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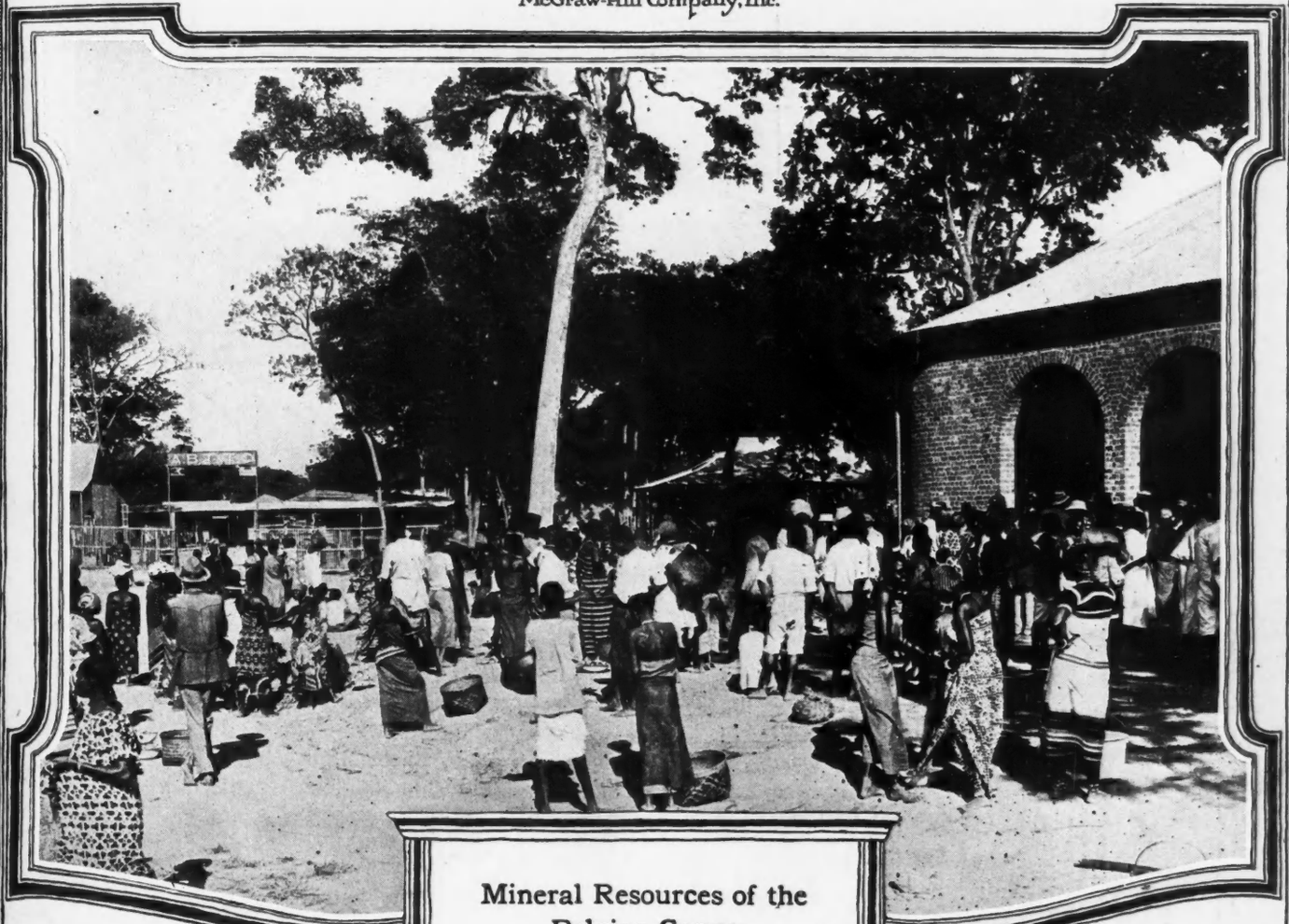

Katanga Copper Belt, Belgian Congo, Africa
Market Place in Elizabethville

Mineral Resources of the Belgian Congo

By S. H. Ball and M. K. Shaler

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Mining Enterprise in 2020

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Gossip: How Wags the World?

THOSE mining men who are in remote districts may be interested in the bird's-eye views or impressions of those who are situated at the nerve centers of modern life.

Looking out over the world on a fine October morning, we perceive that the wild onrush of historical events which has characterized the last six years is still progressing. The war between Poland and Russia draws at least to a temporary close with the defeat of the Reds. It was a great war, with vast armies involved; yet on our stunned perceptions it has made little impression. Future historians will celebrate the turning back of the Reds by the Poles as like the stemming of the German tide by the Belgians, or the turning back of the Turks at Vienna in the Middle Ages.

The rest of Europe is in a ferment—political, social, commercial, financial. Germany is busily spreading propaganda calculated to release her from paying the bills for the calculated damage that she wrought during the years that she had the upper hand, and apparently is having some little success here and there. The French are presenting a firm front to the Teutonic propaganda, and, having aided in the victory of Poland, now continue the pressure on the Reds; while Lloyd George apparently is still trying to figure which way England will make the most money.

Foreign travelers tell us Americans and English are popular in Germany, the former for the deeds of mercy of the Quakers and others, the latter because of a prospective trade alliance; and the Americans are unpopular with all the Allies, who consider them cocky and stingy. The old rule still works: if you want to lose a friend, lend him money.

To call a nation "a nation of shopkeepers" used to be a reproach. Yet shop—commerce, trade, economics—has run away with all and sundry; and what shall we eat, and if we shall drink, and wherewithal shall we be clothed, is our chiefest if not our only thought; also, how we shall maintain ourselves in comfort against our neighbor's effort to do likewise against us.

The world in general has spent all its money and exhausted all its credit, and now is facing the inevitable bills, and the threat "No pay, no eat." Russia finds the paper-money game played out, and is starving, and Austria, having tested this banking device to an equal extreme, is in almost as bad a way. Germany is treading the same primrose path. What of the rest of Europe?

The United States is relatively rich and really very prosperous, but she, too, has to liquidate and make good on her inflated dollar. The world is in liquidation, and we must share. It is said that the Federal Reserve system will prevent our having a panic, but it will not prevent Europe having one, nor can it prevent our feeling it acutely if Europe slumps still further. Anyhow, we are engaged in the fundamentally necessary surgical operation of paying up—deflation.

The products of the mines and the mining industries go with the current, with wool, cotton, hides, wheat, automobiles and the rest. Europe cannot buy sufficiently to sustain business—her money is no good, and her credit is not sound. On a declining market the psychology is not to buy; therefore our own industries hold back. So the prices of metals slide downward, and no buying is attracted. Nobody wants a thing when it is cheap. Yet for a long view ahead this would be the time to buy and equip mines, and be ready for the upward swing which will come in time. Adjustment took a long time after the Civil War, but we do those things more swiftly these days.

The greatest step for the healing of the world would apparently be a sound constructive foreign policy on the part of the United States. This, of course, will not occur till after the new President is inaugurated, but it may be foreshadowed. Harding lost some votes on account of a careless presentation of his opposition to "the League," but his subsequent proclamation of his belief in "a league" helps. Indications are strongly for his election; and there is no doubt that the people favor "a league."

Altogether, while storms still rage, and the tempest has scarcely passed its height, the outlook for Old Mother World is better than for some time past—even with declining markets and metal prices.

Concrete Hearths for Roasting Furnaces

WE ARE glad to see that the information which we recently published in the Consultation section on concrete hearths has brought forth considerable discussion from those who have had experience in this form of furnace construction. We are publishing three of the letters this week. We originally stated that concrete furnace hearths had been generally found wanting, although we mentioned that they might have been a success at Great Falls. Mr. Wiggin then informed us that they did good service in the McDougall furnaces, but that brick had been used in the new Wedge furnaces. One of our readers, on hearing this, suggested that this looked like another exemplification of the old wheeze about the patient who died, although the operation was perfectly successful. W. W. Taylor, who superintended the construction of the Braden furnaces in Chile, says that concrete hearths were a failure there, although considerable care was taken in their construction. Possibly the proportions were wrong, inasmuch as 1 part of portland cement was mixed with 2½ parts of granulated slag. No sand was used, and we would have anticipated better results with *crushed* slag. Frank Corwin comes to the defense of concrete for this purpose, as we hoped that he would. Mr. Corwin was one

of the originators of this type of construction and a patentee, and will make a success of it at Humboldt if possible. Metallurgists will watch the results there with interest, for this type of construction, if it can be made to stand up, will permit a considerable reduction in the original cost of roasting furnaces and also lower repair charges.

Our Declining Foreign Commerce

IT TAKES only a boat trip across New York Harbor forcibly and visually to impress upon one the fact that increased imports are coming to the United States. A few days ago, on such a trip, we counted over fifty merchant and tramp steamers anchored in the harbor alone, with more vessels at berths alongside the many docks and piers constructed to receive them. In fact, it looked to us as if there were a little congestion in New York's great bay and that the anchorages almost interfered with the regular ferryboat traffic in the harbor lanes. Some of these ships, no doubt, recently brought part of the lead and zinc to this country that had such a profound effect in lowering the market for those metals, and all of them are factors in a sweeping world trade readjustment, which is being reflected in the nation's trade balance, as figures covering our foreign commerce indicate.

Without giving a dry statistical table, it may be stated that, compared with the year 1913, our preponderance of exports over imports in 1919 *increased almost six times*, for reasons plain to everyone. At the same time the trade balance of the large majority of other nations, chiefly the warring ones, fell sharply. France, to take one example, had an *adverse* trade balance in 1913 which was multiplied almost fourteen-fold in 1919. Such disparities cannot continue for an extended period, for in the long run all trade between countries becomes neutralized, or balances—no one is giving anything away for nothing. This phase of readjustment is progressing at this time, and it is for that reason that current export and import figures are of prime importance. Thus, the foreign-commerce figures for August, consisting of exports valued at $584,000,000 and imports at $519,000,000, indicate the smallest monthly excess of exports shown for several years and compare with average excess exports for the earlier months of this year of over $200,000,000.

The year 1919 was a banner one in regard to favorable trade balances, because of the unabated foreign demand for our raw materials, regardless of exchange and high prices immediately after the war, but the tide ebbs as well as flows, a change slowly but surely is setting in, reversing the flow, and consequently it would appear that our export balance in 1920 will be less than half of the 1919 figure.

Expressed in other words, we must be prepared to receive a larger number of European commodities, as Europe gradually progresses with reconstruction, and at the same time we must realize that our exports cannot continue on the exaggerated war and post-war scale. Agricultural and mineral producers may complain that a decline in the volume of exports is unwelcome, and the trade inclination can easily be viewed with misgivings, but when the true significance of this trend of foreign commerce and its compensating effect on the high cost of living in the United States is understood, the result is more than gratifying. Although the nation's external trade suffers, the great consuming public gains by the increased domestic supply, and if any subject is more pressing, or, rather, oppressive today, it is the burdensome living cost.

City and Country

THE CENSUS BUREAU announces that the present population of the United States is 105,683,108, an increase of 13,710,842 since 1910. Outlying possessions and citizens now abroad, will, it is estimated, bring the total number under the American flag to 118,000,000.

During the last decade it is shown that there has been a strong flow of population from the country to the city, a trend that has been very much accentuated as compared with the previous decade; for the first time in the history of the country, 51 per cent, or more than one-half, of the total population live in cities.

This does not impress us as a healthy condition. Doubtless it has been brought about largely through the war, with the consequent high wages paid to industrial workers, and the resultant rich "pickings" by merchants and the whole urban tribe who struggle to share in the rewards of industrialism and production. The farmer tends to forsake the farm and find work in the factory, where he can earn more and spend more. Doubtless this has in part been artificial, and with the letting down or deflation which is now going on, with lowered wages or unemployment in towns, there may be a certain ebb "back to the land," to the farms, the forests, and the mines. The automobile boom in Detroit drew five or six thousand miners away from the copper country of Michigan. Will not some of these go back?

But something more than this deflation will be needed to foster the healthy growth of the country, whose prosperity is the best guarantee of the nation's welfare and stability. The farmer leaves the farm because the city dweller has the best of it. The natural urge toward the land is strong, but many a wage worker leaves his job and undertakes farming only to find he cannot earn a living at it; and, defeated, he goes back to the industrial ranks. As a farmer, he finds that the cards are stacked, and that the organization of the urban population is arrayed against him. If he triumphs over natural obstacles and accidents and produces a crop, he often finds that he cannot market it at a fair profit. In the greatest apple year of recent record in New York State, apples are offered four for fifty cents in New York streets. Rural organization, to match urban organization, is needed, if our abundant vacant fields are to be progressively cultivated. Similar fair and even favorable conditions are necessary for that other great basic industry, mining. The predominant city dwellers must concede a fair deal to those who produce the metals, whether gold, zinc, or copper, so that prospecting, enterprise, and production will be encouraged. Off this production, from farm, forest, and mine, all the population lives. Let the urbanite see that he does not let the cow that gives him the milk he lives on dry up under too little nourishment.

The Divining Rod Improved

A CORRESPONDENT interested in our recent editorial on the divining rod sends us in a long clipping from the *St. Louis Post-Despatch*, whereby we perceive that our earlier account of the divining rod was not up to date.

It appears that in the spring of 1919 there arrived in Pierre, S. D., an elderly man named Switzer, who prospected around and then informed the mayor that he had "positively located a spot where a large deposit of gold could be found." Some unusual interest seems to attach to getting Switzer's name right, which we do not rightly comprehend. We have heard it said that each one must be "a man, a mouse, or a piece of cheese," and if the name had been Schweitzer (and we suspect it) we should have had a clue. Anyhow, next the story of how the gold came there.

It appears that a barge laden with gold bullion bars was brought down the Missouri in 1850, "being attacked by a large force of Sioux Indians"—but you know the rest. The crew, being hard pressed, scuttled and sank the boat, hoping to return in happier days and dig up the gold. But, alas! all were killed. The same bunch hid their treasure, and were killed about this time, all over North America, and up and down the East and West coast.

The treasure near Pierre now slumbers awaiting the Prince Charming—and after just forty years in the wilderness he arrives—no other, impatient readers, than Mr. Roquefort. Schweitzer-Roquefort bore with him a magic device presumably given him by the Goddess of Cheese, the gentle Fromage de Brie—a "mineral indicator"—a divining rod, if you please. This led him on and on and on and on from Wyoming into Dakota. "Starting from Wyoming he approached Pierre, and as he neared that portion of South Dakota the indicator (he said) pointed ahead of him. Arriving at the St. Charles hotel in Pierre, the needle swerved in a southerly direction."

We have a correspondent in Boston that uses his divining rod mainly for locating whiskey; and we suggest to Mr. Cheese that the coincidence of arriving at the St. Charles hotel and the agitation of the faithful needle is too significant to be overlooked. Anyhow, his wanderings led him away from the hotel (we wonder why), and finally his needle settled on one spot—whereupon "Switzer departed," making it look more like black magic than ever. Next he apparently reappeared in a different form, as one Embrey, oil expert. We are inclined to suspect this a slight camouflage for Embryo oil expert. At any event, he had an indicator on the same principle as Limberger's, and he struck the same scent and settled on the same spot. Next came the digging, which is now going on—but whether for gold á la Welsh rarebit, or petroleum á la embryo the chronicler of the *Post-Despatch* does not inform us.

Romance has gone out of business, but not mining. We have the tommy-knocker, the busy little gnome woodpecker of the underground. We have heard him ourselves. And we have the divining rod, short-range and long-distance, as marvelous and intangible a fairy gift as seven league boots or cloak of invisibility. We have known several mines where the spirits instructed the owner in detail, periodically, what to do—"turn your tunnel to the left and drive fifty feet, and then crosscut west sixty-three feet and six inches." In one such case the patient owner, after driving like this for a year, broke into his own tunnel near the mouth—and who could do this without supernatural help?

We have only one suggestion for the *St. Louis Post-Despatch*—that it print these tales under "Bedtime Stories for Children."

Americans in Russian Jails

A RECENT dispatch to The Associated Press records the release from a Moscow jail of an American mining engineer, Dr. Alfred Wood Stickney. He was held only for a fortnight, and the excuse was that he was held pending identification. And for that reason he was kept in jail! The Russians have always been famous for their hospitality, and their reluctance to speed the parting guest is proverbial; but why lodge their guests in the jails?

The dispatch mentions by name a number of other Americans who still languish in the unsanitary jails in Moscow, and look forward to the rigors of a Russian winter.

There was a time in the history of the United States when the strong arm of the American navy (of sailing ships only) reached into any corner of the world where American rights were disregarded. American armed frigates descended on the coast of North Africa, at a time when the great European nations prudently stayed at home, sailed into the harbor at Tripoli and brought to terms the freebooters who had been attacking American commerce. This was the period when Thackeray offered America as a model which England would do well to emulate in this respect.

The second stage of America's defense of Americans abroad was the unhappy one from which we have just emerged, where the United States, grown rich and powerful but timid, with a vanished merchant marine, refused to accord any protection to the citizens abroad, and went so far as to inform them that they should have stayed at home! while England, following Thackeray's recommendation, made it uncomfortable for anyone who unfairly injured a British subject, anywhere.

Apparently we have now arrived at the third stage, when excessive caution characterizes both the United States and England. As a contrast, the other day France advised the Bolshevist-dictators, that if the French prisoners were not repatriated within twenty-four hours, the French Black Sea fleet would turn its guns upon Odessa, whereupon Lenine ironically but sincerely replied, "We bow to brute force."

As Thackeray once held up the United States as a model to England, we now hold up intrepid France as a model to both.

Our Foreign Service

WE HAVE recently made arrangements with Mr. W. A. Doman, mining editor of the *London Financial News*, for a weekly London letter covering high points of activity in the mining field which centers in London. We are publishing a monthly letter also from Mr. Sigmund Silberstein, chief editor of the *Hungarian Mining Journal*, in Vienna, giving the chief features of the mining and metal situation in Central Europe. We have special correspondents in Melbourne and Brisbane, Australia, from whom we publish a monthly general letter. We have correspondents in South Africa, and are arranging for a regular letter from that section. For Mexico and Canada, of course, we have the same extended system of correspondents that we have in the United States, and we are extending this system to South America. We wish to call these facts to our readers' attention, that they may be aware of the thought and expense that are being constantly devoted to building up the news service of the *Engineering and Mining Journal*.

WHAT OTHERS THINK

Concrete Hearths Successful if Properly Constructed

I have read with interest the criticisms in the Consultation section of the Aug. 28 issue of the *Engineering and Mining Journal* relative to the use of reinforced concrete for replacing brick in the construction of roasting furnace hearths. As this is a subject to which I have given considerable study during the past eight years, I take this opportunity to state some facts regarding the performance of this type of arch during this period.

The scheme for using reinforced concrete in a monolithic construction to replace brick in roasting furnace hearths originated and was patented by J. H. Klepinger and myself, the first hearths being installed in the McDougall furnaces at the Great Falls Reduction Works of the Anaconda Copper Mining Co. in 1912. Six hearths were installed at that time in two furnaces, the third, fourth and fifth hearths being selected as the ones that would receive the most severe treatment. After these hearths had been in service for over a year they showed no signs of wear whatever, and in a paper written by S. S. Rodgers and myself entitled "Increasing the Efficiency of McDougall Roasters," for presentation at the Butte meeting of the A. I. M. E. held in August, 1913, we made the statement that we considered the reinforced-concrete hearths practically indestructible. Now, after a period of eight years, I have a telegram in response to an inquiry made to A. E. Wiggin, general superintendent of the Great Falls Reduction Works, to the effect that the six reinforced-concrete hearths installed in 1912 are still in good condition, and were operated continuously up to April, 1919, when the roasting department was shut down.

I am aware of the adverse criticism that has been published from time to time, and I am also familiar with the experience that some of the smelting companies have had with the hearths. The information given out, however, has been somewhat misleading, as I have been connected with some of the companies where these hearths have been tried out. It is absolutely essential that care be given to the preparation of the concrete, and that the proper proportions of one part portland cement, two parts tailing sand and four parts crushed slag are intimately mixed and poured on the forms before any setting action takes place in the mixture. Then, after the concrete has set thoroughly and the forms removed, a light fire should be started on the lower hearth of the furnace and the arch thoroughly dried before the furnace is operated. Cement manufacturers have spent considerable sums of money during the last few years in the distribution of information relative to the proper handling of their product, but irrespective of this, concrete construction is usually turned over to some foreman whose only idea is low cost of construction. As these hearths, when properly constructed, will outlast any number of brick hearths, and can be constructed for one-half the cost of brick, it surely pays to give their construction the proper supervision.

We "blew in" our Wedge roasting plant here in February, 1918, and lost our first arch in February, 1920. Our furnaces receive severe treatment owing to the frequent change in the sulphur content of our charge, which makes it necessary intermittently to burn oil, and I consider that two years is good service for a brick arch in a furnace operating with frequent changes in temperature. We replaced the arch with reinforced concrete and it has been in service now over three months and shows no signs of wear whatever. The arch is just above the burners, and when oil is used the flame strikes the under surface of the arch. We have one other arch under construction and will replace all of the brick with reinforced concrete as soon as the brick arches "cave in." We are forced at times to operate all of our roasters at full capacity, and cannot take the time to shut down to replace brick arches, so we are following this plan, feeling satisfied that when we have all of our furnaces equipped throughout with reinforced concrete our arch troubles will be ended. As for the arches rising in the center and causing trouble, it is a very simple matter to allow a little more clearance between the surface of the arch and the rabble blades when the arch is being constructed.

FRANK R. CORWIN.

Humboldt, Ariz.

Concrete Hearths a Failure in Chile

In 1919 the Braden Copper Co. installed, in an extension to its acid plant at Sewell, Chile, a 22-ft. 6-in. seven-hearth Wedge roasting furnace. The construction of this plant was in charge of the writer.

As the cost of brick was very high, due to the ocean freight rates prevailing at that time, it was decided to try two experimental hearths of concrete, and, accordingly, the two upper hearths were so built. The concrete section was about the same shape and size as the other brick hearths, well reinforced with ⅜-in. and ½-in. rods, both radial and circumferential, to make it as strong as possible.

Concrete consisting of native portland cement (which had proved very satisfactory on other work) and granulated slag from the copper blast furnace was used, the proportion being about 1 to 2½. The material was well mixed and placed, the whole job being subject to very rigid inspection. Plenty of time was allowed for the concrete to set, and the furnace was warmed up very slowly, a period of a month elapsing between the time of placing the concrete and putting the furnace in commission.

After about one week of service the lower of the two hearths failed completely. The concrete cracked very badly, and the arch sagged down onto the rabble arms below. Upon examination the concrete was found to be badly disintegrated by the heat, so both hearths were removed and rebuilt with brick.

In regard to the materials used the granulated slag was the subject of a thorough test extending over a year and was used in placing some 30,000 cubic yards of concrete in Chile. It gave higher results even than standard Ottawa sand. The cement is the only other factor. Apparently it contained considerable free lime, but an analysis could not be obtained from the manufacturers, nor were our own laboratory facilities adequate for making one.

F. J. Brulé, construction engineer for the company, and who built the first successful concrete hearths for the Anaconda company, told me that those were the only successful hearths that he knew of, all the others having failed. As he was greatly interested in this matter he had complete data on a great many installations of like character.

I was quite confident at the time that the concrete hearth would be successful. In fact, the trial was made at my request, as I had previously built concrete furnaces to burn sulphur in Tennessee, using identical materials. These concrete furnaces, though subject to temperatures as high as 2,200 deg. F., were very satisfactory.

I regret that I have not my notes available so that I could give fuller details as to our construction. Under the circumstances, I am inclined to doubt the success of concrete hearths of a diameter exceeding 10 or 12 ft. W. W. TAYLOR.

Milwaukee, Wis.

More Information Wanted

The question and answer in regard to Concrete Furnace Hearths that appeared on page 411 of your issue of Aug. 28 was very interesting to me, because whoever wrote it seemed to have a great deal of unpublished information, but it does not refer to the only published statement on the subject except through the allusion to Hofman's "Metallurgy of Copper." In Vol. 46 of the Transactions, pages 419 and 420, Corwin and Rodgers describe the converting of furnaces at Great Falls to concrete hearths, and give the results of the six months' run, which are quite contrary to the general tenor of the reply made to your correspondent. I hope some further statement in regard to this will appear, for I shall be interested to know whether a more extended experience at Great Falls contradicted the conclusions given by Corwin and Rodgers. T. T. READ.

Washington, D. C.

[Mr. Wiggin advises us that the concrete hearths used in the McDougall furnaces at Great Falls gave very satisfactory service but that these furnaces have not been in use for some time. The zinc concentrate, which is the only material now being roasted at Great Falls, is treated in Wedge furnaces with brick hearths. —EDITOR.]

Mineral Statistics for the Census Bureau

A statement on the work of the census of mines and quarries appearing in the article on p. 525 of *Engineering and Mining Journal* for Sept. 11, requires an explanation. The statement is as follows:

> The work has gone far enough to determine that 47 per cent of all mining and quarrying operations have as their object the securing of oil or gas. The remainder of such operations is divided as follows: Coal, 18 per cent; gold, silver, lead, copper, and zinc, 21 per cent; quarries, 11 per cent; iron, 2 per cent; all others, 1 per cent.

The percentages given are merely a sorting of establishments or enterprises, that is, of individuals or organizations, engaged in or interested in the various mineral industries as shown by the census lists prepared as a guide for the census canvass. These figures have no relation to the number of actual operations, the number of men engaged, the quantity or value of output, or the scale of operation measured by any standard. The lists from which these figures were obtained are based on U. S. Geological Survey records and lists from state mining and geological bureaus, industrial registers, state gazetteers, and other published directories and indices of various kinds. The figures will be very materially modified when the results of the canvass are compiled and tabulated.

Washington, D. C. FRANK J. KATZ.

The Formation of the Sevier Valley, In Utah

I have just read the review of "The Ore-Deposits of Utah," by B. S. Butler, G. F. Laughlin, V. C. Heikes, and others, as published in the Aug. 28 issue of *Engineering and Mining Journal.*

Although I agree with you that "geological literature is rotten with faults that 'ain't there'," as well as a lot of other things that "ain't there," I must differ with you about the Sevier Valley not being a structural depression, for if it has not been in large part produced by faulting, there are no such things as structural depressions.

Although the whole of Sevier Valley is undoubtedly a depressed area, it is more particularly evidenced from the vicinity of Marysvale, south to the south end of Circle Valley, a distance of almost thirty miles. Both to the east and west of Marysvale the evidences of faulting are clear, on the east there being two eastward-tilted blocks forming the foot-hills to the main mountains, and to the west immense walls of quartzite practically vertical for hundreds of feet. It is in the mountains around Circle Valley that the faulting in the Tertiary volcanics is best exemplified. The stratification of the rock here is more marked than further north, and tilting and displacement are more easily followed than was possible in contiguous formations.

I would say, however, that there are more than two faults which formed the valley. From the edge of the plateau country on each side there are a number of faults stepping down the country to the valley floor, and below. A noticeable feature is that the formation on the east side of the valley dips to the east, and that on the west side dips to the west, as though the axis of the valley had once been the axis of a low arched anticline.

In Alaska, I have seen wide, flat-bottomed valleys with vertical and steep sides which were mostly, if not wholly, formed by the cutting effect of glacial ice streams. That an ice sheet once covered this country is not to be denied, and Sevier Valley may, in part, have been shaped that way; but there is no doubt of the faults of recent displacement which now are to be seen on its east and west borders, and which from all the trustworthy evidence at present available would appear to be the main factors in the valley's present geological development. JACOB W. YOUNG.

Marysvale, Utah.

Mineral Resources of the Belgian Congo

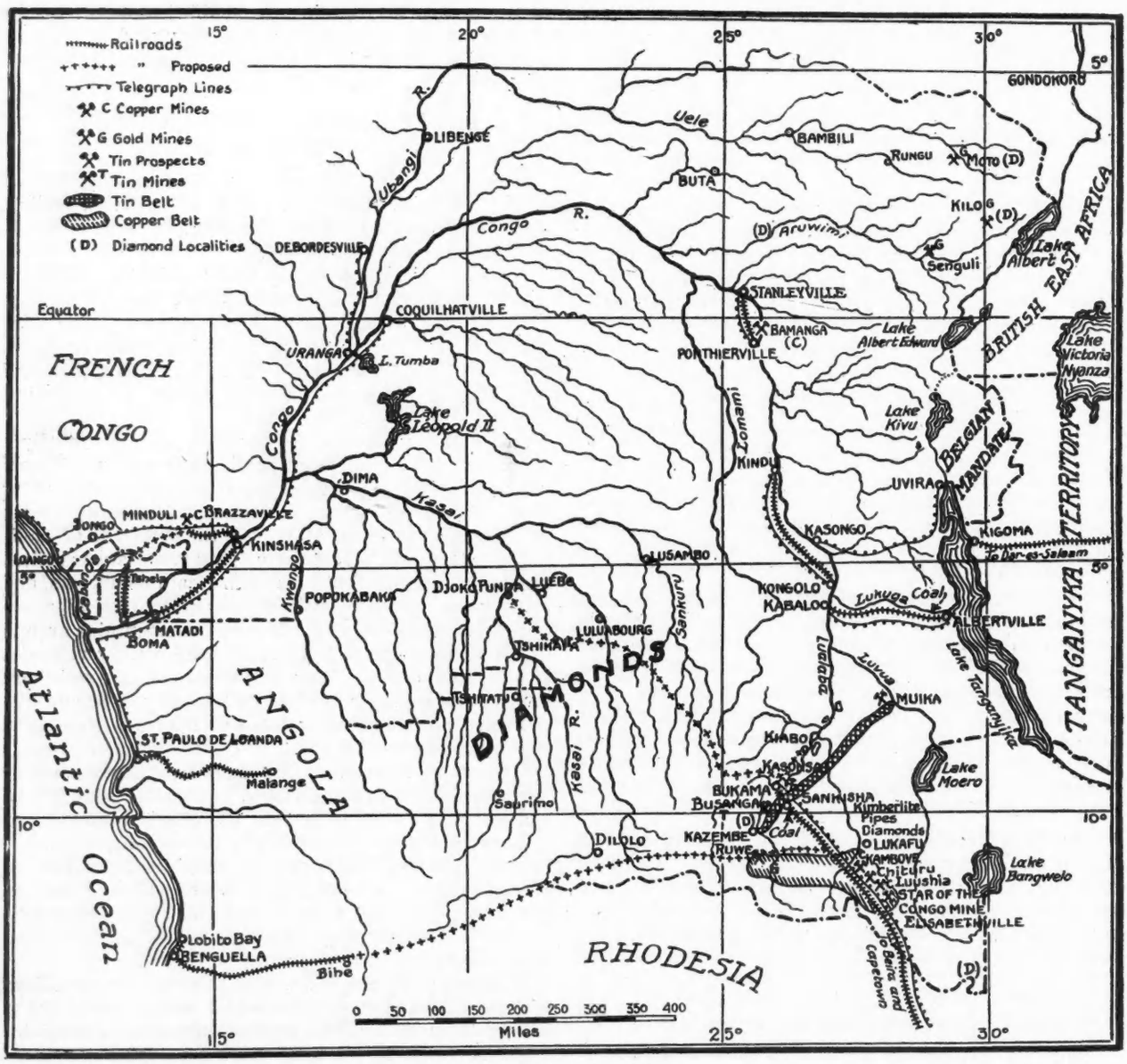
Development Formerly Much Hindered by Inaccessibility of the Colony, but Now Being Actively Pushed—Copper the Chief Product, but Gold, Tin, and Diamonds Also of Importance

BY SYDNEY H. BALL AND MILLARD K. SHALER
Written for *Engineering and Mining Journal*

BELGIUM, in her central African colony, the Belgian Congo, has a treasure house of natural resources from which raw materials, essential to stricken Europe, are being sent in increasing quantities to the mother country. The Belgian Congo comprises the greater portion of the Congo River basin, roughly one-third of its area lying north and two-thirds south of the Equator. The colony itself has an area of 909,000 square miles, and, in addition, the Belgians hold a mandate over 46,000 square miles in the northwestern part of what was formerly German East Africa. The combined area is a quarter that of the United States and Alaska.

Disregarding the narrow coastal plain, the colony lies on the African plateau, and consists of a basin, the centre of which is about 1,000 ft. above sea level. On the north frontier of the colony the elevations are from 2,500 to 4,200 ft., and to the south approximately 1,000 ft. higher. To the east are the high mountains of the lake region, Ruwenzori having an altitude of 16,800 ft.

Contrary to general opinion, one-half of the Belgian Congo is savanna, the great equatorial forest being



THE BELGIAN CONGO

confined largely to the south side of the great horseshoe bend of the Congo River. Heavy rainfall, high humidity, and relatively high temperature characterize the climate.

Interior transport, as in many countries, is the weak link which retards development. At present high freight rates permit the export of only relatively valuable raw materials and burden the cost sheets of all companies. Interior transport follows the Congo and its tributaries, the navigable stretches being linked to one another by railroads. Within the colony are over 9,000 miles of rivers navigable to steamers of light draft, but the service is slow and costly. Larger and faster steamers, channel improvements and loading facilities are necessary and are being provided.

Over a Thousand Miles of Railroad Built

The colony has 1,020 miles of railroad, and one can step off a boat from Antwerp at Matadi and from that port travel across the continent by all rail and steamer routes either to Cape Town, Beira, or Dar-es-Salaam. The building of the Bas-Congo-Katanga railroad between Bukama and Charlesville (Djoko-Punda), on the Kasai, would open up a fertile country, which is not only one of the best labor reservoirs in the Congo, but also is a diamond field of importance. It is not unlikely that construction of this line will begin soon from the Charlesville end. Eventual rail connection between Charlesville and Leopoldville is projected, which would furnish an all Congo rail route for the Katanga copper. The construction of one of the two proposed routes connecting the Congo and Nile rivers would better the transport facilities of the gold fields lying in northeast Congo.

Hydroplanes Used for Passenger, Mail, and Express Service

Fifteen hydroplanes with crews have been provided for the colony, and four are already in service. The program includes carrying passengers, mail, and express between Kinshasa and Stanleyville, a distance of 1,800 miles. It is expected that the round trip can be made in seventy hours, in place of the fifteen days which the river steamers take. Since June 1, a regular six-hour bi-monthly service between Kinshasa and Coquilhatville (360 miles) has been organized. The expansion of hydroplane service in the future is certain.

The climate, although tropical, should have, to a red-blooded person, none of the terrors which the story writers are prone to ascribe to Africa. White men, if proper care is exercised in their selection both as to physique and temperament, can serve their employers well during a continuous period of two years, the usual term of service in the colony, and that, too, without reason to regret later their sojourn in Africa.

