufacture of luminous articles, and in agriculture. Although written in French, the book will not prove formidable to any one having a fair working knowledge of that language and there is nothing in English of corresponding scope so far as the reviewer knows.

Switchboard Handbook—The Electric Power Club, B. F. Keith Bldg., Cleveland, Ohio, has published a 95-page handbook on power switchboard and switching equipment. This gives instructions for the installation, operation, and care of switchboards; definitions, abbreviations and symbols, adopted standards and practices; and safety standards. Copies are obtainable for 50c. each.

Georgia—The Geological Survey of Georgia, Atlanta, Georgia, has recently published Bulletin No. 42 on the "Physical Geography of Georgia," as a bound book of 189 pages.

Mining Laws—The mining laws of the Federated Malay States are given in Vol. 7 of "The Mining Laws of the British Empire and of Foreign Countries," published by the Imperial Mineral Resources Bureau, 178 pp. Price 12s. 6d., from the British Library of Information, 44 Whitehall St., New York City.

The Principles of Accounting

Accounting. By W. A. Paton. Pp. 894. Published by the Macmillan Co., New York. Price $3.50.

Anyone desiring to obtain a good grasp of accounting fundamentals—to know the why of the art—can hardly do better than study a text such as this of Paton's, which is intended for those who wish to go beyond an elementary knowledge of bookkeeping. The book goes several stages further in its exposition of accounting principles, but practice, however, is not subordinated to theory. Mr. Paton gives a very clear explanation of basic terms in accounting, especially the meaning of debit and credit, the very brickwork of the accountant. It is quite a tribute to the mining industries that Mr. Paton, in illustrating some of his remarks, has chosen occasionally sections from mining-company financial reports. Excerpts from the reports of Utah, Ray Consolidated, Chino, and Chile Copper are used, and well they may, for, as *Mining Journal-Press* has stated editorially, they are excellent examples of modern accounting practices. The reader who looks to this book for a discussion of the special problems of the mine accountant will be disappointed, for in a work of an introductory nature it is obviously impossible to go into the higher problems of accounting, to which a consideration of depletion, for example, belongs. But the reader who wishes to obtain a better comprehension of the balance sheet, income statements, and the like, and who wishes to learn how they are constructed and analyzed, will not be disappointed.

F. E. WORMSER.

The Standard Iron-Steel-Metal Directory. 1925. Atlas Publishing Co., New York. Price, $10.

The first 700 pages of this book is a directory, arranged by cities and states, of all metal-manufacturing plants, such as iron and steel mills, rolling mills, and foundries of all kinds. The capitalization, officers, purchasing agent, sales manager, products, equipment, capacity, and raw materials used, are given. Non-ferrous metal-manufacturing plants are included, but smelters of ore are omitted, the book being concerned with users rather than producers of metal. The second section, also of about 700 pages, gives the names classified according to the kind of material produced. The remainder of the book contains various statistical data, trade specifications, lists of railroads, steamship lines, street railways, and automobile manufacturers, together with the names of the purchasing agents.

This is a valuable reference work for any one that is engaged in buying metal products or that wishes to sell raw material to the metal-using industries.

Mining Law—The meaning of the terms and phrases used in the mining laws of the United States are not always clear. Definitions of 205 such terms are given in a 44-page article in *Mining in California* for January, obtainable on request from the California State Mining Bureau, Ferry Bldg., San Francisco.

Chemistry of Engineering Materials. By Robert B. Leighou. 2d ed. McGraw-Hill Book Co., New York. Price $4.

The first edition of this book appeared in 1917 and immediately received much favorable comment. The general arrangement has been retained in the second edition, with chapters on water, fuel, refractories, the non-ferrous metals, non-ferrous alloys, iron and steel, corrosion, foundry sand, building stone, lime and gypsum products, cement, clay, paints, lubricants, glue, rubber, electrical insulating materials, electric cells, and hydrometry. The principal revision has been made in the matter concerning fuel, iron and steel, corrosion, and non-ferrous metals and alloys, these chapters being virtually new. Three classes of readers will find this book of use: manufacturers of the materials mentioned; users; and suppliers of raw material. It is also a valuable book for student use, in which it has perhaps found its principal field. For commerical purposes it is not as detailed as might be desired in all cases, but the author does not pretend to specialize. No one need have a thorough knowledge of chemistry to understand this book, as it is plainly written for the general reader.

Mineral Statistics — The Imperial Mineral Resources Bureau has issued the following pamphlets giving world statistics on production, imports, exports, and prices for the years 1920-1922: "Molybdenum," 9 pp., 6½d.; "Uranium (Radium) Minerals," 10 pp., 6½d.; "Antimony," 22 pp., 1s. 1d.; "Diamonds," 20 pp., 1s. 1d.; "Tungsten," 18 pp., 9½d.; and "Petroleum and Allied Products," 156 pp., 6s. 2d. Obtainable from the British Library of Information, 44 Whitehall St., New York City.

Mine Hoisting—*The Mining Congress Journal* for May (Washington, D. C.; price 30c.) has an interesting 6-page article by F. L. Stone, of the General Electric Co., on "Modern Tendencies in Mine Hoisting."

Treatment of Manganese-Silver Ores—Bulletin 226 of the U. S. Bureau of Mines, 110 pp., is entitled "The Treatment of Manganese-Silver Ores," the authors being Galen H. Clevenger and Martinus H. Caron. The Caron process, with which this bulletin is chiefly concerned, depends upon the reduction of the higher oxides of manganese to manganous oxide, thus decomposing the refractory silver-manganese compound, probably a manganite, and making the silver amenable to cyanidation. The results of many tests on various ores are given in this bulletin, and the apparatus used is described in detail. A bibliography is appended. This work will be discussed more at length in a future issue. The bulletin is obtainable for 20c. from the Superintendent of Documents, Washington, D. C.

Tin Mining—The April issue of *The Far Eastern Review* (Shanghai, China; price 50c.) contains a 4-page illustrated article by T. R. A. Windeatt on "Landmarks in the Tin-Mining Industry," outlining conditions in the tin-mining areas of the Far East, and how primitive methods are being displaced by the use of modern equipment.

Canadian Mining Publications

The *Bulletin* of the Institution of Mining and Metallurgy for May contains the 98-page paper prepared by R. P. D. Graham for the Empire Mining and Metallurgical Congress last year, on the "Mines and Mineral Deposits of Canada." This is an excellent résumé for any one thinking of visiting or investing in the mineral industries of the dominion. Copies are obtainable for 4s. each, from the Offices of the Institution, Cleveland House, 225 City Road, London, E. C. 1.

The Canadian Pacific Railway, Montreal, has issued revisions of its series of bulletins on the various metallic and non-metallic mineral industries of Canada. Sources, uses, production, imports and exports, and Canadian and U. S. tariff schedules are given for each of the following: abrasives, arsenic, asbestos, barytes, chromite, clay, coal, cobalt, copper, diatomaceous earth, feldspar, fluorspar, gold, granite, graphite, gypsum, iron, lead and zinc, magnesite, manganese, mica, mineral water, molybdenum, natural gas, nickel, ocher, petroleum, phosphate, platinum, pyrites, salt, sand and gravel, silver, slate, sulphates, and talc and steatite. Copies of any of these are obtainable on request.

Part III of the Report of the Ontario Department of Mines for 1924, obtainable on request from the Department at Toronto, contains chapters on recent developments in the following districts: Larder Lake area, Night Hawk Lake area, McNeil Township, Lightning River area, and Murphy, Hoyle, and Matheson Townships.

Arizona Map—The Arizona Bureau of Mines, Tucson, Ariz., now has available for distribution the geological map of the state on which it has been working for several years in co-operation with the U. S. Geological Survey. The map is on the same scale as the topographic and base maps recently issued, about eight miles to the inch. The price is 50c. unmounted, or $2.50 mounted on cloth with rollers top and bottom.

Wire Rope—Circular No. 208 of the U. S. Bureau of Standards, Washington, D. C., 37 pages, gives the U. S. Government Master Specification for Wire Rope. It is illustrated and should be of interest to every wire-rope user. Obtainable for 15c. from the Superintendent of Documents, Washington, D. C.

Cyanidation in Ontario — "Cyanidation of Gold and Silver Ores of Northern Ontario" is discussed in an article in the *Journal* of the Society of Chemical Industry, April 17 and 24 issues. Price 1s. 9d. for each issue; Central House, 46 and 47, Finsbury Square, London. E. C. 2, England. The author is Charles Spearman. The article is a general discussion of the method of treatment and the chemistry involved, rather than a description of the work at individual plants.

Classification Efficiency—In the publication just mentioned also appears a 6-page discussion of classification efficiency by H. A. White and others, covering the application of theoretical formulas.

Mineral Fuels—Bulletin 751 of the U. S. Geological Survey, "Contributions to Economic Geology, 1923-1924; Part II.—Mineral Fuels," 326 pages, contains several papers on oil, gas, and lignite fields of the West, most of which have been reported in these columns when they were issued as separates. Obtainable on request from the Survey, at Washington, D. C.

Virgil R. D. Kirkham writes on the "Geology and Oil Possibilities of Bingham, Bonneville, and Caribou Counties, Idaho," in Bulletin No. 8 of the Idaho Bureau of Mines and Geology, Moscow, Idaho; 108 pages, price 50c.

Mineral Statistics — The Imperial Mineral Resources Bureau has issued statistical bulletins covering world data on production, consumption and trade, for 1920 to 1922 inclusive, on the following: "Gypsum," 34 pages, price 1s. 7d.; "Chrome Ore and Chromium." 24 pages, 1s. 1d.; "Monazite," 13 pages, 6½d.; "China Clay." 18 pages, 9½d.; and "Talc," 15 pages. 9½d. Obtainable from The British Library of Information, 44 Whitehall St., New York.

Graham County, Arizona — Bulletin 763 of the U. S. Geological Survey, Washington, D. C., 120 pp., discusses the "Geology and Ore Deposits of the Aravaipa and Stanley Mining Districts, Graham County, Arizona." The author is Clyde P. Ross. This district lies near the southern border of the state and is without rail transportation, so that its development has been retarded. Deposits of silver, copper, and lead have been known for fifty years, though only about 35,000 tons of ore has been mined. Copies of the bulletin are obtainable from the Superintendent of Documents, Washington, D. C., for 25c. each.

Montana Phosphate — "The Melrose Phosphate Field, Montana," is described by R. W. Richards and J. T. Pardee in U. S. Geological Survey Bulletin 780-A, 32 pages, obtainable on request from the Survey at Washington, D. C. No estimate of the tonnage available is made, but the deposits are not so attractive for development as those in Idaho, though they are nearer a source of acid.

Oklahoma Oil—U. S. Geological Survey Bulletin No. 759, 61 pp., discusses the "Geology of the Bristow Quadrangle, Creek County, Oklahoma." It is by A. E. Fath. Most of the field work on which this report was based was done nine years ago. Obtainable from the Superintendent of Documents, Washington, D. C. for 40c. Several maps and charts are included.

