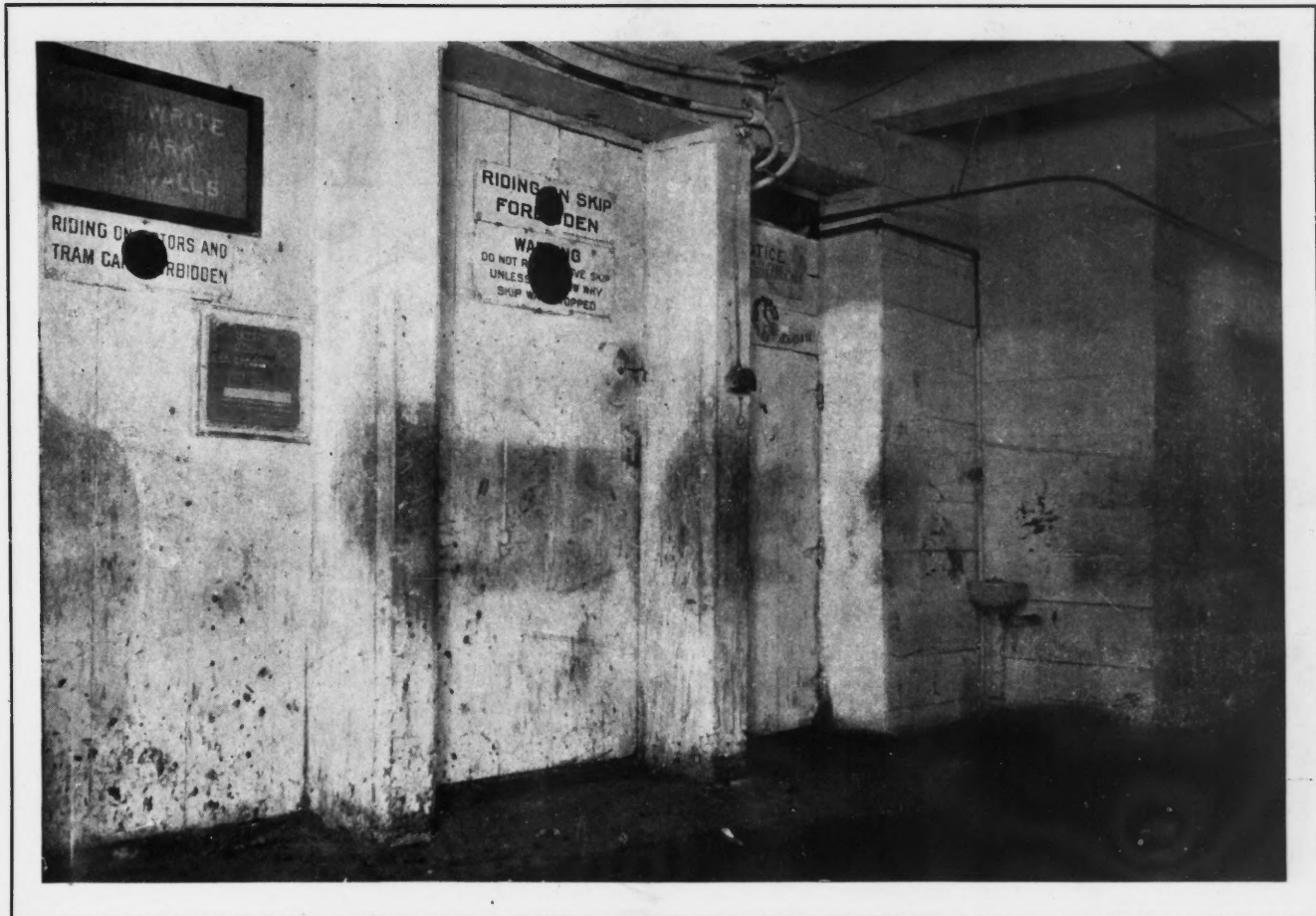


October 8, 1921

ENGINEERING AND MINING JOURNAL



Underground Station at a Mesabi Iron Mine

Chisholm Mine of the Oliver Iron Mining Co., Chisholm, Minn.. Showing Safety Signs and Manner of Covering Entrance to Shaft

War Problems in Minerals

II—Overseas Mineral Movements During the War

By C. K. Leith

The Tenth Annual Safety Congress of the National Safety Council was held in Boston the week of Sept. 26. Among the sessions held were those of the Mining Section, devoted to discussions of safety in mining operations. A report of proceedings at these meetings appears on page 581 of this issue.

The decline in copper production month by month since early this year is shown by the table on page 597. Production is now at its ebb. A table of monthly average metal prices, published once a month, enables ready comparison to be made with last year's quotations and copper output.