Labor Is Cheap, but Natives Do Not Enjoy Work

The wage for common labor is low, varying according to the district from 5 to 10c. a day, although the companies also furnish food, lodging, medical care, bedding, and clothing in part. As a result, although general mining costs, for reasons other than labor, are high, certain types of work (shoveling of gravel and overburden for example) are done at small cost. As in most tropical countries, labor shortage is a chronic cause of complaint. This is due less to the lack of labor than to the unwillingness of many natives to work, and to the fact that some of the mining districts are relatively sparsely inhabited and lack means of easy and direct transportation from more densely populated regions.

Mining in the colony is mostly in the hands of ten or twelve companies and their associates and subsidiaries. Many of these companies are in a strong financial position and possess large concessions. A large number of the concessions held give the right to prospect large territories over a considerable period, at the expiration of which a certain number of smaller but still large mining claims may be staked out. The colony, in return for such rights, is given a participation in the mining companies varying from one-third to one-half of the stock issued. In addition, the colony is paying 2 per cent export tax on all minerals produced, and there is an import tax on supplies entering the colony. A graduated profit tax is proposed. The Katanga was thrown open to individual prospectors before the war, and eventually the whole colony will presumably be opened to general prospecting.

Since the war nationalistic tendencies have marked the policies of all European countries. With countries which have suffered as has Belgium, the policy is right and natural. The Congo gold is now all sent to Belgium, and used either in coinage or reserved for the use of Belgian goldsmiths. Part of the Katanga copper is being directed from England to Belgium, and this will be refined, as will be the Congo gold, in the Hoboken works near Antwerp. A large proportion of the Kasai diamonds must be sold to Belgian cutting works. Further, the mining companies must offer employment to Belgian engineers, and they are encouraged to purchase their supplies in Belgium.

As indicated, mining costs in the colony are relatively high, due to the following factors: high taxation, distance from the home office, slow transportation, high freight rates, and inefficient labor. Several of the operations are, however, carried on at an excellent profit.

Geology of the Region

The coastal plain is underlain by sandstones, limestone and shales of Cretaceous and Tertiary age, which dip gently toward the Atlantic. To the west is a belt of closely folded and ancient gneisses and schists of both sedimentary and igneous origin, intruded by granite bosses and diabase dikes. The central zone is composed of Devonian (?) limestone and the eastern belt is of red, flat-lying Permian (?) sandstones and shales. The interior basin is underlain by flat-lying interbedded sandstones and shales of Jura-Triassic age. As the north, south, and east frontiers are approached these sediments feather out, and rocks similar to those of the geologically complex Crystal Mountains outcrop. To the east, recent lava flows cover considerable areas north of Lake Tanganyika.

Many of the gold- and iron-ore deposits and some of the less important copper deposits are genetically related to the supposedly pre-Cambrian intrusions. The ancient African plateu has been deeply eroded, and these ore deposits are either replacements, fissure veins, series of linked lenses, magmatic segregations, or pegmatitic veins. The tin lode deposits of the Katanga are, however, dependent on the earlier of two Paleozoic

ROCKING SCREENS ON DEVELOPMENT WORK, KASAI DIAMOND FIELD

granites, whereas Studt ascribes the Katanga copper deposits to the latter. The origin of these deposits, however, remains a moot question.

Important mineralization apparently ceased by mid-Carboniferous times. Coal, oil shales, and diamondiferous conglomerates occur in the flat-lying shales and sandstones of the central basin, and it is possible that oil seeps in the coastal plain may lead to the discovery of petroleum.

The three important mining districts include the Katanga, to the southeast, with copper and tin and less important gold, coal, and diamond deposits; the Aruwimi-Uelle region, to the northeast, with gold deposits; and the Kasai region, to the southwest, with diamond deposits.

Extent of the Katanga Copper District

The Katanga copper belt is not only the site of the most important mining industry in the colony but its operating company, the Union Minière du Haut-Katanga, is one of the twenty most important copper producers in the world. Its reserves, proved and potential, warrant the belief that its future importance will be even greater.

The Katanga copper belt lies in the southeastern part of the colony, and, indeed, its lower tip extends into Rhodesia. Two hundred copper deposits have been discovered in a belt from 25 to 40 miles wide and about 200 miles long. The belt extends from east to west.

The ruggedly dissected plateau ranges in elevation from 3,900 to 5,200 ft. above sea level. The copper deposits were relatively easy to locate, as they usually rise above the surrounding territory as cones or ridges bare of verdure. The local natives were also familiar with the location of the numerous pits sunk by the old copper miners.

The copper-bearing rocks (probably of middle Silurian to Devonian-Silurian age) include sericite schist and quartzose rocks, ranging from shaly sandstone to quartzite, and less frequently slate, talc, limestone, and dolomite. The rocks are closely folded, and strike parallel to the extension of the belt, the predominant dip being north. Granites and basic igneous rocks occur in the vicinity. The orebodies are associated with sharp folding, faulting, and brecciation and an unusual degree of metamorphism. The orebodies are tabular masses conforming usually to the bedding planes but in instances to schistose planes cutting the former. Malachite and chrysocolla are the predominant minerals; azurite, copper pitch ore, and melaconite are less abundant; and cuprite, dioptase, native copper, lunite, libethenite, olivenite, and cyanotrichite are rare. Diamond drilling shows that copper sulphides (chalcopyrite, chalcocite, bornite, and covellite) and pyrite occur in several orebodies.

Although figures as to reserves are not available, substantial tonnages are practically in sight, and the amount of the ore which will eventually be developed will be very large. A number of deposits are large, as, for example, Kambove No. 2, reported to be 3,000 ft. long, and, so far as developed, from 240 to 400 ft. wide.

High-grade ore, containing 15 per cent or more copper, and suitable for direct blast-furnace smelting, is in relatively small amounts compared to 6½ to 7 per cent ore. Most of the ore is highly siliceous, although some is high in alumina and still other is dolomitic. Some of the ore carries appreciable quanties of precious metals. The cobalt content is high, and the Katanga copper belt could produce as a byproduct practically all the present world demand.

The copper belt is the property of the Union Minière du Haut-Katanga, in which the Tanganyika Concessions, Ltd., a British corporation, holds a 39 per cent stock interest.

Mining was begun in 1910, and smelting in June, 1911, the production in metric tons being as follows:

Date	Tons	Date	Tons
1911	998	1916	22,167
1912	2,492	1917	27,462
1913	7,407	1918	20,238
1914	10,722	1919	23,004
1915	14,041	Total	128,531

The drop in production in 1918 was due to transportation difficulties, labor shortage, and an influenza plague, whereas the production in 1919 was adversely affected by shortages of supplies and a strike of the white employees.

Americans Hold Important Executive Positions

The staff consists of about 800 whites, several of the more important positions being held by Americans, and a labor force of 12,000 to 13,000 natives. Mining is predominantly open-cut work by pick and shovel or steam shovel, although in several of the mines the ore

HAND-PICKING CONCENTRATES, RAMONA, KASAI DIAMOND FIELD

is milled down chutes to main haulageways. The less rich ore is either hand sorted or washed before reaching the smelter.

The Star of the Congo Mine, formerly the principal producer, produced in 1919 but 20 per cent of the ore; 65 per cent of the production came from the Kambove mine and 15 per cent from the Likashi and Chuturu group. The latter mines were opened up in 1918. To the end of 1919 the Star had produced 888,000 tons of smelting ore, besides the greater part of the dolomite used as flux until recently, when it has been supplanted by Kakontwe limestone. Kambove between June, 1913, and Dec. 31, 1919, furnished about 635,000 tons of smelting ore, and Likashi-Chituru 128,000 tons. The Fungurume mine is being opened up, and the Luishia, Luiswichi, Kakanda, and M'sesa mines have been satisfactorily developed. Development, particularly by diamond drilling, has been pushed in the western group of mines in 1920.

The ore is smelted in blast furnaces at Lubumbashi, near Elisabethville, to black copper containing from 96 to 97 per cent of the metal. In 1916, about 195,000 metric tons of ore, 70,000 tons of iron flux, 52,000 tons of dolomite and 2,700 tons of limestone were smelted, the coke consumed being about 70,000 tons (54 per cent Wankie Rhodesia coke and 45 per cent coke made in Katanga from Wankie coal). In 1919 a total of 189,169 tons of 16 per cent ore and 163,000 tons of flux were smelted. About 73 per cent of the copper content of the ore is recovered. Seven furnaces are in operation, of a theoretical total capacity of from 35,000 to 40,000 tons of copper per year. The plant was therefore running at about 50 per cent capacity during 1919.

A 4,000-ton mill to concentrate the malachite stringers in the lower-grade ore is being built this year near the Likashi and Chuturu mines, and will probably be put into operation during the second half of 1921. The tailings are to be stored for later treatment by a leaching plant. An experimental leaching plant (100 tons copper per month) was planned to be erected this year, and this pilot plant will be superseded, within the next three or four years, by one of a capacity of 55,000 tons of copper yearly. Its probable location is near N'Zilo, where hydro-electric power can be generated. In prewar days, the copper was sold in Germany, but during the war most of it went to England. Since 1919, part of the production is shipped to England and part to Antwerp, where it is refined at the Hoboken plant. The Union Minière holds a 25 per cent interest in this 20,000,000-fr. refining corporation.

Cupriferous quartz veins and lenses, lenses of chalcopyrite, magmatic segregations of chalcopyrite, and cupriferous beds in red sandstone occur in the older rocks of other portions of the Congo basin, but of the copper deposits those of the Katanga are alone known to be exploitable. Ten years ago a few tons of high-grade ore was shipped from quartz-chalcocite lenses at Bamanga, near Ponthierville. The Simkat is to continue development of the Kapulo copper mine, near Lake Mwero, a deposit found during the war.

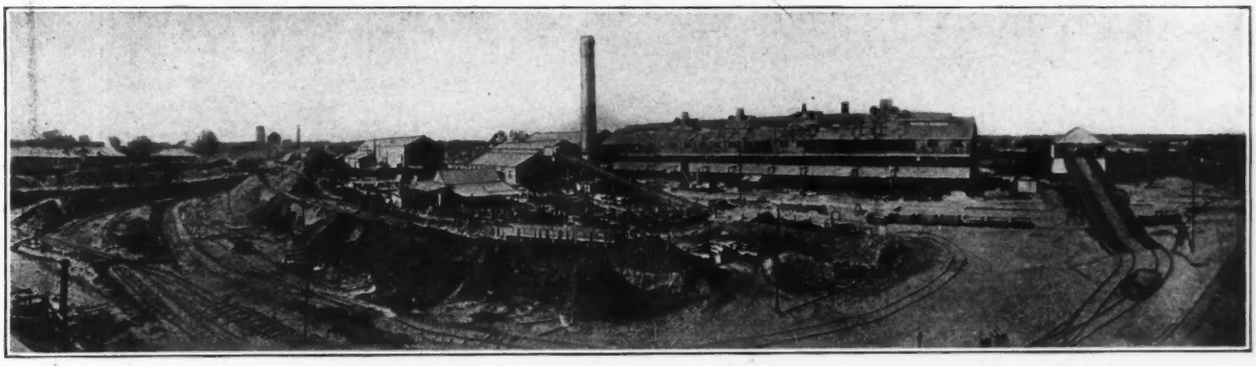
The Belgian Congo produced to the end of 1919 from its placers about $16,626,255 worth of gold, or 24,750 kg.

GOLD PRODUCED IN BELGIAN CONGO TO END OF 1919

Property	Kg.	Property	Kg.
Kilo-moto	23,243.617	Nebula	(a) 50.775
Sengule	17.797	Ruwe	530.000
Babeyru	750.000		
Kanwa	158.000	Total	24,750.189

(a) Figure of the Colonial Office.

The placers now worked are situated in the northeastern part of the colony, although gold is widely distributed around the rim of the basin and is even an occasional clastic constituent of the interior sandstones.



THE LUBUMBASHI SMELTER, KATANGA COPPER BELT

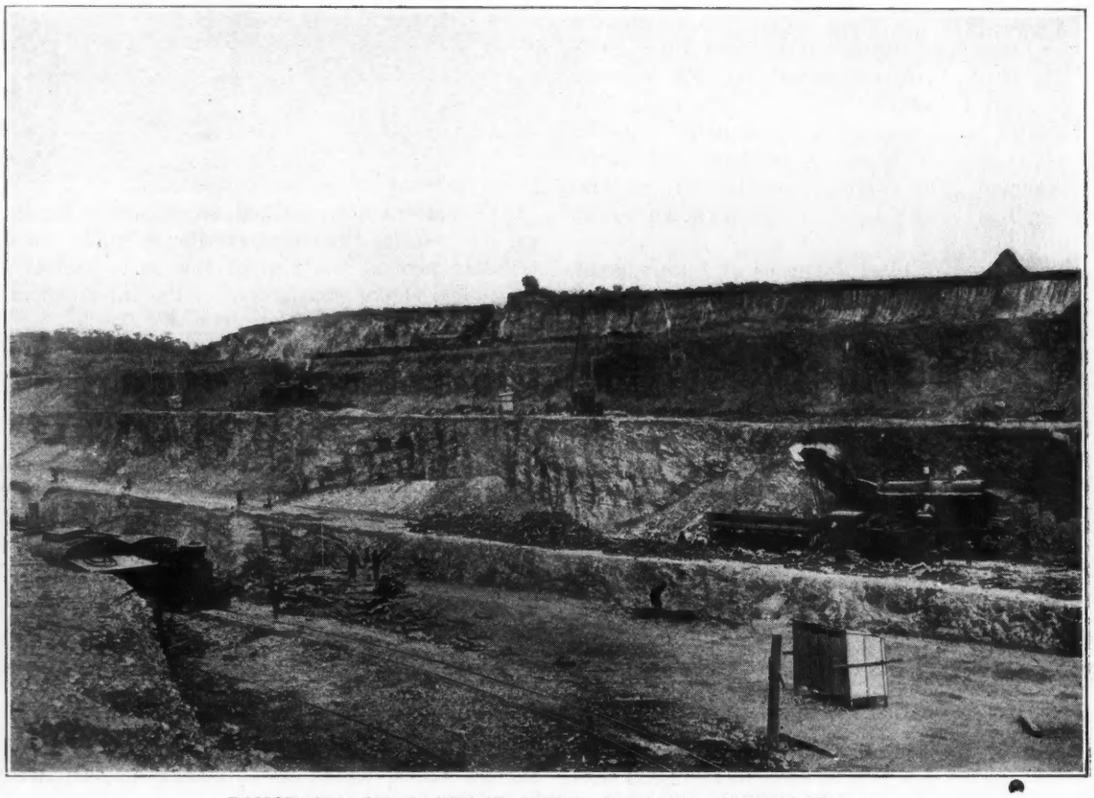
The northeastern part of the colony is a region of ancient rocks, which have undergone deep weathering and erosion, resulting in the concentration, in present-day streams, of gold once widely distributed in stringers and other non-exploitable bodies. The bullion runs about 93 per cent gold and 7 per cent silver.

The colony owns and operates the two important placers, namely Kilo and Moto, in the Ituri and Uelle basins. The two placers, which are about 100 miles apart (and this in Africa, due to difficulties of communication, is the equivalent of a thousand miles in America), were operated by a single management in Africa, but in 1918 the two mines were placed under separate African managements. In March, 1920, the Colonial Ministry placed the management of these placers in the hands of a committee sitting in Brussels and composed of experienced engineers and colonials, who are to be responsible for the mines paying a return on an assumed capitalization of 100,000,000 fr.

The gold is chiefly sold in England, and a part of it is reserved to Belgian goldsmiths. Recent production has been from one to two thousand kilograms a year each from Kilo and Moto.

The country rock at Kilo is diorite, schist, syenite, and granite. The gold probably originates from quartz-pyrite stringers in the diorite itself and along the diorite-granite contact, as the streams become barren as they pass from the diorite into the granite. The average depth of gravel is 2.75 ft. at Kilo and 1.85 ft. at

Moto. The bottom at Kilo is a greenish clay, an alteration product of the diorite into which the gold penetrates for four and in places over eight inches. Operations began in 1905. Excavation is largely by pick and shovel, although a small giant is used, and more machinery should by now have arrived at the mine. The gold is chiefly recovered in sluices. A dredge has been working the wash of Chari River since 1918, and gave for the year 1919 a production of 96.514 kg.



PANORAMA OF KAMBORE MINE, KATANGA COPPER BELT

In 1918 the gravel treated averaged $2.17 per cu.yd., and costs are reported to be about $1.25 per cu.yd. Details concerning the two exploitations during 1919 follow:

	Kilo	Moto
Production	1,740.697 kg.	1,618.598 kg.
Cubic meters of gravel washed	350,436	700,000
Gold contents per cubic meter	4.96 g.	3.32 g.
Cubic meters of overburden	273,447	800,000
Number of native workmen	2,900	5,600
Number of white agents	37	23

The reserves now determined can be estimated at about 10,000 kg. for Kilo and 5,000 kg. for Moto. Part of the territory is not yet prospected.

Lode Deposits Also Known

Lode deposits have been found at Kilo, and these are soon to be exploited, as machinery is said to have arrived in the fields. The Colonial Office reports that about 432,000 tons of quartz, containing approximately 5,550 kg. of gold, or $7.50 per ton, has been developed. Certain lodes have been cut at a depth of 60 to 120 meters. Their thickness averages about one meter and they strike nearly E.-W. along a distance of over one kilometer. At Moto, lode prospecting is not yet sufficiently advanced to permit an estimate; however, the results obtained are encouraging.

Some diamonds have been discovered in the alluvial deposits at Kilo and Moto, and a sample of serpentine yielding platinum has been found at Kilo. The gold region is relatively sparsely settled and labor is difficult to procure. During the war there was a shortage of white staff, and since the armistice the region has suffered from several epidemics.

The Moto placer began operating in 1911. The country rock is reported to be granite, diorite, and hematitic schist. The Senguli placer of the Kasai company, also in the northeastern part of the Belgian Congo, was opened in 1919, and its production for the year was about 18 kg. of gold. The discovery, in May, 1919, of a new placer in the northeastern part of the Uelle basin, was also reported. West of Moto mines in the Uelle, and near Niangara, the bed of the river is reported to contain paying gold. The Orientale company (since taken over by the Intertropical) has located a placer in the Ituri region. Small placers derived from two of the Katanga deposits (the copper ore, as already stated, is slightly auriferous) were formerly worked; at Kambove very little gold has been extracted. The placers of the Forminière at Kanwa and Babeyru have been temporarily abandoned because of low grade and high working costs. The production from these mines totaled 908 kg.

The Ruwe mine structurally resembled the copper deposits, and, indeed, its ore contains some copper. The ore shoot is reported to be about 1,400 ft. long and to average 7.5 ft. wide. The ore was reported, prior to the war, to average $14 per ton in gold, platinum, palladium, and silver, equivalent, at present metal prices, to at least $28. There are rumors that it is soon to be worked. Between 1904 and 1908 about $330,000 worth of gold was washed from a detrital deposit derived from the weathering of this lode.

On the northwest face of the dissected plateau known as Monts Mutumba, in the Katanga, is a tin belt 250 miles long and of considerable promise. The strike of the belt is northeast to southwest. The rocks are mica-schist, tourmaline-bearing quartzite, and slate of pre-Cambrian or Cambrian age, which are intensely intruded by biotite granite and pegmatite of Ordovician age. The cassiterite occurs in pegmatites and greisens, but the commercial deposits are detrital and to a less extent stream deposits. The southern 175 miles of the belt is owned by the Union Minière du Haut-Katanga, the central portion by the Geomines, and the north end by the Simkat.

In 1906 the Union Minière smelted ten tons of tin concentrates at the Busanga mine in a locally constructed furnace. This mine was reopened in 1916. The company has contracted the mining, its engineers merely superintending the exploitation and doing development work. An epidemic of grippe and delays in road construction have held the work back, but it is hoped that the two contractors will soon be producing monthly the fifty tons of cassiterite (65 to 75 per cent) for which the contract was made. The first shipment of concentrates reached Elisabethville in April, 1920. The better gravel is said to carry about 1 per cent of cassiterite, and the reserves now developed contain approximately 10,000 tons of that mineral.

The Geomines is exploiting the Manono and three smaller placers near Kiambi, using giants and sluices. About ten white men and 600 natives are employed. From 15,000 to 20,000 tons of cassiterite in low grade gravel (0.1 to 0.01 per cent) have been blocked out. In 1917 a total of 103 tons of concentrates were sold, and in 1918, 274 tons. The concentrate carries 74 per cent tin and is highly prized by British smeltermen. The company's other tin placer at Naulongo-Kikondja is not now being exploited. Exploitation was begun in 1915, and to June 30, 1918, the production totaled 443 tons.

The Simkat is reported to have started work on its placer at Muika. The lode is reported to contain from 0.2 to 0.5 per cent and the placer from 0.05 to 0.07 per cent of cassiterite.

The reported tin production in metric tons follows:

Date	Carats	Date	Carats
1915	48,935	1918	164,000
1916	53,940	1919	215,000
1917	100,000		

Diamonds are widely distributed in the Belgian Congo. They exist at two alluvial occurrences and as constituents of several kimberlite pipes in the Katanga, as alluvial diamonds over an area of 45,000 square miles in the southwestern part of the Belgian Congo called the Kasai diamond fields, and at six places scattered over the northeastern part of the colony.

In the Kasai diamond fields are the only exploitable deposits so far found in the colony. The region consists of a foundation of ancient (pre-Cambian?) schists, gneisses, and granites, on the peneplaned surface of which rest flat-lying sandstones, shales, and conglomerates of Jura-Triassic age. The conglomerate lenses contain diamonds, in instances in commercial quantities, and in consequence the diamonds are much older than those mined from the South African pipes. The deposits now being exploited are, however, creek and terrace deposits, which are in instances rich. The stones are generally small, averaging about one-tenth of a carat; and the largest stone yet found weighs about 32 carats. In quality, the diamonds resemble those of the Southwest African Protectorate, and a large portion of them are suitable for cutting.

TAKING OFF OVERBURDEN IN THE GRAVEL PIT AT M'PESO, KASAI DIAMOND FIELDS

The field was discovered in 1907 by the Forminière, a Belgian corporation in which American capital is interested. Production began in June, 1913, since when 620,000 carats have been produced. Recent production follows:

Date	Metric Tons	Date	Metric Tons
1913	19.369	1917	103
1914	30.947	1918	274
1915	40.250	1919	465
1916	0.025		

From eight to ten different placer mines are under exploitation. Excavation is largely by pick and shovel, and concentration by pan plants, or (after sizing by rocking screens or trommels) by jigs. Fifty white men and 8,000 blacks are employed. The capital of this company has recently been increased from 8,000,000 to 16,000,000 fr. On Oct. 1, 1919, the company declared 6 per cent dividends on the preferred stock, covering the period from 1909 to 1913 inclusive. In 1919, the government requested that three-fourths of the production, as a minimum, be disposed of in the Belgian market.

The staff of the Forminière is prospecting the concessions of six other companies and syndicates in the Kasai diamond fields, of which the Beceka, a mining

company subsidiary to the Lower Congo-Katanga R.R. Co., will in 1920 begin to exploit at least one of the deposits which it has found to be northeast of the Forminière concessions. The Kasai company has also located some promising deposits and is forming a subsidiary company, which will soon start exploitation. These exploitations as well as further prospecting work will be carried out under the auspices of the Forminière. Capitalists associated with the Forminière have also obtained diamond prospecting concessions in the northern part of the Katanga, where prospecting work has begun.

In the southern part of the Katanga are about forty pipes composed of a rock resembling kimberlite, and, indeed, these pipes may well be contemporaneous with those of South Africa. The largest has an area of forty-five acres. Many of these pipes are known to be diamondiferous. Several hundred stones have been obtained from the Luanza pipe.

Fourteen known pipes are owned by the Simkat, others by the Geomines, and by the Kundelungu Exploitation Co., the latter a subsidiary of the Katanga Special Committee, and the Tanganyika Concessions, Ltd. Now that the war is over, further washing tests will be undertaken on certain of these pipes.

Colony Also Has Coal Deposits

The Geomines has uncovered coal beds at Kilometer 262 on the Kabolo-Lukuga railroad. Five seams of coal from four to six feet thick occur in rocks of Karoo age, which formation includes the coal-bearing strata of South Africa. The beds vary from horizontal to vertical. The weathered coal is reported to contain 61.9 per cent of carbon and 13.25 per cent of ash, and produces 5,891 B.t.u. Although it clinkers badly, it can doubtless be used locally on the railroads. The coal is known to underlie a considerable area.

The Geomines, Simkat, and the Paris Banks Consortium jointly own the Luena field, also in the Katanga. The coal is about four feet thick and the outcrop has been traced for thirty-two miles. The Luena field is twenty-six miles south of Bukama and a mile from the railroad. The field is to be immediately prospected.

The Union Minière du Haut-Katanga and the Compagnie du Chemin de Fer du Bas Congo au Katanga have taken up several circles for coal near Sankishia (on the Katanga railway), and methodical prospecting was started several months ago. Several drill holes and shafts have already been put down. They have proved the existence of an aggregate of coal beds approximately fifty feet in thickness containing approximately fourteen feet of clean coal in five seams. Two of the seams, as far as known, vary in thickness from three to five feet. One of the bore-holes struck the coal at about 225-ft. depth.

The outcrop of the overlying formation can be traced along a considerable distance, which justifies the conclusion that the coal field is of great extent. The coal is something between a true lignite and bituminous coal, and is non-coking where sampled. The volatile matter varies from 18 to 32 per cent; the ash from 22 to 41 per cent; and the sulphur from 1.4 to 4 per cent. Part of it is probably suitable for use in stationary boilers, locomotives, gas producers and reverberatory furnaces, either as it is or after pulverization.

It is anticipated that the discovery of this coal will facilitate considerably the fuel problem of the Union Minière and the Katanga railroad, which are at present using wood fuel exclusively for their stationary boilers and locomotives. The total monthly consumption of wood for this purpose is estimated for next year at not less than 50,000 tons, which could be replaced by 8,000 to 10,000 tons of coal. This substitution of coal for wood would release a considerable number of whites and native workmen.

Very impure coals have been found at several other places in the Katanga.

The Simkat is preparing to construct a cement plant in the Katanga, and another company (Société des Ciments du Congo) is to burn lime and manufacture cement bricks and other building materials in the Katanga. The Simkat and Geomines, besides their activities mentioned, form part of a syndicate for which the Forminière is prospecting for diamonds in the Kwango and Kasai regions. They are both to continue prospecting their mining blocks in the Katanga.

The above notes cover the Congo mining activities. Among the colony's undeveloped resources may, however, be mentioned considerable bodies of iron bauxite, manganese, tungsten, molybdenum, and lead ores, and uranium and radium minerals are also present. Monazite is a relatively common constituent of certain of the stream gravels, and thorianite is also reported.

In addition to diamonds, a number of other precious stones, including chrysoberyl, rose tourmaline, ruby, sapphire, meerschaum, cyanite, and amethyst, occur, although none so far as known are present in commercial quantities. Oil shales outcrop in the vicinity of Ponthierville. Apatite, fluorspar, barite, asbestos, muscovite, and strontianite, although occurring in fair quantities, are not exploited.

Branch of the Royal Mint Established

The creation of a mint in the Union of South Africa was provided for in legislation passed by the Union Parliament in June, 1919. The mint will be a branch of the Royal Mint so far as gold coinage is concerned, according to *Commerce Reports*. This insures that the output will be legal tender throughout the British Empire.

The gold mines in South Africa exist entirely by selling their gold. They strongly urged the creation of a mint, as it would have, under normal conditions, added to their profits and would have relieved them from the many difficulties which beset the industry during the past few years. Work on the mint is now proceeding, but with the high premium on gold which the mining companies are receiving since the placing of gold on the open market, minting at present would not be profitable. Until the premium disappears no advantage will be gained by minting locally.

Exports of Gold Dust, Graphite and Corundum From Madagascar

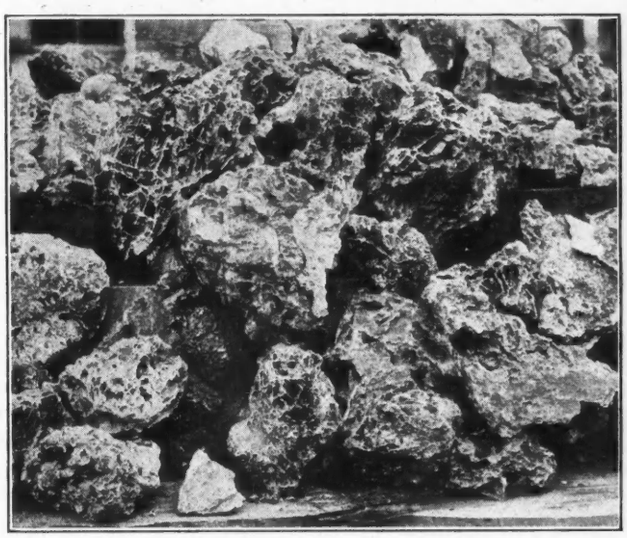
For the nine months ending Sept. 30, 1919, according to Vice Consul Feibelman, 725 metric tons of corundum, 13,278 troy ounces of gold dust and 2,363 metric tons of graphite were exported from Madagascar. During the last quarter of 1919, 99 metric tons of corundum, 4,501 troy ounces of gold dust, and 1,687 metric tons of graphite were exported.

Zinc Ores of the North Arkansas Field

Smithsonite and Calamine Are Easily Mined, and the Milling Methods Used Are Simple —Ores Are Especially Desirable in Chemical Industry for Manufacture Of Zinc Oxide, Lithopone, and Zinc Chloride

BY TOM SHIRAS
Written for *Engineering and Mining Journal*

THE growing scarcity of smithsonite, or carbonate of zinc, and calamine, or silicate of zinc, in the United States, is creating a new interest among big consumers of these ores in the north Arkansas zinc field. The difference between the price of these ores, the selling base of which is 40 per cent metallic zinc, and the price of blende, the selling base of which is 60 per cent metallic zinc, is gradually growing smaller. On a basis of metallic content, the smithsonite and calamine should bring only two-thirds as much as blende, but recent market quotations have shown it to be bringing as high as slightly under seven-eighths as much and in some instances this year choice lots have brought as much as the lower-grade blende at Joplin.



REPRESENTATIVE DISPLAY OF NORTH ARKANSAS SMITHSONITE AND CALAMINE ORES

STARTING A NEW TUNNEL ON A SMITHSONITE OUTCROP ON RUSH CREEK

Nine-tenths or even more of all the developed zinc mines in the north Arkansas field are smithsonite or calamine mines, the bodies of "jack," or blende, being practically unexplored, and this condition will probably exist until the former ores are exhausted.

The development of the smithsonite and calamine instead of the blende was brought about by natural conditions. A miner is no different from the average human being. He follows the lines of the least resistance. Most of the orebodies lie in the upper ore-bearing stratas above water level, and are easily mined in practically dry ground by tunneling and drifting. Although some bodies of blende have been opened up at these higher levels, most of them have been encountered below the water level, and have to be mined by shafts and drifts which require pumping to be kept in a workable condition.

The smithsonite and calamine are distributed over a large area in the northern part of the state. Mining is actively carried on in Marion, Boone, Newton, Searcy, and Baxter counties. There are also commercial deposits of these ores in Sharp and Lawrence counties, which are worked spasmodically. The earliest mining done in the state for the ores mentioned has been in the two latter counties. In 1857 a zinc smelter was operated by the Independence Mining Co. at Calamine, in Sharp County. This company did a general mining and smelting business, but its operations were stopped by the Civil War, its machinery being confiscated or destroyed by the Confederate Army.

Large areas in the North Arkansas field are still unprospected, and places where development has made commercial bodies of ore available constitute but a small area of the field. Smithsonite outcrops are of common occurrence along the exposed ledges bordering the rivers, creeks, and hollows in many sections of the field. Only a few of the known outcrops have been investigated to determine whether commercial bodies of ore exist or not. From the number of commercial mines that have been developed during the last few years, and considering the character and number of the outcrops, it would seem that the field as a whole contains an unlimited quantity of these ores, the production being limited only by economical development and mining. The smithsonite is invariably found in greater or lesser abundance along the outcrops of beds that contain or did contain blende.

Discussing the origin of the smithsonite and calamine ores, John C. Branner, former State Geologist, says:

It is evident in all cases that the smithsonite is formed by the alteration of zinc blende and its recrystallization in the form of smithsonite. Calamine, like smithsonite, is formed from blende, but is not of such common occurrence. It is especially abundant in the Zinc Camp, which lies around

the town of Zinc, in Boone County. The siliceous rocks there are much broken. At several places where the calamine is found the blande has been removed in solution from the compact chert gangue, and cavities thus left have been filled with calamine crystals. Like smithsonite, calamine is found in many instances in loose lumps in the surface clays, and wherever it has been found in hard rocks, the rocks bear unmistakable evidence of having been altered by the action of the surface waters.

The carbonate and calamine deposits are invariably found along faults, fractures and synclines. These afford convenient paths for underground waters, and waters percolating through them coming from bedded deposits of blende carrying zinc solution naturally deposit these values there.

An interesting feature in connection with the faults is that it sometimes happens that the ores have accumulated not in the faults themselves but close to them on one side or the other.

When the ores occur along the ancient underground watercourses guided by the folds, faults, or fractures, they can be located approximately, at least, by a study of the surface of the geological structure.

In drawing general conclusions regarding these ores, Mr. Branner states:

The position of the ores in the secondary deposits has been determined largely by those structural features that have guided the underground waters in their passage through the rocks.

In some cases the accumulations have taken place along synclinal troughs; in other cases, in fissures along fault lines, and in still others, in the breccias formed along ancient underground watercourses. The subterranean waterways have in many instances been closed by the deposition of these ores and the water forced into other channels. The smithsonite and calamine ores are produced by the alteration of blende mostly in place.

The rocks throughout the north Arkansas field are for the most part horizontal. To this rule there are a few important exceptions, and in these exceptions the bending or tilting of the beds is for the most part comparatively gentle. Faults, however, have performed a prominent part in the disturbance of the horizontal bedding and the continuity of the strata of the region. In some places these faults are of but local importance, though in other instances a single break may be traced almost continuously for thirty miles or more.

By far the greater part of smithsonite and calamine is found associated with gangue and must be milled to prepare it for the market. A small portion of the production comes from the ground in chunks, and with a little hand cleaning is ready for shipment.