First Aid—A valuable illustrated booklet on first aid, which may be easily carried on trips, may be obtained free of charge by addressing R. F. Edwards, Prudential Insurance Co., Newark, N. J.

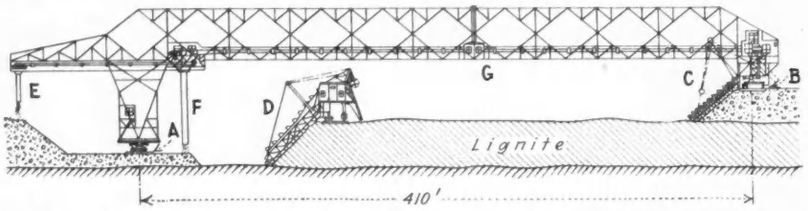
Utah Industries—Bulletin No. 4 of The Industrial Commission of Utah, Salt Lake City, obtainable on request, contains a biennial report of the metal mines, smelters, and mills, by E. A. Hodges, State Metal Mine Inspector. This is an up-to-date directory of all the mines of the state, with particulars as to officers, capitalization, development and operation.

New Machinery and Inventions

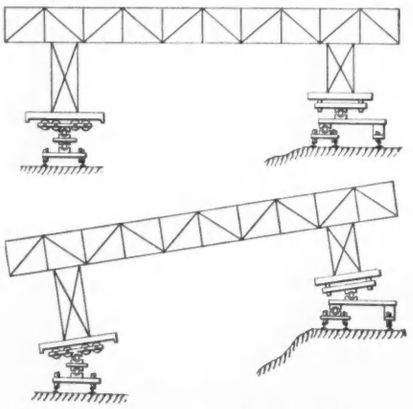
A Shovel Bridge for Stripping Overburden

For a long time the audacious design here described remained merely an idea, until recently Director Delius, of the Plessa Lignite Works, Elsterwerda (Germany), put it into effect. In lignite mining there the stripping of the overburden and its subsequent replacement after removal of the lignite often present a serious problem. When the thickness of the overburden is out of proportion to that of the lignite vein, it may even prohibit the mining altogether.

The bridge shown in the accompanying drawings was designed to overcome this difficulty. It affords a means of passing the overburden, after it has been excavated, overhead above the mining pit proper to its ultimate place and runs on specially designed rollers. In Fig. 1, *A* and *B* are the rails on which run the bridge posts. Attached to the post which rests on the top soil is a dredge *C*, which removes the layer of deposit. The bridge is 528 ft. long covering the lignite. Across the bridge runs an endless rubber belt, which carries the material to the other end of the bridge, where through the funnel *F* it is dumped into that part of the pit from which the lignite has already been mined, or it is even carried to funnel *E*, where it gradually fills the entire pit again. A dredge, *D*, mines the exposed lignite. At *G* on the bridge heating equipment is provided, intended to protect the expensive rubber belt against excessive temperature variations.



Stripping of the overburden and replacement of it proceed continuously with the aid of this shovel bridge



Provision is made for lateral and vertical adjustments of the bridge supports

As it presents difficulties to lay exactly parallel rails at a distance of 528 ft. from each other, care had to be taken that any deviations might not have an injurious effect upon the bridge. The bridge post on the left does not rest immediately upon the roller, but on a second roller which can move sideways on the lower one.

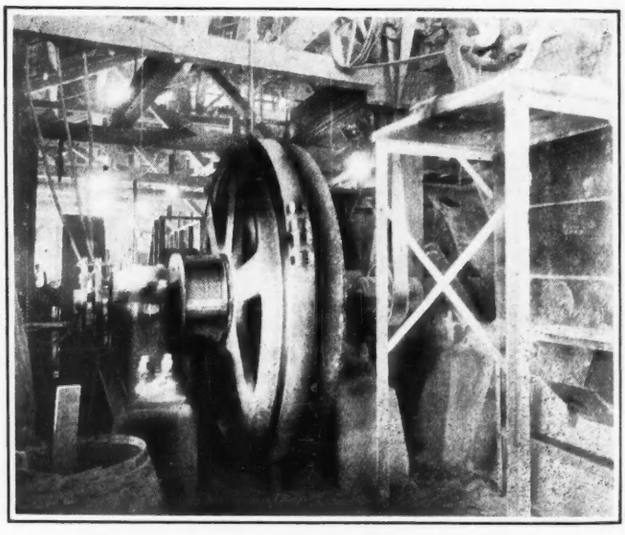
In order to eliminate any danger to the bridge when it may have to be tilted, the bridge posts rest on ball bearings. Fig. 2 illustrates an extreme case of this nature. These ball bearings also permit a twisting of the bridge horizontally, which may occur when the motors at the two ends should not run at even speed.

As the buckets of the stripping dredge *C* remove an amount of material equal to the width of the buckets in one trip, the rails have to be shifted this same distance for the return trip, which is done by two rail-shifting machines attached to each end of the bridge. In one hour the bridge removes 654 cu.yd. from one side to the other, which is equal to about seventy carloads of 15 tons each. This work requires about 100 hp., including the moving of the bridge. In the Plessa works the bridge has replaced five engines of 200 hp. each and the operating force was reduced 30 per cent.

Super-synchronous Motor in Mill Work

A machine that is said to be rapidly finding favor in the mining industry is the super-synchronous motor. The accompanying photograph shows one of these machines, rated 350 hp., in the mill of the Golden Cycle Mining & Reduction Co., Colorado Springs, Colo., where it is driving a Hardinge mill requiring about 200 per cent torque to start. The motor in question was made by the General Electric Co., and, in actual operation, after the outside frame has attained synchronous speed, approximately three minutes only is required to start the load and bring the mill up to speed.

Super-synchronous motor direct-driving a ball mill at plant of Golden Cycle Mining & Reduction Co., Colorado Springs, Colo.



Power Relay of Improved Design

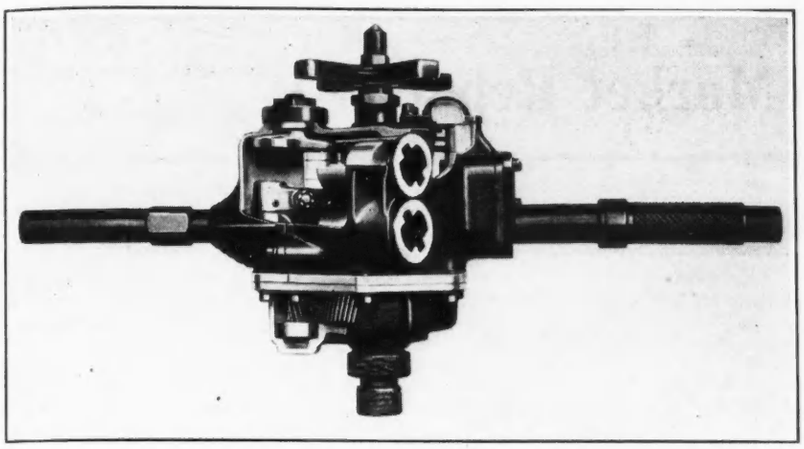
A new General Electric power relay can be calibrated without removing the cover by means of a knob projecting through the glass window at the upper part of the case. This relay is for use in limiting the power on distribution lines to a predetermined quantity. It has a large range of calibration, running from zero to 1,000 watts, secondary; heavy contacts are used, and the internal mechanism is very simple.

This relay is manufactured in three forms: the "IG-102," an "over power" and "under power" device with contacts for controlling either alternating or direct current; and two "over power" devices, one for alternating current and the other for direct current, known as the IG-103 and IG-104, respectively. By rotating the knob at the window, the relay may be adjusted for operation at any deviation from the desired load. A graduated dial, mounted beneath a fixed needle, rotates with the calibrating knob, giving visible indication of the load setting.

A New Long Stroke Air Drill

A new design of four-cylinder pneumatic drills has been brought out by the Ingersoll-Rand Co., 11 Broadway, New York, in both reversible and non-reversible sizes. One feature of the new drill—namely, the speed governor—will, it is claimed, in approximately a year's time pay the cost of the drill in air saved. Every wearing part is renewable.

The speed governor limits the speed of a drill after it has passed the point of maximum horsepower and so prevents racing and extra consumption of air. It avoids wear and tear on the drill of high free speeds, excessive fric-



The speed of this new long-stroke air-drill is limited by a governor after it has passed the point of maximum horsepower

tion heat and consequent lubrication troubles.

Cylinder liners of special steel are fitted into the steel casing and are easily removable and renewable. A worn cylinder may be easily renewed. The cylinder case proper never wears out. It is practically impossible to dent a cylinder and cause sticking of a piston. A space between liner and cylinder case wall prevents this. The liners are held in place by cylinder heads that screw into the liner and shoulder against the case. The threads are in the liner and not in the case, so that stripped threads would necessitate only a new cylinder liner.

The crank pins are fitted with a sleeve held stationary on the crank pin, so that all the wear takes place on the sleeve instead of on the crank pin. Lubrication of the crank pins is from the inside as well as from the outside. All other drills have been lubricated by the crank shaft supposedly turning in the grease in the crank case. However, it has been found that centrifugal force throws the grease away, resulting in very little lubrication.

The main valve is of large diameter with long bearing surfaces. It is air balanced so as to avoid wear on its bushing. It is gear timed so that no intricate valve mechanisms, toggles, levers, or cranks are needed. Gearing is of helical type. Connecting rods are of one-piece drop forgings. The crank shaft construction permits the use of solid end connecting rods and renewable crank pin sleeves. It is accurately counterbalanced to insure smooth operation. The complete crankshaft with pistons and connecting rods can be assembled outside of the case and be then inserted in place.

Extension Rails for Temporary Track

A device intended to do away with temporary track laying underground has recently been introduced. It is known as the Tompkins extension rail and is made by the Midland Steel Products Co., Cleveland, Ohio. According to the manufacturer, the rail will make possible a saving to the operator in the following ways:

By eliminating the labor cost in laying down and taking up short extensions or temporary sections of jumper track.

By reducing the total cost of track laying.

By saving all the indirect cost incident to jumper track laying, such as idle miners and working places, inefficient functioning of every day man and piece of machinery from the face to the surface; a loss of time that costs the operator fully as much as his direct costs for track laying under any one of the old systems.

By saving the cost of spikes, bolts, clamps, track tools, etc., required under the "balling-in," "jumper," "switch-point" or any of the old kinds of temporary tracks in mining.

By saving the cost of taking bottom or brushing top in the average low vein.

It is evident that it also will save the miner's time otherwise lost in waiting for a track crew to lay or tear up temporary track. The rail is quickly laid by the miner himself, without the aid of a crew or without tools or supplies. It permits the car to be laid as close to the face as desired. The combination handle and car stop keeps the car from running against the face.

Trade Catalogs

Diamond Drills. Diamond core drills and supplies are covered in Catalog No. 7 of E. J. Longyear Co., Minneapolis, Minn. It contains 64 pages.