Decay of Timber in Return Air Courses

By Daniel Harrington

Biography of C. L. Colburn



Give the Belt a Chance

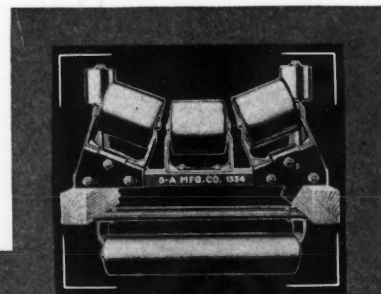
Good conveyor belts can render satisfactory service only when they are operated in conjunction with machinery which is correctly designed and well built.

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New York, October 8, 1921

Number 15

The Outlook for Our Mineral Industries

ARE INDUSTRIAL CONDITIONS IMPROVING?
More particularly, have the mineral industries passed through the worst of the depression? These questions can be answered in only a qualified way. Without a doubt some manufacturing industries are on the mend, and as all forms of activity use minerals and metals in some way, an improved demand for them will be, or is, evident. The number of idle freight cars is less than it was; the stock market shows indications of having passed the low point, though of this we cannot yet be sure; wage levels are slowly but surely coming back to normal; retail prices are still excessively high, but they are coming down; and commodity prices are becoming more stable. All of these are good signs, and there are others.

Metal prices were among the first to be reduced, and in many cases, as with copper, zinc, tin, antimony, and aluminum, the depression has carried prices below pre-war figures. With such early and complete deflation it is only fair to expect that these raw materials should be among the first to show an improvement with a return to normal industrial conditions. Why, then, have not metal prices already shown more of an upward tendency? To answer this it will be best to consider each metal separately.

Silver and lead are the only two important non-ferrous metals which have at no time since the Armistice been produced much faster than they have been sold. Consequently, no large surplus stocks have accumulated. In fact in the case of silver, the Pittman Act has had just the opposite effect from that of a surplus. It might be considered a sink hole in which 207,000,000 oz. must be placed which will never come upon the market. Silver then should have been the first to respond to the better feeling, and looking back over metal prices for the year we find that this has been the case. The low price of silver of 52 $\frac{3}{4}$ c. was reached on March 5. Except for a reaction in May, there has been a constant rise since that time until Sept. 22, when a sudden spurt upward occurred. There may be a slight reaction but probably not a permanent one. We are, of course, referring to silver of foreign origin, for domestic silver is all being taken by the U. S. Government at the same price at which an equal amount was released during the war.

Lead is in the next best position. No stocks have accumulated, and with manufacturers of lead products showing increased activity the lead market is firm, and prices are slowly going up. The low figure of 3.75c. was passed seven months ago. No violent advance is expected, for consumers are buying only as their needs arise, from month to month. Lead producers have little cause for worry. Their business should be increasingly profitable, and most of them are also benefited by the satisfactory price of silver.

The remaining three major non-ferrous metals, copper, zinc, and tin, are all suffering from the same malady—overproduction during the last three years. Until the surplus metal so accumulated can be marketed, there is little likelihood of a satisfactory price level being reached. Copper is in possibly the best position of the three, because of a violent cut in production and the funding of 400,000,000 lb. for export over a period of four years.

Regarding the copper surplus, our guess, and it is an uninspired one, is that stocks of refined and blister now amount to 900,000,000 lb. They should normally be slightly under 400,000,000 lb., thus leaving 500,000,000 to be sold. Of this, however, 300,000,000 will be taken care of in the last three years in which the funding plan of the Copper Export Association operates, from February, 1922, on. This leaves only 200,000,000 lb. to be marketed before a gradual resumption of copper mining and a return to more normal conditions will be indicated.

Sales during the last five months have averaged about 75,000,000 lb. per month, or, if we deduct say 8,000,000 lb. as coming from the funded stock, 67,000,000 lb., and production marketed in this country is now about 50,000,000 lb. If no improvement in the demand exists, between eleven and twelve months would therefore be required to clean up the available surplus, provided our assumptions are correct. However, we have a right to expect an increased demand; in fact, it has already been in evidence abroad, so that spring should see a resumption of activity in the copper camps, at least in those of the lower-cost producers. Every copper producer will, of course, wish to get under way at the earliest possible time, for several reasons: To obviate the expense incident to maintaining a dormant property; to take care of faithful employees; and to have the best choice of new men. It is greatly to be desired, however, that patience be shown; otherwise a flood of copper may be thrown on the market before it is in position to absorb it.

Zinc has begun to show an improved position also. Consumption during August exceeded production by about 6,000 tons, but on the first of September a surplus of about 86,000 tons was recorded, compared with a normal surplus of 5,000 to 10,000 tons. About thirteen months would be required to absorb this under conditions existing in August; but here, as with copper, demand should gradually improve.