Milling Practice Improved by Use of Tables

The milling plants used in the field are the regular Joplin type mills equipped with sludge tanks, or Dorr thickeners and tables. A few plants have been erected in which the jigs have been entirely eliminated, the concentrating being done entirely with tables. This type of plant has been found to be very successful. The first mills, erected in the field over twenty years ago, were not equipped with tables, the entire concentration process being done with jigs. Assays of the old tailings at these plants have run as high as 8 per cent metallic zinc and few have run under 5 per cent. With table equipment this loss has been reduced to a fraction.

Ores Desirable in Chemical Industry

The purity of the smithsonite and calamine produced in the north Arkansas field makes them especially desirable for many purposes. They contain no iron, lead, or other foreign matter detrimental to either their manufacture into chemicals or spelter. They produce the best spelter that can be made from virgin ores, for which they were used almost entirely until two years ago, when the chemical companies were attracted to them. In the chemical industry they are principally used in the manufacture of zinc oxide, lithophone, and zinc chloride.

In many of the mines, especially in those where the orebodies have been built up in ancient underground watercourses, rare specimens in the shape of stalactites have been found. Some specimens resemble old castles and spires with a shelly interior, and others show grille work in delicate patterns. In one mine fifty-one specimens were saved, each of a different texture or color. Owing to their range in color and texture, the new prospector in the field many times confuses some specimens with lime carbonate or crystalized silica. Native prospectors determine their value largely by their weight, the ore being much heavier than any other formation resembling it.

Select specimens of smithsonite run as high as 52 per cent. metallic zinc, and calamine 54 per cent. The average car of concentrates or hand-cobbed ore ready for the market runs from 40 to 44 per cent. Few run as high as 47 per cent, or as low as 36.

In the early history of the field these ores were not much sought, blende being the lure for the prospector. John C. Branner made the following statement at that time: "It should not be forgotten that some of the most important and best-paying zinc mines in the world have been mines of smithsonite." And in connection with the north Arkansas field, and its subsequent development, his statement has been well substantiated.

Japanese Aluminum Industry Dependent Upon Foreign Raw Materials

Although the aluminum industry is now well established in Japan, most of the forty-four manufacturers conduct business on only a small scale, chiefly for home consumption, says a recent article in the *World Salesman*. The variety of articles manufactured is comprehensive, including all kinds of cooking utensils, candlesticks, pipes, cigarette cases, alcohol lamps, army canteens, bottles, and various kinds of castings. Japan is entirely dependent upon the United States and England for raw material in connection with this industry, though at present, in co-operation with an American aluminum company, plans are under way for the erection of a plant in Fukui Prefecture, which, with the help of experienced American workmen, will later be able to supply the raw aluminum material needed. In 1918 imports of ingots from the United States amounted to 1,466,967 kin (kin = 1⅓ lb.), valued at 1,662,471 yen, and from England they reached 12,346 kin, valued at 13,652 yen.

Federated Malay States Gold Production

The quantity of gold placed upon the market by Federated Malay States producers was 18,309 oz. in 1918, an increase of 155 oz. over that of the previous year, according to *Commerce Reports*. The approximate value of the 1918 production was $345,157. The production of gold from the Raub mines, in Pahang, totaled 16,990 oz.

Mining Enterprise in 2020

A Concise Account of the Discovery, Examination, and Exploitation of a New Element Occurring In a Hitherto Unexplored Part of the Extreme Southern Tip of South America—Prospecting, Mining, and Reduction by Wireless Devices

BY JULES VERNE IV, JR.*
Written for *Engineering and Mining Journal*

F. WALLINGCRUDE BLACKSTONE sat at his desk dribbling a small stone back and forth from hand to hand. He was evidently trying to make up his mind. If we could have looked more closely at the stone we would have noted that its black mass contained small cubes of a metallic-like mineral which glowed with a smouldering fluorescence. He had been turning over a series of reports from many professional mineralogists and chemists, the burden of which was to the effect that the metallic mineral was unlike anything that had ever been discovered. Its specific gravity was 5; it was distinctly brittle; it left a bright fluorescent streak, but it apparently had neither name nor place among the discovered minerals. One chemist who had made a more thorough investigation than others stated that the mineral was a new element and fell into Group IV, Period VII, of the Periodic Table of Elements.

The stone had been forwarded to F. Wallingcrude Blackstone by an aviator friend who, when investigating high-altitude conditions in the vicinity of the South Pole, had been compelled to land on a high plateau in almost the center of Terra del Fuego to make adjustments on his turbo-supercharger. As he was about to touch the ground he had noticed a large prominent mass of black rock, which glinted strangely in the soft rays of the setting sun. After making necessary repairs, he investigated the mass and found it to be of considerable extent. Scattered almost uniformly through every piece which he broke off were the strange crystals we have described. Knowing of the keen interest taken by F. Wallingcrude Blackstone in minerals and mines, he had sent a specimen, together with the latitude and longitude of the place, to him on returning to New York. An immediate investigation of the strange mineral had been made, with the results as already given.

F. Wallingcrude Blackstone placed the stone on his desk, moved a jeweled indicator to a number, and said: "J. Montmorency Findit?" Apparently from the air at his left a voice said: "Here, sir!" "Note these instructions and act on them immediately," said F. Wallingcrude. "Arrange with the International Electro Prospecting Company of Newark to have one of their latest Model D24, single-stage prospecting machines sent to your office at once. Leave tomorrow for latitude ——, longitude ——. There you will find a conspicuous mass of black rock showing a peculiar mineral. Ascertain the size of this deposit, the proportion of contained mineral, and such general conditions necessary for its exploitation as your judgment indicates. Have your report on my desk at 10 a. m. day after tomorrow. Good luck!"

J. Montmorency Findit leaned back in his chair, laid his pencil down, and picked up his half-consumed cigarette. Puffing away, he touched a dial indicator in his desk and said: "Is this the airage?" A voice answered at his elbow: "Right here, sir." "Observe these instructions," said J. Montmorency Findit. "Prepare two high altitude planes for immediate service. Expect party of four to leave at 8 a. m. tomorrow. Adjust latitude and longitude controls for latitude ——, longitude ——, South Hemisphere." J. Montmorency Findit then called up in turn the members of his party who were to accompany him and notified the Electro Prospecting Company of Newark. He then wandered over to his club and spent the rest of the day at a game of billiards, which, however, was not played in the ancient way by wooden cues but by an electric impulse and direction machine, which enabled a player to smoke comfortably while playing an exciting game with several opponents.

The next morning the party, consisting of J. Montmorency Findit, his assayer, K. Dore, and two assistants, climbed into the seats back of the respective pilots in the two machines, and the word was given to start. Without a sound the machines rose rapidly to an altitude of 40,000 ft., the passengers quickly adjusting the atmosphere within the closed fusilage. The assistants settled down to a two-handed game of cards, J. Montmorency Findit being busy with the final adjustments upon the prospecting machine. The pilots had little to do, for by means of the latitude and longitude control the two planes, at a fixed distance apart, went unerringly to the point selected. When they reached the locality they automatically spiraled down at 10 a. m. to the minute, within hands' reach of the black rock mass.

THE FUTURE MODE

J. Montmorency descended from his plane and lifted the prospecting machine down. He then lighted a cigarette, for in spite of the fact that he was one of the famous mining engineers of the time, he still adhered to the ancient habit of thinking through a haze of cigarette smoke. He handed two small metallic cylinders to the assistants and directed them to walk in a north-south direction at a distance 500 ft. apart, placing the little cylinders upon the ground at intervals of 200 ft. He then set up the prospecting machine, upon which were two dials, respectively marked "Quantity" and "Proportion." K. Dore took his position in front of the last named dial, J. Montmorency standing in front of the first. The machine was an automatic integrating device, which determined quantity and proportion with a single setting. After tuning the machine J. Montmorency gave the assistants the signal to start. At the end of an hour the index fingers upon the dials stopped. J. Montmorency touched a button to recall his assistants and took down the readings, which were 7,000,000,031 metric tons on the one and 5.378 per cent on the other. As soon as the assistants returned they all entered the machines and at 4 in the afternoon were at the airage in New York. J. Montmorency dismissed his assistants and hastened to his club.

The report which he submitted the next morning was on a slip of paper and simply reiterated the figures we

*The inspiration for this article is due to Mr. J. F. Kellock Brown, but he is not responsible for the vagaries of the execution, for the article has a composite authorship.

have already given. F. Wallingcrude Blackstone looked at the slip and said aloud: "An enormous quantity like that must have some use. I am going to put it up to Professor Relativity, and in the meantime I will proceed with the organization of the company." He sprang to the jeweled indicator, gave it a whirl and said: "Oh, Professor! Tune up with this office and J. Montmorency Findit. I want a conference." Thus with F. Wallingcrude Blackstone in New York on Broad Street and Professor Relativity at Bear Mountain, on the Hudson, and J. Montmorency Findit in Brooklyn, the three entered into an animated discussion, the outcome of which was that Professor Relativity was to enter into immediate research for a possible utilization of the new element and report the next morning.

Organization Preliminaries

J. Montmorency was to arrange a modern mining and reduction plant, which was to be shipped by high altitude aeroplanes within the week, and during the rest of the day he was to organize and finance a $100,000,000 company. J. Montmorency turned the company affair over to the Finance Foundation of America, and then got into wireless with the Emerald Ray Mining Machinery Company and the Airero Induction Reduction Company, and placed orders for a unit of 25,000 metric tons' capacity daily. He then arranged with the Wireless Power of America to set an extra switchboard panel in their power house to transmit 50,000 kw. daily to latitude ——, longitude ——, Terre del Fuego. With these essential details off his mind he departed for another game of cueless billiards at his club.

Professor Relativity got into communication with F. Wallingcrude Blackstone the next morning, and reported that the element had unique possibilities in that it appeared to be the unknown base out of which the individual elements were constructed. By a simple transmutation it could be converted into any metal. At the limitless possibilities, F. Wallingcrude gave a long low whistle which degenerated into a chuckle. "At last I have it," he muttered to himself. Professor Relativity continued with his report by saying: "Unfortunately I have to report that the transmutation will be very costly, prohibitive, in fact, for all metals with an atomic number between 30 and 80. I have made cost sheets for all the metals, and, comparing these with the quotations in the *Engineering and Mining Journal*, have arrived at the limits I mention. While this is disappointing, the range is such as to cover copper, lead, and zinc and a few other metals."

F. Wallingcrude slid a peculiar board from one side of his desk and touched a point on a intricate diagram thereon. Almost at once a voice was heard to say: "The latest statistical information as compiled by the *Engineering and Mining Journal* is to the effect that there is a considerable shortage in many of the base metals and that prices have been steadily advancing during the past seven decades. In fact, there is an impending shortage and little potential supply." With a satisfied smile the board was slid back to place and F. Wallingcrude turned to another set of reports.

Two weeks later F. Wallingcrude was dreaming away on other mighty projects when a voice out of the air said: "This is J. Montmorency Findit. I have to report that the plant has been installed and the first shipment will be made today. The Emerald Ray mining machine is eating into the deposit, disintegrating it into a fine powder of 60 mesh. The reduction plant receives this in a blast of air and makes a 99.8 per cent recovery. The whole plant is working sweetly and is automatic with the exception of five men, who are required to load concentrates into high altitude planes, of which a fleet has been organized. Professor Relativity has constructed an entirely automatic refining plant and is ready to receive the first shipment. Marketing of our product has already been arranged for by the Base Metal Exchange."

F. Wallingcrude Blackstone sat in deep thought for awhile, and then he made a memorandum to the effect that on the next day the directors of the new company and himself were to meet for the first time and that he would personally report the progress that had been made and which promised a huge success both financially and technically.

It was a happy group that gathered at a well-served table in the aërial gardens of a well-known New York hotel of the period. J. Wallingcrude Blackstone was at one end of the table, Professor Relativity at the other, and between were the directors and J. Montmorency Findit. At the last minute a cautious stockholder, who had dropped into J. Wallingcrude's office while he was in the midst of inviting the directors to the dinner and had been included in the invitations, dropped in and took his place. He was a meek-appearing person and scarcely filled his chair. In fact, his smooth-shaved chin just cleared the snowy white cloth.

We will not weary you with an account of the animated discussion that ensued at the completion of the meal, nor with the intricate explanations of the action of the new element by Professor Relativity, nor of the technical descriptions of the Emerald Ray mining machine, enthusiastically pictured by Findit, but it is worth recording that at the very end our meek little stockholder who had not uttered a word throughout the meeting, said:

"Professor Relativity, I would like to ask you a question. Could you have produced these base metals by the transmutations you have just described without the use of the new element?" "Oh, yes," said the professor. "We have long been in possession of the methods by which this can be done." "Well, why did the company go down and open up that mine then," said the inquisitive stockholder.

Impending Promotion Methods

The professor waved his hand as he turned to F. Wallingcrude nonchalantly, saying: "There are lots of things we can do, but we always rely upon men like F. Wallingcrude Blackstone to start them. The mine was only an accident. It served, however, a useful purpose in making possible the capitalization of the enterprise. If you will take the trouble to consult the Register of Mining History in the Bureau of Industry you will find that shortly after the Minerals Separation period, about a hundred years ago, there was established, as a principle of mining-company flotation, the rule that a mineral deposit must be developed and the quantity and grade of the orebody pretty conclusively determined before a company could be formed. Even our friend Wallingcrude, skilled though he is in financing large projects, could not have formed a company, in this instance, without filing an affidavit giving the critical facts of the case. Fortunately for us, the development of scientific prospecting apparatus enabled us to get these important data in an acceptable way. We can now shut down our mine but continue our oprations and maintain our enviable position in the metal markets."

Western Hearings of Minerals Separation Case by Federal Trade Commission

BY GILBERT H. MONTAGUE*
Written for *Engineering and Mining Journal*

THE vigorous prosecution of Minerals Separation, Ltd., for violation of the Clayton Act and the Federal Trade Commission Act, by the Federal Trade Commission, was resumed early in the summer and was continued with hearings in San Francisco, Salt Lake City, and Denver until the commission and counsel adjourned for the vacation season. Thirty-one witnesses were called by the commission's counsel, Hon. Claude R. Porter and Hon. Gaylord R. Hawkins. Among the witnesses were: Edward H. Nutter, chief engineer of Minerals Separation North American Corporation; Theodore J. Hoover, who was formerly with Minerals Separation, Ltd., and T. A. Rickard, editor of *Mining and Scientific Press*.

The Government's case was recorded with many interruptions, objections, exceptions, and arguments on the part of the Minerals Separation counsel, Alfred A. Cook, of New York. One such protest covered nine pages of the record, and was tersely characterized by the chief counsel of the commission as "camouflage." The strength of the Government's case is indicated by Mr. Cook's admission when he said, "This matter seems to be developing into a matter of considerable importance."

The royalty rates of Minerals Separation were under fire by the Government throughout the testimony of over a dozen witnesses. Counsel for Minerals Separation stated: "We have a right to deal with whomsoever we please, on such terms and conditions as we please, irrespective of the Clayton Act." One licensee, who testified that his relations with Minerals Separation had been pleasant, said, "The royalty is too high. . . . We regard it as entirely too high. . . It becomes a very burdensome charge."

Mr. Hoover, in giving his judgment on the subject, based on his extensive experience and knowledge, said, "A careful inspection of royalties charged by the flotation process, compared with the royalties charged elsewhere in metallurgical industry, convinces me they are excessive."

John V. Quigley, a Minerals Separation field man, testified, "I tried to get them to take up the proposition of securing a license with Minerals Separation company, and they told me that it would be practically impossible to pay royalty of two-fifths of a cent a pound at the present price."

A mine operator, who negotiated with Minerals Separation regarding a license, but refused when the terms were disclosed, said that "under the schedule of royalties which had theretofore been sent to him by Minerals Separation it would work out as a very great injustice to his company's particular conditions, inasmuch as it indicated a royalty of between four and five dollars per ton of ore. Such a royalty he said, was exorbitant beyond all question.

An official of a Minerals Separation licensee narrated in detail the story of "a highly dishonorable" attempt by Minerals Separation to increase the royalty rate from the agreed figure of 3½ or 4c. a ton to 6c. and later to 12c. To make its demand for a 25c. royalty effective, Minerals Separation stopped in transit necessary machinery which had been partially paid for by its client. "Mr. Nutter said that he regretted the situation had arisen, but that the London officials had refused to permit the 6c. agreement to be gone through with," said the witness. "We had already stood for an advance of 50 per cent approximately, in the royalty charge, and it was altogether unfair and improper to try and increase it 200 per cent, or up to 12c. . . . We considered it a gouge, a hold-up on the part of his company. . . . We replevined the machinery . . . refused to sign the agreement and finally they agreed to the 6c. license." Correspondence which fully substantiated the oral narrative of this attempted "hold-up" was offered in evidence.

The facts on which Minerals Separation based its charges of infringement against scores of mining companies were shown by the testimony to have been vague and indefinite. E. H. Nutter, chief engineer of Minerals Separation North American Corporation, testified: "I am not familiar with the interlocking of these different patents. . . . To tell the truth, I am not very familiar with them. . . I believe that our process patents cover, broadly, the commercial application of flotation, and where a commercial operation is going on, using flotation, that is presumptive evidence to my mind that they are infringing some one of our patents . . . the general theory being that they could not be using flotation in a commercial way without coming under some one of our patents."

Mr. Nutter told of visits to mills by his field men, and voiced the opinion that only infringers would refuse to permit the Minerals Separation representative's inspection of their plants. "They will say," said Mr. Nutter, "We are using flotation, perhaps, but we don't want you to go through! Well, that is a confession to our mind that they are infringing us there, if they don't want us to go through to see what they are doing."

"Every user of flotation not a Minerals Separation licensee is on our infringement list," said Mr. Nutter. Companies on this list were notified of their "infringement" by the Minerals Separation patent attorney, no mention being made by him as to how they were infringing or as to what specific patent was involved. Mr. Nutter first said, with regard to this infringement list of 250 or 300 names, "My opinion is that they are all infringers." Later he said: "I don't think there are that many actually operating the infringements of our patents. . . . I should think something less than on hundred, perhaps—perhaps more than that, but not nearly so many as we have on our preliminary list." From these admissions of the chief engineer of Minerals Separation it would appear that two-thirds of the notices of infringement sent out by their patent attorney were addressed to those who even Minerals Separation admits were not infringing.

In the light of this admission, Mr. Nutter's further testimony is of considerable interest. "In making the settlements," inquired the commission's counsel, "haven't you taken up with these infringers the ques-

*This summary gives the case from the point of view of the American Mining Congress, for which Mr. Montague is counsel.—EDITOR.

tion as to what constitutes infringement, and how they were infringing?"

"I don't recollect" replied Mr. Nutter, "that that has ever come up. I think it has always been taken for granted by both sides that they were infringers."

The commission's counsel brought out numerous instances in which alleged infringers, as a result of notice mailed by Minerals Separation patent attorney threatening a lawsuit, settled with Minerals Separation, although Mr. Nutter, the chief engineer of Minerals Separation, was not able to point out their infringement.

Of one operator Mr. Nutter said, "He was sinning against the law of using flotation illegally."

"How was he using flotation illegally?" asked the commission's counsel.

"I don't know," replied Mr. Nutter; "I don't recall making any investigation at all. I think his statement was the result of the letter which Mr. Henry D. Williams (Minerals Separation patent attorney) sent around generally to those on our list of infringers."

One mine operator, who testified that he had experimented with oil flotation, but had never treated any tonnage or used it on a commercial basis, produced a letter from Minerals Separation's patent attorney, in which the latter stated: "You are hereby notified of infringement of my clients' patents . . . you are thereby directed to send me a full statement of your infringing operations in accordance with the interrogatories inclosed herewith, in default whereof I am directed to commence suit against you for an injunction, profits, and damages, including a preliminary injunction at the commencement of the suit to immediately stop your infringing operations." Referring to this letter, Minerals Separation counsel said, "I think there are a great many similar to it."

Another operator told of a visit by a Minerals Separation field man, who, he said, "got into the subject of our infringing immediately." "Did he say you were infringing?" asked the commission's counsel. "Yes," was the reply. "Now, in what particular did he say you were infringing their patents?" asked the counsel. "Didn't go into particulars," said the operator. "Did he point out in any way whatever the manner in which you were infringing Minerals Separation patents?" continued the counsel. "No, merely by using flotation," replied the operator. Similar experiences were recounted by other operators.

"There are a number of the staff men," said Mr. Nutter, "who are sometimes, or have been in the past, field men, who are now chiefly engaged in litigation work in New York." This statement was confirmed by Chester B. Allen, secretary of North American Corporation, who added, "In the intervals when litigation is slack—a time that occurs very rarely—we send them out into the field."

A number of companies were segregated by Mr. Allen into the "litigation group." A letter from John Ballot, president of Minerals Separation North American Corporation, referred to "visits to important infringers, outside of the litigation group or combine."

In addition to the threats of lawsuits sent broadcast by its patent counsel, Minerals Separation suggested unpleasant eventualities through its field men. "I endeavored," testified one of the field men "to get them to come into the fold and take out a license with the Minerals Separation company, to avoid any disagreeable business that might follow up."

"What has deterred you from reopening your mill?" asked the commission's counsel of a mine operator on the stand. "Well, the price of copper, for one thing," was the answer, "and the fear of litigation." "Litigation by whom?" "By the Minerals Separation." To ascertain which of the two reasons given—the price of copper or the fear of Minerals Separation litigation—was the more cogent to the operator, the commission's counsel asked: "If you had not fear of litigation by the Minerals Separation company, and with the price of copper as it is now, would you reopen your mill or not?" "Very probably we would," he stated.

Another operator, who had paid Minerals Separation $35,000 in settlement of alleged infringement, was frank in giving his reason for so doing. "The fear of getting into a row with Minerals Separation was the only consideration in mind. . . . After talking the matter over with my counsel we both agreed that we could not get into a fight with Minerals Separation. It was not because we felt Minerals Separation was in the right—purely and simply because the cost of getting into a fight was wholly beyond what we could consider. It was purely a matter of expediency. . . . It seemed as though Minerals Separation were getting the best of it, but we felt perfectly sure they were not entitled to it."

Important and authoritative testimony was given by Theodore J. Hoover, now head of the School of Mines at Stanford University, but from 1906 to 1910 connected with Minerals Separation, and well known as the author of the first book published on flotation. Mr. Hoover visited Australia in 1907. "I found on my arrival," said Mr. Hoover, "four distinct flotation processes in operation. One known at that time as the Potter-Delprat; one known as the De Bavay process, Minerals Separation process is the third, and the Elmore vacuum process is the fourth." All these processes, stated Mr. Hoover, were being used on a large commercial and profitable scale. "During the year 1908 the Potter-Delprat process produced 65,000 tons of zinc concentrates," he said. "The De Bavay process produced 23,000 tons of zinc concentrates, and the Elmore process produced 50,000 tons." The total production of these processes was 138,000 tons, which was 11,000 tons more than the two Minerals Separation plants produced.

Regarding the present status of these operations, Mr. Hoover said, "the Potter-Delprat plant, at the time of the closing down by the recent strike of Broken Hill, was in good working order, working on as large a scale as it ever had in any of its period. The De Bavay plant had grown to be the largest plant in Australia. . . . I cannot say definitely with regard to the Elmore process."

The commission's counsel asked "whether or not each of these processes is capable of use in the competitive field generally?" "Certainly," responded Mr. Hoover, "It is not likely that any one or two or three or four of these processes would be equally adapted to the same ore."

"Do you know whether or not any of these processes that you have described have been acquired by Minerals Separation?" "Yes," Mr. Hoover replied, "I cannot fix the time, but some time, I should say, between 1911 and 1914, we were quite cognizant of a combination of the patents involved under the names of Potter-Delprat, De Bavay, and the long list of so-called Minerals Separation patents."

Mr. Hoover produced, and the commission's counsel

put in evidence, a treatise by H. L. Sulman and H. P. Picard, entitled "The Theory of Concentration Processes Involving Surface Tension," which was given to Mr. Hoover by Mr. Sulman in 1906 or 1907. The authors were at that time, and are still, consulting engineers of Minerals Separation, Ltd., and patentees of several patents now owned by Minerals Separation.

According to the chief engineer of Minerals Separation, the process of concentrating ores by means of flotation, wherein the elements are agitation, aëration, and froth formation by the use of soluble and certain other reagents, is what Minerals Separation consider their process. The statements of Mr. Sulman and Mr. Picard, two Minerals Separation engineers, whose connection with the company and with flotation matters antedates that of Mr. Nutter, form an interesting comparison, as they were not intended for publication.

Mr. Hoover pointed out statements in the treatise regarding the use of a thick coherent froth in the Potter-Delprat, the Froment process, the Cattermole-Sulman-Picard process and the Elmore vacuum process. He called attention to statements concerning the use of air or gas as the exclusive lifting force in all these processes. He referred to statements regarding the use of "a small quantity of oil, so minute as to form an infinitesimal film coating, which, to all intents and purposes, became a part and parcel of the particle in the mineral," in all of these different processes. These statements Mr. Hoover characterized as being different from the present statements of the inventors.

Mr. Hoover was asked whether his attention had been called at any time to any statements of the respondents in this case different than the statements that he pointed out to the commissioner as appearing in the treatise by Sulman and Picard? "Yes," he replied, "the first one that occurs to my mind was the statement made in this court two days ago, I think, by Mr. Nutter. . . . the general statement that anyone using the flotation process (without a license) was an infringer. . . . I think all the statements of counsel and witnesses for the Minerals Separation in the various lawsuits would be classified under that same heading, as being inconsistent with the statement of fact in the book."

Mr. Hoover told how, as a young engineer, he had agreed that after, as well as during, his connection with the company, he would maintain secrecy with regard to his work with Minerals Separation. "One of the chiefest of my own derelictions," said Mr. Hoover, "was the signing of this iniquitous contract. . . . The carrying out of that contract has been a constant burden, has been a handicap in my professional career of the most pronounced nature. It has, on occasions, caused me great mental distress, and great financial loss."

Mr. Hoover said this imposition of secrecy was carried out to the limit of human endurance and was only disregarded by him when he concluded that otherwise he became an accessory to whatever misconduct he conceived the Minerals Separation were engaged in. It was as a result of this decision that Mr. Hoover made public the treatise of Sulman & Picard, which had been withheld from the public by Minerals Separation.

Minerals Separation, according to Mr. Hoover, objected strongly to the publication of his book (on flotation), and submitted "rather ample suggestions." They also objected to the publication of articles prepared by him, both before and after his connection with the company.

"The progress of the art in this country," said Mr. Rickard, "has been retarded by the attempt to impose secrecy upon the experiments and the operations of those using the process by means, of course, of those license agreements and other methods, but more particularly by the effort to tie individual metallurgists to the chariot wheels of this patent-exploiting agency."

Thomas Varley, superintendent of the Salt Lake City experiment station of the U. S. Bureau of Mines, was asked: "From all your investigations, as an official of the U. S. Bureau of Mines, can you tell whether the effect of the attitude of Minerals Separation company and its license agreement has been to increase or retard the saving of mineral waste by the flotation process?" "Their attitude," responded Mr. Varley, "has been to retard the development of the flotation art."

Another metallurgist of the Bureau of Mines, Will H. Coghill, was asked: "Would you say, having in mind the license agreement that you say you have read, the attitude that you have described in the press on the part of Minerals Separation company—would you say as a student, an observer and an expert on flotation, that Minerals Separation company's efforts have been to retard the development of the art of flotation, or have they been to assist in its development?" "Tending more to retard than to accelerate," was the answer.

"I might add that it is our belief," said the chief engineer of North American Corporation, "that our technical knowledge of the use of flotation alone, if there were not any patent at all, is worth more than the royalty to our licensees—just our knowledge of the technique."

Testimony of licensees and others has already been quoted with regard to the royalty rates charged. It remains to report what was said by some licensees concerning the value of the respondents' technical knowledge of the flotation process.

"Were you satisfied," asked the prosecutor of one Minerals Separation licensee, "with the results that you were obtaining under their process?" "Oh, no," was the answer. "Mr. Nutter sent a representative at the time the plant was installed, and the results hardly came up to expectations, and since then we would send down ore to Mr. Nutter, and they would make experiments. . . . One of their suggestions, I think, was beneficial; but aside from that I don't think there was much that helped." After stating that a point was reached where Minerals Separation apparently could be of no further help to them, the witness told of consulting an outside metallurgist, acting on his suggestions, and raising their recovery 16 per cent above that attained with the assistance of Minerals Separation's technical knowledge.

A letter from Mr. Nutter to another licensee was quoted, in which Mr. Nutter said: "I think I should say from the tests we have so far made it can be assumed that from the ores amenable to flotation a little bit better than 90 per cent can be expected in a concentrate."

"After you started the mill," the commission's counsel asked an operator, "what recoveries did you make?" "We made very poor recoveries," was the reply. "In July, we made 54 per cent recovery; in August, 62 per cent; in September, 60 per cent." Minerals Separation was then asked for assistance, the operator stated. "We made some changes at his suggestion," he continued, "and it looked promising for a few days, but it did not last. . . . I wrote Mr.

Nutter very earnestly that we were in a very bad way, and I felt that they were largely responsible, and that they should accept the responsibility of getting us on our feet. . . . I was discouraged over their failure to help us, and in casting about for chances for relief I wrote to Mr. Will H. Coghill, of the Bureau of Mines. . . . The chief objection of Minerals Separation company was that we were not grinding our ore fine enough. . . . Mr. Coghill told us we were using improper oils and we were grinding our ore too fine." Following Mr. Coghill's instructions, the ore was ground coarse, and the oils were changed, stated the witness. "In October," he continued, "the per cent of recovery was 67; in November 80; in December 82.7; in January 78; in February 73.6; in March 74.1. I might say in regard to the decreasing recovery in the last two or three months that we were approaching the surface with a large stope, and found a great deal of oxidized material."

After this testimony, counsel for Minerals Separation stated, "I would just as leave concede that Mr. Coghill went there and that his operations were better than ours."

The Minerals Separation license agreement was again under fire by the Government. An operator who negotiated with Minerals Separation for a license, balked at the royalty and the license agreement. "The royalty," he said, "seemed prohibitive, and to give a warranty deed on the brains of our organization for any improvement we might discover seemed ridiculous."

Another operator refused to disclose his secret processes to Minerals Separation. "There were certain processes or steps in our work that I am not willing to advise anyone regarding; there were certain fixtures and various chemical treatments that we had discovered ourselves; I said, 'As to the various constituents we are using in addition to oil, that is where I draw the line,' because I thought that was our own private property that cost us a lot of money to find out."

Mr. Varley, of the Bureau of Mines, testified that one company had not installed the flotation process, due to rather complicated conditions in the metallurgical practice, that is in the art of flotation, and due to the fact that the contracts which were presented by Minerals Separation company were not attractive. Of another company he said, "My investigation showed that the reason for not installing the system was due to the cost, and the unattractive license presented by the Minerals Separation."

Another witness, who declined a license, said, "I told him (the Minerals Separation representative) I thought the royalties were excessive, and that I also very seriously objected to the clauses which provided that we had to release all inventions or improvements to the Minerals Separation company."

A manufacturer of flotation machinery told of one mine operator who stated that he would not purchase a machine as long as the Minerals Separation company offered such impossible contracts. "He would not put in a flotation machine," said the witness, "until the Minerals Separation company permitted people to operate under their contracts in such a form that they could make money without paying exorbitant rates, and without the all-around disagreeable methods of doing business with them."

"I have always objected," said another witness, "to some of the clauses of their contract—the clause requiring employees to sign contracts to report their improvements, etc., to the Minerals Separation."

"In regard to the use of Minerals Separation and Callow machines in conjunction," said Mr. Nutter in a letter to a prospective licensee, "I think it rather likely that Minerals Separation would not look with favor on this, as the Minerals Separation alone can be depended upon to give a maximum result."

"I instilled some doubt in his mind," reported a Minerals Separation field man regarding his interview with a prospective licensee, "that the Hyde machine which he was installing in one of his mills would do satisfactory work." Mr. Nutter supplemented this by saying, "I think possibly they (Minerals Separation field men) had rather a poor opinion of it (the Hyde machine) . . . I have an idea that there are two machines that Mr. Hyde has gotten up. . . . . One was a pretty close imitation of what we call our standard machine, and another was a pretty close imitation of the so-called Callow machine. . . . I think some engineer told me it was not much good."

A Minerals Separation licensee testified that their consulting engineers had recommended the installation of Janney flotation equipment, but, he said, "Mr. Nutter said at that time they were not encouraging the installation of the Janney machines, and it would be quite necessary for me to secure the written consent of the company to make the installation. . . . He doubted whether it would be granted; hardly thought it would. . . . In reply to my question as to what might happen, he thought our license might possibly be revoked if we went ahead and made this installation without the consent of the company." Minerals Separation machines were accordingly installed at the company's plant.

Negotiations were described between the Stimpson Equipment Co., which sells the Janney machine, and Minerals Separation, with a view to effecting an agreement for their sale to Minerals Separation licensees. The terms stipulated by Mr. Nutter were objected to by the Stimpson company. For the privilege of selling their patented machine to Minerals Separation licensees, Minerals Separation asked 25 per cent of the gross profits and the sole license for the machine. "The objections we raised to it," said the witness for the Stimpson company, "were that we thought 25 per cent of the gross profits was too much, that we did not see why we should have to let Minerals Separation become sole licensee of the Janney machines." No contract resulted from these negotiations.

The comparative test of the Janney and the Minerals Separation machines at the Ohio Copper Co.'s plant, results of which were circulated by Minerals Separation as demonstrating the superiority of their machine, was delved into by the prosecutor. The witness, who was general manager of the Ohio Copper Co. at the time of this test, testified that the Janney machine used was a cast-iron affair, bought for experimental purposes, and that at the time of the test with the Minerals Separation machine it was badly eaten out and corroded. The Minerals Separation machine, on the other hand, was new, and of their standard type of construction. "My conclusion," said the witness, "was that the Janney machine did slightly better metallurgical work than the other."

The hearings are to be resumed, it is understood, at the office of the Federal Trade Commission in Washington in the late fall.