Car Dumper. The Link-Belt Co., Chicago, has just issued an 8-p. booklet which describes the operation and use of the Link-Belt gondola car dumper. It is replete with photographs of installations and line drawings showing method of operation. Copies will be sent to those interested.

Water Softener. Bulletin 509 of the Graver Corporation, East Chicago, Ind., describes the Graver zeolite water softener. Copies will be sent to those interested.

Mine Lamp. The Wheat electric safety mine lamp, made by the Koehler Manufacturing Co., Marlboro, Mass., is described in a 16-page catalog issued by the company under date of May 1, 1925.

Automatic Station Equipments. The June issue of the *General Electric Review* is a special number devoted to automatic station equipments. It contains nearly double the usual number of articles, all prepared especially for the purpose by authorities in their various fields. The information includes answers to such questions as (1) How do automatic equipments work? (2) What will they do? (3) Where are they used? (4) How do they stand up in service?

Blowers. Bulletin 23A of the Connersville Blower Co., Connersville, Ind., covers the "Boston Type" rotary positive blowers, of medium capacities intended for flotation processes, aëration and agitation of chemicals, water and other liquids. 4 pp.

Power Shovels. The Osgood Co., Marion, Ohio, has issued a 4-page folder, Bulletin 256, featuring its ¾-cu.yd. power shovel and its combinations.

Speed Reducer. Type AT-Cleveland worm-gear reduction unit is described in Bulletin 104 received from the Cleveland Worm & Gear Co., Cleveland, Ohio.

Doing Away With Temporary Track Laying Underground

Miner sliding extension rail to face by means of combination handle and car stop.

The Market Report

Daily Prices of Metals

June July	Copper N. Y. net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
25	13.375	55 00	56.125	8.20	7.85	6.95@7.00
26	13.375	55.00	56.25	8.20	7.85	6.95@7.00
27	13.375	55.625	56.75	8.20	7.85	6.975
29	13.475	55.75	57.00	8.10@8.15	7.85	7.00@7.025
30	13.475	55.50	57.00	8.00	7.625@7.80	7.00
1	13.500	55.50	57.00	8.00	7.625@7.80	7.00
Av.	13.429	55.396	56.688	8.121	7.804	6.990

*The prices correspond to the following quotations for copper delivered: June 25th, 26th and 27th, 13.625c.; June 29th and 30th, 13.725c.; and July 1st, 13.75c.

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

June July	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
25	59¾	60¾	63⅝	251⅛	253¼	33 1/16	32½	34 1/16	33⅜
26	59½	60½	63	250¾	252¾	33⅛	32 7/16	34⅛	33 7/16
29	59⅞	60⅞	63¾	253⅛	255¼	33 9/16	32¾	34 5/16	33⅝
30	60	61	63¾	252¾	255⅛	33 9/16	32⅝	34⅜	33⅝
1	60⅛	61⅛	63¾	253	255¼	33 3/16	32½	34 3/16	33 11/16

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

June	Sterling Exchange "Checks"	Silver		Gold London	June July	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
25	4.85⅝	70⅜	32 5/16	84s11½d	29	4.85⅝	70¼	32⅛	84s11½d
26	4.85⅝	70½	32⅜	84s11½d	30	4.85⅝	69¼	32 1/16	84s11d
27	4.85⅝	70½	32½	....	1	4.85⅜	69⅛	32	84s11d

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 one-half cent premium.

Average Metal Prices for June, 1925

Copper:	
New York Electrolytic	13.399
London Standard	59.899
London Electrolytic	63.369
Lead:	
New York	8.321
St. Louis	8.024
London	33.479
Silver:	
New York	69.106
London	31.863
Sterling Exchange	485.553
Zinc:	
St. Louis	6.990
London	34.149
Tin:	
99 per cent	54.885
Straits	55.957
London	252.476
Quicksilver	83.154
Antimony	16.500
Platinum:	
Refined	120.000
Crude	115.000
Aluminum, 99 per cent	28.000

Copper and Tin Higher; Lead and Silver Weaker

New York, July 1, 1925—Copper has been very firm, with the weaker offerings quickly absorbed, and tin has been in active demand, with premiums asked for spot deliveries. Lead has been lower the last day or two, as has silver, but the undertone is firm in both of these metals. Zinc has sold well at unchanged prices.

Copper Reacts to 13¾c.

As reported in these columns last week, copper dropped back to 13⅝c. delivered, at which price it was obtainable from perhaps half of the sellers on Thursday, Friday, and Saturday, though metal for June and July shipment was more freely offered than later deliveries. The selling pressure in Germany seems to have been lifted over the week-end, and with the improved London quotation on Monday, practically all sellers here revised their prices upward to 13¾c., though a slight shading of this quotation has been made in some instances. The total volume of sales has not been large, either here or abroad. The foreign market has ruled from 13¾ to 14c., c.i.f., with most of the American agencies selling a meager tonnage and holding firm at the higher level, though one of them came down to 13.90c. today. As a result most of the foreign business has been done by dealers.

Lead Drops to 8c., New York

The official contract price for New York lead, set by the American Smelting & Refining Co., was marked down to 8.10c. from the previous level of 8.20c., on Monday, June 29, and on June 30 a further decline to 8c. was made. These two reductions surprised followers of the market, as few if any offerings had been made in the New York district at less than the "official" price. However, it is said that Chicago competition was responsible for the reduction, and it is also likely that in a quiet market it was not thought best to accumulate too much high-cost lead ore. The principal producer in St. Louis continues to be a reluctant seller, desiring to add somewhat to stocks at present levels. One of the smaller producers, who enters the market only occasionally, has unloaded a few hundred tons in the last two days at 7⅝c., though the general level for carload business in St. Louis has been 7.80c. The lead market has a firm undertone and no alarm has been caused in the ranks of producers by the reductions.

Zinc in Better Demand

Sales of zinc have been very satisfactory during the last week, with prices unchanged around 7c., the minor fluctuations following the London market, on which domestic prices have lately been depending absolutely. Though buying has not been very large for some time, prices have held well, so that producers are inclined to be optimistic, and with good reason. Brass special commands 10 points over Prime Western, and high-grade

zinc continues at 8½@8¾c. delivered. Export demand continues to take a moderate tonnage of American zinc.

Tin Market Active

The tin market was quite active on Thursday, Friday, and Saturday, and the consuming demand has been good all week. Spot tin is extremely scarce and has commanded about ½c. less than tin at dock in the last three days. August and September tin is about ¼c. less than that for early shipment. The premiums on Straits for early delivery have not extended to 99 per cent, so that the differential between the two grades has been more than 1c.

Silver Price Rises, Then Falls

The recent advance in silver carried quotations to 70½c. in New York and 32½d. in London, the former rate being a new high for the year, and the latter within 1/16d. of the previous London peak.

The premium in New York prices over the London net parity continued, and at the top of the rise this differential amounted to more than ½c. Apparently a squeeze for June delivery was responsible for this condition in the local market.

A sharp reaction occurred on the 29th and the market continued to decline for several days as China turned seller; the drop in New York being much more severe, however, since the premium over London was eliminated and the respective rates are about equal at the lower level.

The market is quiet at the close.

Mexican Dollars: June 25th, 54¼c.; 26th and 27th, 54⅜c.; 29th, 54c.; 30th, 53¾c.; July 1st, 53⅜c.

Francs Continue Weak

Closing cable quotations on Tuesday, June 30, for the principal foreign exchanges, were as follows: Francs, 4.48c.; lire, 3.5025c.; and marks, 23.805c. Canadian dollars, ⅞ per cent premium.

Steel Consumption Continues Heavy

Pittsburgh, June 30, 1925

Steel mill operations have made a much stronger finish for the half year than was expected. The rate has passed only a little below 70 per cent and it is doubtful whether the rate will go below 60 per cent in the next two months, which by tradition represent the dull period of the year.

Steel ingot production in the half year has been about 22,350,000 gross tons, or 3 per cent above the average rate in 1923, the best post-war year, but this year, as in 1923, the second half will probably show somewhat lighter production.

Steel buying is very conservative, on a hand-to-mouth basis, yet mills are able to run at a good rate, showing that consumption is very heavy. The oil industry is taking much steel, the automobile industry is tapering off very slightly, and structural business has been increasing of late. Freight car buying, however, is very poor.

Steel prices are unchanged except for the familiar further softening in sheets, galvanized having gone at 4.10c. or less. The $35 sheet bar price is being maintained in hope of preventing further declines in sheets.

Pig Iron — Foundry iron is quieter after the moderate buying movement through September, steel-making iron remaining dull. Prices are unchanged, at $19 for bessemer, $18 for basic, and $18.50 for foundry, f.o.b. Valley furnaces.

Connellsville Coke—Market very dull. Furnace coke, spot, $2.75@$2.85; contract, $3; foundry coke, spot, $3.75@$4.25.

Zinc Ore Higher—Lead Lower

Joplin, Mo., June 27, 1925.

Zinc Blende	Per Ton
High	$54.40
Premium, basis 60 per cent zinc	$52.00@$53.00
Prime Western, 60 per cent zinc	$49.00@$50.00
Fines and slimes	$48.00@$46.00
Average settling price, all	$47.84
Lead Ore	
High	$116.16
Basis 80 per cent lead	$105.00
Average settling price, all	$111.73

Shipments for the week: Blende, 15,138; lead, 3,244 tons. Value, all ores the week, $1,087,600. Shipments for six months: Blende, 397,725; calamine, 579; lead, 64,595 tons. Value, all ores six months, $27,974,490.

There has been 6,250 tons of zinc blende reported purchased for export and approximately 5,200 reported loaded.

It is reported that two buyers advanced the $49 to $49.50 basis of the past several weeks in an endeavor to procure sufficient ore for loading over Fourth of July week without further purchases. This was done yesterday, and purchasers today were forced to meet this basis to fill orders.

Lead prices receded again this week, with practically all reserve ore sold on $110 to $112.50 basis, before the break occurred. Ores were settled for this week, as quoted above, as high as $116.16 per ton, with the average at $111.73. Current production disposed of this week will be settled for when loaded on the basis quotation of this week.

Platteville, Wis., June 27, 1925

Zinc Blende	Per Ton
Blende, basis 60 per cent zinc	$51.00
Lead Ore	
Lead, basis 80 per cent lead	$110.00

Shipments for the week: Blende, 497 tons; lead, none. Shipments for the year: Blende, 22,655; lead, 942 tons. Shipments for the week to separating plants: 1,293 tons blende.

Other Metals

Quotations cover large wholesale lots, f.o.b. New York, unless otherwise specified.

Aluminum—99 per cent, 28c. per lb.; 98 per cent, 27c. London, 98 per cent. £118 long ton. Prices holding steady and demand satisfactory considering the time of year.

Antimony—Per lb.:

Chinese brands, nominal, 16¼@16¾c. Practically no spot metal available, and shipments are indefinite.

Cookson's "C" grade, 19⅝@20¼c.

Chinese needle, lump, nominal, 14c.

Standard powdered needle, 200 mesh, nominal, 16@17c.