Mining Engineers of Note

William Young Westervelt

IN THE ever-changing order of things today, it is refreshing to find consistency—consistency of purpose, of interest and of endeavor. After a quarter of a century the Ducktown Basin of Tennessee remains the dominating interest of William Young Westervelt. Graduating from the Columbia School of Mines in 1894, Mr. Westervelt took his first job, that of chemist and surveyor, with the Ducktown Sulphur, Copper & Iron Co., Ltd. Later he became the company's engineer, then superintendent, and in 1898, when he entered consulting practice in New York City, he was retained as consulting engineer and was responsible for the development of the Ducktown company's mines. The same thoroughness which characterized his success in this enterprise has been evident in other undertakings. In 1905 Mr. Westervelt, as consulting engineer for the Anglo-American Copper Co. of London, directed and developed the Ray property to the point of successful sale to the present owners, the Ray Consolidated Copper Co. It is interesting to note in this connection that it was due to Mr. Westervelt's advice that the system of horizontal drifting in exploratory work was replaced by vertical drilling in that district, where the flat-lying orebodies lend themselves favorably to the latter method. In 1909, as consulting engineer to the Grasselli Chemical Co., Mr. Westervelt developed and organized the New Market zinc property at New Market, Tenn., and also valued for the first bond issue the Butte & Superior property at Butte, Mont. In 1910 he examined the copper mines of the New Lymni, Ltd., on the Island of Cyprus, in the Mediterranean Sea. As consulting engineer for the Wilkes-Barre Dredging Co. he organized the gold properties of that company in Folsum County, Cal., during 1914, and in 1916 he prepared a report on the pyrites resources of the world.

WILLIAM YOUNG WESTERVELT

It was the consideration of these signal accomplishments that decided the American Institute of Mining and Metallurgical Engineers and the Mining and Metallurgical Society of America in their designation of Mr. Westervelt as a member of the War Minerals Committee at Washington in 1917. As chairman of that committee he directed the preparation of the War Minerals Bill, the utility of which is generally known, and although the ending of the war terminated the necessity for passage of the bill and the further need for the committee, there remains no doubt as to the value of the work which was done by Mr. Westervelt and his associates.

Recently Mr. Westervelt organized the Copper Pyrites Corporation, of which he is president, in the Ducktown mining district of Tennessee. He is at present giving most of his attention to the development of the iron and sulphur resources of the Ducktown Basin, and it is safe to predict that the next few years will see great strides made in the treatment processes now being used in that district. In addition to his membership in the American Institute of Mining and Metallurgical Engineers and the Mining and Metallurgical Society of America, of which he is vice-president, Mr. Westervelt also is a member of the American Electrochemical Society and the American Mining Congress. He holds fellowships in the following: American Geographical Society, Royal Society of Arts (London), and the North British Academy of Arts. Although Mr. Westervelt's contributions to technical publications have not been numerous they make up in quality what they lack in quantity. His well-prepared chapter in Robert Peele's "Mining Engineers' Handbook," "Mine Examinations, Valuations and Reports," is exceptional in its clearness, and the examples given to illustrate various points leave no doubt as to the author's meaning and his complete familiarity with the subject. He has also written several valuable papers on shaft sinking and similar subjects.

Mr. Westervelt, during a recent interview, assured a representative of the *Engineering and Mining Journal* that he had met with no exciting adventures during his career, that his life had been devoid of "thrillers," and he had led the existence of an ordinary, typical mining engineer. Some of this may be true, but to the last statement we take exception. No "ordinary" engineer could fill the enviable record Mr. Westervelt has made. His familiarity with organization, thoroughness of execution, urbanity, and a keen interest in the affairs of engineering and engineers make William Young Westervelt an outstanding figure in his profession.

By The Way*

Tipped With Iron

Iron nails are acceptable in Soviet Russia as tips for courtesy or service, according to an Associated Press dispatch from Germany. Members of the German Economic Mission to Russia are said to have advised Herr Crispien to fill his pockets with nails on setting out on a journey through that country. One immediately thinks of all the little tips that could be taken from father Hindenburg's statue if it were still standing. But there is nothing new in the use of iron for currency. The ancient Greeks so used it, and the student doubtless remembers how one of them had to hitch up a yoke of oxen to carry $20 or so with him when he went traveling. If iron is so valuable in Russia, the junk man must be king, or would be, were it not for the Soviets. With equipment rapidly being reduced to junk from breakdowns and lack of spare parts, it seems as if a reel of baling wire would carry a traveler further than a pocketful of nails. Indeed, under the existing conditions it looks as if there might be several good opportunities in various plants in Soviet Russia for master mechanics having experience in making quick repairs solely with baling wire. Joplin papers please copy.

Possibilities of Tin

Henry Ford is said to have a "synthetic metal" that is to replace vanadium in construction of automobile chassis. According to reports, however, Mr. Ford refuses to confirm or deny the story. Is it possible that after all a synthetic process for making tin has been discovered? If it be true that tin can be successfully substituted for vanadium in making automobile parts, then the same metal can also be substituted for vanadium in making the countless other things for which vanadium steel is employed, all of which, if true, may keep vanadium producers awake nights. Mr. Ford has already invested in iron mines in northern Michigan. If our surmise about tin be true, we shall not be surprised at all if, by chance, we hear that Mr. Ford is seeking to acquire tin mines in the Black Hills of South Dakota, a locality that has already produced an infinitesimal part of the world's tin, with the production steadily becoming more and more infinitesimal as the district grows older. We had hopes a while back that South Dakota's tin output in 1920 would show an increase that would augur well for the future, but these hopes were dashed when a notorious non-producer almost produced but didn't. Still we have faith in Mr. Ford's productive genius, especially where tin is concerned. We are certain that if Mr. Ford undertakes to mine tin in the Black Hills or any other hills he will mine it, if he has to put it there first himself. If tin should come to be mined on a large scale in the Black Hills, and if Mr. Ford should invest in tin properties there, Hill City or some other mountain city there might eventually be chosen for the site of a great automobile plant, if there really is anything to this synthetic tin that we started to talk about. But we don't believe it.

A Metropolitan Gold Mine

Why journey from New York to see a gold mine, when all one has to do is step into the office of Glaus Consolidated, Inc., on Broadway, drop into an easy chair and by the aid of the magic carpet of the movies be transported to the Golden Chief mine, which is in "Yavapia" County, in the heart of the richest mining district in Arizona? "Here you can see the land surrounding the Golden Chief (to quote from the company's prospectus), including the ranch, orchards and the mine itself. See the ore dumps, the railroad, and supply depot at Turkey Creek. Then travel along to Humboldt, where the mammoth smelters are located. See how the ore is handled from the time it leaves the mine until it is loaded, in ingot form, into cars ready for shipment. It's an interesting, educational picture, which you will enjoy. It will do more than words can to vividly portray this eldorado to you." The company's property consists of 240 acres. To quote further:

> The ore is very favorable in having a very rich deposit of Silica and also having the formation of a granite schist with a quartz base. Golden Chief is being actively operated right now. In fact a 100-ft. tunnel has been installed and we are about to crosscut on the vein, and by diamond drilling will eventually come to our rich ore deposits.

There is no serpent in this Garden of Eden. The workers are happy and contented. Welfare work is unnecessary. Comfortable homes, a fruit orchard, truck gardens and a ranch, a half-mile away, all will help keep down the labor turnover. For the thirsty there is an abundant supply of good—yes, water, from Dripping Springs, another camp luxury, which the company's men are not denied. The company, indeed, has a gold mine right in its own office.

From Our Own Sermon Barrel

How hard it is for a rich man to enter Heaven! The acquisition of wealth is often but a stepping stone to irreligion. No sooner do some amass a few ducats than they stick up their noses at their household gods and all the other deities, and go straight to the devil. Nothing is sacred to them any longer. We had supposed that there was one law so sacred, so sacrosanct, that none knowingly would dare flout it, namely, the law of supply and demand, the law which economists, editors, and even plutocrats have always spoken of with bated breath, as though it had a name that might not be uttered. This is the law that must be allowed to work without interference, even though it kill in the act of working, just as the car of the Juggernaut crushes the devotees in worship before it as it passes on. What tears have been shed at its violation by the Food Control Act and other nefarious acts during the war! Yet recently one of those in high places, President Breitmeyer, of the Diamond Syndicate of London, has foresaken the faith. He states that diamonds will not decline in price, no matter what happens to other commodities. As far as diamonds are concerned, President Breitmeyer's syndicate has the world by the tail, for it controls 90 per cent of the diamond industry. Let the law of supply and demand act, we beseech you, Mr. Breitmeyer, even though diamonds are one of the necessities of life.

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*Editorial Notes

This page is not to be taken seriously. If our attempts at occasional humor are not detected as such, we at least wish to disclaim all responsibility. Our chronicling in a recent issue of the new German scheme for extracting gold from sea water has brought us in an honest offer to raise money for subscriptions. We have thought of labeling each of our whimsical paragraphs "Joke," but have concluded that perhaps a general notice will serve.

CONSULTATION

Liquid-Oxygen Explosives

"The principle upon which liquid oxygen is employed as an explosive is not quite clear to me—is it the physical property of the material that is relied upon to act? Is the explosive used to any extent commercially in this country? Where can I get further information?"

The use of liquid oxygen as an explosive is not new, as twenty-three years ago experiments showed that this material could be used as a powerful explosive. The principles upon which the explosive nature of liquid oxygen depend are both chemical and physical, but mainly chemical. Liquid oxygen alone is not utilized but is mixed with some carbonaceous material and the powerfully explosive mixture ignited. The rapidity with which oxygen will unite with finely divided carbon or carbonaceous material when intimately mixed with it is sufficient to generate great explosive force. The more condensed the oxygen (a greater amount for the same volume), the more violent is the explosion. Thus liquid oxygen, being very condensed and intensely cold, is employed. Liquid air has also been used, but as its explosive power depends upon the oxygen content, it is not as efficient as liquid oxygen.

The great drawbacks to using liquid oxygen as an explosive are the necessity of having an installation of a plant to liquefy the air, and the fact that ignition of the charge must take place within a very few minutes after setting it. On the other hand, this type of explosive is less dangerous to handle than dynamite or black powder, though care must be taken not to be "burned" by the exceedingly cold liquid. Misfires are not dangerous, as the unexploded oxygen evaporates in a relatively short time. Other advantages are claimed for the use of liquid oxygen, such as lower costs per unit of material blasted and elimination of the storage danger common to other explosives. The advantages claimed for the use of liquid oxygen explosives appear attractive.

Liquid oxygen has not been used commercially in this country so far as we are aware, and any introduction will have to overcome the familiarity of the miner with the present-day practice of using dynamite and black powder. The U. S. Bureau of Mines experimented with the material and reported upon the development of this class of explosives during the stress of the war, and has issued a Technical Paper, 243, upon the subject.

Uses and Production of Selenium

"Will you kindly tell me where and how much selenium is obtained in the United States, and what its chief uses are?"

The production of selenium in the United States is almost entirely confined to the electrolytic copper refineries of the country, which recover the metal from the sludge as a byproduct. In 1919, according to the U. S. Geological Survey, 60,025 lb. of selenium, valued at $125,966, was recovered in this fashion, compared with 103,694 lb., valued at $206,540, in 1918, and 39,630 lb., valued at $70,000, in 1917, indicating a highly variable production for the past three years.

The demand for the metal is slight. It is used chiefly in the glass industry, in photographic chemistry, and for medicinal purposes. The peculiar electrical property which selenium possesses of having a varying conductivity, according to the intensity of light to which it is subjected, has led to its application in electrical work. Under the influence of light its conductivity may be 500 times more than its "dark" conductivity. It has been recently reported that as the result of research work at the University of Wisconsin by Prof. Lenher another property of selenium has been discovered which is likely to increase the demand for the metal. The discovery was made that selenium oxychloride acts as a strong solvent on certain organic substances. The unsaturated hydrocarbons such as acetylene, benzine, and toluene, dissolve readily, whereas the paraffine hydrocarbons are unaffected (vaseline, paraffine wax, gasoline). Pure rubber, asphalt, bitumen, and the casein glue used in aëroplane construction dissolve easily in selenium oxychloride, and it can be used in coal analysis to extract the bituminous material in soft coal.

The present price of selenium is between $2 and $2.25 per lb., practically the same price as in 1918 and 1919.

The Market for Quartz

"I see an advertisement in *Engineering and Mining Journal* for quartz rock at from $5 to $17.50 per ton, according to size. Will you kindly advise me what this quartz is used for, and if there is a ready market for any or all quartz that I may be able to produce. I am working on a copper mine [North Carolina] that has considerable quartz, which I should like to place on the market if the price justifies my doing so."

The quartz quotations as given by *Engineering and Mining Journal* refer to various grades of the material as used for different purposes. The largest size, "fist to head," which designates that the pieces of quartz vary from the size of a fist to that of a head, is used as a filler in the acid towers employed in chemical manufacture; the larger sizes of quartz are also used as fluxes in copper smelting. Crushed and graded to various sizes, quartz is used in making sandpaper and sand belts, in sand-blast apparatus for "frosting" glass, and for numerous other purposes. The finely ground quartz may be used in filters, by dentists in cleansing the teeth, and in tooth powders.

The quartz that is mined in North Carolina is used chiefly in packing acid towers, although part of it finds application in the manufacture of acid-proof cements. It would thus appear that the best market for material mined in that state is its employment in the chemical manufacturing industry.

Method of Marketing South African Gold

In the Oct. 16 issue of *Engineering and Mining Journal* the last sentence of the article "Method of Marketing South African Gold," should have read " . . . about 117s. is now being received for the *fine* ounce"—a *standard* ounce is 11/12 a fine ounce. Of course, as pointed out in the first paragraph, the payment for gold is made in depreciated paper currency, in contrast to pre-war payments with currency on a par with gold.

HANDY KNOWLEDGE

Patching the Roofs of Copper Reverberatory Furnaces

BY GEORGE J. YOUNG
Written for *Engineering and Mining Journal*

Patching reverberatory roofs may involve the replacement of a comparatively short longitudinal length up to as great a length as 35 ft., dependent on local failure or the general weakening of an entire section of the reverberatory. Where a reverberatory is to be shut down, the construction, whether of an entire roof section or a part only, does not involve any features particularly different from those used in its initial construction. If the furnace is in use and the requirement is put up to the mason to construct the patch in the most expeditious manner possible, considerable opportunity is offered for skill in devising methods.

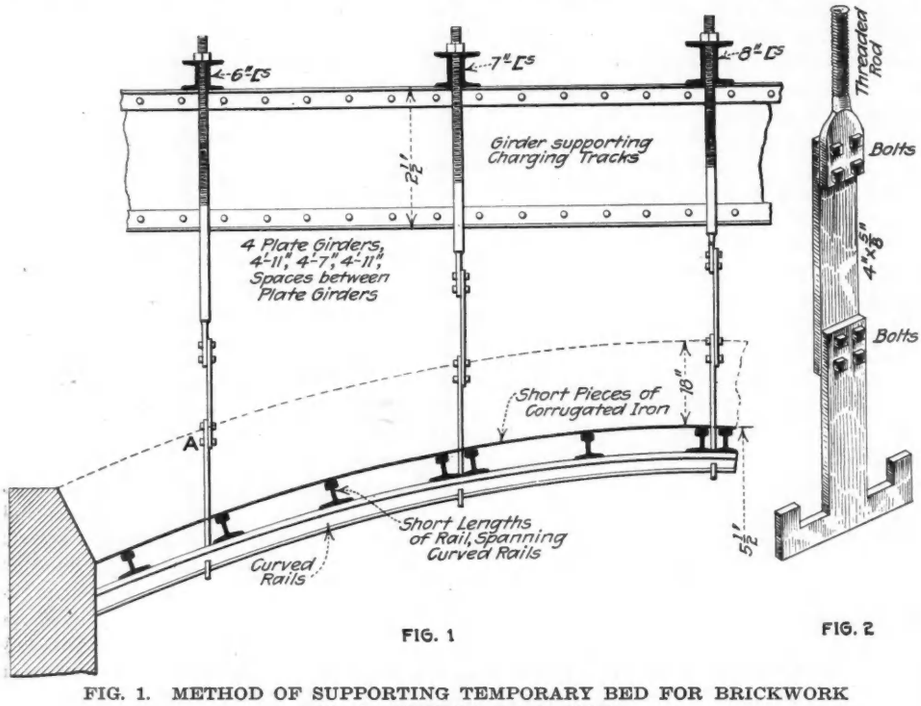


FIG. 1. METHOD OF SUPPORTING TEMPORARY BED FOR BRICKWORK
FIG. 2. SKETCH OF HANGER

One method is to fill the furnace space with calcine, flue dust, or crushed ore, after allowing a cooling interval sufficient to permit the workers to get at the furnace. This material is charged into the furnace through the opening made after breaking down the roof within the limits of the patch. It is rounded off to conform to the radius of the roof, making a center upon which the masons lay the arch. On completion, the filling is dragged out through side doors. It is evident that a considerable amount of labor and time is required. Another method requires a considerable time for cooling before work can begin. When the furnace has cooled sufficiently to permit the workmen to begin, a wooden arch centering is constructed, following the pattern used in the initial construction of the furnace. On this the roof is laid, and when completed the wooden centering is removed from the furnace through the bridge wall or side doors.

A third method in use by the Arizona Copper Co. at its smelter in Clifton, Ariz., has the merit of simplicity, reduces the time for cooling and the labor and time in constructing and removing arch centering, and effects a saving in material. The significant feature is a steel hanger, Fig. 2, which supports a light steel centering constructed of steel rails. The hanger consists of two parts, an upper threaded rod which is bolted to a ⅝ x 4-in. flat plate and a lower part which is bolted to the upper flat plate. On the lower part is a "tee," in which there are two receptacles for steel rails. The threaded rod is supported by a nut, which bears upon a pair of channel irons and enables the rods to be adjusted to the necessary height of the roof, as shown in Fig. 1.

The pairs of channels are supported on the track girders, which extend across the reverberatory roof at the charging end, the part of the reverberatory roof subjected to the greatest heat and most excessive corrosion. Five pairs of channels are used for the full width of the roof, the center pair being 8-in. channels, the two contiguous pairs being 7-in. and the outer pairs 6-in. Curved rails conforming to the radius of the roof are placed in the hangers and short lengths of rail across these. On the top of this centering, second-hand corrugated iron or tin plate is placed. A small amount of fine ore or flue dust is used to level up the inequalities of the surface, after which the centering is ready for the construction of the arch. On its completion the hangers are unbolted at "A," Fig. 1, and the steel centering is dropped. It is dragged out through the side doors, and the furnace is ready to resume operations.

In one case where a 35-ft. patch was necessary the reverberatory was shut down at 2 a.m. At 7:30 a.m. the repair gang went to work, and in 5½ hours the steel centering had been placed. Twenty hours was required for the mason work, using two masons and three helpers, and the steel was pulled by the furnace crew in two hours, making a total of 32½ hours for the completed job.

The method just described is in use at a number of smelters in the Southwest, and the novelty in this instance is its use for making larger patches than at other plants. The details were worked out by J. Owen Ambler, smelter superintendent for the Arizona Copper Co., Ltd., and his staff.

THE PETROLEUM INDUSTRY

Liquid Fuels—Wanted: A National Policy

Consideration Should Be Given to the Need for Securing Maximum Oil Production, Reduction of Consumption, or the Finding of New Sources, to the Obtaining Of Substitutes and to Adequate Distribution of Available Supplies

BY R. S. MCBRIDE
Written for *Engineering and Mining Journal*

ONE day we read of the curtailment of Mexican oil supplies by a new revolution and the domination of the world petroleum markets by Great Britain. The next we are informed that the petroleum interests in Mexico are to be fully protected by the provisional government, and that Great Britain would not think of interfering with United States petroleum development or of attempting any of the unreasonable things which are charged. As a consequence, an uncertain state of mind has been developed with respect to the imminence of the liquid-fuel shortages which we know must ultimately confront this country. It is not worth while to speculate respecting the merit of these claims as to Great Britain, Mexico, Persia or any of the rest, for at best it would be speculation. It is worth while, however, to raise the more important question: What is going to be the United States policy with respect to the future of liquid fuels?

NEED OF A UNITED STATES FUEL POLICY

When the need of a national policy is suggested it is not meant that the Government should enter the petroleum business to direct or interfere. The industry must serve itself; but it must do this along national lines, and intelligently. Paternalism is not a successful stimulent; it is rather a prop for weak industries. Petroleum, or rather our liquid fuels, do not need such a cane or crutch. They need only a tonic for the nerves and then a vigorous prod from the rear to start things into action along the right line.

The needed national policy will consider three things:

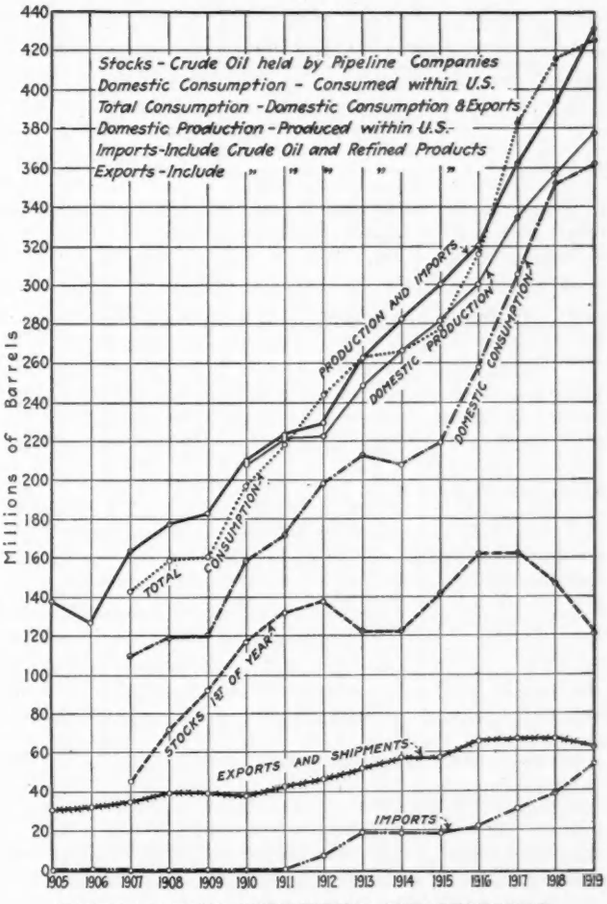
1. How can we secure the maximum petroleum production and delivery to markets, and what will this maximum be?

2. What substitutes or supplements in liquid fuel supply can be produced, and in what quantities?

3. How can the available supplies be best distributed among the various classes of users, when the total demand exceeds the available supply?

These three questions would each justify extended discussion, but for the present article they can be treated only briefly to show the need of further consideration on a broad basis.

One need not worry as to details or exact figures regarding petroleum resources or consumption of the next few years. It makes little difference, indeed, as to whose figures or interpretation of figures is used; there are at least three outstanding facts that are undisputed: (1) The United States still produces more than half of the oil marketed in the world. (2) At the same time, the United States uses about 80 per cent of the world's output. (3) The United States has approximately 10 to 15 per cent of the total known oil reserves of the world. These three facts are generally agreed upon, and almost any interpreter of them will agree that we are prodigal in this line as elsewhere and have rapidly built up so-called "essential" uses beyond our means of supply.

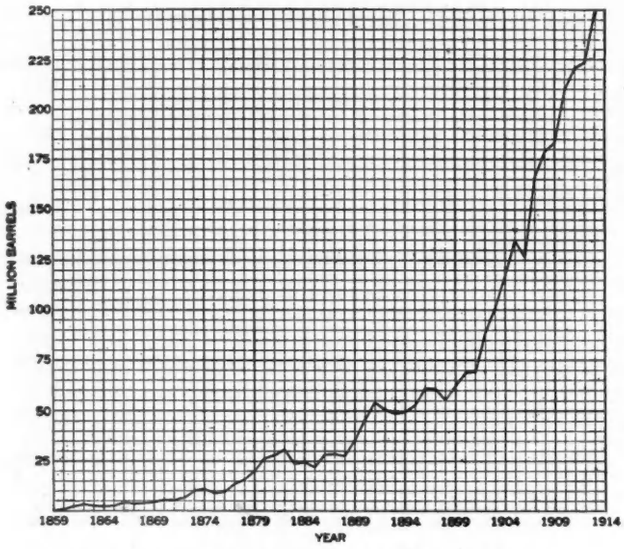


UNITED STATES PETROLEUM AND PRODUCTS
(Courtesy Bureau of Mines)

We can accept any of the several estimates of petroleum reserves, six, or eight, or ten billions of barrels, and then may use any particular system of estimating the rate at which consumption is going to increase, either gradually or by continually progressing steps, as in the past, and we have the same result. The best we can make of the situation when we set production and consumption figures side by side is to admit that with

petroleum alone we cannot maintain the present pace. David White, in a recent statement, summarizes the situation as follows:

The recoverable oil in this country, according to the conservative estimate, would probably be practically exhausted in seventeen years if the 1919 rate (nearly 380,000,000 bbl.)



ANNUAL PRODUCTION OF PETROLEUM IN THE UNITED STATES
(*Courtesy Bureau of Mines*)

of production could be maintained for so long, while a reserve of seven billion barrels, a moderately liberal estimate, would disappear in eighteen and one-half years.

Whether we agree exactly with this part of his statement or not, we cannot deny his later statement as follows:

The production of natural petroleum in the United States must pass its peak at an early date—probably within five years and possibly within three years—though the long sagging production curve may be carried out beyond the century. . . . The output of oil in 1919 could only with great difficulty be made to increase abreast of the increase of consumption in 1919, and possibly within three years and very probably within seven years, the production of this country would pass its climax, notwithstanding the growing deficiency as compared with the needs of the country.

Even the most sanguine, therefore, will have to agree that we are doomed either to reduce our liquid-fuel consumption or new sources must be sought. For the present article we go only this far in the discussion of the first question of national policy above mentioned.

Supplementary Supplies and Substitutes

The second question in national policy demands consideration of the substitutes and supplementary supplies of liquid fuel. Most discussions of this subject have given principal consideration to only one or two of the several possibilities. As a matter of fact, all means for supplementing existing liquid-fuel supplies are needed. Even taken together they are not enough adequately to satisfy the total of the liquid-fuel demands of the country.

The most obvious means of augmenting liquid-fuel supplies is, of course, increasing domestic production. An increasing import of foreign production, or, what is equivalent, a decreasing export, would work to the same end. The less obvious but equally effective method of increasing the efficiency of use, thereby decreasing demand, also requires consideration. These three considerations taken together afford the major means of supplementing the petroleum supply on which the United States must depend.

The question of substitutes is, however, quite a different one. Shale oil will in time become available in tremendous quantities in this country. It has afforded, therefore, a basis for most spectacular prophecy of new resources to substitute for petroleum. Alcohol and benzol from sources such as fermentation, coking of coal, and others offer promise on a smaller scale as substitutes for certain petroleum fractions, particularly gasoline. None of these suggestions, however, rival shale oil in available quantities nor general applicability of the liquids available.

Use of Coal, Byproduct Gas, and Electricity in Place of Petroleum

A third group of what may be termed petroleum substitutes is found in a field foreign to liquid fuels. Materials in this class are powdered coal, coal-oil mixtures, byproduct gas, and even electricity. These sources of heat, light, and power would, of course, readily lend themselves to many of the purposes for which petroleum is now applied. In any general discussion, therefore, the possibilities in these directions must be considered carefully.

An extended discussion might be developed of all these varieties of supplementary or substitute materials. For the present article, however, they cannot be considered in detail. As clearly pointed out, all materials and methods, taken together, are not enough to bring the present supply up to the total demand. For this reason, it is more profitable for the present to turn to the third national question as to how the available supplies can be used to best effect during such period of inadequacy.

Present Applications of Petroleum

It is not practicable to give any exact statement of the present uses of petroleum, but an excellent idea of the principal application is obtained from the Bureau of Mines figures of refinery output in this country during 1919. The important points in this summary are as follows:

Product	Output in Millions of Gallons
Gasoline	3,958
Kerosene	2,342
Gas and fuel oil	7,627
Lubricants	847
Miscellaneous	1,279
Total	16,053

The gasoline goes principally into automotive and other internal-engine uses. The kerosene is to some extent used for internal-combustion engines, but primarily is an illuminant. Lubricating oils have obvious application. The gas and fuel oils go into naval and marine-engine and power-plant applications, to the water-gas and oil-gas manufacturer, for a wide variety of industrial heating and steam raising, and to some extent to industrial chemical applications. The miscellaneous output is made up of specialized products which are applied in many fields, partly as fuels but also largely for other uses, such as inks, medicinal products, paints, road oils, and other minor uses.

A still more significant method of classifying the present distribution of petroleum was used by the U. S. Geological Survey in its study of the fuel and gas oil

requirements. This bureau summarizes some of the major demands in this field from official sources as follows:

	Barrels
Shipping Board—for merchant marine (1920)	40,000,000
Shipping Board—for merchant marine (1921)	60,000,000
Navy requirements (1918-19)	5,500,000
Navy requirements (1920-21)	8,000,000
Railroads (1918)	36,700,000
Gas manufacture	25,000,000
Other public utilities	11,000,000
Crude oil used on leases	5,700,000
Total accounted for (1920, approximately)	150,000,000

This tabulation is by no means a complete representation of fuel-oil demands, but it indicates the order of magnitude of the requirements of some of the principal users that have been conspicuously in the market during recent months. They, indeed, represent over 60 per cent of the United States fuel-oil requirements at present. The notable increase in the requirement of the merchant marine and Navy is a point that should be particularly considered in this connection.

Ranking of the Petroleum Users

Not all users of petroleum products are in competition with each other for their supply, because certain of the products are available only for a limited variety of uses. It is undoubtedly worth while, therefore, to consider the relative importance of the various demands for these materials. As a result, we can gain at least some measure of the economic justification of these applications and establish what might be termed an economic priority list for petroleum.

It is not intended to suggest that the Government should now establish any machinery for classifying petroleum uses or enforcing of priorities. The question may well be asked, therefore, as to what application is intended for any such preference list. Certainly, under our present scheme of regulation of industry, we cannot expect that a co-operation of petroleum producers will undertake to establish a distribution system giving priority to certain classes of users. Even if they wished to do so, the existing law forbidding such means for restraint of trade would prevent. On the other hand, that users will of their own volition comply with any schedule of priorities that may be advanced or suggested is beyond belief.

Despite these facts, there still remains an important function to be served by a system of classification of users of petroleum. This function is the direction of thought of the industry toward reasonable trade practices for the best interest of the industry, and the similar guidance of engineering plans by users of petroleum who must of necessity sooner or later be confronted with some limitations upon the purchase of liquid fuels. If we can establish even approximately what is to be, in the more or less immediate future, the order in which petroleum preference is granted, it will become a much simpler problem to determine where and in what manner essential liquid fuels are most advantageously to be applied.

News From The Oil Fields

Continental Mexican Brings in First Well in Chinampa Field

Several Companies in Tampico Region Pass Million Mark in September

From Our Special Correspondent

Another big gusher was brought in recently on the Continental Mexican Petroleum Co.'s Lot 95, Chinampa. It is estimated that the daily flow is in the neighborhood of 60,000 bbl. The oil was found at a depth of 2,083 ft. After closing the gate valve it was found that there was a leak between the 8¼-in. and the 10-in. casing which was flowing about 600 bbl. This was soon closed off tightly and no further trouble expected from it. This is the first well drilled in this field by the Continental Mexican Petroleum Co., as they have just recently commenced operations. They have a flow tank station at Palo Blanco, and their terminal and tank farm is opposite Tampico on the Panuco River.

The Compania Mexicana Petroleo, "El Aguila," lost their sixth 55,000-bbl. tank within the period of one month when their tank No. 116 was struck by lightning and destroyed. Much of the oil was saved by pumping it out of the tank but the estimated loss is $60,000.

Several of the companies passed the million barrel mark in September exports. Among the "top-notchers," are the Huasteca Petroleum Co., the Island Oil Co., and the Cortez Oil Corp.

Change in Mexican Petroleum Tax Considered

Petroleum companies have completed payment of their export taxes for July and August, the amount of revenue received by the treasury totaling more than 8,500,000 pesos. Announcement is made that more than 2,000,000 pesos paid to Gen. Pelaez and other revolutionary leaders would be applied to account as tax payments.

Consideration is being given complaints by oil companies relative to methods adopted for fixing the tax rate, and it is planned to change the system so that the average selling price for a period of six months will be taken as the basis, instead of prices for two months.

The Bolin Oil Co., of Casper, Wyo., has acquired leases on an extensive acreage near Round Butte, Col., 20 miles north of Fort Collins. Drilling will be started soon on the Grimes ranch in this leased area.

Controversy Over Oil Lands in Utah

From Our Special Correspondent

Interest in the oil fields of the San Rafael swell in Emery and Grand Counties, Utah, increases since the passage of the Federal Leasing Bill, which throws open large areas to development, and a controversy as to the ownership of certain sections has arisen between the state and Federal governments. The land in question comprises Sections 2, 16, 32, and 36 in each township in the San Rafael section, and the matter of ownership hinges on the question as to whether it was known to be mineral bearing at the time of cession to the state under the enabling act under which corresponding sections in each township in the state were granted to the state. Survey of the land in question was not undertaken until 1912, and a part of the area remains unsurveyed. The Government claims it was known to contain oil in commercial quantity at the time of the survey, and includes it in the naval reserve withdrawn from entry in 1912, and now offers it for lease for oil development. The state claims it as land known to be non-mineral in 1912, on grounds already set forth.

Date Set for Red River Boundary Case

Oil and Gas Leasers Given Time Extensions—Completions in Burkeburnett and West Columbia Fields

From Our Special Correspondent

The Supreme Court of the United States has set Dec. 13, 1920, for hearings in the Red River boundary case between Oklahoma and Texas. This case is of especial interest because of the valuable oil-producing area along the part of the boundary affected.

At the last special session of the Thirty-sixth Legislature Governor Hobby signed a bill extending the time in which holders of gas and oil leases on University lands may finish development work. Through an emergency clause the bill is in immediate effect. Lessees holding about 2,000,000 acres of University land in West Texas are affected by this bill, and $200,000 annually will be paid the University in rents.

Judgment was entered in the Fifty-third District Court of Travis County in favor of the State against eleven oil companies for violations of the regulations of the Railroad Commission. The fines were only $50 to $100 each, as it was shown that no wilful violation of the regulations was intended.

Stephens County oil production increased 5,000 bbl. per day for the week ended Oct. 9 over the production of the previous week.

A number of producing wells were completed in the Burkburnett district during the week ended Oct. 9, but all were within the known producing area. Northwest Burkburnett and the Texhoma section, south of the Breckenridge townsite, were the areas in which most of the wells were brought in.

The well of chief interest completed in the coastal fields during the week ended Oct. 9 is the Bassett Blakely No. B3 of the Gulf Production Co. at Blue Ridge, Fort Bend County. This well is reported to have made an initial production of 1,200 bbl. of oil daily from a depth between 2,800 and 2,900 ft. It finally proves Blue Ridge to be an oil field. Drilling has been carried on here for years, and nothing but indications were found until the Gulf Production Co. brought in its Nos. 1-B and 2-B, two small producers, during this year.

At West Columbia, the largest Gulf Coast producing field, the Humble Oil & Refining Co.'s. No. 1 Robertson was completed early in the week of Oct. 9 at 3,270 ft., making over 1,000 bbl. of oil. It sanded, and after bailing the flow increased until it was making 8,000 bbl. through a choker. This well is about 1,200 ft. north and west of the Abrams No. 1 well of the Texas Co. The Mary C. Masterson No. 1. well of the Gulf Production Co. was also completed during this week, flowing five hours at the rate of 10,000 bbl. daily, when it sanded. It is now being worked over. This well is also about 1,200 ft. north of the Abrams No. 1 well.

Operative Agreement Reached in Lander County, Wyo.

From Our Special Correspondent

The Producers & Refiners' Corporation and the Wind River Refining Co. recently signed an agreement whereby the former is to operate the eight Wind River wells in Lander County, belonging to the latter, pay all expenses, and divide the oil equally between the two companies. This agreement is in settlement of certain legal difficulties arising over sale of part of the Wind River property in the Lander Field to the Producers & Refiners' last December. It is stated that the Wind River Co. will reopen its refinery at Lander next spring, and operate it on its own and purchased oil to its full capacity of 1,000 bbl. daily.

The Twin Sisters Oil Co. recently filed articles of incorporation in the State of Wyoming. The capitalization is $3,000,000. The company will operate near Lander; the directors are: E. H. Fourt, J. F. Longenecker, and Charles Waters.

Well No. 4 of the Ohio Oil Co. on Sec. 34 of the Rock Creek field, recently completed, is making 250 bbl. daily from the first sand. It is expected this well will make a larger production when drilled deeper. Work has started on No. 1 well of Wilson & French on Sect. 24 of this field.

Western Illinois Oil Notes

From Our Special Correspondent

The Petro Oil & Gas Co. has moved in two drilling outfits to the Irvington district, in Washington County, near Centralia, where it will drill six or more test wells on a strong "structure" or anticline that has been favorably reported on by several geologists and mining engineers. Some oil has already been found in the No. 3 or "Stein" sand at 1,460 ft. and seepage occurs in neighboring coal shafts. It was through oil seepage in the coal shafts that led to the opening up of the Junction City, Sandoval and Centralia pools in the Nos. 3 and 4 sand. The Sandoval pool has been one of the most reliable pools in the state, the wells coming in with an average of 118 bbl. and are still making 5 to 12 bbl. when over ten years old. Some of the wells came in at 500 bbl. from the No. 4 sand, while the Carlyle pool, some 15 miles distant, produced 1,000 to 1,800 bbl. wells from the No. 3 sand.

The Centralia Oil Co. recently brought in a 20-bbl. well on the Langewisch farm and another well is now drilling at over 800 ft.

The value of the Illinois oil output this year is estimated at about $40,000,000, which is the largest in the history of the state. As Illinois oil is now bringing $3.77 to $4 per bbl. at the well, this now old oil state is being given considerable attention by Mid-Continent oil men, many of whom got their start and made fortunes in Illinois 7 to 15 years ago when the oil sold for 60 to 70c., before the present extensive pipe lines were built.

Eastern Kentucky Leads in September Drilling

From Our Special Correspondent

In eastern Kentucky, Lee, Wolfe, Estill, and Powell Counties show the greatest part of the drilling during the month of September, with Magoffin, Johnson, Lawrence and Floyd showing an increasing amount of new work. Recently in Lee County, the Associated Producers' No. 7 on the Townsend lease made 20 bbl. The Security Producing and Refining Co. on the Estes lease got a 15-bbl. producer. In Powell, two strikes of 10 bbl. were made by the Ohio Oil Co., on the Brandenburg lease, and Ohio Fuel Oil Co., on the Smyth lease. In Wolfe, the Carter Oil Co. has a 10-bbl. well on the Honaker lease. A number of small pumpers were drilled in Lee, Estill, Powell and Wolfe Counties.

In the Johnson-Magoffin pool several 10 to 20 bbl. strikes have been made, while the Lawrence County field shows four new wells averaging 5 bbl. each.

Oil Activities in Arizona

From Our Special Correspondent

It is reported that gas is raising not only at the Adamana well near Holbrook, Ariz., but also at the well of the Holbrook Co., ten miles distant, and in the Black Canyon well, twenty miles to the northwest, indicating similar and encouraging conditions over a large area at the same depth, about 2,100 ft. The Adamana well is drilling steadily, with continuing gas pressure. The Holbrook Co. has received a supply of 8-inch casing that has been expected for a long time. The gas at the Black Canyon is said to have thrown water 12 ft. above the collar, though the water has been standing 400 ft. below the surface. The original Zuni well has been abandoned, with a string of tools left in it, and another has been started, 40 ft. distant. Work has been suspended for some time on the Hopi well. On complaint of a stockholder, President G. S. Mayfield and Secretary Thomas McCauley of the company have been summoned to appear November 5 before the State Corporation Commission at Phoenix to answer charges with regard to the use by them of moneys secured through the sale of stock.

Oil Excitement Starts in South Dakota District

From Our Special Correspondent

A standard oil rig has arrived and has been moved to the Crooked Oaks district in South Dakota, where Messrs. Norbeck and Nicholson will drill the first well in this new field. Twelve thousand acres have been leased by the above firm and the rig was brought in from Wyoming, where they already have several oil wells. A feeling of much excitement is in evidence throughout that part of Butte County and some of the larger oil concerns have geologists on the ground making investigations and taking leases.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

A Producer's View on Copper

Abnormal Profits of Manufacturers of Brass and Copper Goods Retarding Consumption

"Large profits that copper manufacturers are demanding on their products are doing much to keep down domestic consumption," said an official quoted by *Wall Street Journal*. "Personally, I know of a number of instances where copper and brass were to be used until the manufacturer found out the high prices demanded for those products.

"Producers have been mining their ore and making it into copper with practically no profit. Manufacturers have not been willing as yet to reduce their profits.

"Producers are getting tired of this. The result is quite likely to be an entry of the copper producers into copper and brass manufacturing, making copper companies self-maintained enterprises similar to steel companies.

"Anaconda has pointed the way. At Great Falls, Mont., that company is already drawing copper into wire, and it would not be surprising to see it making brass before long. American Smelting & Refining Co. has been rolling copper into sheets for years.

"Copper-wire drawers tell me that many companies have all the work booked that they can do for months to come. Much of this copper-wire drawing is for foreign account. It would seem there is no real reason for wire-drawers to keep out of the market. I know that their old contracts for coper are almost exhausted.

"What copper needs is concerted action by producers. However, the laws prevent this. The largest companies are in the main producing about half what they did in 1918. Some companies, however, are still mining at from 70 to 85 per cent, or even nearer, their war rate. All companies that are mining at more than 40 per cent their 1918 rate should curtail.

"If any important producers should find themselves forced to curtail production drastically within the next few weeks, you can be perfectly sure that they will make plans for entering upon the manufacture of copper goods, thereby protecting themselves in the future from the short-sightedly rapacious middlemen of the copper industry, the manufacturers."

Franch Gold Shipped by Germany

Bits of French gold paid to Germany as indemnity in 1872 are in the shipment of gold which arrived Oct. 4 in the United States and came indirectly from Germany. That gold is a part of that which Germany paid to the United States Food Commission.

Tin Deposits of Mexico Are Widespread and Promising

The failure to realize any successful tin-mining operations in the United States under the war stimulus to the general mining industry, except one inconsiderable operation in South Dakota, renews interest in the possibilities for the tin mining in Mexico. The Mexican tin deposits have been long known. In fact, they were worked in pre-Cortez times, and there has been a continuous production on a small scale in various parts of the republic. At no time has the total output of the Mexican tin mines reached large proportions, and the industrial operations have been on a small scale, and mostly by the Mexicans.

About twenty-five years ago a Pittsburgh syndicate undertook the development of tin in Durango. The capital raised and expended was large, and the operations for the time were elaborate. This undertaking was unsuccessful, according to *The World's Markets*, partly because of the extravagance of the ideas of its backers and certain internal financial features, but chiefly, of course, by reasons of the fact that tin was not found in commercial quantities. This failure and the publicity it engendered in the United States had a great deal to do with the neglect of the Mexican tin resources by the aggressive North American capital for nearly a quarter of a century after. Perhaps, also, the fact that there was practically no successful tin mining in the United States influenced the trend of American interests in the Mexican tin deposits.

During the later years of the Porfirio Diaz era several serious and reasonably promising attempts to realize on these Mexican tin deposits were made. Notable among these were the operations in the western part of the State of Aguas Calientes, in the southern part of the State of Zacatecas and near San Luis Potosi. Other promising but less accessible deposits, on the border of Durango and Zacatecas and in the south of Mexico, were controlled with a view to later developments.

It is known that the limited explorations which had been done on some of the more promising of these Mexican tin deposits resulted in favorable reports by engineers from the United States, and serious operations were planned. It is expected that the resumption of mining in Mexico will result in a continuation of these operations and probably in the inauguration of new ones. Well posted authorities express the opinion that tin mining in Mexico will be a successful branch of the industry. Considering the reported wide-spread occurrence of tin ores, it is also to be expected that tin mining will not be confined to a single locality.

Vanadium From Oil and Super-Steel Discussed

J. Leonard Replogle, president of the Vanadium Corporation of America, when interrogated at the annual meeting of the company regarding rumors of the discovery of vanadium substitutes, as well as vanadium ore having been obtained from oil seepage, replied that the so-called super-steel discovered by Professor Arnold, of Sheffield, England, one of the processes referred to, actually calls for use of 100 per cent more vanadium than is now employed in making high-grade steel. The Arnold steel also used more molybdenum, another alloy of which the Vanadium Corporation owns large deposits in Colorado. Development of molybdenum could only benefit the Vanadium Corporation.

The head of the Vanadium Corporation also expressed no apprehension regarding competition from oil producers. He said that vanadium in minute quantities is found in iron ore, clay, and even in oil, but the cost of production made development of these sources of supply utterly out of the question. Only recently a cable from England stated that the oil company reported to be obtaining vanadium from seepage had given up its experiments.

It developed that E. E. Fernandini, who originally owned the Peruvian vanadium deposits of the Vanadium Corporation of America, and who is accounted the wealthiest man in Peru, was some time ago elected a director.

Iron and Steel Engineers Meet in New York City

The Association of Iron and Steel Electrical Engineers held its fourteenth annual convention, in the Hotel Pennsylvania, New York City. After registration and business sessions during the forenoon of the first day, the technical program began that afternoon with papers on practical education by B. A. Cornwell, and standardization by Walter Greenwood. Tuesday's papers dealt with power transmission, A. L. Freret discussing "Underground Transmission," while Tuesday afternoon was devoted to an interesting excursion. Wednesday's sessions considered the annual report of the electrical development committee and two papers, "Determination of Auxiliary Drives" by Gordon Fox, and the tonnage of the reversing electric mill, by K. A. Pauly. The annual banquet was held on that evening and greatly enlivened by the presence of many wives of members.

The addresses were continued on Thursday and the convention closed on Friday with an excursion after hearing the standardization report.

Zion National Park, Utah, Dedicated

The formal dedication of Zion National Park, Utah, to the American people was held at the Park, Stephen T. Mather, director of the National Park Service, presiding. Congress created the Zion Park, Nov. 19, 1919, making it the ninetieth member of the National Park system. The area has been reserved since 1909 and was first known as the Mukuntuweap and later as the Zion National Monument.

Utah's interest in the dedication of her greatest scenic exhibit as a national park for all the people is worthy of special note. Governor Simon Bamberger and U. S. Senators Reed Smoot and William H. King all made appropriate addresses and the Salt Lake Commercial Club arranged a special trade excursion to the dedication.

Zion National Park is in extreme southwestern Utah. It is reached by rail from both Salt Lake City and Los Angeles by the Salt Lake route to Lund, thence by motor stage a distance of a hundred miles. It is also reached by motor from either Salt Lake City or Los Angeles over the Arrowhead Trail.

The park contains 120 square miles. Zion Canyon is the most important scenic feature, bisecting the park from north to south. This canyon is 15 miles in length varying in width from 50 to 2,500 feet, with walls 800 to 2,000 feet high. A well known writer says, "This canyon, winding like a snake, abounding in enormous peaks and domes, and glowing like a Roman sash, is one of the most striking spectacles which even America has to offer." Because of its gorgeous coloring Zion Canyon has been called the "Rainbow of the Desert."

Although the newest of our national parks, Zion Park is only new in presentation as an attraction for our traveler and lover of the marvelous in nature. Historically the canyon is probably thousands of years old. Only this year ruined cliff dwellings of the pre-historic race have been discovered in almost inaccessible places in the canyon walls. The Mormon pioneers were the first Europeans to discover the region, entering in 1858. In 1861 Brigham Young visited the region and named the canyon Little Zion. Capt. Clarence E. Dutton, geologist and explorer, wrote, "No wonder the fierce Mormon zealot who named it was reminded of the Great Zion on which his fervent thoughts were bent, of houses not built with hands, eternal in the heavens." Major John W. Powell visited the region in 1870. Captain Dutton studied it several years later.

However, until the coming of the railroad and the motor road few persons had ever seen the region. Those who did had described it in such glowing terms that it was supposed their enthusiasm had run away with their veracity. Elevated to parkhood in the age of automobiles and plentiful gasoline, and of an enthusiatstic nation, Zion Park may come into its own.

International Lists of Papers Need Support

Royal Society Calls a Conference To Discuss the International Catalog

The Royal Society of London called a conference to be held in London to consider the future of the *International Catalogue of Scientific Literature*. Financial problems confront this great compilation of selected titles of current contributions to all branches of scientific knowledge, and it is uncertain what further steps are necessary for its continuance or modification. American representatives are in attendance to speak for the National Research Council, the Smithsonian Institution, and the National Academy of Sciences of the United States. Robert Mearns Yerkes and Shepherd Ivory Franz of Washington, D. C., represent the National Research Council; Leonard Eugene Dickson, professor of mathematics in the University of Chicago, the National Academy of Sciences; and Leonard C. Gunnell of Washington, the Smithsonian Institution.

The Metric System Neglected by Australia's Parliament

During the past summer a motion in favor of the establishment of a metric system of weights and measures came before the Australian House of Representatives, but was shelved after brief debate.

"Some of the arguments advanced against the metric system were as diverting as ever" states *Chemical Engineering & Mining Review* of Melbourne. "For instance one opponent used the fact that under a metric system one-sixty-fourth would have to be referred to as 0.015625; but he carefully refrained from mentioning the further fact, that if a metric system were in universal use no one would want to refer to one-sixty-fourth at all.

"Another representative advanced the ingenuous argument that under a metric system goods could not be packed for transport so conveniently as under a system which dealt in cubes. Sir Granville Ryrie met his argument very effectively by asking him how he would deal with a cube of galvanized iron sheets 10 ft. long."

The labor of learning the metric system is not as great as the labor required to learn the much more complicated systems of weights and measures now in use; and as for changes in machinery required, the metric system advocates have shown that a very small percentage of the existing mechanisms would have to be actually scrapped, but as the *Review* remarks, "if the new apparatus would give more efficient service, the sooner the old is scrapped the better. The chemist . . . uses metric weights and measures in his laboratory, and the old heterogeneous collection of pints, pounds, and inches in his everyday relations to commerce. How many chemists would be found to vote against the adoption of a metric system?"

American Manufacturers' Export Association Holds Annual Meeting

The fact that during the war exports of machinery and raw materials from the United States increased tremendously in value and that now the tendency is for a contraction of this trade led to a discussion of this topic at the annual meeting of the American Manufacturers Export Association on Oct. 14 at the Waldorf-Astoria. W. L. Saunders, of the Ingersoll-Rand Co., a mining engineer and president of the association, presided and presented the initial paper. He pointed out that although the value of the commodities exported during the past six years had increased greatly, comparative consideration of the actual tonnage or bulk exported showed but a much smaller upward trend. The strong competition from European and other quarters that might be expected, was another subject emphasized in his paper. Financial cooperation is all essential to make an attempt to capture "the great promise and opportunity of export trade now before the country."

James S. Alexander, President of the National Bank of Commerce, spoke from the standpoint of the banker, outlining the abnormal credit situation in the country, the necessity of conserving credit and the co-operation that the banks can render in the matter of export trade. He also stressed the European need of raw products rather than manufactures, which Europe is gradually becoming in a position to manufacture herself. His paper was replete with practical suggestions for the guidance of the exporter.

W. A. Harriman, President of the American Shipping and Commerce Corporation, discussed "The Big Shipping Problems of the United States," the keen competition of foreign shipping interests, and the serious lack of proper personnel in the American Merchant Marine.

Then followed an address by Dr. MacElwee, Director of the Bureau of Foreign and Domestic Commerce, divulging the Bureau's plans for the future. Other papers of more or less economic nature followed, of importance particularly to exporters.

An interesting feature of the exhibit was a display in a side room of paper clothing from Austria. It was the first the writer had seen; the texture of the cloth rather resembles that of our grass-carpets.

Mining Society of Pennsylvania State College Meets

The first fall meeting of the College Mining Society was held Oct. 1 in the furnace room of the Old Mining Building at Pennsylvania State College School of Mines, State College, Pa. There was a large attendance, and an agreeable, profitable program for the coming winter was outlined. The officers are H. H. Fraser, president; G. R. Sutton, vice-president; C. E. Bersinger, secretary-treasurer.

Book Reviews

Steam Shovel Mining. By Robert Marsh, Jr. Cloth, pp. 258, 9 x 5½. First Edition. McGraw-Hill Book Co. Inc., New York. Price, $3.50.

Much has been written concerning the use of power excavators in the civil engineering field, but of their application in mining comparatively little has appeared in print except in scattered form, and the attempt of Mr. Marsh to segregate this data on steam-shovel mining will be highly appreciated by those who are interested in this method of mine operation. The first chapter discusses the utility of the power shovel and describes the general types. This is followed by the considerations governing the selection of equipment, such as shovels, locomotives, cars, track, and drills. Chapter 3 deals with the general problems of steam-shovel excavation and pit layouts. Chapter 4 contains descriptions of the methods of drilling and blasting which are used in the different districts. The disposal of material, under which is included transportation and the building and maintenance of dumps, is covered in Chapter 5. Chapter 6 deals with the engineering work necessary in planning the development of a power-shovel mine, also outlining the mapping and estimation of the orebody and the manner of reaching certain conclusions which affect the ultimate removal of the overburden and ore. Chapters 7 and 8 contain, respectively, data on the cost of shovel work and general administration. The matter is well arranged, and the author has carefully analyzed the problems of steam-shovel mining, making comparisons and suggestions in a most helpful manner. D. E. A. C.

Aluminium. By G. Mortimer. Cloth; 5 x 7¼; pp. 152. Isaac Pitman & Sons, New York. Price, $1.

A text on the metallurgy and application of aluminum is a rare thing, but in this handy little volume, which is a companion text to similar books upon other metals and commodities, are described the essential features of the manufacture, manipulation, and marketing of the metal.

The metallurgy of aluminum, as practiced nowadays, is comparatively simple; in fact, to use the author's own words, "The electrolytic process [for aluminum manufacture] is one of those fatally simple ideas which look so attractive on paper, beautifully conceived, and straightforward enough to describe. In practice, owing to the essential delicacy of the series of operations and the difficulty of insuring a consistent level of purity in large consignments of materials, the production of pure metal from one year's end to another demands experience and able management. The progress of the metal from the preparation of pure alumina to the final casting into slab form for rolling is girt about with pitfalls and chequered with the failure of concerns which had not just that meed of experience essential to the success of this most intriguing of industrial processes."

Sketching the early history of the chemical discovery and isolation of the metal, the author describes the relatively recent large-scale electro-metallurgical development of the aluminum industry, concurrent with the introduction of cheap electric power, and the epoch-making invention of Charles Hall, of Oberlin, by which large-scale commercial production was made practicable. In 1854 aluminum was worth aout $112 per lb. Its present price is about 35c.

In illustrating the narrow limits of working in the electric furnace, it is shown that in the solid condition aluminum is lighter than the other materials in the bath, but heavier in the fused state, enabling it to sink to the bottom of the furnace. If it did not sink a disorganization of the whole process would ensue.

The alloys of aluminum, their treatment, and hints on working the metal receive extended consideration in the text, and the growing tendency to use aluminum in the electrical trade, and thereby displace copper, is stressed. The crux of the matter, "that one pound of aluminum will do the work of two pounds of copper and that it must show a saving, therefore, at anything under double the price of the red metal," emphasizes the competition between these two metals in the electrical field, and in high-tension transmission work especially.

The book is well illustrated with photographs and diagrams, and we cannot but echo the opinion of a prominent metallurgist who has perused the volume, that "It enables one quickly to grasp the big outstanding features of aluminum metallurgy and is highly stimulative of thought upon various branches of the industry."

It is to be noted that the spelling used is the British form, aluminium (not aluminum). F. E. W.

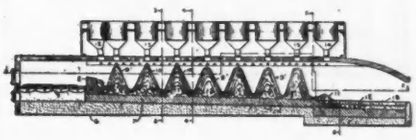
Recent Patents

1,351,091. Method of Obtaining Zirconium Oxide. Louis E. Barton, Niagara Falls, N. Y., assignor to the Titanium Alloy Manufacturing Co., New York, N. Y. Filed Sept. 24, 1919.

In obtaining zirconium oxide from a material containing an undesired substance, the steps which consist in melting said material with a carbonaceous reducing agent to production of zirconium cyanonitride; and subjecting the resulting product to the action of sulphate of an alkali metal.

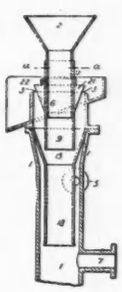
1,351,835. Reverberatory Furnace. Henry L. Charles, Butte, Mont. Filed Aug. 30, 1917.

The within described method of feeding ores into a reverberatory furnace consisting in dropping the same upon the hearth in such a manner as to provide piles or mounds at frequent intervals.



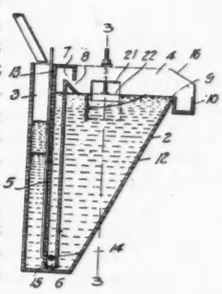
1,351,234. Separator for the Treatment of Coal, Clays, Ores, and the Like. John Marriott Draper, Bridgend, England. Filed Feb. 4, 1919.

A separator comprising an outer tube or receptacle, an inverted conical inner chamber contained within the upper part of said receptacle and from the apex of which a tube extends downward, a central feed fitted with a telescopic adjustable delivery tube to regulate the point of delivery in relation to the bottom or apex of the inverted conical chamber, a hydraulic connection for the admission of liquid to the outer tube or receptacle below the top of the inner chamber, and a circular or peripheral overflow ledge above the upper end of said chamber.



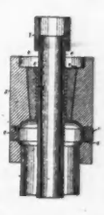
1,351,155. Ore-Flotation Apparatus. James B. Brown, Denver, Col. Filed Sept. 4, 1917.

A container divided into a feed chamber, a separating chamber provided with an overflow and a transfer conduit which adjacent its bottom communicates with each of the chambers for the reception of material, and which has an outlet adapted to deliver material in sheet-like form onto the liquid level in the separating chamber, determined by the overflow, and means for introducing a gas into the lower part of the transfer conduit.



1,352,075. Casing-Head. Henry S. McGarry and John D. Carr, Humble, Tex. Filed Mar. 28, 1919.

A device comprising a tubular member having an opening therethrough, provided to receive a pipe, said member being adapted to be screwed on the upper end of a well casing, and being provided with an annular recess in the upper end, a portion of the wall being formed with an upwardly inclined wall, and the covering adapted to fit into said recess and through which said pipe extends, said covering closing the openings through said tubular member.



MEN YOU SHOULD KNOW ABOUT

D. F. Hewett is making an examination of the Crimora mine in Virginia, for the U. S. Geological Survey.

E. F. Burchard has returned to his desk at Washington after an absence during most of the field season.

John Gross, of the U. S. Bureau of Mines, has been transferred from Fairbanks, Alaska, to the Rolla, Mo., station.

E. R. Mansfield has returned to Washington after completing an extensive examination of phosphate deposits in Idaho.

E. W. Shaw will sail from Buenos Aires on Nov. 1, for New York. Mr. Shaw has been working on oil geology in Bolivia.

W. Parsons Todd, vice-president of the Quincy Mining Co., is in the Michigan copper country on his regular inspection trip.

W. S. Murray, chief engineer of Super-Power Survey, addressed the Water Power League of America at Washington recently.

F. B. Laney has been placed in charge of the department of geology of the University of Idaho, at Moscow, to succeed **D. C. Livingston.**

Phillip Maverick has resigned as testing engineer with the Greene-Cananea Copper Co., at Cananea, and has gone to Tampico, Mexico.

Samuel W. Cohen, consulting mining engineer, of Montreal, sailed Oct. 6 for Europe, where he will spend two months on professional business.

S. M. Greenidge and **Walker S. Clute** have been appointed valuation engineers in the oil and gas section of the Bureau of Internal Revenue income tax unit.

George I. Adams, formerly on the geologic staff of the U. S. Geological Survey, was in Washington early in the month, having just returned from China.

David White, chief geologist of the U. S. Geological Survey, has completed an inspection trip through the oil and oil-shale regions in Utah and Colorado, and is now in Wyoming.

H. H. Armstead, president of Armstead Mines, Inc., and of Armstead United Cos., is in Talache, Bonner County, Idaho, inspecting one of the company's mines there.

Harry T. Hamilton, manager of the Moctezuma Copper Co., Nacozari, Sonora, Mexico, was a recent visitor to the Arizona Copper Co.'s Concentrator No. 6 at Morenci, Arizona.

Stephen L. Kapper, chief engineer, and **Harold Yost**, geologist, of the Phelps Dodge Corporation at Tyrone, N. M., attended the meeting of Phelps Dodge engineers recently at Nacozari, New Mexico.

Rienzi W. Macfarlane, assistant superintendent of the Arizona Copper Co., Ltd., Longfellow mining division, has returned to Morenci, Ariz., after a month's absence in Mexico.

William Russell, London manager of the Dorr Co., 101 Park Ave., New York City, is now studying the latest practices in metallurgical and chemical engineering fields in this country.

G. Perry Crawford has completed his work for the season in Spitzbergen and returned to London. Mr. Crawford will visit France, Switzerland and Italy before returning to the United States.

L.-A.-E. Sauvage, lately retired from L'Ecole Nationale Supérieure des Mines, Paris, writes that he still continues to lecture on machinery at the Conservatoire des Arts et Metiers. His present address is 292, rue St. Martin, Paris, 3me.

E. J. Donahue, for some time past the secretary-treasurer of Britannia Mining & Smelting Co., Ltd., has been promoted to be general manager vice **J. W. D. Moodie**, who recently retired. Mr. Donahue will be stationed at Britannia Beach, B. C.

N. C. Sheridan, mining engineer, of Wallace, Idaho, who has been in charge of operations for the Snake & Opportunity Mines Co., near Hillsboro, N. M., has returned to the Cœur d'Alene district as manager of the Midnight Mining Co., Mullan, Idaho.

Henry W. Crowther, after nearly five years' service, has resigned as manager of the Kingman Consolidated mines in Mohave County, Ariz., and has gone to Los Angeles, Cal. He has been succeeded by **Will Halloran**, former superintendent of the property.

A. J. Reef, formerly construction engineer at the Mammoth plant, Kennett, Cal., of the U. S. Smelting, Refining & Mining Co., and recently at the Salt Lake City office, has been transferred to the home office of the company at 55 Congress St., Boston, Mass.

H. L. Chamberlain, E. M., general efficiency engineer for the Quincy Mining Co., Hancock, Mich., has resigned. Mr. Chamberlain is a graduate of the Michigan College of Mines, class of 1903, and has been with the Quincy company for the last seven years.

F. G. Cottrell, Director of the Bureau of Mines, will leave Washington Nov. 8 for an absence of three weeks. He will visit the Bureau stations at Petrolia, Tex., and at Bartlesville, Okla. From Bartlesville he will proceed to Denver to attend the convention of the American Mining Congress.

J. A. Burgess, who resigned lately as manager of the United Eastern Mining Co., Oatman, Ariz., has opened an office in San Francisco, as a consulting engineer and geologist. He is making a geological examination of the Oatman district, preparatory to the hearing of the apex case of the United Eastern and Tom Reed companies.

Theodore Dengler, general manager of the Mohawk Mining Co. and of the Wolverine Copper Mining Co., has had the management of the Michigan Copper Mining Co., Ontonagon County, Michigan, added to his duties. **Jesse Butler**, who has been superintendent of this property since Mr. Brady's death, will continue to act in that capacity.

OBITUARY

Michael L. Foley, of the Foley O'Brien Mining Co., Toronto, died Oct. 9 in that city at the age of 51. Mr. Foley was for many years actively associated with mining and oil interests and was widely known in the mining districts of northern Ontario. Previous to his last illness he was manager of the Canadian Petroleum Co.

David A. Herron, for the past 15 years manager of the Tomboy Gold Mines Co.'s properties near Telluride, Col., died Sept. 24, in Denver, Col. Mr. Herron was born in Dehra, India, Dec. 24, 1860, but received his technical education in Pennsylvania and Illinois. For a time he practiced civil engineering, and later followed mining. He succeeded his brother John Herron as manager of the Tomboy properties, and was an eminently successful mining executive, devoting almost his entire time to his work. He was a kind, thoughtful man and was respected and loved by his employees. The banks and many of the business houses of Telluride closed during his funeral and for the balance of the day, in token of respect for the deceased and his family. He was buried in Telluride on Sept. 27.

SOCIETY MEETINGS ANNOUNCED

The American Society of Safety Engineers met at 29 W. 39th St., New York City on Oct. 22, in joint session with the New York section of the Illuminating Engineering Society. The program was devoted to papers that brought out the various ways by which good lighting arrangements promoted the safety of employees in various occupations. An informal dinner at Healy's preceded the meeting.

The Northwest Mining Convention will be held in Spokane, Wash., Feb. 28 to Mar. 5, 1921. In addition to the mineral exhibit the committee is planning for an educational and machinery exhibit. Members of the national bureaus, including the Geological Survey, the Bureau of Mines and the Forestry Service, will be invited to address the convention. Topics to be discussed will include the price fixing, importing, and exporting of gold, silver and other metals. Each of the several societies identified with the convention will have charge of a session.

THE MINING NEWS

The Mining News of ENGINEERING AND MINING JOURNAL 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.

LEADING EVENTS

Joplin Zinc Producers Again Shut Down for Two Weeks

This To Be Followed by Drastic Curtailment for Rest of Year—Hope To Extend Movement

Zinc ore producers, representing over 90 per cent of the entire production of the Joplin - Miami district, voted on Oct. 15 to shut down for two weeks, this shutdown to be followed by drastic curtailment for the remainder of the year. Virtually all of the large producing companies are in the agreement, including the Eagle-Picher Lead Co., which it is understood, was willing to shut down for one month. It is estimated the shutdown will mean a decrease in production of at least 9,000 tons of ore and probably 9,500 or 10,000 tons.

A shutdown similar to this was tried last June and was quite successful. Organizations at the mines were regained almost intact and it is believed this will be the case this time. The companies, of course, will endeavor to give employment to as many of their men as possible in development or prospect work, or any other work not actual production. The men mostly are acquiescent to the shutdown, believing that it was either that or a cut in wages. Operators frankly state they do not believe they could fairly cut wages so long as the price of living remains what it is in this district.

An effort is being made to get the co-operation of large zinc producers in the Montana, Tennessee and Wisconsin fields in the shutdown movement. Many mines shut down on Oct. 15, and the remainder the following day.

Broken Hill Strike May Be Settled Soon

The prospects of an early resumption of work at Broken Hill and Port Pirie, New South Wales, Australia, are favorable. An independent tribunal was appointed to consider the matters in dispute, Mr. Justice Edmunds, of New South Wales, being appointed chairman. It is unofficially reported that the claims of the union for a reduction in the hours of work underground have been dismissed and that the judge's award provides for a 48-hour week for surface men and a 44-hour week underground. It is also reported that Justice Edmunds refuses to abolish the contract system. Increases will probably be given in the rates of pay but no information is yet available as to this.

WEEKLY RÉSUMÉ

Zinc producers of the Joplin-Miami district have shut down for two weeks, as a result of market conditions; this is to be followed by a policy of drastic curtailment during the balance of the year. In Colorado the carriers have undertaken to readjust freight rates on ores and concentrates within the state in response to appeals from shippers. In Utah, many companies are pushing the assessment work that must be done on claims in 1920. In Arizona on Oct. 11, fire destroyed part of the town of Lowell in the Warren district. The labor survey recently undertaken by the provincial government in northern Ontario has shown the mining camps to be in need of 2,000 men. Twenty-five million dollars worth of bonds, the balance of those authorized almost two years ago, has been issued by the Anaconda Copper Mining Co. Ore shipments sent to Ashland docks from the Gogebic Range in northern Michigan were recently interfered with for a few days by forest and brush fires along the C. & N-W. It is reported from Australia that the chances are good for a speedy settlement of the strike at Broken Hill and Port Pirie; also that various state mining ventures in Queensland have recently suffered setbacks.

From Washington it is stated that W. R. Crane has been appointed head of the new Bureau of Mines experiment station at Tuscaloosa, Ala.

Anaconda Issues Balance of Bonds Authorized Two Years Ago

A new issue of $25,000,000 of Anaconda Copper Mining Co. 7 per cent secured gold bonds, series B, is offered at 96¼ and interest, to yield about 7⅜ per cent, by a syndicate of which the National City Company and the Guaranty Trust Company of New York are the joint managers. The bonds are due in 1929 and close the issue of $50,000,000, $25,000,000 Series A of which were sold in January, 1919. The proceeds of this issue are to provide additional working capital. This issue completes the financing authorized nearly two years ago, when $50,000,000 in bonds was authorized and half of them sold at 6 per cent, paying in part for development of South American properties.

According to John D. Ryan, chairman of the board of directors, earnings of the company for the seven years ended Dec. 31, 1919, averaged more than $24,500,000 annually after paying interest and all taxes, but before depreciation charges. The average yearly earnings have been equal to nearly 50 per cent of the Series A and B bonds, which constitute the sole funded debt of this company. The bonds are secured by a pledge of stocks of constituent companies.