White oxide, Chinese, 99 per cent Sb_2O_3, 16@19c.

Bismuth—$2.65@$2.70 per lb. in ton lots. London, advanced July 1, to 10s.

Cadmium—55@60c. per lb. London, 2s. 3d.@2s. 4d.

Cobalt—Shot, 97@99 per cent, $2.50 per lb. Black oxide, $2.10; gray, $2.25. London, 10s. for metal; 8s. for black oxide. Market fair.

[1]Germanium Oxide—25 to 50 gm. lots, $6 per gm.

Iridium—$400 per oz. Nominal. London, £80.

[1]Lithium—95@96 per cent grade in 1 to 5 lb. lots, $75 per lb.

Magnesium—Ingot, 99.85 per cent, $1 per lb., in one-half ton lots; Ingot, 99 per cent, 95c. per lb.

London, 4s. for 99 per cent ingots or sticks.

[1]Molybdenum—99 per cent, $25 per kg.

Monel Metal—32c. per lb.

Nickel—Ingot, 34c.; shot, 35c.; electrolytic, 38c. **(99.75 per cent grade).** London, £170@£175 per long ton.

Prices recently advanced 3c. except on electrolytic.

Osmiridium—Crude, $58.50 per oz.

Osmium—$105@$110 per oz.

Palladium—$79@$83 per oz. Crude, $65 per oz. London, £16.

Platinum — Refined, $120 per oz. Prices often shaded.

Crude, $115.

London, £25 per oz. for refined, and £23 for crude.

Quicksilver—Per 75-lb. flask, $83@$84. San Francisco wires $82.75. Quiet. London £14¼.

Radium—$70 per mg. radium content.

Rhodium—$85@$90 per oz.

Ruthenium—$50@$60 per oz.

[1]Selenium — Black powdered, amorphous, 99.5 per cent pure, $2.10 per lb.

[1]Tantalum—Metal sheets, $275 per lb.

Tellurium—$2 per lb.

[1]Thallium Metal—Ingot, 99 per cent pure, $4.50 per lb. in 25-lb. lots.

Tungsten Metal—Powder, 97 to 98 per cent, $1.16 per lb. contained tungsten.

[1]Zirconium Metal—98 per cent grade, per lb., $30.

Metallic Ores

Chrome Ore—Per long ton, c.i.f. Atlantic ports:

Indian, 48 per cent minimum Cr_2O_3, 6 per cent SiO_2, 12-15 per cent Fe, $21.50@$22.

Rhodesian, about 50 per cent Cr_2O_3, maximum 6 per cent SiO_2, 12 per cent Fe, $22.

New Caledonian, 52-54 per cent Cr_2O_3, $24.

Price of Indian and Rhodesian largely governed by New Caledonian offerings.

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[1]Price furnished by Foote Mineral Co., Philadelphia.

[1]Galena Radio Crystals—Best quality (50 per cent of sized fragments good) 50c. per lb. in 500-lb. lots, f.o.b. Philadelphia.

Iron Ore—Lake Superior ores, per long ton, Lower Lake ports:

Mesabi, non-bessemer, 51½ per cent iron, $4.25. Old Range, $4.40.

Mesabi, bessemer, 51½ per cent iron, $4.40. Old Range, $4.55.

High phosphorus foundry, over 0.18 per cent P, $4.15.

Eastern ores, cents per unit delivered at furnaces:

Foundry and basic, 53 to 63 per cent, 8.75c.

Foreign ores, f.o.b. cars Atlantic ports, cents per unit:

Swedish and Norwegian, low phosphorus, 68 per cent, 11@11½c.

Spanish, low phosphorus, 52@54 per cent, 8@9½c.

Spanish, foundry or basic, 66@68 per cent, 9@10c.

Swedish foundry or basic, 66@68 per cent, 9@10c.

Manganese Ore—45c. per long ton unit, seaport, exclusive of duty. Market nominal. Chemical grades[1], powdered, coarse or fine, 82@87 per cent MnO_2, Brazilian, and Cuban, $70@$80 per ton in carloads.

Molybdenum Ore—65@70c. per lb. of MoS_2 for 85 per cent MoS_2 concentrates, f.o.b. mines. Nominal.

Pyrite Radio Crystals—50c.@$1 per lb.

Tantalum Ore—Foreign, 75c. per lb. of Ta_2O_5 contained, c.i.f. New York.

Tungsten Ore—Per unit, N. Y.:

Ordinary wolframite, $11@$11.50.

High-grade wolframite, $11.50@$11.75.

Ordinary scheelite, $11.50.

High-grade scheelite, $11.50@$12.

Market very firm, though prices largely nominal.

Vanadium Ore—Minimum 18 per cent V_2O_5, $1@$1.25 per lb. V_2O_5. Nominal.

Non-Metallic Minerals

Prices received for non-metallic minerals vary widely and depend upon the physical and chemical characteristics of the commodity. Hence the following quotations can only serve as a general guide as to the prices obtained by producers and dealers in different parts of the United States for their own product. In the last analysis the value of a particular non-metallic mineral can only be ascertained by direct negotiation between buyer and seller.

The net ton of 2,000 lb. is meant unless otherwise stated.

[1]Amblygonite—8@9 per cent lithium oxide, $50@$60 per ton, f.o.b. mines.

Andalusite—Sorted, $35@$50 per ton, f.o.b. South Dakota mines.

Asbestos:

Crude No. 1—$450.

Crude No. 2—$250@$275.

Spinning fibers—$110@$200.

Magnesia and compressed sheet fibers—$65@$115.

Shingle stock—$50@$75.

Paper stock—$35@$40.

Paper fillers—$20.

Cement stock—$8@$12.

Floats—$9@$12.

Sand—$6@$8.

All per short ton, f.o.b. mine, Quebec; tax and bags included.

No. 1 Rhodesian crude, $280; No. 2, $200@$225 per short ton, c.i.f. New York.

Merger virtually consummated, under auspices Dillon, Read & Co. Reported that only one producer has not signed. More economical production and higher prices expected to result.

Barytes — F.o.b. Kings Creek, S. C., bags extra:

Crude, $7@$8 per gross ton.

Ground, off color, $14@$17 per short ton.

White, bleached, $17 per ton.

Charlotte, N. C.:

White bleached, $22 per short ton; white natural, $20.

Crude, $8, f.o.b. Ga.

Crude, $8.50, f.o.b. Mo.

Water ground and floated, bleached, $23@$24, f.o.b. St. Louis.

In Canada, 94@96 per cent $BaSO_4$, $9 per net ton, f.o.b. mine.

Demand remains steady but may be less in July and August.

Bauxite — American, f.o.b. shipping point per gross ton:

Crushed and dried, $5.50@$8.50.

Pulverized and dried, $14.

Calcined, crushed, $19@$20.

Foreign, per metric ton, c.i.f.:

French red, 5 per cent SiO_2, $5@$7.

Dalmatian, low SiO_2, $5@$6.50.

Istrian, $5.50@$6.50.

Dutch Guiana bauxite offered at $8.50 per long ton, c.i.f. New York. Market active.

Beryl—$70 per ton, hand-sorted crystals, 14 per cent BeO, in ton lots f.o.b. Vermont. Western beryl, of inferior quality, offered at $45 @ $60 per ton. Market quiet.

Borax—Granulated or powdered, in bags, 4¾c. per lb., delivered. Crystals, 5c. Market normal.

[1]Celestite—90 per cent $SrSO_4$, finely powdered, $35 per ton in carload lots.

Chalk—F.o.b. New York, per lb.:

English, extra light, 5c.

Domestic, light, 4½@4¾c.

Domestic, heavy, 3½@3¾c.

In bulk, $4.75@$5 per ton.

China Clay (Kaolin)—F.o.b. Virginia mines, per short ton:

Crude No. 1, $7.

Crude No. 2, $5.50.

Washed, $8.

Powdered, $10@$20.

Powdered (Blue Ridge), $10@$14.

Imported English, f.o.b. American ports:

Lump, $12@$19.

Powdered, $45@$50.

1A grades, domestic, $16@$18, f.o.b. mines. Market slow.

Corundum — South African, $65 per ton, New York.

Diatomaceous Earth—Per short ton, f.o.b. plant, California:

Kiln-fired brick, $65.

Kiln-fired aggregate, ¼ in., $45.

Insulating powder, $30.

Natural aggregate, ¼ in., $20.

Air-floated powder, $40.

"Calatom" (millrun), $20.

"Calatom", 3b, $30.

Demand fair; becoming more active. Used largely as an admixture with cement in concrete, as it tends to waterproof concrete and make it flexible. The 3b grade is suitable for paint filler and dust sprays.

In *New England*, per ton:

Pulverized, $65.

Air float, $75.

Emery—Per lb., f.o.b. plant:

Greek Naxos, 6½c.

Turkish, 6½c.

Khasia, 5½c.

American, 3½c.

Market remains good.

Feldspar—Per long ton, f.o.b. cars, *North Carolina:*

No. 1 pottery grade, $5.50@$6.50, depending upon quality. Market dull.

No. 2 pottery grade, $4.50@$5, depending upon quality.

No. 1 soap grade, $6.75@$7.25.

In *Connecticut*, per net ton, f.o.b. mines:

40 to 200 mesh, $16@$30.

In *New Hampshire*, per net ton, f.o.b. mines:

No. 1, not over 10 per cent SiO_2, $7.75.

No. 2 pottery grade, $7.

Ground, $17, f.o.b. mill.

Market fair.

In *New York*, per ton, f.o.b. cars:

No. 1 crude, $8.

Market good.

In *Maine:*

No. 1, ground, $19.

Market good; mills running to capacity.

In *Tennessee:*

Pottery grades, $16@$21, according to analysis and mesh.

Tile grades, No. 2 ground, $14@16.

Enameling grades, $11@$16.

Crude, $7 for ordinary grades. As high as $7.25 offered for exceptional quality.

Market dull.

In *Virginia:*

No. 1 Porcelain, 140 mesh, $23.

Enamelers' grades, 120 mesh, $22.

Glassmakers', 30-100 mesh, $19.

In *Maryland:*

No. 1 body spar, 120 mesh, $17.

Enamelers' grade, 80-100 mesh, $15.

Glassmakers' grade, 30-100 mesh, $13@$15.

Market quiet but good.

In *Canada*, f.o.b. mine:

Crude, No. 1, over 12½ per cent potash, less than 5 per cent SiO_2, $7.25 @$7.50 per net ton.

Crude, No. 2, 20 to 25 per cent SiO_2, $5@$5.50 per net ton.

Ground, No. 1, 180 mesh, $20 per net ton, bags included.

Ground, No. 2, 180 mesh, $15 per net ton, bags included.

Fluorspar — F.o.b. Middle Western mines, per net ton:

Gravel, not less than 85 per cent CaF_2, and not over 5 per cent SiO_2, $16@$17. Tonnage fair. Some producers holding at $18@$20.

Lump, No. 1, 95@98 per cent CaF_2, not over 2½ per cent SiO_2, $30.