Denver Convention of American Mining Congress Next Month

Approaching Meeting of Great Importance to Metal Mining Industry, Particularly to Colorado

The 23rd annual convention of the American Mining Congress will be held in Denver, commencing Nov. 15. This will be an event of importance to the metal mining industry, and therefore to several of the western states besides Colorado. The convention will not be confined exclusively to the consideration of the metal mining industry. Nine general divisions of the convention's work will be considered as follows:

1. Present-day relations between employer and employee; improvement in efficiency; wages; hours; working conditions; and contracts.

2. Tariff pertaining to mine products; and uniformity of national and state mining laws.

3. A national conference on the standardization of mining machinery, labor and life-saving devices.

4. The existing excess profits tax law, which has proved unworkable, unfair, and destructive to business, will be considered in connection with the report on the subject by a committee now at work.

5. The problem of the decline of the national gold production, and steps to prevent the further depletion of the nation's monetary gold reserve will be considered.

6. War minerals will receive attention, and the relief of worthy claimants who, under the technicalities of the existing law, have been refused relief.

7. The petroleum industry and the development of the vast oil shale deposits of Colorado and other states will receive special attention.

8. There will be a conference of coal operators to consider many problems of vital importance to the industry nationally and locally; also a conference of users of oil flotation processes.

9. There will be a conference for educational and scientific purposes, under a special committee working with the permanent American Mining Congress committee on standardization.

A publicity committee has been organized in connection with the convention, consisting of Warren E. Boyer, of the Denver tourist bureau; Edward Foster, Colorado commissioner of immigration; Dowell Livesey, editor of the Denver *Commercial;* Alva A. Swain,

Pueblo Chieftain; and Thomas Tonge, of Denver, as chairman.

The convention is of special interest to Denver as a mining and mining machinery center. The metal mining industry of the whole country is confronted by adverse post-war conditions. Unsatisfactory labor supply, high price of all mining supplies, and increase in freight, smelting, and power charges conspire to increase the cost of production. In many cases the margin of profit has been wiped out, and mines will close down. Many properties have suspended development work, are curtailing their output, and reducing the number of men employed. It is generally understood that some gold mining companies are actually planning to shut down for an indefinite period as soon as present ore reserves have been reduced to a point where they will no longer return a profit under present conditions, and with this end in view the companies are letting their equipment run down, and are not making the customary replacements and renewals. Under these conditions it is difficult, if not impossible, to interest new capital in mining enterprises of a speculative nature. This condition is resulting in a migration from mining districts, thus reducing the local demand for farm produce and manufactured goods. This, in turn, adversely affects commercial centers like Denver, and reduces railroad business to and from mining districts. Moreover, the decreased taxable values in mining districts will mean that the other districts, such as farming and city communities, will have to supply the deficit. If agricultural interests were forced to carry a large part of the burden of such redistribution of taxation, little sympathy would be wasted on them by mining men, for during the past several years the agricultural interests in Colorado have exercised a predominating influence in legislative affairs, and have had little consideration for mining interests.

Overlapping Research Work Causes Dissatisfaction

The resignation of Dr. A. B. McCallum as chairman of the Canadian Advisory Council for Scientific and Industrial Research is stated to be due to dissatisfaction with the overlapping in research work and conflict between different organizations having similar objects. The Mines Branch and Geological Survey have their functions along lines of research which from time to time infringe upon the work of the Conservation Commissions or conflict with the plans of the Research Council. It is stated further that the Council has been subjected to the inconvenience of having to ask the Civil Service Commission for those it employed even for expert work. The Council moreover was greatly disappointed over the failure of the Government to approximate $500,000 for the establishment of a laboratory and bureau for research at Ottawa in accordance with the recommendation of a parliamentary committee.

New Developments in Don Luis District, Ariz., Important

About 80,000 Tons Shipped From Extension of Warren District Ore Zone—Sulphide at Depth

Recent developments have shown a very interesting extension of the ore zone of the Warren district, in Cochise County, Ariz., on the south side of the range. This ore area, the development of which has been independent of that of the main zone, is known as the Don Luis district. The probable connection with the main zone is through the Cole orebodies of the Calumet & Arizona Mining Co. However, insufficient work has been done to prove this.

Good orebodies have been developed by the Wolverine & Arizona, the White Tailed Deer mine of the Copper Queen, the Night Hawk Leasing Co., and the Boras Leasing Co. Small ore showings have also been encountered in the Wade Hampton mine of the Copper Queen and the L. S. & P. No. 3 workings of the C. & A. company.

The first work done in this area was from 1900 to 1902 on the White Tailed Deer claim on which copper and gold-silver ore outcropped. Subsequent to this early work, the White Tailed Deer group of claims was bought by the Copper Queen.

In 1902 the L. S. & P. Mining Co. acquired ground in this area, the ground being the southern extension of their South Bisbee Group of claims. In 1903 they sank the L. S. & P. shaft No. 3 on the Uncle Sam claim and did some drifting with indifferent results.

The Wolverine & Arizona Mining Co.'s group also extends into this area. This company in 1903 sank a shaft on the Broken Promise claim. Considerable development was done from this shaft both by drifting and by diamond drilling, but no ore was encountered, and work was discontinued in 1906.

The area lay dormant until 1910 when Mr. Lundvall, of Don Luis, obtained a lease on the White Tailed Deer mine. Work was done in a small way by him on the outcrop, and considerable silver and copper ore was shipped. In 1911 the White Tailed Deer shaft was sunk with the idea of prospecting for the extension of the ore outcropping. This ore dipped into the hill to the north. In 1912 a large orebody was encountered on the 150 level in the Sweepstakes claim. Shipments from this orebody continued on lease account until 1916, when operations were discontinued. In the latter part of the same year the Copper Queen company reopened the mine, developing considerable new ore and extensions The mine was shut down in 1918. Considerable ore is still in sight.

In 1912 Mark Dixon, of Don Luis, obtained a lease on the Wade Hampton mine. Stringers of silver bearing copper ore outcrop there, and were followed down. Considerable prospecting was done, but ore did not open up and work was discontinued in 1915. The ground was leased again in 1918 and some ore shipped as special silica ore to the Copper Queen smelter. The copper content was very low and the mine was again shut down in 1919.

In 1916 a lease was granted to Messrs. White and Verfurth by the Wolverine & Arizona Mining Co. on their Broken Promise claim. The shaft was started on an outcrop of iron and silica. Ore was entered at 240 ft. and some shipped. The company, on the discontinuance of the lease, developed this showing which proved to be a large orebody. Shipments have been continued intermittently to date and considerable ore is blocked out.

In 1917 the Boras claim of the Copper Queen was leased to the Boras Leasing Co., which was backed by local capital. Work was started on a stringer of copper ore outcropping on the claim. Operations were continued in a small way from an inclined shaft until the early part of 1919, when it was decided to sink a vertical shaft and prospect for the continuation of this stringer in depth. M. J. Elsing, formerly mine superintendent at Greene Cananea, was put in charge of operations. The shaft was sunk and toward the end of 1919 ore was encountered on the 400 level. This ore developed rapidly into a large high-grade compact orebody, from which steady shipments have been made and continue to date. This ore and all of the previous ore developed in the district was oxidized ore. In August, 1920, sulphide ore was encountered on the 600 level which has developed into a large orebody.

In 1917 the Night Hawk Leasing Co. was started by local capital to operate the Night Hawk claim, situated between the Boras and White Tailed Deer claims. Considerable work was done before ore was encountered. In 1919 a winze from the 450 level struck ore, which was subsequently developed on the 650 level, into a body of fair size from which steady shipments have been made. In September, 1920, a new orebody was encountered on the 650 level which is very promising. The work has been under the management of James McKenna, of Bisbee.

During the war a considerable tonnage of manganese ore was mined on the No. 4 claim of the Copper Queen. This ore outcropped and was worked by surface cut. Some of this type of ore was also mined on the Loyalty and Happy Home claims of the Copper Queen.

The encouraging results obtained by all operators in the Don Luis district is significant of the possibilities of outlying ground away from the main ore zone. This area has the advantage over other areas in that the ore appears to lie at shallow depths.

The total ore shipped to date is about 80,000 tons. The tenor of the ore is as good as that in the rest of the camp. As only a small part of the area has been prospected, the outlook is good here for a very valuable addition to the ore reserves of the Warren district.

Miami produced 4,549,140 lb. copper in September and 4,630,720 in August.

Readjusting Freight Rates in Colorado

But Those on Ore and Concentrates Shipped to Eastern Points Are Called Prohibitive

In compliance with the application of the Colorado Metal Mining Association for a readjustment of freight rates on ores and concentrates shipped from points of production in Colorado to destinations within the state, the carriers are now readjusting rates throughout the metal mining districts.

On Sept. 13, at a general conference of operators and traffic managers of Colorado roads, assurances were given that although no general order would be issued concerning the increased rate authorized by the Interstate Commerce Commission, readjustments would be made to meet conditions of each particular district. Operators were assured that if the shippers from each district would present their problems to their carriers, adjustments would be promptly made.

Readjustments have already been made in the San Juan, Leadville and Aspen districts and rapid progress is being made in fixing a rate satisfactory to shippers from various other districts. In most instances the rate in effect up to Aug. 26 has been restored on ores and concentrates carrying values less than $25 per ton, though in some instances, the lower rate is extended to a product of higher grade where it is shown that the rate was necessary to move the ore.

In the main, the adjustment of rates on intra-state shipments have been satisfactory, but operators declare that rates on ores and concentrates shipped to the zinc plants in Kansas, Oklahoma and other eastern points, under the increased schedule, are prohibitive and will result in a total cessation of shipments unless the former rates are restored. On Oct. 12, the Colorado Metal Mining Association made application to the Western Trunk Line Committee at Chicago, asking that it submit to the carriers a proposition looking to the restoration of the rates of Aug. 25. In the petition it was stated that:

"Increased production costs due largely to increased freight rates have resulted in an alarming decrease in production of zinc-bearing ore in this state, and the recent further increase threatens to effect an almost entire cessation of shipments of zinc ore and concentrates from Colorado common points to Kansas and Oklahoma smelters. In 1917 the production of zinc from Colorado ore amounted to 130,115,000 lb.; the production in 1919 decreased to 51,445,000 lb. At present there remain but three important shippers of these ores, and in the case of at least two of them, the increased rate wipes out the margin of profit and unless a readjustment of rates is made at an early day, these mines will cease production.

"The situation as to zinc ores in Colorado is such that outside of a very few exceptionally favored cases, the increased rate entirely absorbed the small margin of profit previously awarded mines which depended on shipping to eastern plants. Any further increase will terminate the existence of the few mines which are still shipping.

"The reason why increased freight rates are especially burdensome to Colorado zinc mines is that their product nearly always contains precious metals, lead and copper as well as zinc, and in order to recover them, after distilling off the zinc, the residue has to be shipped back to Colorado for smelting. Finally the crude bullion produced by smelting has to be shipped back to the eastern refineries. In this way the industry has to bear a triple freight charge and the effect of each increase is tripled, the final outcome being that most Colorado zinc producers can no longer compete with the Missouri and Oklahoma mines."

It is believed that an early date will be fixed for the hearing, and that the old rate, or possibly a lower one will be established.

Skip Wrecks Head Gear in Spite of Safety Devices

A serious overwinding accident occurred at "C" shaft of the East Norrie mine on the Gogebic Range in northern Michigan on Oct. 14, although no casualties occurred. With the empty skip a short distance below the collar and the loaded one on the first level the engineer made a mistake, reversed his engine and hoisted the empty skip at full speed. The hoist is driven through a reduction gear by an 875-hp. induction motor, has post brakes, and is fitted with two safety devices of recent design to prevent overwinding and overspeed, but these were improperly adjusted or were inadequate to prevent hoisting the skip up against the headsheave causing considerable damage.

The steelwork in the dump was wrecked, the crosshead torn from the skip and over to the first idler stand, and the body of the skip jammed just below the headsheave. It will require several days to repair the damage. Fortunately ore can be hoisted meanwhile at "D" shaft. The accident emphasizes the importance of frequent adjusting and testing of safety devices on hoists.

Forest Fires Hamper Shipping from Gogebic Range

During the last week shipments of ore from the Gogebic Range to the Ashland docks were greatly interfered with by brush and forest fires along the right-of-way of the C. & N-W. Ry. The Soo Line escaped the fires pretty well and many of the C. & N-W. trains were run over its tracks. However, many mines could not get enough cars even for the daily hoist let alone stockpile shipments. Many train crews were sent out to fight the fires and managed to prevent serious damage to the tracks. Heavy rains finally removed all further danger.

Utah Companies Getting Busy on Assessment Work

Little Chance of Exemption for 1920 Causes Work To Be Pushed—Chief Con. Active

Assessment work, allowed to lapse with government permission during the period of the war and subsequently owing to labor shortage and abnormal conditions, is being done in various Utah camps to hold unpatented ground for 1920. There is a good deal work of this kind going on in the Tintic district where some of the larger companies have been taking new ground, and where many new enterprises were undertaken following the coming in of a new producer in the Tintic Standard in the eastern end of the district. Much deep work is necessary in Tintic, where the ores are found largely some distance below the surface, and shaft sinking, although in its nature expensive, has been the best method of development.

The Chief Consolidated, which from its older ground is the largest producer of silver ores in the state, is this year doing its assessment work on its large holdings of newer territory, some of which is unpatented, by means of shaft work centrally located to benefit the group in question and of permanent value to it. It is now starting two new shafts, one to the northeast of the Central Standard, and another southwest of the Copper Leaf near the old Baltimore claims, which it acquired a number of years ago. A third shaft is projected for the extreme northern end of the Chief holdings. Last year this company spent over $25,000 in assessment work on its unpatented claims, although not obliged to by law to develop its holdings. Other companies are starting their assessment work. The East Crown Point is understood to be arranging a contract for the further sinking of its main shaft as assessment work. The Tintic Humboldt has put a small force on assessment work.

B. C. Operators Would Change Tax Act To Allow for Depletion

Representatives of the mine operators of British Columbia are anxious to induce the provincial government to amend the Taxation Act in order that allowance may be made for the depletion of ore reserves in mining property. As it now stands anything that is allowed comes as a concession from the minister of finance after an investigation. The opinion among mining men is that the principle of allowance for depletion of ore reserves should be recognized in arriving at the basis for the taxation of a producing mine. A delegation from mining companies interested in this Province recently met the Premier and members of the Executive to discuss this and other phases of the Taxation Act. They are confident that their arguments will have the effect of producing the desired amendments at the next session of the legislature.

Army Gas Mask and Dust Respirator Worthless in Mine Fire

Two Men So Equipped Killed in Recent Fire in Calaveras Copper Co.'s Mine in California

The following report of the recent fire in the mine of the Calaveras Copper Co., at Copperopolis, Cal., has been published in the California Metal and Mineral Producers' *Bulletin* to correct any erroneous impression that may have been received from the incorrect and garbled accounts published in the daily press:

"On Sept. 30 at 12:20 a.m. a fire was discovered in buildings near the collar of the Union shaft. As soon as possible all men were taken from the mine. The next morning about 9 a.m., an ex-soldier wearing his army mask started for the 1,200 level of the Discovery shaft, the main working shaft, to open an air valve. The mine at this time was filled with gas from the fire which had burned down the headframe at the Union shaft and the falling burning timbers had ignited the timbering in the shaft.

"This man did not return and two other men wearing the ordinary dust respirators started for the 1,200 level to recover the first man who had gone into the mine. Just what happened to these two men is uncertain, but one of them got back to the surface alive but suffering from the effects of gas.

"Mr. Kelsey, manager of the Argonaut mine, with three men and mine rescue apparatus arrived at the mine during the day but acting under instructions from the chief mining engineer of Industrial Accident Commission made no attempt to enter the mine until more trained men and apparatus were at hand.

"F. L. Lowell, deputy mining engineer of the Industrial Accident Commission, and Mr. Cooke, of the Bureau of Mines, left Berkeley on Thursday with the Bureau of Mines Rescue Truck No. 6 and had arrived within eight miles of Copperopolis at 4 a.m., Oct. 1, when the magneto drive shaft on the truck broke. The rescue apparatus from the truck was then taken to the mine in an automobile. B. O. Pickard, district engineer of the Bureau of Mines, and Mr. Gardner, in charge of Mine Rescue Car No. 1, of the Bureau of Mines, were at Reno when advised of the fire and arrived at Copperopolis on the morning of Oct. 1. Mine Rescue Car No. 1 was at Tonopah and arrived at Milton, the nearest railroad point to Copperopolis, at 2 p.m., Oct. 2.

"As soon as the mine rescue apparatus from the truck reached the camp preparations were made to train men in its use. The first descent into the mine was made on the afternoon of Oct. 1. Upon the arrival of the crew of Mine Rescue Car No. 1 rescue crews were organized and the bodies of the two men were recovered on the night of Oct. 2. Their bodies were found in the sump below the 1,200 level and apparently both men had been overcome by the gas and had fallen into the sump. Both men were killed either by gas or by falls, as their necks were broken and the bodies were otherwise bruised, but their lungs contained no water.

"*We wish to state in the most emphatic terms in the English language or in any other language that to wear an army gas mask when entering places containing gases from mine fires or from blasting is certain death to the man wearing the mask and as in the above case other men may lose their lives in trying to recover the first man.*

"*Do not allow an army mask to be brought onto your property for any purpose whatsoever.*

"*Dust respirators are good for dust only.*"

New Dredging Project To Be Undertaken in Guianas

Guiana Development Co. Plans To Instal Dredge and To Build Modern Camp on Upper Maroni

Perry Tiffany, president of the Liberty Company, and George A. Laird, general manager of the Guiana Development Co., with a party of ten engineers and operators, will sail for South America about Oct. 20 to begin active work on installation of dredging equipment on the Maroni River, between French and Dutch Guiana. The company intends extensive development work including the construction of docks, power plant, machine shops, and other buildings, as well as the building of a modern camp, to be equipped with ice and cold storage plant, water works and sewage system. A large part of the equipment has already been shipped to San Laurent, French Guiana.

No. 1 dredge, now being built by the Yuba Construction Co., of Marysville, Calif., will be shipped from San Francisco early in January by which time it is expected that barges for river transfer of equipment and a road passing around the Armira Falls will be ready for the transfer of equipment to the plant where operations will be started. While attempts have been made at various times to install equipment in the upper waters of the Maroni, the obstacles in the way of transportation have been too great for the successful culmination of the venture. The Guiana Development Co. is prepared to meet any emergency and is thoroughly equipped for marine and land transportation.

Reno Chamber of Commerce Establishes Bureau of Mining Information

Development of the little known minerals and metals of Nevada is contemplated by the Reno Chamber of Commerce through a recently established bureau of mining information. The bureau proposes to bring together buyers of these minerals and owners of deposits. Owners have been invited to send in descriptions of their properties to the bureau for listing.

First National Standardization Conference at Denver in November

The standardization committees of the American Mining Congress recently issued invitations to a National Standardization Conference, to be held in Denver, Col., in conjunction with the 23rd Annual Convention of the American Mining Congress, to be held Nov. 15 to 20, 1920. The purpose of the conference is to discuss improvement and standardization of mining practice, or mining methods, as applied to mining equipment and machinery, labor and labor saving devices, safety codes, costs, accounting, government and state co-operation with mining companies. The invitation is signed by Colonel Warren R. Roberts, of Chicago, Ill., chairman of the coal mines section, and Charles A. Mitke of Bisbee, Ariz., chairman of the metal mines section of the standardization committee; Horace F. Lunt, State Commissioner of Mines of Colorado, and Richard A. Parker, chairman of the mining bureau of the Denver Civic and Commercial Association.

The standardization committee of the American Mining Congress is divided into the coal and metal sections. Each section is composed of a general committee, and a number of subcommittees, the chairmen of which automatically become members of the general committee.

The metal mines section of the committee came into existence this spring with the appointment of a number of subcommittees, and others are planned. Seven subcommittees have already been appointed. They are:

The subcommittee on standardization of drilling machines and drill steel; on standardization of steam shovel equipment; on standardization of underground power shovels; on standardization of underground transportation; on standardization of fire-fighting equipment; on standardization of mine timbers; and on standardization of mine ventilating equipment.

The personnel of these subcommittees is representative of the large metal producers of the country, and efforts were directed toward the making of an impartial selection, in order that the standards finally adopted might be the result of the concentrated thought of the best talent in the industry.

As the committee members are very widely scattered, frequent meetings were considered an impossibility, and the work of the committees is therefore being carried on largely through correspondence. In order to collect material for a working basis, and to obtain an idea of the needs of the industry, a questionnaire embodying the main points proposed to be taken up by the various committees is sent to each committee member and to operators in districts not represented by committee members. Upon the return of this information, the chairman of the subcommittee compiles and tabulates the data thus obtained, sending

copies to each of his committee members, with a request that after carefully studying the same he will furnish the chairman with suggestions and comments. A further exchange of such suggestions is then made, which paves the way for a general discussion between the chairman and his committee members, and which, it is hoped, will ultimately result in the evolution of standards of value to the mining industry.

Lake Iron Ore Shipments Put At $57,000,000 Tons for Season

It has been estimated that about 57,000,000 tons of iron ore will be sent out from the Lake Superior district during the 1920 season. This will be several million tons short of requirements, due to the fact that the boats lost considerable time during the early part of the navigation season and it was close to mid-summer before the mines were able to ship steadily. The coal shortage also has had something to do with slowing up the shipments. However, the season's movement will be close to 10,000,000 tons ahead of 1919, but about 8,000,000 tons short of the biggest year. It is reported from Cleveland that some furnaces will be short of ore for the winter run and they are willing to contract now for more ore if they can get the vessels to haul the ore. It is almost impossible to make vessel contracts at present as many of the boats will soon enter the grain trade and the others will have all they can do to meet present requirements.

Some operators are already trying to figure what the iron ore price for 1921 will be in view of the fact that pig iron is a trifle weaker and steel is expected to take a drop. Ore is selling higher than ever before and it is not believed that the price can be maintained if pig and steel go down. The recent increase in rail and freight rates hit the mining companies hard as they must pay the transportation charges on ore to lower lake ports from the mines. Many a small operator would suffer if the price declined and wages and freight rates remained at the existing levels.

Mount Bischoff Tin Reserves Less

J. D. Millen, late general manager of the Mt. Bischoff Tin Mining Co., operating at Waratah, Tasmania, is now a senator in the Commonwealth Parliament. C. W. Gudgeon, the new mine manager, has issued an estimate of the ore reserves showing a considerable reduction in the tonnage estimated by Mr. Millen. Mr. Gudgeon estimates that there are 123,870 tons, averaging 0.35 per cent tin, in sight together with 266,000 tons of "probable" ore. This is equivalent approximately to three years output, but active development work is proceeding and the mine has been such a consistent producer for so many years that its supporters are optimistic as to the result. The output during the half year ended July 31 was 49,098 tons.

Ontario Mining Camps Short 2,000 Men

Labor Survey Completed by Government Finds Shovelers and Trammers Most Scarce

Following the inspection of the labor situation in Northern Ontario by the general superintendent of the employment service of Ontario, it was found that the actual shortage in Cobalt, Porcupine and Kirkland Lake amounts to 2,000 men. This figure applies only to the operating mines and does not take into account the smaller properties, nor the number of men required for new exploration work, which would be undertaken if labor were available. The mine managers have been trying to arrange to have foreign labor imported to fill this shortage. Although there is a certain amount of unemployment in the factory centers, it is generally found that this class of labor is not suitable for mining purposes. In Cobalt the average labor turnover is about 25 per cent a month, and it is impossible for the companies to do efficient work under these conditions. The shortage of shovellers and trammers is most acute and this class of labor was generally recruited from foreign countries previous to the war.

Fire Destroys Part of Lowell in Warren District, Ariz.

Fire on the night of Oct. 11 wiped out more than one-half of the town of Lowell, a suburb of Bisbee, sweeping everything on the north side of Main Street and up to the municipal market on Naco road. The damage is estimated at $750,000.

Claims of Returned Soldiers Opened for Re-staking, It Is Charged

Complaints have been made to the Ontario government that in many cases claims staked by returned soldiers have been thrown open for re-staking and taken up by other parties in disregard of an Order-in-Council issued Dec. 18, 1919, relieving such claims from forfeiture for non-performance of assessment work until Jan. 1, 1921. The Minister of Mines has issued instructions to mining recorders to protect the holders of such claims against forfeiture, but in the meantime the situation has been complicated by reason of the new holders having performed assessment work in good faith. What measure of relief will be adopted in such cases is as yet undecided.

Lectures for Prospectors

Instructions have been given the different government mining engineers of British Columbia to prepare to deliver a series of lectures on elementary geology and mineralogy at the different important centers of their several districts during the winter. This is being done at the suggestion of the Prospectors' Protective Association of British Columbia.

Tintic Standard Co. Erecting Ore Treatment Plant

The Tintic Standard Mining Co. is erecting an ore-treatment plant at Harold, Utah, 12 miles from their mine in the East Tintic district and on the Tintic branch of the D. & R. G. The process to be used will be the Holt-Dern, at present in use at Silver City, Utah. Only low-grade and highly siliceous ore will be treated at the plant. The high-grade and basic ores are to be shipped directly to the smelters. The unit under construction at present will consist of seven standard Holt-Dern roasters, each of an average daily capacity of 160 tons of charge. The crushing plant will be of sufficient capacity for two units of the size now being installed. It will consist of a gyratory, Symons disc crusher and two sets of 48 x 16-in. rolls. The leaching and solution tanks will be of concrete construction. A boarding house, machine shop, carpenter shop and warehouse will also be constructed. In addition to scrap iron precipitation erection of an electrolytic precipitation unit is planned after the plant is started. This will be about Dec. 1.

Recent Production Reports

The Rand's gold output in September was 682,000 oz. against 702,000 in August.

Butte & Superior produced 7,500,000 lb. zinc in concentrates and 138,000 oz. silver in September compared with 7,800,000 lb. zinc and 140,000 oz. silver in August.

Utah Copper produced 8,420,000 lb. copper in September compared with 8,820,000 in August.

Chino Copper's September output was 5,161,894 lb. copper compared with 4,000,148 in August.

Ray Consolidated's output in September was 4,502,000 lb. copper compared with 4,505,000 in August.

Nevada Consolidated's production in September was 4,650,000 lb. copper, the same as in August.

Granby Cons. M. S. & P. Co. produced 2,239,174 lb. copper in September compared with 2,471,200 in August.

Chile Copper produced 9,496,000 lb. copper in September compared with 10,640,000 in August.

Calumet & Hecla produced 7,278,215 lb. copper in September against 7,520,107 in August. Production by companies in September was: Ahmeek, 1,618,300; Allouez, 0; C. & H., 4,169,788; Centennial, 0; Isle Royale, 727,864; La Salle, 0; Osceola, 643,200; Superior, 46,893; and White Pine, 82,169.

Shipments of copper ore, matte, etc., to the United States from Alaska in September were 2,287 gross tons containing 1,635,677 lb. copper. Other metal shipments were: Palladium, 175 oz.; platinum, 19 oz.; gold ore and base bullion, $263,850; gold bullion, 36,592 oz., and silver ore and bullion, $13,687.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Cottrell's Successor a Topic of Discussion

Chemists Want a Chemist, Geologists a Geologist, and Oil Men a Petroleum Technologist

Country-wide interest is being evidenced in the type of man who is to succeed Dr. F. G. Cottrell as director of the U. S. Bureau of Mines. Chemists are taking exception to the assumption that the new director must be a metal-mining executive. They see no reason why a chemist, who is a good executive, should not be a perfectly proper director for a Bureau which is divided into branches of chemistry, petroleum, coal mining, metal mining and safety.

The geologists also have been heard from and they suggest that one of their profession may possess the necessary requisities for the directorship. Some oil men are of the opinion that, since their industry represents investments greater than those in any other branch of mining, a petroleum technologist should be considered, thereby insuring that the Bureau would expand its petroleum work, which is held to be entirely inadequate to the importance of that industry.

Crane Heads New Tuscaloosa Experiment Station

W. R. Crane, who has been chief engineer of the War Minerals Relief Commission, has been chosen to be superintendent of the new experiment station of the Bureau of Mines at Tuscaloosa, Ala. The work of the station is to be largely on coking and by-product problems, but two non-metals specialists will be assigned to the station. It is the hope of Bureau officials that eventually this station can be expanded to the point where coking and byproduct experimentation may be commensurate with the importance of those industries.

There is an insistent demand on the part of the industries interested in non-metallics that they have a station of their own in the center of the non-metals producing region. They are anxious that the work done by the two specialists at Tuscaloosa be regarded as temporary, pending the granting of the appropriation for another station which they fully expect to be devoted exclusively to non-metals work.

Bert W. Dyer New Federal Mine Inspector for Alaska

In the future the work of the Federal mine inspector for Alaska is to be on a somewhat different basis. The vacancy, which has existed in this position since the resignation several months ago of Sumner Smith, has been filled by the appointment of Bert W. Dyer, who has been in charge of one of the Bureau's mine rescue cars. He is a mining engineer and has had experience in both metal and coal mining.

In the past the headquarters of the Federal mine inspector have been at Juneau. Mr. Dyer's headquarters will be at the mining experiment station at Fairbanks. It is believed that his field work will tie in effectively with the work of the station. It is believed that the territorial mine inspector can take care of the metal mines without a great deal of assistance from the Federal inspector. This will give the Federal inspector a chance to devote more of his time to the coal mine areas.

Disabled Soldiers Studying Mining Engineering

Courses in mining engineering are being pursued by 104 disabled former service men under the vocational education statute. The total number taking engineering courses is 1,949. The work in mining engineering is divided among thirty-seven schools, of which two are in New England, nine in the east, four in the south, eight in the middle west and fourteen in the west.

Courses in oil engineering are being pursued at the University of Pittsburgh, University of Florida, Marietta College (Michigan), National Petroleum School (Chicago), University of Utah, California Polytechnic School, Occidental College (Los Angeles), and State School of Mines (Oklahoma). Eighteen ex-service men are enrolled at these schools. The work is under the auspices of the Federal Board for Vocational Education.

War Minerals Awards

Only two awards were recommended by the War Minerals Relief Commission during the week ended Oct. 9. Both were chrome cases. In one, Walker & Arnold made claim for $5,174.47 and were awarded $713.34. The other claim was that of C. D. McGonnigal. He asked to be reimbursed to the extent of $1,910.62, but the Commission awarded only $51.78.

In addition, re-allowances totaling $2,731.05 were recommended. In the claim of Fred A. Babcock, an additional $159.95 was allowed. A review of the claim of Gaylord & Landis, which had been disallowed, resulted in an award of $680.93. An additional $610 was allowed in the claim of the Hillside mine which already had been awarded $10,642.27. In the claim of E. C. Trask, the original award was $483.99. On review an additional $1,280.17 was allowed.

Operators Meet Bureau of Mines' Officials at St. Louis

Ways of Aiding Zinc and Lead Industries in Tributary Districts Discussed

That the Bureau of Mines can extend material assistance to the zinc and the lead industries in the region tributary to St. Louis was an opinion unanimously expressed at the conference in that city on Oct. 9, when Bureau officials met representatives of the operators.

It was agreed that the Bureau should confine itself to problems common to all mines, rather than undertake to be of any great amount of assistance in aiding individual companies. The problems of the district are divided into three classes—those of metallurgy, ore dressing and mining. The underground handling of ore is the principal mining problem common to all properties in the region. John Gross, one of the Bureau's ore-dressing engineers already is on the ground. A survey is to be made of milling operations. Work is to be begun at once on the Illinois ores containing fluorspar. This will be followed by a study of the ores in the Joplin district.

In the metallurgical studies efforts will not be confined to the improvement of the retort practice but will include efforts to develop new thermal metallurgy. Dorsey A. Lyon, the supervisor of the Bureau's experiment stations, is now casting about for the necessary personnel to organize the highly specialized work necessary in conducting the Rolla station.

Goodpaster-Salchaket Area Surveyed in Alaska

During the field season, just closed, in Alaska a geologic survey was made of the eastern extension of the rocks which in the Fairbanks district have proven so richly auriferous. The region in which the survey was made last summer is known as the Goodpaster-Salchaket area. Most of the general region east of Fairbanks already had been surveyed, but this area, which contains some 2,000 square miles, never had been covered. The work was done by P. S. Smith, of the Survey.

To Study Effect of Oxy-Acetylene

Increasing use of the oxy-acetylene torch in underground mining operations is bringing many inquiries to the Bureau of Mines as to the possible injurious effects which may result from this operation when carried on in confined places. It is known that some irritation to the eyes and lungs results from the use of these torches, even in the open air.

NEWS BY MINING DISTRICTS

Special London Letter

Excited Trading in Esperanza on News of Rich Strike—Passing Rio Tinto Dividend Causes No Surprise —Rand Stocks Prominent

BY W. A. DOMAN

London, Oct. 5—Relief to the otherwise stagnant condition of the mining market has been provided by excited dealings in Esperanza shares. The mine is managed in America, but the holding company is a London undertaking. At the last annual meeting of shareholders the chairman, R. J. Frecheville, referred to development work that was in progress, and his remarks led to high expectations as to the values that would be encountered in the Descubridora vein. These have proved to be of a very remarkable character, and the price of the shares jumped, by stages, from about 15s. to 52s. 6d. Jobbers were caught short, and some of them are reported to have cut very substantial losses. With business quiet in other departments dealers flocked to the Esperanza arena, and helped themselves more or less liberally. The interesting point in the mine at the moment appears to be the No. 5 level. In the north drift 10 ft. gave the extraordinary values of 64.84 oz. gold and 577 oz. silver; the previous 16 ft. assayed 40.5 oz. gold and 664 oz. silver. Of this very rich ore there is a length of 47 ft. Latest disclosures are not so high, though they are still of a remarkable character, 21 ft. showing the reef to be 25 in. wide, and containing 13 oz. gold and 397 oz. silver to the ton of 2,000 lb. In the south drift latest advices are to the effect that 15 ft. over 12 in. show 4 dwt. gold and 13 oz. silver. Apparently a fair sized bonanza has been struck, the point being emphasized by news that good values have been met with 150 ft. higher in the mine, but such values are not yet announced. The above figures might not of themselves warrant such an improvement in price as has taken place, but the Esperanza company possesses other important interests that are expected to turn out well.

To anyone who had followed events the non-declaration of an interim dividend by the Rio Tinto company did not come as a surprise. Apart from that in October, 1914, this is the sole occasion when the interim dividend on the ordinary shares has been passed. The Rio Tinto makes more out of its pyrites nowadays than out of copper, and the European market has ruled decidedly dull. The company has also felt the competition of America, where during the war greater quantities of pyrites were produced. Added to this there has been a strike of workmen which the management attribute to external influences. Other parties blame the company for not raising wages, because the whole district is dependent upon the mine, and it is a serious thing when 10,000 men cease operations. In order to avoid starvation thousands of miners have left the district. The shares are mainly held in France, and from Paris they have recently been turned out, with the result that the quotation is the somewhat nominal one of £30. Previously double this figure was nearer the mark.