Lump, No. 2, not less than 85 per cent CaF_2 and not over 5 per cent SiO_2, $19@$20.

Ground, 95 to 98 per cent CaF_2 and not over 2½ per cent SiO_2, $32.50@$34 in bulk, $37@$38 in bags or barrels.

Acid lump, 98 per cent CaF_2, not over 1 per cent SiO_2, $35@$36.

Acid, ground, not less than 97 per cent CaF_2 and not over 1 per cent SiO_2, $38 in bulk, $42 in packages.

Market poor.

In Canada, 84@86 per cent CaF_2, less

[1]Price furnished by Foote Mineral Co., Philadelphia.

than 5 per cent silica, $18 per net ton, f.o.b. mine.

Fuller's Earth—Per ton, f.o.b. Midway, Fla.:
16 to 30 mesh, $16.50.
16 to 60 mesh, $18.
30 to 60 mesh, $18.
60 to 100 mesh, $14.
Plus 100 mesh, $7.50.
Powdered, imported, duty paid, $23 @$25 per ton.
Florida Fuller's Earth Co. reported out of business.

Garnet—Per short ton:
Spanish grades, $60, c.i.f. port of entry.
Domestic Adirondack, $85, f.o.b. shipping point.
Canadian, $70@$80, f.o.b. mines.

Gilsonite—Per ton, f.o.b. Colorado:
Jet asphaltum, $36.
Selects, $33.
Seconds (ordinary grades), $25.50.
Prices strong. Demand fair.
Peerless black, $32.90.
Market steady.

Graphite—First quality, per lb.:
Ceylon lump, 8@9½c.
Ceylon chip, 6¾@7½c.
Ceylon dust, 3@5c.
Market fair.
Crude amorphous, $15@$35 per ton.
Flake, No. 1 and No. 2 from New York, 12@30c.
Manufactured grades:
Fine ground, crystalline, 8@30c.
Facings, 5@8c.
Amorphous, 6@8c. per lb.
Stocks somewhat low and prices much higher than last year. Business moderate.

Greensand—Per net ton, f.o.b. cars, New Jersey:
Run of mine, $15.
Washed, $20.
Market improving.

Gypsum—Per ton, depending upon source:
Crushed rock, $2.75@$3.
Ground, $4@$6.
Agricultural, $6@$7.
Calcined, $8@$10.

Ilmenite—Concentrates, 52 per cent TiO_2, 1½c. per lb., f.o.b. Virginia points. $60 per short ton, Florida mines.

Iron Oxide (See Ocher) — Ground, 95 per cent through 200 mesh, Standard Spanish red, $40 per ton.

Kaolin—See China Clay.

Lepidolite—$20@$30 per ton for ordinary grades. Nominal.

Limestone—Depending upon source, f.o.b. shipping points; per ton:
Crushed, ½ in. and less, 90c.@$2.
Crushed, 3 in. and larger, 90c.@$1.50.
Agricultural, $1@$5 for pulverized, depending upon source, purity, and fineness.

Magnesite—Per ton, f.o.b. California mines:
Calcined lump, 85 per cent MgO, $35.
Calcined ground, 200 mesh, $42.50.
Dead burned, $29@$31, Washington.
Dead burned, $40@$42, Chester, Pa.
Caustic calcined, Grecian, $50@$51, c.i.f., New York.
Market fairly good and improving, for domestic magnesite.

Manjak — Barbados, in 10-ton lots, c.i.f. New York:
Grade "A," 6c. per lb.
Grade "AA," fine, 8c. per lb.
Grade "C," 10c.
Market reported stagnant due apparently to the high prices at which the product is maintained by distributors in New York. The name "Manjak" originated in Barbados; but owing to the high qualities of the Barbados product, the name "Manjak" is now used indiscriminately for all imported bitumens in the United States, and Barbados producers as well as varnish manufacturers are said to suffer from this lack of discrimination.

Mica—
North Carolina prices:
Scrap, $20 per net ton.
Sheet, per lb., No. 1 quality, clear: Punch, 1¼ in., 7c.

1½ x 2 in., 18c.	3 x 4 in., $2.40.
2 x 2 in., 50c.	3 x 5 in., $2.75.
2 x 3 in., $1.00.	4 x 6 in., $3.50.
3 x 3 in., $2.00.	6 x 8 in., $6.00

No. 2 quality per lb.:

1½ x 2 in., 15c.	3 x 4 in., $1.30.
2 x 2 in., 30c.	3 x 5 in., $1.80.
2 x 3 in., 60c.	4 x 6 in., $2.40.
3 x 3 in., $1.00.	Punch 6c.

Market very good. Prices strong. Demand for scrap improved.
Ground, 60 mesh, $65 per ton.
Ground, 80 mesh, $70.
Ground, 120 mesh, $120.
Ground, 140 mesh, $125.
Dry ground, roofing, $30.
Dry ground, 80 mesh, $35.
Dry ground, 100 mesh, $67.50.
Dry ground, 160 mesh, $70.00.
Roofing grade, 20 mesh, $35.
Roofing grade, 100 mesh, $70.
Market good.
In *New Hampshire:*
Washer and disk, $320 per ton.
Scrap, $24 per ton.
White, dry ground, f.o.b. New England mill:
20 mesh, $30 per ton.
40 mesh, $50.
60 mesh, $65.
100 mesh, $80.
200 mesh, $90.

Madagascar, amber, dark, free from iron, per lb., f.o.b. New York:

No. 1	$1.80	No. 4	$0.50
No. 2	1.30	No. 5	.20
No. 3	.85	No. 6	.15

[1]**Monazite**—Minimum 6 per cent ThO_2, $120 per ton.

Ocher—"Yellow Peruvian," $25@$30 per ton, Georgia mines. Market good.

Ozocerite—Per lb. in bags, New York:
Black, 160 deg. melting point, 24@25c.
Green, 170 deg. melting point, 26@30c.

Phosphate — Per long ton, f.o.b., *Florida* export prices:
76@77 per cent, pebble, $5.75.
75 per cent, $5.25.
74@75 per cent, $5.
70 per cent, $3.50.
68 per cent, $3.25.
Market firm.
In *Tennessee*, per long ton:
78 per cent lump, $8.
75 per cent hand-mined lump, $6.75 @$7.
75 per cent washed lump, $7.
72 per cent washed run of mine, $5 @$5.50.
65 per cent ground 95 per cent through 100 mesh, $7 per short ton.

Potash—	Bags	Bulk
Muriate of potash 80@85 per cent, basis 80 per cent	$34.55	$33.30
Sulphate of potash 90@95 per cent, basis 90 per cent	45.85	44.60
Sulphate of potash-magnesia 48@53 per cent, basis 48 per cent	26.35	25.10
Manure salt 30 per cent	19.03	17.80
Manure salt 20 per cent	12.55	11.00
Kainit 14 per cent	10.25	8.35
Kainit 12.4 per cent	9.75	7.75

Two thousand pounds net weight, c.i.f. Atlantic and Gulf ports. German weights, tares and analyses.
Discounts for prompt shipment:
5 per cent on minimum quantity of 50 short tons K_2O
6 per cent on minimum quantity of 100 short tons K_2O
7 per cent on minimum quantity of 300 short tons K_2O
10 per cent on minimum quantity of 500 short tons K_2O

Pumice Stone—Imported lump, 3@40c. per lb.
Powdered, in bbl., 3@5c.
Lumps, in bbl., 6@8c.

Pyrites—Tharsis, per long ton unit, c.i.f. U. S. ports:
Furnace size, 13c. per unit of sulphur.
Run of mine, 12c. per unit of sulphur.
Cinder from ore to remain property of buyers. Market a little more active.

Quartz Rock Crystals — Colorless, clear and flawed, pieces ¼ to ½ lb. in weight, 30c. per lb. in ton lots.
For optical purposes, double above prices.

Rutile—F.o.b. Virginia points, per lb.:
Granular, 94@96 per cent TiO_2, 12@15c.
Pulverized, 100 mesh, 94@96 per cent, 17@30c.
93 per cent TiO_2, $200 per ton, Florida.

Silica—Water ground and floated, per ton, f.o.b. Illinois:
400 mesh, $31.
325 mesh, $26.
250 mesh, $22.
200 mesh, $20.
100 mesh, $8.
Other grades per ton:
140 mesh, $6.25.
200 mesh, $8.75.
Packed in bags, f.o.b. Ottawa, Ill.
Quartzite, in Canada, 99 per cent SiO_2, $3 net ton.
Glass sand, $1@$5 per ton; brick and moulding sand, 60c.@$3. Fair.

Spodumene — $20@$30 per ton, depending upon lithium content. Nominal.

Sulphur—$15 per ton for domestic, f.o.b. Texas mines; $19 for export, f.a.s. New York. Demand is improving and surplus stocks said to be decreasing rapidly.

Talc—Per ton, in 50-lb. paper bags, *Vermont* mills, carloads:
Ground, 200 mesh, extra white, $11.
180 mesh, medium white, $10.50.
160 mesh, medium white, $10.
If packed in burlap bags, $1 per ton less plus 15c. each for bags.
Prices firm but demand rather quiet.
In *New York*, double air-floated, including containers, per net ton:
200 mesh, $13.75.
325 mesh, $14.75.
100 mesh, $11, not air-floated.
Demand good.
In *California*, $20@$30 per ton, ground.

[1]Price furnished by Foote Mineral Co., Philadelphia.

In *Georgia*, powdered, per ton:
Gray or yellow, $8@$10.
Red or white, $10@$14.
Market good for powders but poor for crayon and pencils.
White, $12@$15.
Grayish white, $8@$10.
Red, $10@$15.
Yellow, $8@$10.
Roofing, $8@$10.
Market good.
In *New Jersey*, per ton:
Soapstone, $8@$12.
Market fairly good.

Tripoli—Per short ton, burlap bags, paper liners, per minimum carload 30 tons, f.o.b. Missouri:
Once ground through 40 mesh:
Rose and cream colored, $20.
White, $18@$27.
Double ground through 110 mesh:
Rose and cream, $17@$25.
White, $19@$30.
Air-float through 200 mesh:
Rose and cream, $35@$40.
White, $40.
Usual summer dullness.

Zircon—Freight allowed east of Mississippi River:
99 per cent, 6c. per lb., f.o.b. Florida.
Powdered, 7c. per lb., f.o.b. Florida.

Mineral Products

Arsenious Oxide (white arsenic)—4½@4¾c. per lb. delivered. Quiet.

Copper Sulphate—4.40@4.60c. per lb.

Sodium Nitrate — $2.44@$2.57½ per 100 lb., ex vessel Atlantic ports.

Sodium Sulphate—$17@$18 per ton, for imported material, New York.

Zinc Oxide—Per lb. in bags:
Lead free, 7¼c.
Leaded grades, 7c.
French, red seal, 9¾c.
French, green seal, 10¾c.
French, white seal, 12c.

Ferro-Alloys

[1]**Ferrocerium—$7 per lb.**

Ferrochrome — 0.1 per cent carbon, 35c. per lb. of contained chromium; 2 per cent carbon, 23c. per lb.; 4 to 8 per cent carbon, 11½c. per lb.