As the premium on gold is being maintained at a high level, and as there are indications that the South African gold mining companies will declare enhanced dividends for the current half year, public attention is again being directed to this market. Many companies are making more out of the premium than out of working profit at standard price. The East Rand Proprietary Mines which, before a free market in its product was permitted, could see the end approaching, has taken on a new lease of life, and its profits are becoming very substantial. At the moment the shares are more or less of a gambling counter, but the position of the debenture holders is greatly improved.

CANADA

British Columbia

Labor Situation in Slocan Unchanged—Trail Smoke Nuisance Case Being Arbitrated

Nelson—The strike in the Slocan continues in effect, operators showing no dispostion to return to their former state of activity, even if the One Big Union organization should officially declare the strike ended. Operations are being maintained at the Silversmith Mines, at Sandon, with an O. B. U. crew. The Bosun, between New Denver and Silverton, is working with a force recruited from the diminished ranks of the International Union of Mine, Mill and Smelter Workers, and a start has been made in the direction of resuming operations at Noble Five and Rambler-Cariboo. Outside of these properties, and a number of leasing syndicates, the Florence at Ainsworth and the Blue Bell at Riondel, mining activity in the Slocan and Ainsworth mining divisions is at a very low ebb. There is no prospect of improvement this winter, unless the labor situation eases up. The lumber operators' demand for labor is lessening.

The California mine, near Nelson, continues development with a small crew, although milling operations have been temporarily suspended. The milling done this fall has been more in the nature of a test of a process worked out for concentration of ores of the California mine, the old Athabasca gold stamp mill being leased and practically rebuilt for that purpose.

Trail—Much interest is being shown in the outcome of the case involving claims for damages by ranchers near Trail against the Consolidated M. & S. Co., on account of alleged injury to fruit trees by smoke and fumes from the smelter at Trail. The case has gone to arbitration, with Judge Forin, of Nelson, as arbiter. Voluminous evidence is now being taken, but it is not anticipated that a decision will be reached until the end of the year.

Allenby—Canada Copper Co.'s 2,000-ton concentrator is ready to start. The power line was completed in September and at present the company is drying out the transformers. The ratio of concentration will be approximately 19 to 1.

Yukon Territory

Operations in Keno Hill Region

W. E. Cockfield, of the Canadian Geological Survey, who has been working in the Keno Hill, Mayo, and other adjacent sections of the Yukon during the summer, says that there is much activity in the Keno Hill region and that much development is being carried on by the Yukon Gold Co. The company expected to ship 3,000 tons of ore this winter. The ore assayed high grade silver-lead, running 200 oz. of silver and 50 to 60 per cent lead to the ton. The principal ore, he said, was galena, siderite, and manganese, occasionally carrying freibergite. The gold content was small, not exceeding, as a rule, $4 to the ton. On the upper Stewart River there were some stamp mills in operation but little placer mining was being done. A gold dredge had been in operation on Highett Creek during the summer. Mr. Cockfield has gone East.

Ontario

May Merge Orr Gold Mines With Kirkland Lake and Teck Hughes—No Oil at Paradis Bay

Gowganda—The Trethewey mine in Gowganda has shipped another ten tons of high-grade ore.

Elk Lake—The Cane property in the Elk Lake district has shipped 200 bags of ore, and has an additional quantity on hand. This ore, it is expected, will run approximately 400 oz. to the ton.

Cobalt—The annual report of the Hudson Bay mine shows a total income of $102,000 and expenses of $99,000, leaving a profit of $3,000 for the year.

There appears to be very little foundation for the recent report of oil at Paradis Bay, near Cobalt. An investigation by the Provincial Department shows that no oil exists, but that there is a possibility of there being gas.

Kirkland Lake—Since the recent reopening of the Orr Gold Mines in Kirkland, the orebody has been further extended, and has now been proven for a length of about 400 ft. and a width of 10 ft. The amalgamation of this property with the Kirkland Lake and Teck Hughes mines is being talked of.

ALASKA

The matter of using part of the mill equipment of the Alaska Gold Mines for the manufacture of wood pulp is under consideration by the company and certain outside interests. Nothing definite has developed to date, it is stated.

CALIFORNIA

Electro Metals Co. To Build Smelter at Trinidad

Quincy—The Seneca-Eureka mine in the Seneca district of Plumas County, about five miles from Lake Almanor, a gold property of some promise, is now being actively developed by its owner, C. D. Hazzard, of Quincy. The property covers an area about two miles long and one mile wide reaching from the North Fork of the Feather River to the top of the mountain. All claims are contiguous and the entire group is covered with good timber and has two streams of water on it that may be used for power purposes. The property contains five ledges, four of which show good values in free gold and the fifth carries considerable arsenical sulphides.

The Blue King group of claims, five miles northeast of the Walker mine, and which is now being operated by the Mason Valley Mines Co., has one of the widest mineralized zones on the surface to be found on the Plumas copper belt. There are three parallel veins, 150 ft. apart, with sufficient values between so that the mineralized zone is considered 300 ft. wide. The veins are 8 ft., 12 ft. and 20 ft. wide, respectively, and are traced by croppings for a length of 800 ft. There are seams of high-grade which run 6 per cent copper, though the average near the surface is not believed to be over 2 per cent. The ore, however, runs better in silver and gold than most of the ores of the belt.

Eureka—The old town of Trinidad, 30 miles north of Eureka, which was once one of the principal lumber shipping ports of the county, is getting on the map once more. An electric smelter for producing aluminum and the treatment of other metallic ores by electro-chemical processes is to be built. A deed conveying the whole property and rights and another instrument placing the property in the hands of trustees to operate and conduct it for a term of 25 years from July 31, 1920, have been filed with the County Recorder. The deed is from Frank and Carl Langford, of Eureka, and W. G. Devereaux, of San Francisco, to B. L. Thane, Roy H. Elliott, Frank R. Wehe and E. K. and F. Solinsky of San Francisco. The company will be known as the Electro Metals Co.

Downieville—Work on the 3,000-ft. tunnel to tap the channel in the Bella Union-Poor Boy ground will begin shortly. Most of the tunnel will have to be run through hard rock, and it is planned to instal power as early as possible next spring, but it will be several months before definite plans can be made.

NEVADA

Arrowhead's First Shipment Nets $57.40 Per Ton—Nevada Packard in Receiver's Hands

Arrowhead—The first shipment of 30 tons from the Arrowhead mine netted the company an average of $57.40 per ton. Mark Bradshaw is now consulting engineer.

Packard—The Nevada Packard mine is now in the hands of a receiver as a result of action taken by creditors to whom about $55,000 is owed. Captain Herman Davis, superintendent, has been named as receiver. The Packard has been shut down for some weeks owing to lack of power and this precipitated the action.

Eureka—Shipments for the first week in October were as follows: Eureka Holly, 13 cars of ore; Eureka-Croesus, 6; Eureka-Prince, 5; Cyanide mine, 3; Silver West slag dump, 3 cars of speiss; Richmond-Eureka Mining Co., 29 cars spiess.

Virginia City—The production of the Con. Virginia for the first week in October is given a gross value of $15,000. The north drift from the bottom of winze on 2,150 level was advanced 41 ft. and is credited with yielding 134 tons of ore assaying $77.84 per ton.

Pioche—Ore shipments from the Pioche district for the week ended Oct. 7 were 50 per cent below normal owing to increased freight rates. A reduction of train service is already reported. Shippers were as follows: Prince Consolidated, 950 tons; Virginia Louise, 400; Bristol Silver Mines Co., 150; Black Metals Co., 110; Emerick Deerfoot Lease, 85; Combined Metals Co., 50, and S. T. Campbell Bristol, 50; total, 1,795.

ARIZONA

Shannon Working Yeager Canyon Property

Jerome—Shannon has resumed development of its Yeager Canyon property, near Jerome, intending to sink to depth and outline the copper deposit that has been cut above. In Cochise County ore is being shipped from the Gleeson mine to the Douglas furnaces of the Copper Queen. The Shannon directorate had been empowered to venture in Texas oil, backed by the money realized from the sale of its property in the Clifton-Metcalf district, but the officers have found nothing attractive and are turning back to their Arizona mines. Much of the cash realized has been securely placed in bonds.

Globe—A station has been cut on the 1,500 level of Iron Cap and extensive lateral development work will be started at that depth, as well as upon the 800 level, where there will be exploration to the westward. The new mill is reported working well, with a high percentage of recovery from 300 tons treated daily. A fire control system is being established underground, with doors that are closed by release of pneumatic pressure on the surface.

NEW MEXICO

Great Eagle Fluorspar Mine Sold—Amory Stevens Manganese Properties To Resume Shipments

Lordsburg—The Great Eagle fluorspar mine on the Gila River north of Lordsburg was sold Oct. 2 to Michigan capitalists represented by A. Ross, mining engineer. A considerable cash payment was made with balance to follow in a short time. The deal was consummated by D. L. Hill, president of the Bonney-Consolidated Copper Co. A mill will be erected at once, some of the machinery being contracted for by wire. A finished high-grade product will be turned out, suitable for acid and enamel purposes, the middlings being sold and shipped subsequently for metallurgical purposes.

The Co-operative Mining Co. has purchased all the equipment of the Radium Co. of America's property at White Signal. The new hoist has been installed and the main shaft will be sunk 200 ft. below the present level, which is 235 ft. A car of mine-run ore is shipped about every two weeks to the El Paso smelter.

Silver City—Judge M. W. Porterfield, who has been in charge of the Amory Stevens manganese properties on Boston Hill, has been in Chicago, Washington and Pittsburgh in an effort to have the old freight rates restored on this product, which is low grade, the advance in freight rates having utterly killed the business. He reports that his efforts have been successful and shipments will start again just as soon as the old rates are officially restored. These properties had been shipping about 300 tons daily to the C. F. & I. at Pueblo.

COLORADO

New Plant for Treating Radium Ores Erected in Boulder

Ouray—Development at the Camp Bird in the east heading from the tunnel level has been unencouraging. Only short stretches of commercial ore have been opened, and these are in narrow widths. It is not believed that these ore showings will afford a sufficient daly tonnage for profitable milling. Therefore work in this part of the mine has been suspended for the present, and activities have been transferred to the west end workings from the tunnel level and reaching out under the past productive area in this end of the mine. The west heading is 614 ft. long, measuring from the tunnel intersection with the vein. For a distance the vein was pinched and indistinct, but widened to 4 or 5 ft. near the breast, having all the characteristics of the vein in overlying levels, except that it is lean in values, and no payable ore has been encountered. During April the heavy snowfall did some damage to buildings. The roof of one wing of the cyanide mill collapsed. During the quarter ended June 30, 1920, 881 ft. of development work was performed. The length of the east heading was 2,270 ft.

Boulder — The Tungsten Products Co. has expended about $7,000 in the erection of a chemical plant for treating radium ores. The plant is located in Boulder at the corner of Pearl and Third Streets. The ores which will be treated at this plant are being mined in the company's property at Gateway, Col., on the southwestern slope.

SOUTH DAKOTA

Bob Ingersoll Mine Sold, Also Swansea Lithia Property—Golden Summit Shuts Down—Cutting to Resume

Keystone—The Bob Ingersoll has been sold to Dennis Henault and associates. This property has produced considerable lithia ore, mica and beryl during past years and it is expected that under the new ownership the output will be greatly increased.

The Swansea lithia mine in the same district was also sold within the last few weeks and active work is to be started soon.

The Maywood Chemical Co. continue shipments of spodumene to their plant in New Jersey, the Etta mine supplying most of the material.

Hill City—Work at the Golden Summit mine, under lease and option to the First National Gold Mining Co., has been suspended owing to scarcity of labor and high costs of operation.

Deadwood—Preparations are under way to resume work at the Cutting property. New pumps capable of handling the large amount of water have been ordered and upon their arrival will be installed and the development work will be continued.

UTAH

Utah Apex To Add Flotation Unit—Homestake, at Park City, Being Reopened

Bingham Canyon—The Utah Apex is sinking its shaft to the 2,000-ft. level to reach the downward extension of the orebody on the 1,800 level. A flotation unit will be added to the mill, which will reduce costs on low-grade ores. A decision in the suit with the Utah Consolidated is expected before long from the United States District Court at Salt Lake City which has had the case under advisement for nearly a year.

Park City—The Homestake situated near the Glen-Allen and the Park-Utah in the southeastern part of the camp is being reopened after several years, owing to promising developments in neighboring properties. There is a 150-ft. shaft on the ground and a tunnel reaching the vein at a depth of 200 ft. The first work to be undertaken will be drifting on the vein. Samuel Paul is president and general manager and Robert Gorlinski, vice president.

The Ontario has resumed work on the 2,000-ft. level, the lowest level in the mine, after a months' intermission, owing to breaking a crank shaft on the compressor. A new pump has been installed on the 2,000 level which has been unwatered.

MONTANA

Silver Butte To Reopen Balaklava—Cascade M. & M. Co. Leases Property of Cascade Con.

The Silver Butte Mines Corporation has acquired through purchase and under a reorganization plan all of the Butte-Balaklava's $225,000 bond issue. Under the reorganization scheme Balaklava stockholders received 50 per cent of the bonds in cash and the balance in stock of the Silver Butte Mines at a par value of $1. Holders of Butte-Balaklava stock can exchange it share for share with Silver Butte Mines with 50c. added for each share exchanged. Considerable stock, it is stated, already has been exchanged. Arrangements are under way for the immediate reopening of the old Balaklava mine in the Butte district, which has not been operated since 1917. The Balaklava shaft is down to a depth of 1,600 ft. but is in need of repairs. From 20 to 30 leasing applications to work the Balaklava have been received. The Corbin property of the Silver Butte Mines embraces the Corbin King group of 26 acres, through which four known veins strike, three of which have been cut at a depth of 400 ft. by a two-compartment shaft, conditions being promising with respect to vein filling. Six carloads of ore already have been shipped from development operations, which averaged 21 oz. of silver and a 12 per cent copper. Unwatering and cleaning out will require about a month's time. Lumber was shipped to Corbin recently. An electric hoist, good for 1,000 ft. in depth, will be installed together with a compressor plant.

The stockholders of the Cascade Mines & Mills Co., operating in the Neihart district, have leased to the Cascade Consolidated Silver Mines Co. its property, including mines and mill, for three years. W. L. Creden, formerly of the Davis Daly, is in charge.

ARKANSAS

Arkansas Lime Co. Adopts New Methods To Overcome Labor Shortage

Ruddells—The Arkansas Lime Co. has almost eliminated hand labor from its quarry operations. A steam shovel replacing twenty-five men was recently installed. George Weigart, manager, states that a saving of $50 a day over the old method is being made. A churn drill has also been installed and jackhammers and other rock drills are now used only for breaking large boulders. The churn drill is now at work on a round of four holes at the south end of the quarry, the face being 250 ft. wide and 85 ft. high. The holes will be 75 ft. deep and are about 15 ft. behind the face. It is estimated that these four holes can be shot successfully with 1,200 lb. of dynamite breaking 10,000 tons of rock. This blast will be fired next month after which a round of fifteen 75-ft. holes will be drilled back of the whole face. It will take until spring to complete this work. It is estimated that 36,000 tons will be broken with this round. These methods have been adopted to overcome the labor shortage which has hampered operations for the last two years.

MICHIGAN

The Copper District

Superior's Shafts Closed—Quincy Not To Absorb Hancock

Calumet—Both shafts of the Superior Copper Co. are completely shut down, the rails having been removed from No. 2 shaft. The winze which was sunk from the 31st level at a point 1,400 ft. south of No. 1 shaft did not show up copper bearing ground of commercial quality.

The persistent rumor to the effect that the Hancock Consolidated Mining Co. was to be absorbed by the Quincy Mining Co. has been officially denied. The basis of this rumor has probably been the fact that they have been working together in building the concrete reservoir at the 53rd level of the Hancock mine.

JOPLIN-MIAMI DISTRICT

Oklahoma-Kansas-Missouri

Picher, Okla.—The Mogul Mining Co. is sinking to 230 ft. after operating for several months at the 217-ft. level. Heavy water has kept the company from sinking deeper heretofore, but now by joining with the St. Louis Smelting & Refining Co. the water problem is believed solved. The company expects to sink two shafts near the mill to a deeper level later on and to operate the mine double shift. A. E. Dunlap, Miami, is manager and J. B. Stringer, Carterville, Mo., superintendent.

The Vinegar Hill Zinc Co. has taken an option on the Texas mine and mill and has placed four drill rigs upon the ground for prospecting purposes. The mine is located southwest of Hockerville, Okla., in good territory, but the company has been handicapped with lack of money for operation.

ALABAMA

Helen Bess Mines Recovering from Recent Fire

Birmingham—The Helen Bess mines of the Birmingham Ore & Mining Co., after suffering a disastrous fire which burned its washing plant, machine shop and other buildings recently, is again getting out ore in limited quantities. The fire started, it is believed, from high voltage wires on the top of the washing plant. The loss is estimated at $150,000 with partial insurance. A tipple and other buildings needed for actual operation are being built and some ore is again being mined. Labor trouble was recently nipped in the bud at this plant and at first it was thought that the fire was incendiary origin. The company does a commercial ore business.

THE MARKET REPORT

Daily Prices of Metals

Oct.	Copper, N. Y. net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
14	16.00	37.75	38.75@39.00	7.00@7.10	7.00@7.10	7.20
15	15.60	37.00	38.00@38.50	7.00	7.00@7.10	7.15
16	15.35	37.00	38.00@38.50	7.00@7.20	7.00@7.10	7.15
18	15.10	36.50	37.50@38.00	7.00@7.10	6.85@7.20	7.10@7.15
19	15.10	37.00	38.25@38.75	6.85@7.10	6.85@7.15	7.10@7.15
20	15.10	38.50	41.00@41.25	6.85@7.10	6.85@7.00	7.10

*These prices correspond to the following quotations for copper, "delivered": 16.15, 15.75, 15.50, 15.25, 15.25 and 15.25c.

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. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Oct.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3 M		Spot	3 M	Spot	3 M	Spot	3 M
14	93¼	91¼	106	249	254½	34½	34¼	40⅜	41⅛
15	92½	88¼	104	244½	249½	34⅞	34½	39½	40½
16	....	....	...	..	....	...	...	...	...
18	93	88¼	102	238½	245	35¼	34¾	39⅜	40⅜
19	92½	89½	102	241¾	247½	35¾	35½	39	40
20	92	88⅞	101	250	255½	35¾	35⅝	38⅞	39¾

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

Silver and Sterling Exchange

Oct.	Sterling Exchange	Silver			Oct.	Sterling Exchange	Silver		
		New York, Domestic Origin	New York, Foreign Origin	London			New York, Domestic Origin	New York, Foreign Origin	London
14	349	99½	85⅝	55¼	18	342½	99½	79¼	52⅛
15	346	99½	82⅜	53⅝	19	340	99½	76¼	50½
16	345½	99½	81¼	53	20	342	99½	78⅛	51⅜

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

Metal Markets

New York, Oct. 20, 1920

Metal-marketing conditions are much the same as last week. The trend of prices is still downward, but has not been met by any startling response on the part of consumers. Some experienced dealers feel that prices may be near the bottom in the case of copper, zinc, and tin, and that the wisdom of buying will soon be apparent to consumers. The latter are, however, in many instances financially unable, or unwilling, to lay in stocks at any price, and are using the last pound of metal which they can clean up in odd corners. The large quantities of scrap metal which have been available have exerted a particularly depressing influence, especially in the case of copper. These stocks have existed in Europe as well as in this country, and so have affected the foreign trade.

Copper

This metal has declined particularly rapidly, about 2½c. in three weeks. The cheap prices at which copper is now being offered in an effort to stimulate sales have been mildly successful in some quarters, and the sales reported to us, principally for forward delivery, were the largest for several weeks. These sales were, however, not due to any particular consumer demand. Inquiries have been few and for small lots. Nobody seems to want immediate shipment.

Cancellation of orders and demoralized trade conditions have been felt more by producers during the last week than at any previous time. It is questionable whether 15c. copper will attract any great demand from consumers, but the metal can hardly go much lower without being bought up by speculative interests, who rightly feel that such cheap copper is as good to have on hand as cash.

Lead

Conforming to the market trend, the A. S. & R. price was reduced ½c. to 7.25c., New York, on Friday the 15th. The outside market is even below this figure. Lead is the only major metal selling for what is considered to be a fair price, but at 7c. producers are certainly not profiteering. Production continues below normal, and supplies for the current month have generally been marketed. On the other hand, there is no particular scarcity. The market is being allowed to drift along, and demand is just about equal to supply. Inquiries have not been numerous; battery and lead-pipe manufacturers particularly have kept out of the market, though the demand from the paint and cable companies continues good.

Imported lead is reported to have been offered during the last week at 6.70@7.10c. The London advance was a surprise to the trade. Importations will now hardly pay, and, as long as present conditions hold, the market has seen the last of European lead. Mexican production is also cut down, owing to the strike of the coal miners in Coahuila; the low price of silver also exerts an influence. There are, therefore, some bullish factors to offset general trade conditions, and lead producers may consider themselves fairly well off.

The market for forward delivery is absent, buyers demanding a discount from prompt, which sellers are not willing to give.

Zinc

Some metal has been sold, but at declining prices. Producers are losing money on zinc now marketed, and are generally unwilling to sell into speculative hands, even at five to ten points' premium over the prices which they obtain from actual consumers. Production is rapidly decreasing, and it is felt that this will automatically stop any further large decline. Reports state that many producers will shut down entirely for two weeks, and at least one large smelting interest has practically ceased operations.

Tin

The extremely low prices of tin, only 3 or 4c. higher than the average for any of the last ten years, has stimulated interest among consumers in the last three days. The market is still dull and weak, however. The interest is mostly

confined to December and January metal, and spot is neglected. Electrolytic has been in fair demand at the same price as Straits to ¼c. under.

Straits tin for future delivery: Oct. 14th, 39.50@40.00c.; 15th, 39.00@39.50c.; 16th, 39.00@39.50c.; 18th, 38.50@39.00c.; 19th, 39.25@39.75c.; 20th, 41.00@41.25c.

Arrivals of tin in long tons: Oct. 11th, Australia, 150; 13th, Hongkong, 100; 14th, London, 25; 16th, Straits, 35; 18th, London, 125.

Silver

Since our last report the London market has declined daily to a low level of 50½d. on the 19th, but reacted to 51⅜d. on the 20th. On this latter date, rupee exchange rose somewhat, and purchases of silver for account of the Indian Bazaars were reported. The New York price has closely followed the London parity, and moderate buying for China account has continued, although the inquiry from this quarter has broadened at the present writing. The trend of the market is uncertain.

Mexican Dollars—Oct. 14th, 65¼; 15th, 62⅞; 16th, 62; 18th, 60½; 19th, 58¼; 20th, 59⅜.

Gold

Gold in London on Oct. 14th, 117s. 6d.; 15th, 118s.; 18th, 118s. 10d.; 19th, 120s. 3d.; 20th, 120s. 3d.

Foreign Exchange

The British coal strike has weakened sterling, exerting an influence in two ways—first, by making coal shipments from the United States to Europe necessary, and second by decreasing British exports to this country.

On Tuesday, Oct. 19, francs were 6.435c.; lire, 3.79c.; and marks, 1.43c. Marks continue to ease off with the continued use of the currency-printing press in Germany. New York funds in Montreal, 10½ per cent premium.

Other Metals

Aluminum—For 50-ton lots: ingot, 99 per cent and purer, 33.1c.; 98@99 per cent, 32.90c. The market is dull and weak. Importers find it hard to make sales.

Antimony—Spot metal, 6½@7c. per lb. Cookson's "C" grade, 12½@13c. Chinese and Japanese brands, 6⅞@7c. W. C. C. brand, 8½@9c. Chinese needle antimony, lump, firm at 6¼@7c. per lb. Standard powdered needle antimony[1] (200 mesh), 10c. per lb. Market dull.

White antimony oxide, Chinese, guaranteed 99 per cent Sb_2O_3, wholesale lots, 10c.

Bismuth—$2.55 per lb., 500-lb. lots, and $2.57 per lb., 100-lb. lots.

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

Cobalt—Metal, $6 per lb.; black oxide, $4.10 per lb.; sulphate, $1.60.

Iridium—Nominal, $400@$450 per oz.

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

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

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c., f.o.b. Bayonne, N. J.

Monel Metal—Shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

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

Palladium—$95@$100 per oz.

Platinum—Firm at $95@$105 per oz.

Quicksilver—Market quiet; $70 per 75-lb. flask. San Francisco wires $68@$70. Market weak.

Ruthenium—$200@$220 per troy oz.

[1]**Selenium**—Black powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb. Demand strong.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $20 per lb.

[1]**Tungsten Metal**—$35@$60 per kilogram, according to purity and gage.

Metallic Ores

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a maximum of 6 per cent silica, 75@85c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 70@75c.

Manganese Ore[1]—60@70c. per unit, seaport; chemical ore (MnO_2) $70@$80 per gross ton, lump; $80@$90 per net ton, powdered.

Molybdenum Ore—85 per cent MoS_2, 65@70c. per lb. of contained sulphide, New York.

[1]**Tantalum Ore**—Guaranteed minimum 60 per cent tantalic acid, 55@65c. per lb. in ton lots.

[1]**Titanium Ores**—Ilmenite, 52 per cent TiO_2, 1¼@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 15c. per lb. for ore, with concessions on large lots or running contracts.

Tungsten Ore—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $6 f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, $4.50@$5, in New York.

Uranium Ore (Carnotite)—$2.75@$3 per lb. for 96 per cent of the contained oxide (U_3O_8). Ores must contain a minimum of 2 per cent U_3O_8.

Vanadium Ore—$1.25@$1.50 per lb. of V_2O_5 (guaranteed minimum of 11 per cent V_2O_5), New York.

[1]**Zircon**—Washed, iron free, 5c. per lb.

[1]**Zirkite**—According to conditions, $80@$90 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 16—Zinc blende, per ton, high, $51.30; basis 60 per cent zinc, premium, $41; Prime Western buying $40@$37.50, settling $50@$40; fines and slimes, $37.50@$35; calamine, basis 40 per cent zinc, $35@$30. Average settling prices: Blende, $45.11; calamine, $38.93; all zinc ores, $44.94.

Lead, high, $115.60; basis 80 per cent lead; buying, $65; settling, up to $112.50; average settling prices, all grades of lead, $92.19 per ton.

Shipments for the week: Blende, 12,698; calamine, 356; lead, 1,962 tons. Value, all ores the week, $767,690.

The last settlement of lead ore bought on $112.50 basis was made this week, but deliveries are still being made on $110 basis, with reported contracts extending deliveries to Dec. 1 on $110 basis.

The last deliveries on $50 basis for zinc were made this week, with considerable ore outstanding bought on $47.50@$42.50 basis.

The mines are closing down tonight for two weeks, or for an indefinite period, both statements have been issued from semi-reliable sources. There is a sold tonnage in bins around 40,000 tons, with 25,000 tons unsold. Closing the mines is deemed expedient to permit purchasers to load out the purchased ore. The restriction is believed will be as thorough as the midsummer closing. Followed by a proposed lighter restriction it is possible shipments may catch up with purchases by Dec. 1.

Platteville, Wis., Oct. 16 — Blende, basis 60 per cent zinc, $45 per ton for high grade. Lead ore, basis 80 per cent lead, $75 per ton. Shipments for the week: Blende, 1,078; calamine, 15 tons. Shipments for the year: Blende, 54,779; calamine, 2,474; lead, 4,398; sulphur ore, 1,284 tons. Shipped during the week to separating plants, 2,455 tons blende.

Non-Metallic Minerals

Asbestos—Crude, No. 1, $2,000@$3,000; No. 2, $1,400@$1,700; spinning fibres, $400@$800; magnesia and compressed sheet fibres, $325@$400; shingle stock, $110@$150; paper stock, $60@$75; cement stock, $17.50@$30; floats, $8.50@$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax.

Barytes—Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $24@$30 in bags, carload lots; (off-color) $22@$26 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $23; ground (white), $45; ground (off color) $30@$32 per net ton, less than carload lots, f.o.b. New York. Crude, first grade, $10 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

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

China Clay (Kaolin)—Crude, $9@$12; washed, $12@$15; powdered, $18@$22; bags extra, per net ton, f.o.b. mines, Georgia; crude, $8@$12; ground, $15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@$30; imported lump, $25@$35; powdered, $30@$60, f.o.b. New York.

Feldspar—Crude, $8@$18 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10, f.o.b. Maine; ground, $30@$35, car lots, f.o.b. Baltimore; ground, $17@$21, f.o.b. North Carolina points; $17@$21 per ton, No. 1 ground, f.o.b. New York State; $21@

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

$23 per ton, ground, f.o.b. Maine. Crude spar very scarce.

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

Graphite—The 90 per cent crucible grade is held in Alabama for 9c. per lb. and 85 per cent grade is practically unobtainable, prices being 7@9c. The higher lubricating grades sell for 11@40c., according to carbon content. In Ceylon, some of the largest producers have closed their mines until prices advance to meet increased production costs, and stocks at Colombo were lowered only 3,000 tons in the first five months of 1920.

Gravel—No analysis guarantee, f.o.b. Roseview, Ill., $25 per ton; gravel suitable for acid, chemical or enameling purposes, $60.

Gypsum—Plaster of Paris in carload lots sells for $4.25 per 250-lb. bbl., alongside dock, New York. Raw crushed rock, $3.50@$4.50; calcined stucco, $9; f.o.b. works, Illinois.

Kaolin—See China Clay.

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

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. Freshly ground calcined, suitable for flooring trade, $75@$85 per ton, f.o.b. Eastern points.

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

Mica—India block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20@$1.40; No. 4, $2@$3; No. 3, $4.25@$5; No. 2, $5.50@$7; No. 1, $8. Clear block: No. 6, 55c.; No. 5, $2; No. 4, $3.50; No. 3, $5, No. 2, $6.50; No. 1, $8; A1, $10; extra large, $25, all f.o.b. New York; ground, $150 per ton, Philadelphia. Domestic, uncut, f.o.b. Franklin, N. C., as follows: Scrap, $45@$50 per ton; punch, 10c. per lb.; circle, 15@25c.; 1½ x 2 in., 75c.; 2 x 2 in., $1.15; 2 x 3 in., $1.65; 3 x 3 in., $2.10; 3 x 4 in., $2.50; 3 x 5 in., $2.75; 3 x 6 in., $3.75; ground 165 mesh, $240 per ton; ground roofing mica, $60; mica washers, 75c.@$2 per lb.; 1½-in. disks, No. 1, $1.60 per lb.; No. 2, $1.30.

[1]**Monazite** — Minimum of 6 per cent thorium oxide, $35 per unit, duty paid.

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

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

Pyrites—Spanish fines, per unit, 12c., c.i.f. Atlantic seaport; furnace size, 17c.; Spanish lump, 14@16c.; domestic fines, f.o.b. mines, Georgia, 12@14c. Market improving.

Quartz—(Acid tower) fist to head, $10; 1¼ to 2 in., $14; rice, $17, all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines.

Sand (Glass)—Dry glass sand, $4 per net ton, f.o.b. cars Mapleton, Pa. Sand, f.o.b. Ottawa, Ill., is $3 per ton; $2.50 on annual contracts. Sand at Klondike, Gray Summit and Pacific, all in Missouri, is $2.50 on contract; some outside sales have been made at $4. St. Louis, open market, at $3.50; contract price on large quantities, $2.50; on small quantities, $3.

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

Talc — Paper making, $12@$22 per ton; roofing grades, $9.50@$15; rubber grades, $12@$18, all f.o.b. Vermont. California talc, $20@$45, talcum powder grade. Southern talc, powdered, carload lots, $12@$15 per ton; less than carload, $25, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60@$70; Canadian, $20@$40 per ton.

Mineral Products

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

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

Potassium Sulphate—Domestic, $225@$250 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

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

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

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 18½@19c. per lb. of chromium contained; 4 to 6 per cent carbon, 19@20c., f.o.b. works.

Ferromanganese—For 76 to 80 per cent, prompt delivery, $170@$175 freight allowed; last half, $170; English, $170, c.i.f. Atlantic seaports. Spiegeleisen, 18@22 per cent, $82.50@$85, f.o.b. furnace.

Ferromolybdenum[1]—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2@$2.50 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $60@$65; 50 per cent, $82.50@$85; 75 per cent, $150@$160.

Ferrotungsten[1]—Domestic, 70 to 80 per cent W, 80@90c. per lb. of contained tungsten, f.o.b. works. Foreign, 70c.

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

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

Ferrovanadium[1]—Basis 30 to 40 per cent, $6.50@$8 per lb. of V contained, f.o.b. works.

Metal Products

Copper Sheets — Current New York price, 26½c. per lb.; wire, 20c.

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

Nickel Silver — Unchanged at 38½c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 25½c.; sheathing, 24½c.; rods, § to 3 in., 22½c.

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

Refractories

Bauxite Brick—56 per cent alumina, $160 per 1,000, f.o.b. Pittsburgh.

Chrome Cement—40@45 per cent Cr_2O_3, $55@$60 per net ton, and $65 in sacks, carload lots, f.o.b. eastern shipping points.

Fire Clay—First quality, 9-in. shapes, $55@$60 per 1,000, Pennsylvania, Ohio and Kentucky. Second quality, $45@$50.

Magnesite Brick — 9-in. straights, $110 per net ton; 9-in. arches, wedges and keys, $121; soaps and splits, $134.

Silica Brick—9-in., per 1,000: Chicago district, $65@$70; Birmingham, Ala., $56@$61; Mount Union, Pa., $55@$60.

Iron Trade Review

Pittsburgh, Oct. 19, 1920

Although some independents are disposed to lower their prices from time to time as they need business, others seem disposed to hold prices and curtail output, while predictions are made that production will be forcibly curtailed this winter by reappearance of transportation difficulties.

Pig Iron—Basic iron, which lagged in the advance because consumers were not covering ahead to the extent that obtained in foundry iron, is naturally leading in the decline, as there is occasional demand to induce sellers to name competitive prices. Although $45, Valley, as against the previous market of $48.50, was the lowest noted a week ago, since then a Pittsburgh district consumer has bought 1,500 tons from a middleman at $40 and has been quoted $42 by three producers. Some odd lots of foundry have been sold at last quotations. We quote: Bessemer, $48.50; basic, $42; foundry, $47, f.o.b. Valley furnaces, freight to Pittsburgh being $1.96.