Ferromanganese—Domestic and foreign, 78@82 per cent, $115 per gross ton. Spiegeleisen, 19@21 per cent, $33 f.o.b. furnace; 16@19 per cent, $32.

Ferromolybdenum—$1.25@$1.75 per lb. of contained molybdenum for 50 to 55 per cent grades depending on conditions of sale.

Ferrosilicon—10 to 12 per cent, $35.50 @$39.50 per gross ton, f.o.b. works; 50 per cent, $85 delivered, 75 per cent, $155.

Ferrotitanium—For 15 to 18 per cent material, $200 per ton, f.o.b. Niagara Falls, N. Y.

Ferrotungsten—95c.@$1.05 per lb. of contained W, f.o.b. works, according to grade.

[1]**Ferro-uranium—30 to 40 per cent U, $4.50 per lb. of U contained, f.o.b. works.**

Ferrovanadium—Per lb. of V contained f.o.b. works:
Open hearth, $3.25@$3.50.
Crucible, $3.50@$3.65.
Primos, $3.65@$4.
All ferro-alloys active.

[1]Price furnished by Foote Mineral Co., Philadelphia.

Metal Products

Rolled Copper—Sheets, 21¾c.; wire, 15½c.

Lead Sheets—Full lead sheets, 12c. per lb.; cut lead sheets, 12½c. in quantity, mill lots.

Nickel Silver—28c. per lb. for 18 per cent nickel Grade A sheets.

Yellow Metal — Dimension sheets, 19¾c. per lb.; rods, 16¾c. per lb.

Zinc Sheets — 10¼c. per lb., f.o.b. works.

Refractories

Bauxite Brick—$140@$145 per M., Pittsburgh, Pa.

Chrome Brick—$45 per net ton, f.o.b. shipping point.

Firebrick—First quality, $43@$46 per M., Ohio, Kentucky, Central Pennsylvania; second quality, $36@$40.

Magnesite — Brick, 9-in. straights, $65 per net ton, f.o.b. works.

Silica Brick—$40@$42 per M. Pennsylvania; $45@$47 Alabama; $49@$51, Indiana.

[1]**Zirkite**—Powdered, 80 per cent ZrO_2, 2½c. per lb. Brick, straights, 80c.@$1 each.

Imports and Exports of Ores and Metals in May, 1924 and 1925

Imports

In Pounds, Unless Otherwise Stated

	May, 1924	May, 1925
Antimony		
Ore		
Liquated, regulus or metal	750,624	930,684
Copper		
Ores	11,242,810	22,208,029
Concentrates	5,370,853	2,809,115
Regulus	448,199	259,211
From: Spain	840,954	1,914,967
Canada	2,443,598	6,956,295
Mexico	3,458,972	2,038,520
Cuba	1,848,000	1,850,240
Chile	4,737,728	11,815,338
Peru	154,338	22,222
Venezuela	770,560	
Other countries	2,807,712	678,773
Unrefined, black, blister and converted copper in pigs, bars, and other forms	36,563,022	31,412,309
From: Spain	2,126,739	4,567,181
United Kingdom	10,758	
Canada	5,682,990	5,556,000
Mexico	6,286,099	6,948,000
Chile	14,657,052	5,962,828
Peru	7,23-,566	1,140,734
Portuguese Africa	564,818	4,963,041
Other countries		2,274,525
Refined copper	8,259,021	8,281,292
Old and clippings for remanufacture	688,023	485,673
Composition metal, copper chief value	14,754	4,732
Brass		
Old and clippings for remanufacture	574,030	652,007
Manufactures of brass	65,472	73,443
Lead		
Ore and matte	7,446,006	4,487,200
Bullion or base bullion	11,015,916	16,063,914
Pigs, bars, other forms, and old	3,348,740	
Manufactures of, except type metal	11,312	14,480
Manganese ore, long tons	31,993	25,922
Pyrites, long tons	27,607	53,446
Tin		
Tin ore, tons	6	
In blocks, bars and pigs	11,316,332	8,617,387
From: United Kingdom	3,899,284	2,628,900
Br. Straits Settlements	4,797,351	5,108,658
Dutch E. Indies	664,301	58,263
Hongkong	886,675	235,743
Australia	284,480	100,800
Other countries	784,241	485,023
Zinc		
Ore, free	125,675	
Dutiable		4,072,650
Blocks, pigs, and other forms		751
Zinc dust	12,941	3,435

Exports of Copper, Lead, and Zinc

In Pounds	May, 1924	May, 1925
Copper		
Ores, concentrates, matte and regulus	14,199	1,064
Copper and manufactures of	99,977,440	114,875,975
Refined in ingots, bars, and other forms	91,742,806	103,325,236
Exported to:		
Belgium	8,416,619	5,980,141
France	12,347,345	17,973,376
Germany	24,203,300	23,999,954
Italy	9,269,423	7,758,069
Netherlands	3,746,727	14,359,895
Spain	381,192	1,220,513
Sweden	2,889,997	2,532,276
United Kingdom	18,042,751	21,127,462
Canada	4,169,412	1,659,714
British India	15,732	1,351,453
China	5,185,606	2,762,900
Japan	936,320	1,063,807
Other countries	2,138,382	1,535,676
Old and scrap copper	450,431	1,321,485
Pipes and tubes	2o2,440	277,818
Plates and sheets	321,158	2,227,887
Rods	4,969,327	4,714,890
Wire	564,535	1,459,959
Insulated copper wire and cable	1,242,752	1,267,423
Other manufactures of copper	423,991	281,277
Lead		
Pigs, bars and other forms:		
From domestic ore	669,643	30>,836
From foreign ore	4,360,507	20,888,050
Exported to:		
France	448,192	1,400,381
Germany	1,216,609	5,635,524
Netherlands		224,019
United Kingdom	1,226,937	8,904,876
Other Europe	229,530	1,837,395
Argentina	280,046	481,651
Brazil	582,482	728,126
Other countries	986,354	1,981,914
Other lead manufactures	1,712,292	1,515,956
Zinc		
Dross		2,558,982
Ores and concentrates	435	34
Zinc (spelter) in slabs, blocks, or pigs	5,704,693	12,000,406
Exported to:		
Belgium	336,041	111,962
France	1,773,31o	1,904,487
Germany	616,283	279,996
Italy	1,064,848	2,868,540
United Kingdom	1,764,456	5,417,083
Canada	3,513	249,618
Other countries	146,242	1,168,720
In sheets, strips and other forms	932,654	640,621
Zinc dust	228,394	308,701
Other zinc manufactures	63,240	91,522

Metal Statistics

Monthly Average Prices of Metals

Silver

	New York		London		Sterling Exchange	
	1924	1925	1924	1925	1924	1925
January	63.447	68.447	33.549	32.197	425.524	477.702
February	64.359	68.472	33.565	32.245	430.457	476.886
March	63.957	67.808	33.483	31.935	428.769	477.279
April	64.139	66.899	33.065	31.372	434.788	479.034
May	65.524	67.580	33.870	31.276	435.716	484.960
June	66.690	69.106	34.758	31.863	431.675	485.553
July	67.159	.....	34.509	.....	436.649	.....
August	68.519	.....	34.213	.....	449.510	.....
September	69.350	.....	34.832	.....	445.740	.....
October	70.827	.....	35.387	.....	448.274	.....
November	69.299	.....	33.775	.....	460.543	.....
December	68.096	.....	32.620	.....	469.115	.....
Year	66.781	.....	33.969	.....	441.397	.....

New York quotations, cents per ounce troy, 999 fine, foreign silver. London, pence per ounce, sterling silver, 925 fine.

Copper

	New York		London			
	Electrolytic		Standard		Electrolytic	
	1924	1925	1924	1925	1924	1925
January	12.401	14.709	61.273	66.065	67.193	70.607
February	12.708	14.463	63.113	64.713	68.167	69.525
March	13.515	14.004	66.137	62.892	72.087	67.739
April	13.206	13.252	64.338	60.575	70.150	64.194
May	12.772	13.347	62.006	60.131	67.648	63.560
June	12.327	13.399	61.375	59.899	66.313	63.369
July	12.390	.....	61.652	.....	65.815	.....
August	13.221	.....	63.481	.....	67.800	.....
September	12.917	.....	62.750	.....	67.125	.....
October	12.933	.....	62.641	.....	66.620	.....
November	13.635	.....	63.731	.....	68.063	.....
December	14.260	.....	65.295	.....	69.762	.....
Year	13.024	.....	63.149	.....	68.062	.....

New York quotations, cents per lb. London, pounds sterling per long ton.

Lead

	New York		St. Louis		London	
	1924	1925	1924	1925	1924	1925
January	7.972	10.169	8.002	9.953	31.528	41.443
February	8.554	9.428	8.643	9.126	34.589	37.944
March	9.013	8.914	8.891	8.578	37.161	36.804
April	8.263	8.005	7.932	7.662	32.819	32.791
May	7.269	7.985	6.973	7.780	29.426	32.283
June	7.020	8.321	6.848	8.024	32.138	33.479
July	7.117	.....	6.886	.....	32.916	.....
August	7.827	.....	7.764	.....	32.728	.....
September	8.00	.....	7.876	.....	33.023	.....
October	8.235	.....	8.118	.....	35.715	.....
November	8.689	.....	8.590	.....	39.425	.....
December	9.207	.....	9.106	.....	41.583	.....
	8.097	.....	7.969	.....	34.421	.....

New York and St. Louis quotations, cents per lb. London, pounds sterling per long ton.

Tin

	New York				London	
	99%		Straits			
	1924	1925	1924	1925	1924	1925
January	48.250	57.692	48.750	58.250	246.790	265.560
February	52.772	56.517	53.272	57.068	272.399	262.181
March	54.370	53.038	54.870	53.733	277.429	245.682
April	49.457	51.380	49.957	52.135	250.863	237.006
May	43.611	53.675	44.111	54.620	218.511	245.476
June	42.265	54.885	42.765	55.957	219.219	252.476
July	45.750	.....	46.250	.....	233.332	.....
August	51.409	.....	51.909	.....	254.638	.....
September	48.595	.....	49.095	.....	243.511	.....
October	50.038	.....	50.538	.....	248.543	.....
November	53.848	.....	54.348	.....	257.738	.....
December	55.721	.....	56.245	.....	261.875	.....
Year	49.674	.....	50.176	.....	248.737	.....

New York quotations, cents per lb. London, pounds sterling per long ton.

Zinc

	St. Louis		London	
	1924	1925	1924	1925
January	6.426	7.738	34.761	37.917
February	6.756	7.480	36.518	36.528
March	6.488	7.319	35.298	35.741
April	6.121	6.985	32.588	34.644
May	5.793	6.951	30.648	34.223
June	5.792	6.990	31.788	34.149
July	5.898	.....	32.193	.....
August	6.175	.....	32.544	.....
September	6.181	.....	32.926	.....
October	6.324	.....	33.514	.....
November	6.796	.....	35.022	.....
December	7.374	.....	36.932	.....
Year	6.344	.....	33.728	.....

St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Antimony, Quicksilver and Platinum

	Antimony (a) New York		Quicksilver (b) New York		Platinum (c) Refined New York		Platinum (c) Crude
	1924	1925	1924	1925	1924	1925	1925
January	10.279	17.428	59.500	81.596	122.115	117.000	111.663
February	10.935	19.795	59.565	79.386	124.739	117.000	114.216
March	11.442	15.553	64.269	80.481	121.692	117.000	115.000
April	9.952	12.553	74.308	82.327	115.572	118.269	114.769
May	8.755	15.770	76.962	81.360	115.731	119.850	115.000
June	8.403	16.500	73.720	83.154	116.000	120.000	115.000
July	8.477	.....	72.173	.....	118.231	.....	.....
August	9.839	.....	2.096	.....	120.000	.....	.....
September	11.022	.....	72.423	.....	118.923	.....	.....
October	11.519	.....	70.654	.....	118.000	.....	.....
November	14.385	.....	68.708	.....	117.792	.....	.....
December	15.024	.....	72.750	.....	117.000	.....	.....
Year	10.836	.....	69.761	.....	118.817	.....	.....

(a) Antimony quotations in cents per lb. for ordinary brands. (b) Quicksilver in dollars per flask. (c) Platinum in dollars per ounce.

Pig Iron, Pittsburgh

	Bessemer		Basic		No. 2 Foundry	
	1924	1925	1924	1925	1924	1925
January	24.76	24.66	23.76	23.76	23.88	23.76
February	25.26	24.50	23.76	23.26	25.06	23.76
March	25.14	24.06	23.76	23.06	24.76	22.91
April	24.56	21.57	23.26	20.26	23.80	21.16
May	23.89	.....	22.08	.....	22.91	.....
June	22.90	.....	21.49	.....	21.48	.....
July	21.90	.....	20.76	.....	20.76	.....
August	21.76	.....	20.76	.....	20.99	.....
September	21.76	.....	20.76	.....	21.68	.....
October	21.76	.....	20.26	.....	21.26	.....
November	22.08	.....	21.44	.....	21.17	.....
December	23.65	.....	22.04	.....	22.86	.....
Year	23.28	.....	22.01	.....	22.55	.....

In dollars per long ton.

Monthly Crude Copper Production

Domestic

	1925			
	February	March	April	May
Alaska shipments	6,855,097	11,177,011	7,329,681	5,756,693
Calumet & Arizona	3,068,000	3,416,000	5,196,000	4,410,000
Miami	4,317,000	4,428,000	4,388,000	4,419,000
New Cornelia	6,063,428	6,489,000	6,335,821	6,691,648
Old Dominion	3,377,000	3,152,000	2,550,000	2,836,000
Phelps Dodge	13,036,000	13,786,000	13,797,000	14,108,000
United Verde Extension	3,631,638	3,368,904	3,810,358	3,625,252
A.S. & R. & Tenn. Copper	12,500,000	15,500,000	15,500,000	13,200,000
Imports: Ore and concentrates, matte	16,662,339	8,496,693	18,022,747	25,276,355
Imports of black and blister, unrefined	35,002,977	27,513,110	40,255,461	31,412,309
Imports of refined and old	8,561,246	9,044,000	8,508,750	8,771,697

Foreign

Boleo, Mexico	1,389,150	1,551,769	110,250	.....
Falcon Mines, Rhodesia	.....	438,000	.....	.....
Furukawa, Japan	2,703,682	2,930,286	.....	.....
Cons. M & S., Canada	.....	.....	.....	.....
Granby Cons., Canada	2,761,468	2,938,903	3,316,290	3,529,582
Katanga, Africa	12,857,510	15,922,305	15,435,000	17,996,160
Mount Morgan, Aust.	202,000	544,000	722,000	998,000
Mount Lyell, Aust.	800,000	800,000	.....	.....
Phelps Dodge, Mexican	3,518,000	3,983,000	3,283,000	3,147,000
Sumitomo, Japan	2,124,442	1,888,021	2,445,236	.....

Comparative U. S. Copper Mine Production

	1922	1923	1924	1925
January	32,010,292	112,267,000	133,356,000	148,716,000
February	45,957,530	102,725,000	128,260,000	137,578,000
March	55,705,760	121,562,000	129,816,000	149,802,000
April	76,601,000	118,157,000	131,928,000	140,864,000
May	88,714,000	125,438,000	130,644,000	139,512,000
June	93,740,000	125,479,000	127,506,000	.....
July	91,000,000	125,249,000	129,574,000	.....
August	101,188,000	131,088,000	133,512,000	.....
September	96,408,000	124,523,000	126,346,000	.....
October	103,273,000	132,481,000	137,924,000	.....
November	102,845,000	127,963,000	136,582,000	.....
December	103,003,000	129,354,000	135,294,000	.....

World production of blister copper estimated by American Bureau of Metal Statistics as follows, in short tons: January, 1925, 134,300; February, 126,700; March, 139,600; April, 128,400; May, 129,700.

Mining Stocks—Week Ended June 27, 1925

Stock	Exch.	High	Low	Last		Last Div.
COPPER						
Anaconda	New York	39¼	38½	38½	Jy.18, Au.24, Q	0.75
Arcadian Consol.	Boston	1½	1½	1½		
Ariz. Com'l.	Boston	11	10	10	Ja.19, Ja 31 SA	0.50
Calaveras	N. Y. Curb			2		
Calumet & Arizona	New York	50¾	48	48	Jn.15, Jn.22 Q	0.50
Calumet & Hecla	Boston	14	13¾	13¾	Ja.30, Mh.4	0.50
Canario Copper	N. Y. Curb	5¼	5¼	5¼		
Cerro de Pasco	New York	52¼	51	51¼	Ap.23 My.1, Q	1.00
Chile Copper	New York	34¼	33¼	33¾	Jn.3, Jn.29, Q	0.62½
Chino	New York	21½	20¾	21½	Sept., 1920	0.37½
Con. Coppermines	N. Y. Curb	2¾	2¼	2¼		
Copper Range	Boston	22	19¾	19¾	Ap.9, My.4	1.00
Crystal Copper	Boston Curb	*51	*48	*48		
East Butte	Boston	3¾	3¼	3¼	Dec., 1919	0.50
First National	Boston Curb	*19	*18	*18	Feb., 1919	0.15
Franklin	Boston			1		
Granby Consol.	New York	15	14¼	14¼	May, 1919	1.25
Greene-Cananea	New York	13½	13½	13½	Nov., 1920	0.50
Hancock	Boston	*75	*75	*75		
HoweSound,new,r. t.c.	N. Y. Curb			16½	April, 1924	0.05
Inspiration Consl.	New York	26⅛	26	26⅛	Jn.18, Jy.6, Q	0.50
Iron Cap	Boston Curb	1½	1⅛	1½	May, 1923	0.15
Isle Royale	Boston	12½	11¼	11½	Sept., 1923	0.50
Jerome Verde Dev.	N. Y. Curb	1¼	1	1¼		
Kennecott	New York	51⅛	50	50½	Jn.5, Jy.1, Q	0.75
Lake Copper	Boston			1½	Jn.1, Jn.15 Q	0.50
Magma Copper	NewYork	41½	40	40¼	Jn. 15, Jy. 15,	0.75
Mason Valley	N. Y. Curb	1⅝	1¼	1½		
Mass Consolidated	Boston	*60	*60	*60	Nov., 1917	1.00
Miami Copper	New York	9¼	8⅛	8⅛	My.1 My.15 Q	0.25
Mohawk	Boston	27½	26	27½	My. 2, Jn. 2	1.00
Mother Lode Coa.	New York	7⅛	6⅞	7	Jn. 12, Jn. 30	0.37½
Nevada Consol.	New York	12½	12¼	12½	Sept., 1920	0.25
New Cornelia	Boston	20¼	19¼	19¼	My. 8, My. 25Q	0.25
North Butte	Boston	*99	*95	*96	Oct., 1918	0.25
Ohio Copper	N. Y. Curb	*87	*81	*83	No.14, De.2	0.05
Old Dominion	Boston	18½	18⅛	18⅜	Dec., 1918	1.00
Phelps Dodge	Open Mar.	†108	†100		Jn 20, Jy.2 Q	1.00
Quincy	Boston	23½	22	22	Mar., 1920	1.00
Ray Consolidated	New York	13	12¼	12⅛	Dec., 1920	0.25
Ray Hercules	N. Y. Curb			14		
St. Mary's Min. Ld.	Boston	33⅛	33⅛	33⅛	Ap. 20, My.20,	3.00
Shannon	Boston	*60	*60	*60	Nov., 1917	0.25
Shattuck Arizona	New York	6	6	6	Jan., 1920	0.25
Superior & Boston	Boston	1¼	1 1/16	1 1/16		
Tenn. C. & C.	New York	11¼	10⅛	10⅛	De.31, Ja.15,Q	0.25
United Verde Ex.	N. Y. Curb	24⅛	23¼	24	Jy. 6, Aug. 1	0.50
Utah Copper	New York	90¾	88	88¼	Mh.20,Mh.31,Q	1.00
Utah Metal & T.	Boston	*50	*45	*50	Dec., 1917	0.30
Victoria	Boston			*40		
Walker Mining	Salt Lake	2.50	2.40	2.40		
NICKEL-COPPER						
Internat. Nickel	New York	30½	29¼	29⅜	March, 1919	0.50
Internat. Nickel pfd.	New York	99½	99½	99½	Ap.16, My.1, Q	1.50
LEAD						
Carnegie Lead & Zinc	Pittsburgh	7¼	7	7¼		
Gladstone M. M. Co.	Spokane	*25	*24½	*25	Ap. 1925	0.00½
National Lead	New York	151	144½	149	Jn.12, Jn.30, Q	2.00
National Lead pfd.	New York	117	116¼	117	My.22, Jn.15 Q	1.75
St. Joseph Lead	New York	39	36⅜	37	Jn. 9, Jn. 22	0.50
ZINC						
Am. Z. L. & S.	New York	8¼	7⅞	7⅞	May, 1920	1.00
Am. Z. L. & S. pfd.	New York	28½	28	28½	Nov., 1920	1.50
Butte C. & Z.	New York	5¼	5⅛	5⅛	De.10, De.24	0.50
Butte & Superior	New York	12⅝	11⅞	12⅛	Mh.19, Mh.31	0.50
Callahan Zn-Ld	New York	2⅞	2⅜	2⅜	Dec., 1920	0.50
New Jersey Zn.	N. Y. Curb	185¼	183¼	185	Jn.20,Jy.10 Ex.	2.00
United Zinc	N. Y. Curb			*35		
Yellow Pine	Los Angeles	*72	*63	*72	De.10,De.15 Q	0.04
GOLD						
Alaska Juneau	New York	1⅝	1⅝	1⅝		
Argonaut	Toronto	*26½	*23	*26½		
Barry-Hollinger	Toronto	*46	*45	*46		
Carson Hill	Boston	*25	*25	*25		
Consol. W. Dome L.	Toronto	*13½	*13	*13¼		
Cresson Consol. G.	N. Y. Curb	3⅛	3⅛	3⅛	Mh.31, Ap.10 Q	0.10
Crown Reserve	Toronto	*28½	*28	*28	Jan. 1917	0.05
Dome Mines	New York	14⅜	14¼	14¼	Mh.31,Ap.20,Q	0.50
Golden Cycle	Colo. Springs	1.41	1.40	1.40	Dec.11, 1924	0.03
Hollinger Consol.	Toronto	14.80	14.65	14.70	Jn.29, Jy.15,	0.08
Homestake Mining	New York	44¼	43¾	44	Jn.20 Jn.25 M	0.50
Kirkland Lake	Toronto	*38½	*38⅛	*38½		
Lake Shore	Toronto	5.77	5.75	5.75	Mh.2, Mh.16,	0.05
McIntyre-Porcupine	New York	17⅛	17⅛	17⅛	My.1, Jn.1,	0.25
Newray	Toronto	*19½	*18½	*19½		
Night Hawk Pen.	Toronto	*22	*22	*22		
Portland	Colo. Springs			*40	Oct., 1920	0.01
Rand Mines	New York			36½	Fe.17, Fe.25	1.79
Teck-Hughes	Toronto	1.40	1.37	1.39		
Tom Reed	Los Angeles	*40	*28	*35	Dec., 1919	0.02
Tough-Oakes	Toronto	*32	*31	*31		
United Eastern	N. Y. Curb			*48	July, 1924	0.05
Vipond Cons.	Toronto	1.09	1.05	1.07		
Wright-Hargreaves	Toronto	4.45	4.40	4.43	Jn.15, Jy.1	5.00
GOLD AND SILVER						
Black Oak	N. Y. Curb			*81		
Con. Cortez	N. Y. Curb	*8	*7	*7		
Con. Virginia	San Francisco	*4	*3½	*3½		
Continental Mines	N. Y. Curb			1½		
Dolores Esperanza	N. Y. Curb	*51	*51	*51	July, 1923	0.05
Premier Gold	N. Y. Curb	2¼	2¼	2¼	Jn.18, Jy.1,	0.08
Tonopah Belmont	N. Y. Curb	*60	*60	*60	Mh.15, Ap.1	0.05
Tonopah Divide	N. Y. Curb			*23	Oct., 1923	0.10
Tonopah Extension	N. Y. Curb	1⅜	1⅜	1⅜	Mh.11, Ap.1, Q	0.05
Tonopah Mining	N. Y. Curb	3⅞	3⅞	3⅞	Mh.31, Ap.21,	0.07½
Unity Gold	N. Y. Curb	*90	*85	*85		
West End Consol.	N. Y. Curb	*55	*55	*55	Mar., 1923	0.05
Yukon Gold	N. Y. Curb			*35	June, 1918	0.02