Steel—Mills seem to be endeavoring to hold to $60 for billets and $65 for sheet bars, but on a 5,000-ton lot of billets $55 or less was done.

Charcoal and Coke

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

Connellsville — Furnace, $16.50@$17; foundry, $18.

The Antimony Price Recession

As the United States Is Dependent Upon Foreign Supplies, a Price Drop Is of Little Domestic Consequence—Large Available Stocks and Pre-War Demand Indicate Maintenance of Low Quotations

THE antimony market is exceedingly dull, and supplies are fairly large; in fact, the purchase of surplus stocks of the metal from England, consisting of antimonial lead composition metal, or shrapnel material, is having a depressing effect upon the market. Prices are already below the pre-war figure of about 7½c., and in common with most other metals, a price tendency downward is recorded. However, the price of antimony gives little concern to the country at large, as there is no appreciable primary domestic production and the consumption is small.

Undeveloped natural antimony resources are available and were profitably worked during the war, when the price of antimony remained over 25c. per lb., but in normal times, or periods in which the price does not rule over 7 or 8c., the domestic prospects and mines can be worked only at prohibitive costs. From an economic standpoint this forced curtailment of domestic production is really an asset, as it leaves untouched a reserve that can readily be utilized in times of necessity when foreign supplies are unavailable.

Numerous Uses of Antimony, but a Small Demand

The relatively small but numerous pre-war uses of antimony, and the cheap foreign supplies, with their large resources, were greatly stimulated during the war by the consumption of antimony in shrapnel ammunition. But as this use has disappeared, the reversion to peace-time employment has again sharply limited the use of the metal.

Type metal, an alloy of antimony, lead, and tin, which has the property of expanding on solidification, is, from the standpoint of utility, the most important alloy of antimony. Britannia metal, an alloy of antimony, tin, copper and zinc, is used in cheap tableware; acid-resisting valves can be made from a lead-antimony alloy. Minor uses of antimony alloys are in battery plates, toys, brasses, and aluminum alloys.

The oxides of antimony are finding increasing application. The white oxide (Sb_2O_4) is used in the manufacture of opaque white enamel and sanitary ware, an application to which tin oxide is also put, and with which it must compete. The trioxide, Sb_2O_3, is used as a coloring agent in glass manufacture, it being more fusible than the tetraoxide. Antimony oxides and antimony sulphides are also used as paint pigments, and the coloring of rubber red is frequently accomplished with the aid of the sulphide. Safety matches, medicines, and ceramic industries consume minor amounts of antimony compounds.

Foreign Sources Important

China and Japan have been the chief supplying agencies of antimony in its various forms, but Mexico, France, and Bolivia are other countries with an important production that helps supply the world. China is by far the most important antimony-producing country, but its position was formerly minimized by the control which Great Britain had over the antimony-smelting industry. Brands of British antimony such as Cookson's and Halett's, made from foreign ores, enjoyed world-wide favor, and through well-developed antimony-smelting facilities in the British Isles, England was enabled practically to dominate the world's antimony market. Chinese, Mexican, Australian, and Continental ore was formerly smelted and refined in England, and the close co-operation of British trading interests exerted a strong influence in obtaining the raw material necessary for the furnaces and markets for the product. The war naturally changed this situation. Exports of Chinese ore and metal were in the hands of English and Continental firms, but this grip was broken by the war, and one result was the organization of the Wah Chang Trading Co. and the establishment of a direct selling agency in New York for the Chinese antimonial products. Through this step the Chinese metal has grown in favor and has become firmly established in the domestic market. The fact that China has large antimony reserves and adequate marketing facilities is assurance that the most important source for antimony for many years to come lies in the Far East.

Domestic Production Negligible

The great antimony-consuming countries of the world—that is, the United States, France, Germany, and Great Britain—are, with the exception of France, normally dependent upon foreign supplies of the metal. The producing countries are slight consumers.

The table gives the essential features of the domestic antimony industry for the war period. It is to be noted that domestic antimony production from ores jumped during the war, only to vanish in 1919. Under the present economic situation it would require a price of at least 20c. to make domestic antimony production profitable.

PRINCIPAL FEATURES OF THE UNITED STATES ANTIMONY INDUSTRY
(In Short Tons)

	U. S. Production From Ores	Antimony Content in Byproduct Antimonial Lead	Smelter Production From Foreign and Domestic Ores	Imports—Ore	Imports—Metal, (Regulus)	Exports Matte, Regulus, Metal	Average Price, Cents
1913	.....	2,508	.....	2,007	6,249	.....	7.52
1914	.....	2,693	.....	1,254	6,555	800	8.76
1915	2,100	3,425	.....	1,544	7,354	1,573	30.28
1916	1,770	3,496	.....	4,622	7,064	1,509	25.37
1917	390	2,759	2,440	5,832	11,286	494	20.69
1918	50	2,566	2,617	1,425	14,011	705	12.58
1919	.....	1,943	.....	409	7,159	214	8.20

It is altogether likely, now that the prospect of stabler conditions in Mexico seems realized, that our southern neighbor may increase her antimony production. In 1912 and 1913, 3,296 and 2,345 long tons of crude metal and regulus were shipped to England, but none came to the United States. Both English and American capital are engaged in developing Mexican antimony resources, and the necessary smelting facilities are available locally. The most important mines are owned by Cookson's, of England.

The world's production of antimony easily responded to the war demands. Whereas pre-war production was about 20,000 metric tons per year, during the war a peak production (1916) of 75,000 metric tons was attained. The ability of the world to meet any extraordinary demand for antimony is clearly apparent from the war record.

Latest Rand Gold Production

During September, the gold production of the Rand, in South Africa, amounted to 682,173 oz., a decrease in output from the August figure, 702,083 oz. A table summarizing production since 1917 follows:

RAND GOLD OUTPUT 1917-1920
(Fine Ounces)

	1920	1919	1918	1917
January	670,503	676,059	714,182	782,634
February	625,330	636,728	659,750	721,321
March	707,036	712,379	696,281	787,094
April	686,979	694,944	717,099	742,778
May	699,041	724,995	741,217	729,385
June	715,957	702,379	727,696	759,724
July	736,099	725,497	736,199	757,890
August	702,083	706,669	740,210	756,658
September	682,173	698,558	708,206	738,231
October	.....	723,722	679,764	751,290
November	.....	677,970	658,701	722,839
December	.....	650,191	641,245	722,419

MINING STOCKS

Week Ended October 16, 1920

Stock	Exch.	High	Low	Last	Last Div.	
COPPER						
Adventure	Boston	*65	*65	*65		
Ahmeek	Boston	56	55½	55½	Sept. '20, Q	.50
Alaska-B.C.	N. Y. Curb.	1/16	1/16	1/16		
Allouez	Boston	24½	23½	23½	Mar. '19,	1.00
Anaconda	N. Y.	51½	49½	50	Aug. '20, Q	1.00
Ariz. Com'l	Boston	9	8⅛	8⅛	Oct. '18,	.50
Big Ledge	N. Y. Curb.	1/16	1/16	1/16		
Bingham Mines	Boston	9¼	9¼	9¼	Sept. '19, Q	.25
Calumet & Ariz.	Boston	56	55½	55½	Sept. '20, Q	1.00
Calumet & Hecla	Boston	270	250	253	June '20, Q	5.00
Canada Copper	N. Y. Curb.	...	...	⅛		
Centennial	Boston	9⅛	9⅛	9⅛	Dec. '18, SA	1.00
Cerro de Pasco	N. Y.	39⅞	37⅜	38½	Sept. '20, Q	1.00
Chief Consol	Boston Curb	4	3½	4	Feb. '20, Q	.10
Chile Copper	N. Y.	13⅞	13⅜	13⅞		
Chino	N. Y.	26	24	24½	Sept. '20, Q	.37½
Columbus Rexall	Salt Lake	*37½	*36½	*36½		
Con. Ariz.	N. Y. Curb.	....	....	¼	Dec. '18, Q	.05
Con. Copper M	N. Y. Curb.	....	....	*61		
Copper Range	Boston	34½	33	33½	Sept. '20, Q	.50
Crystal Copper	Boston Curb	*34	*28	*33		
Davis-Daly	Boston	7½	7	7	Mar. '20, Q	.25
East Butte	Boston	10½	10	10	Dec. '19, A	.50
First Nat'l	Boston Curb	*82	*80	*80	Feb. '19, SA	.15
Frankl'n	Boston	...	...	2 1/16		
Gadsden Copper	N. Y. Curb.	...	...	*70		
Granby Consol	N. Y.	33	32	32	May '19, Q	1.25
Greene Cananea	N. Y.	27⅜	27½	27⅜	Aug. '20, Q	.50
Hancock	Boston	4	3	4		
Houghton	Boston Curb	...	...	*40		
Howe Sound	N. Y. Curb.	...	...	3½	Oct. '20, Q	.05
Inspiration Con	N. Y.	44½	43	43	Oct. '20, Q	1.00
Iron Cap	Boston Curb	...	...	8¾	Sept. '20, K	.25
Isle Royale	Boston	25	25	25	Sept. '19, SA	.50
Kennecott	N. Y.	23⅞	22½	27⅞	Sept. '20, Q	.50
Keweenaw	Boston	...	...	1⅜		
Lake Copper	Boston	...	...	3		
La Salle	Boston	...	...	2½		
Magma Chief	N. Y. Curb.	...	...	*21		
Magma Copper	N. Y. Curb.	...	...	17	Jan. '19, Q	.50
Majestic	Boston Curb	*14	*14	*14		
Mason Valley	Boston	...	...	1½		
Mass. Con	Boston	2¾	2½	2¾	Nov. '17, Q	1.00
Mayflower-O.C.	Boston	5⅜	4 13/16	4 13/16		
Miami	N. Y.	19⅜	18⅝	19	Aug. '20, Q	.50
Michigan	Boston	...	...	3½		
Mohawk	Boston	57	55⅞	57	Aug. '20, Q	1.50
Mother Lode (new)	N. Y. Curb.	5⅞	5⅜	5⅜		
Nevada Con	N. Y.	11¼	10⅝	10⅝	Sept. '20, Q	.25
New Arcadian	Boston	...	...	2½		
New Baltic	Boston Curb	...	...	3		
New Cornelia	Boston	19	18	19	Aug. '20,	.25
Nixon Nev	N. Y. Curb.	...	...	*9		
North Butte	Boston	14½	14	14	Oct. '18, Q	.25
North Lake	Boston	*25	*25	*25		
Ohio Copper	N. Y. Curb.	...	...	1/16		
Ojibway	Boston	...	...	1½		
Old Dominion	Boston	23	22½	23	Dec. '18, Q	1.00
Osceola	Boston	35	31	32	June '20, Q	.50
Phelps Dodge	Open Mar.	†190	†170	...	Oct. '20, Q	2.50
Quincy	Boston	44	42	43	Sept. '20, Q	1.00
Ray Con	N. Y.	14⅜	14	14⅜	June '20, Q	.25
Ray Hercules	Boston Curb	*75	*50	*50		
St. Mary's M. L.	Boston	35⅜	35	35	June '20, K	2.00
Seneca	Boston	15	14½	15		
Shannon	Boston	1½	1	1	Nov. '17, Q	.25
Shattuck Ariz	N. Y.	8⅜	8	8	Jan. '20 Q	.25
South Lake	Boston	...	...	2		
South Utah	Boston	*10	*10	*10		
Superior Copper	Boston	4½	4	4½	Apr. '17,	1.00
Superior & Boston	Boston	3½	2⅜	3½		
Tenn. C. & C.	N. Y.	9⅜	9⅜	9½	May '18, I	1.00
Tuolumne	Boston	*55	*50	*54	May '13,	.10
United Verde Ex.	Boston Curb	30⅜	29	29½	Aug. '20, Q	.50
Utah Con.	Boston	6¼	6	6 1/16	Sept. '18,	.25
Utah Copper	N. Y.	60⅜	56½	57⅛	Sept. '20, Q	1.50
Utah M. & T.	Boston	1⅜	1 1/16	1 1/16	Dec. '17,	.30
Victoria	Boston	1⅛	1⅛	1⅛		
Winona	Boston	*40	*35	*35		
Wolverine	Boston	12½	12½	12½	Jan. '20, Q	.50
LEAD						
Hecla	N. Y. Curb.	5	4½	5	Sept '20, QX	.15
St. Joseph Lead	N. Y.	14½	13½	14	Sept '20, QX	.50
Stewart	Boston Curb	...	...	*13	Dec. '15,	.05
Utah Apex	Boston	2⅛	2	2⅛	Nov. '18,	.25
ZINC						
Am. Z. L. & S.	N. Y.	11½	11⅜	11½	May '17,	1.00
Am. Z. L. & S. pf.	N. Y.	45	45	45	Aug. '20, Q	1.50
Butte C. & Z.	N. Y.	6⅞	6½	6⅜	June 18, I	.50
Butte & Superior	N. Y.	17½	16½	16½	Sept. '17,	1.25
Con. Interst. Cal.	N. Y.	9⅜	9	9	June '20, Q	.50
New Jersey Z.	N. Y. Curb.	175	172	173	Aug. '20, Q	4.00
Success	N. Y. Curb.	*4½	*4	*4	July '16,	.03
Yellow Pine	Los Angeles	...	...	*95	June '20, Q	.03

Stock	Exch.	High	Low	Last	Last Div.	
GOLD						
Alaska Gold	N. Y.	2	1⅜	1⅜		
Alaska Juneau	N. Y.	2½	2	2		
Carson Hill	N. Y. Curb.	22⅜	22⅜	22⅜		
Cresson Consol. G.	N. Y. Curb.	1⅜	⅜	1⅜	June '20, Q	.10
Dome Ex.	Toronto	*40	*39½	*40		
Dome Mines	N. Y.	11½	11⅜	11½	Sept. '20, Q	.25
Golden Cycle	Colo. Sprgs.	‡...	...	*73	Sept. '20, Q	.02
Goldfield Con.	N. Y. Curb.	*9½	*8	*9	Dec. '19,	.05
Hedley	Boston	....	....	4½	June '19,	.10
Hollinger Con.	Toronto	5.85	5.74	5.74	Oct. '20, BM	.05
Homestake	N. Y.	....	....	47	Sept. '19,	.50
Kirkland Lake	Toronto	*46½	*45	*46		
Lake Shore	Toronto	1.02	1.02	1.02	Oct. '20, K	.02
McIntyre-Porcupine	Toronto	2.04	2.02	2.02	Sept. '20, K	.05
Porcupine Crown	Toronto	*26	*23	*24	July '17,	.03
Portland	Colo. Sprgs.	‡...	....	*60	Oct. '20, Q	.01½
Reorgan. Booth	N. Y. Curb.	5½	4	4	May '19,	.05
Silver Pick	N. Y. Curb.	*6	*4	*6		
Teck Hughes	Toronto	...	...	*8½		
Tom Reed	Los Angeles	1.50	1.25	1.46	Dec. '19,	.02
United Eastern	N. Y. Curb.	2⅛	2 1/16	2 1/16	Oct. '20, Q	.15
Vindicator Consol.	Colo. Sprgs.	‡...	....	*18	Jan. '20, Q	.01
West Dome Consol.	Toronto	....	....	*6⅜		
White Caps Min.	N. Y. Curb.	*8	*7	*8		
Yukon Gold	Boston Curb	...	...	1⅛	June '18,	.02½
SILVER						
Arizona Silver	Boston Curb	*22	*17	*21	Apr. '20, M	.03
Beaver Con.	Toronto	*39½	*39	*39½	May '20, K	.03
Coniagas	Toronto	†2.50	†2.40	2.55	Aug. '20, Q	.12½
Crown Reserve	Toronto	....	....	*27	Jan. '17,	.05
Kerr Lake	Boston	3⅜	3⅜	3⅜	Oct. '20, K	.12½
La Rose	Toronto	*32	*32	*32	Apr. '18,	.02
McKinley-Dar.	Toronto	*54	*50	*50	Oct. '20, Q	.03
Mining Corp.	Toronto	1.70	1.59	1.70	Sept. '20, Q	.12½
Nipissing	N. Y. Curb.	...	...	9	Oct. '20, QX	.50
Ontario Silver	N. Y.	5	4⅛	5	Jan. '19, Q	.50
Ophir Silver	N. Y. Curb.	⅞	⅞	⅞	Jan. '12,	.10
Peterson Lake	Toronto	....	....	*14½	Jan. '17,	.01⅛
Temiskaming	Toronto	*34½	*34	*34	Jan. '20, K	.04
Trethewey	Toronto	*25	*24	*24½	Jan. '19,	.05
GOLD AND SILVER						
Atlanta	N. Y. Curb.	*2	*1	*1		
Barnes-King	Butte	‡...	....	1.11	Aug. '20, Q	.05
Bost. & Mont.	Boston	....	....	*63		
Cashboy	N. Y. Curb.	*8	*7	*8		
El Salvador	N. Y. Curb.	1	⅞	1		
Jim Butler	N. Y. Curb.	*16	*15	*16	Aug. '18, SA	.07
Jumbo Extension	N. Y. Curb.	*6	*5	*5	June '16,	.05
Louisiana Con.	N. Y. Curb.	1/16	1/16	1/16		
MacNamara M.	N. Y. Curb.	...	...	¼	May '10,	.02½
N.Y. Hond. Rosar	Open Mar.	†12	†10½	...	Oct. '20, QX	.50
Tonopah-Belmont	N. Y. Curb.	1 1/16	1⅛	1⅛	Oct. '20, Q	.05
Tonopah-Divide	N. Y. Curb.	1⅛	1 1/16	1 1/16		
Tonopah Ex.	N. Y. Curb.	1⅜	1 1/16	1 1/16	Oct. '20, Q	.05
Tonopah Mining	N. Y. Curb.	1⅛	1	1	Oct. '20, SA	.05
West End Con.	N. Y. Curb.	1 1/16	1⅛	1⅛	Dec. '19 SA	.05
SILVER-LEAD						
Caledonia	N. Y. Curb.	*17	*16	*16	July, '20, M	.01
Consol. M. & S.	Montreal	25	24⅜	24½	Oct. '20, Q	.62½
Daly Mining	Salt Lake	....	....	2.50	July '20, Q	.10
Daly-West	Boston	4½	4½	4½	Oct. '20, Q	.25
Eagle & Blue Bell	Boston Curb	2 1/16	2 1/16	2 1/16	Apr. '20, Q	.10
Electric Point	Spokane	....	....	*12	May '20, SA	.03
Fed. M. & S.	N. Y.	....	....	13	Jan. '09,	1.50
Fed. M. & S. pf.	N. Y.	33½	33	33	Sept. '20, Q	1.75
Florence Silver	Spokane	....	....	*25	Apr. '19,	.01½
Grand Central	Salt Lake	....	....	*37½	June '20, K	03
Iron Blossom	N. Y. Curb.	¼	¼	¼	Apr. '20, Q	.02½
Judge M. & S.	Salt Lake	....	....	3.97½	Sept. '20, Q	.12½
Marsh Mines	N. Y. Curb.	*15	*9	*13		
Prince Consol.	N. Y. Curb.	⅜	1/16	⅜	Nov. '17,	.02½
Rambler-Cariboo	Spokane	....	....	*9	Feb. '19,	.01
Rex Con.	N. Y. Curb.	*6	*6	*6		
South Hecla	Salt Lake	*89	*88	*88	Sept. '19, K	.15
Stand. S. L.	N. Y. Curb.	1/16	1/16	1/16	Oct. '17,	05
Tamarack-Custer	Spokane	2.30	2.25	2.30	Dec. '19, K	.03
Tintic Standard	Salt Lake	2.95	2.77½	2.95	June '20, Q	.10
Wilbert	N. Y. Curb.	*5	*4	*4½	Nov. '17,	.01
NICKEL-COPPER						
Internat'l Nickel	N. Y.	18½	17⅞	17⅞	Mar. '19,	.50
Internat'l Nick.pf	N. Y.	83	80	83	Aug. '20, Q	1.50
QUICKSILVER						
New Idria	Boston	....	....	5	Jan. '19,	.25
TUNGSTEN						
Mojave Tungsten	Boston Curb	...	...	*10		
VANADIUM						
Vanadium Corp.	N. Y.	66⅜	62½	64½	Oct. '20, Q	1.50
ASBESTOS						
Asbestos Corp.	Montreal	103	95½	96¾	Oct. '20, Q	1.50
Asbestos Corp. pf.	Montreal	107	102	102	Oct. '20, Q	1.75
MINING, SMELTING AND REFINING						
Am. S. & R.	N. Y.	60½	58¼	59¾	Sept. '20, Q	1.00
Am. S. & R.pf.	N. Y.	92½	92	92	Sept. '20, Q	1.75
Am. Sm. pf.A	N. Y.	77	76	77	Oct. '20, Q	1.50
U. S. Sm. R. & M.	N. Y.	54	52⅜	53	Oct. '20, Q	1.50
U.S.S.R.& M. pf.	Boston	44	43½	43½	Oct. '20, Q	.87½

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

INDUSTRIAL NEWS

Auger Rotator of New Design

In drilling soft, broken, or loose ground, it has been found that the ordinary compressed air hammer drill strikes too hard a blow for satisfactory progress. Its penetration is so great at each stroke that it is unable to throw the mud and cuttings from the hole, resulting in speedy clogging of the bit. To overcome this difficulty the so-called auger drill has been developed. In this type the stroke is relatively short and the blow light and rapid. At the same time the strength and speed of rotation have been increased, to provide for keeping the hole true and round, and to aid in ejecting the sludge. Solid spiral steel and a "fishtail" bit are often used with auger drills, the twisted steel serving as a conveyor for the cuttings.

An improved Sullivan Auger Rotator, recently placed in service, possesses certain distinctive features, which are securing added effectiveness in drilling work of the kind described above. The Sullivan "DR-37" Auger Rotator weighs 35½ lb., being shorter and lighter than other types.

The strength and rapidity of rotation have been materially increased. In all the Sullivan rotators the rotation is accomplished by means of straight and spiral flutes milled in the front portion of the piston bar, which are engaged by lugs on a removable bronze nut. The piston grooves also engage lugs on the interior of the encircling ratchet, which imparts the turning movement to the chuck, and thus to the steel. In the ordinary rotator the piston and steel are turned on the up or back stroke; but in the new model Sullivan auger the reverse is true, the steel being turned by a four-pawl ratchet on the forward stroke as the blow of the piston is delivered, thus rendering the rotation of the steel stronger and more positive.

The action of the standard rotator valve combines with the forward stroke rotation to keep vibration and jar on the operator down to a low factor. In this new model an automatic, pulsation-type lubricator has been embodied, thus furnishing the working parts of the tool with a sufficient quantity of oil at all times.

Increased drilling speed, effective cleaning of the drill hole, and smooth operation are factors noticed favorably by drillmen in using these tools. Holes up to ten feet in depth are drilled readily in iron-ore formations. The rate of progress is maintained with unusual evenness as the depth increases, instead of falling off, as is characteristic of older types. For occasional use in hard ore the "DR-37" is equipped to use hollow steel, and a push button in the lower valve-buffer turns the air down the steel for cleaning.

Trucking Ore on Big Cottonwood Canyon Grades

Five Packard trucks owned and operated by the Cardiff Mining & Milling Co., Salt Lake City, Utah, are handling an unusually "steep" job with great success. They are hauling lead ore from the lower ore bins of the Cardiff company three miles from Big Cottonwood Canyon, Salt Lake County, Utah, to Murray, Utah, a distance of fifteen miles.

The first four miles of the haul are comparatively level, as one of the views shows, but the remainder of the route has a total rise in elevation of approximately 1,700 ft. through a narrow and rugged canyon. Two of our photographs give a good idea of this portion of the way, and some indication of the grade overcome.

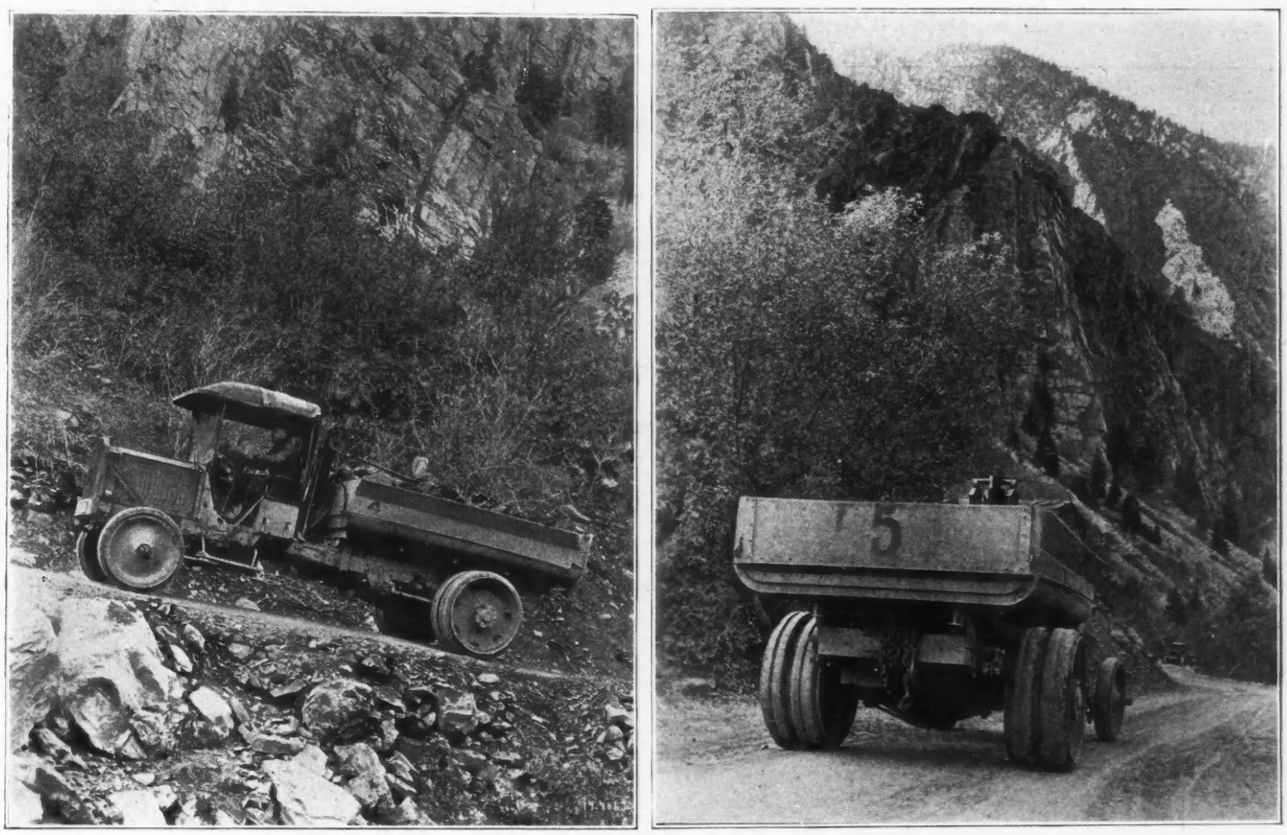


FIG. 1. PACKARD TRUCKS AND THE BIG COTTONWOOD CANYON GRADES THEY CONQUER, WINTER AND SUMMER

The trucks make the trip twice in a twelve-hour day. Part of the time they have been in operation twenty-four hours a day. On the down trip the average load for each of the trucks is from six to eight tons, an over-load of from 10 to 30 per cent. On the return trip each truck carries from 1,000 to 7,000 lb. of up-freight for the mine.

Bad roads made the haul even more difficult at first. This was solved by the use of shale obtained from the bottom of the canyon. After the shale was placed on the road, the trucks on their daily trips packed it down until the road became virtually a boulevard. This was

a material aid in reducing the operating expenses of the trucks.

The truck service is uninterrupted during the summer months and until the snow begins to fall, about Nov. 1. After the first season the trucks were replaced with teams for the winter months; but last winter the trucks managed to operate with the help of teams used in plowing the snow off the road.

Industrial Cost Association Interests Mining Men

The Industrial Cost Association, which met in New York City on Sept. 27, lists among its active members important mining and general industrial organizations. The purpose of the association is the standardization of accounting and cost practices and terminology, to promote the adoption of standard governing principles and active co-operation and interchange of experience between representatives of manufacturers; also to act as a clearing house in distributing all such information.

M. F. Simmons, of the General Electric Co., Schenectady, N. Y., is president of the association, C. H. Smith, of the Westinghouse Air Brake Co., is first vice-president, Roland H. Zinn, of the Tanners' Council, is second vice-president, and A. A. Alles, Jr., secretary of the Fawcus Machine Company, Pittsburgh, Pa., is secretary-treasurer, 2818 Smallman St., Pittsburgh, Pa.

Steel Foundrymen Organize To Perfect Higher Standards in Casting Practice

Announcement has been made of the appointment of R. A. Bull, of Pittsburgh, Pa., as consulting metallurgist for a number of prominent steel foundries grouped for the purpose of developing and perfecting higher standards in the production of steel castings. Mr. Bull will devote his entire time to preliminary research work immediately, and has resigned his position as vice-president of the Duquesne Steel Foundry Co. to secure the necessary freedom.

Among the companies undertaking the work noted are the Electric Steel Co., Chicago, Ill.; Fort Pitt Steel Castings Co., McKeesport, Pa.; Isaac G. Johnson Co., Spuyten Duyvel, N. Y.; Lebanon Steel Foundry Co., Lebanon, Pa.; Michigan Steel Castings Co., Detroit, Mich.; and Sivyer Steel Castings Co., Milwaukee, Wis.

Mr. Bull is a member of numerous technical associations and has frequently contributed to the technical press. Since 1911 he has been a director of the American Foundrymen's Association and during 1916 and 1917 served two terms as its president. His connection with the foundry industry covers a period of over twenty years, during which he has held important positions in foundries at St. Louis, Chicago, New York, and Pittsburgh.

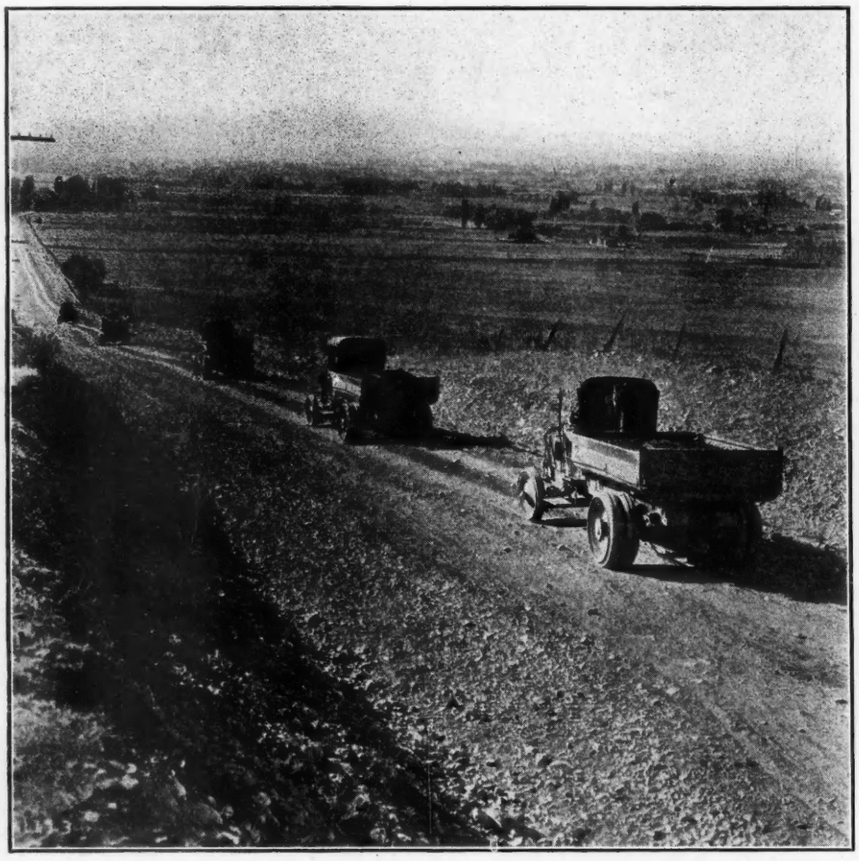


FIG. 2. FLEET OF PACKARD TRUCKS ON AN EASY GRADE

TRADE CATALOGS

Elevator Controllers — The Cutler-Hammer Manufacturing Co., Milwaukee, Wis., has issued a new two-color booklet, "Elevator Controllers," of twenty-four pages, describing the new line of elevator control apparatus recently developed by that firm. This booklet, which is known as Publication 840, illustrates the new controllers and emphasizes their simplicity, quiet operation, and smooth acceleration. The last few pages are devoted to auxiliary apparatus.

New Jersey Concentrating Co., 66 York St., Jersey City, N. J., weighing, sampling, grinding ores, and custom concentrating, sends us an illustrated four-page folder designed to emphasize the completeness of the company's installation and the wide geographic range of its custom business with big and little producers of tungsten, chrome, manganese, zirconium, and other ores. (Telephone 4173 Montgomery.)

Chain Drives—The Link-Belt Co., 910 So. Michigan Ave., Chicago, Ill., announces as ready for distribution its publication No. 345 "Link-Belt Silent Chain Drives for Cement Mill Equipment." Officials of cement mills will find this an interesting and valuable book, and may procure a copy by writing to the above address or any of the company's branch offices.

The same company's publication No. 257 is a 78-page book on the use of roller chains for power transmission, and its tables will appeal as a handbook for the power transmission engineer. A copy will be sent on application.

The Taylor-Wharton Iron & Steel Co. has recently sent us a souvenir booklet which was issued in commemoration of the 125th anniversary of the making of iron and the 25th anniversary of the making of manganese steel at its plant at Highbridge, N. J. The edition is well illustrated with photographs of the officials, employees, plants, and manufactured products. A complete history of the development of the company, which was originally organized in 1742, and its accomplishments are given. On Oct. 13, 1917, a celebration was held at Highbridge, N. J., upon the occasion of the above anniversary. At this time notable addresses were made by Knox Taylor, president of the company, Prof. Henry M. Howe, John R. Hardin and others. It is a most creditable fact that the organization includes several men who have remained in the service of the company for many years.

Condensers—The Link-Belt Co., 910 South Michigan Ave., Chicago, Ill., recently published an attractive illustrated twenty-four-page book (No. 352), covering its traveling water screens. This publication will be sent to anyone interested in the effective and economical screening of condensing water