Stock	Exch.	High	Low	Last		Last Div.
SILVER						
Alvarado	Boston Curb			*50	Oct., 1920	0.50
Beaver Consol.	Toronto	*29¼	*27½	*29	May, 1920	0.03
Castle-Trethewey	Toronto	*84	*83	*83½		
Coniagas	Toronto	1.75	1.50	1.55	May, 1924	0.12½
Keeley	Toronto	1.78	1.76	1.77	Mh.1, Mh.15SA	0.12
Kerr Lake	N. Y. Curb			1	Ap.1, Ap.15, Q	0.12½
La Rose	Toronto	*50	*47½	*48½	Apr., 1922	0.10½
Lorrain Trout Lake	Toronto	1.00	1.00	1.00	Jy. 2, Jy.15	0.05
McKinley-Dar.-Sav.	Toronto	*27½	*26½	*27½	Oct., 1920	0.03
Mining Corp. Can.	Toronto	2.70	2.65	2.67	Sept., 1919	0.12½
Nipissing	N. Y. Curb	5	4¾	4¾	Jn.30, Jy.20, Q	0.15
Ontario Silver	New York	6¼	6¼	6¼	Jan., 1919	0.50
Temiskaming	Toronto	*20	*18	*18	Jan., 1920	0.40
SILVER-LEAD						
Ahumada	New York	11⅛	10½	10½	Jn.15, Jy.2, Q	0.07½
Bingham Mines	Boston	29⅞	29⅜	29⅜	Jn.20, Jn.30 Q	0.50
Cardiff M. & M.	Salt Lake	1.37½	1.30	1.30	De.16, No.18	0.10
Chief Consol.	Salt Lake	3.87½	3.75	3.87½	Ap.10, My. 1	0.10
Columbus Rexall	Salt Lake	*11	*10	*10½	Aug., 1923	0.05
Eruption	Boston Curb	3	2⅛	3	Jn.15, Jy.2, Q	0.07
Federal M. & S.	New York	16½	16½	16½	Fe.26, Mh.15 Q	1.75
Federal M. & S. pfd.	New York	55	54½	55	My.25, Jn.15,Q	1.75
Hecla Mining	N. Y. Curb	13⅞	13½	13½	Jn.15, Jy.1 Q	0.75
Iron Blossom Con.	Salt Lake			*39	Oc.25, 1924	0.01½
Iron King Mining	Salt Lake	*56	*53	*53		
Keystone Mining	Salt Lake	*91	*80	*80	Au.11, Au.26	0.07½
Mammoth Mining	Salt Lake	2.40	2.25	2.30	My.15 My.25	0.10
Marsh Mines	N. Y. Curb			*4	June, 1921	0.02½
Park City	Salt Lake	5.75	5.75	5.75	Jn.15, Jy.1 Q	0.15
Park Utah	Salt Lake	5.80	5.35	5.80	April, 1924	0.15
Prince Consol.	Salt Lake	*47	*40	*47		
Silver King Coal	Salt Lake	7.65	7.60	7.60	Jn.20, Jy.1 Q	0.25
Silversmith	Spokane	*19⅜	*18	*18	Ap.1, Ap.10	0.01
Tamarack-Custer	Spokane	*59	*55	*55	Sept, 1924	0.25
Tintic Standard	Salt Lake	11.25	11.25	11.25	Jn.24, Jn.29 Q	0.40
Utah-Apex	Boston	6½	6½	6⅜	Jy.3, Jy.15, Q	0.35
Western Utah Copper	N. Y. Curb			*18		
IRON						
Bethlehem Steel	New York	39½	37⅜	39½	July, 1924	1.25
Char. Iron	Detroit			*20		
Char. Iron pfd.	Detroit			*85		
Colorado Fuel & Iron	New York	42	39½	40	May, 1921	0.75
Gt. North'n Iron Ore	New York	28½	27½	28½	Ap.11, Ap.30	1.00
Inland Steel	New York	40⅛	40	40⅛	My.15, Jn.1	0.62½
Mesabi Iron	N. Y. Curb	2½	2⅜	2½		
Replogle Steel	New York	13⅞	13	13⅜		
Republic I. & S.	New York	45⅜	44	45	May, 1921	1.50
Republic I. & S. pfd.	New York	87⅞	87⅜	87⅜	Jn.17, Jy.1, Q	1.75
Sloss-Sheffield S. & I.	New York	86	83⅜	84⅛	Jn.10 Jn.20 Q	1.50
Sloss-Shef. S.&I. pfd.	New York	92⅞	92⅜	92⅜	Jn.20, Jy.1, Q	1.75
U. S. Steel	New York	115⅞	114⅛	114⅜	Jn.1, Jn.29, OX	1.75
U. S. Steel pfd.	New York	124	123⅜	123⅞	My.5, My.29,Q	1.75
Virginia I. C. & C.	New York	31	31⅓	31	Jan., 1924	1.50
Virginia I.C.&C.pfd.	New York			73	Jn.20, Jy.2,	2.50
VANADIUM						
Vanadium Corp.	New York	29⅛	27½	28⅛	Jan., 1921	1.00
ASBESTOS						
Asbestos Corp.	Montreal	75¾	73	75¼	My.1, My.15 Q	1.00
Asbestos Corp., pfd.	Montreal	109	105½	108	Ap. 1, Ap. 15, Q	1.50
SULPHUR						
Freeport Texas	New York	18⅛	16⅛	17	Nov., 1919	1.00
Texas Gulf	New York	114	106¼	112½	Jn.1, Jn.15, Q	1.75
DIAMONDS						
De Beers Consol.	New York	21	21	21	Ja.6, Fe.2	0.95
PLATINUM						
So. Am. Gold & P.	N. Y. Curb	2⅛	2⅛	2⅛		
MINING, SMELTING AND REFINING						
Amer. Metal	New York	48	47½	47½	My.19, Jn.1, Q	0.75
Amer. Metal pfd.	New York			113½	My.20, Jn.1, Q	1.75
Amer. Sm. & Ref.	New York	105½	102	104½	Jy.10, Au.1, Q	1.50
Amer.Sm.&Ref.pfd.	New York	111	110	111	Au.7, Se.1 Q	1.75
Consol. M. & S.	Montreal	83¾	81½	82½	Jn.30, Jy.15	0.75
Federated Metals	N. Y. Curb	25⅜	21	25½		
Southwest Metals	N. Y. Curb			*80		
U. S. Sm. R. & M.	New York	36¼	35	36	Jy.6, Jy.15 Q	0.75
U.S. Sm. R.&M.pfd.	New York	45	44½	45	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 JUNE 13

	High	Low	Last	Date	Per Cent
Aramayo Mines (25 frs.)	78/—	76/6	77/6	May 1925	5(c)
British Platinum	8/9	8/—	8/6	Feb. 1925	2½
Bwana M'Kubwa	5/9	5/4½	5/6		
Camp Bird	2/9	2/3	2/7½		
El Oro	5/9	5/3	5/9	Nov. 1924	2½*
Esperanza	1/—	—/9½	—/10½		
Frontino & Bolivia	12/—	11/6	11/9	July 1925	3½
Mexican Corporation	13/3	12/7½	13/3		
Mexico Mines of El Oro	50/—	47/6	50/—	June 1925	10*
Nechi (pref. 10s.)	1/6	1/3	1/4½	1921-22	25
Oroville Dredging	7/9	7/3	7/6	Dec. 1923	3¾
Ouro Preto	5/—	4/4½	4/6	May 1925	2½
St. John del Rey	17/3	16/7½	17/3	June 1925	6¼
San Francisco Mines	25/9	24/3	24/6	June 1925	15
Santa Gertrudis	11/1½	10/3	11/—	July 1920	5
Selukwe (2s. 6d.)	15/6	14/6	15/—	April 1917	6¾
S. American Copper	7/10½	7/4½	7/9	Nov. 1917	75
Tanganyika	31/7½	29/4½	30/—		
Tomboy	4/3	3/6	4/3	Feb. 1925	4½
Union Minière du Haut-Katanga (Brussels) 100 Fr.	5.168	5.030	5.165	July 1924	80(b)

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