Tin is not of so much interest to American producers, there being no domestic tin ores of economic importance and only three reduction works. The tin stocks are held in the Far East; they are almost certain to hang over the market for months to come.

A year from now practically all of our mineral industries should be able to carry on at a profit. It will take more time for some industries than others, and this

time will be dependent largely upon the world's surplus stocks of the material in question. Runaway markets are not to be expected, for the return to normal conditions is now seen to be a slow process, particularly in Europe, and things which were almost necessities in 1914 will, for some time to come, be luxuries in many countries.

Competition, both domestic and foreign, promises to be keen, and the greatest prosperity will go to those who, during the next few months, see that their plants are put in the best possible condition for economical production.

Attitude of Mining Students

THIS IS A TIME when many mining students are resuming their work in college. Although resumption of such work is often attended by about as much disturbance as is evoked by starting a certain well-known brand of automobile on a sandy stretch of hilly road, we doubt whether more than a comparatively few students seriously plan their year in an effective manner, despite the gratuitous advice offered by various presidents and faculty members. Nevertheless, the year does bear a definite relation to the course as a whole and is an appreciable part of the lifetime of the individual. Sports and social and student activities obtrude themselves upon the student to such a degree that he must be strong-willed indeed who can sit down in the quiet of a study and run over the prospective year in detail. Definite purpose is a strong factor in success. The student who can form such a purpose and sensibly consider the whole régime of college life in relation thereto is certainly laying substantial foundations and will undoubtedly be successful in a high proportion of the things he undertakes.

One of the mistakes made by some students is to be too critical of the school, of the course, or of the individual instructor. Instead of being critical of and holding himself to a strict and efficient performance of the daily tasks, he wastes his own time and that of others in ungenerous attacks upon the system of which he is a part and the success of which depends primarily upon his own effort. Worse than that, if persisted in, the practice creates a state of mind which rapidly produces that peculiar byproduct of higher education, the intellectual "sour brow." A hard-working, cheerful student can get something out of any course, no matter how poor the personnel or deficient the equipment, if he will only dig in. He should avoid too close association with the soured student, for the disease is infectious. As a corrective we would advise him to associate with "digs" or else to get interested greatly in his instructors.

Independent study or collateral reading in conjunction with any subject is of great value in getting the perspective of a subject. An instructor presents a single point of view, while parallel independent study gives an additional angle. Curiously enough, this self-effort does more to develop the individual than any other thing. We have heard students complain of lack of time for such study, but this is only an excuse. Careful planning will find time. Some sacrifices are necessary, but character is the byproduct of self-sacrifice, so that nothing is lost in the end. If a student will work out a personal time chart, he will find a surprising number of things which can be eliminated and in their places something of real value substituted.

It is said that gulls will not follow a Scotch ship, and it is equally true that a busy student will not be long annoyed by the type of student who merely serves to perpetuate the college atmosphere—as it is commonly taken to be.

Wholesome physical exercise is vitally essential where there is intensive study. It should not, however, be so strenuous as to create a deficit in the sum total of the individual's vitality. The modern college gladiator cannot also be a satisfactory student. Here the student can find scope for an intelligent division of his energy between work and play. One can play any time, but few have an opportunity of going more than once to college. There are eight months utilized in the year, and what the student misses by cutting the "play" he can catch up on in the vacations.

"The soul beholdeth the likeness of things that are absent." Imagination and vision can be developed. Out of them develops initiative. To visualize the mining industry, a substantial background needs to be cultivated. There are no adequate histories of mining except the continuous record found in the best mining periodicals. A consistent reading of them over the four college years is sufficient to give the student a fair background. We strongly advise the student to do this and keep it up.

Let the mining student visualize his entire course each year, and look upon his time in college as capital to be conserved and wisely apportioned. A student who can do this and render an accounting of the stewardship of his own affairs will make a good man and one who will be in demand.

Tax Exemption in Mexico

A CARTOONIST might well picture the mine operator in Mexico in his relations to the federal government as a lovelorn swain picking a daisy apart and murmuring "She loves me, she loves me not." For a few months this year, through the remission in whole or part of import and export taxes on mining supplies and products, the government apparently sought to lighten the burden on the mining companies. For example, beginning with April 1 for a period of four months a considerable reduction was made in the export tax on silver. The hoped-for extension of this period did not materialize, however, for by a decree effective Aug. 1 taxes were restored on exports and imports as under the old decree that became effective on June 15, 1919.

Just what the influences were that caused this sudden stand can only be conjectured. First, the government undoubtedly needs the money, a fact which usually outweighs all other considerations. The Minister of Finance has announced that the government does not intend to change the taxes, either now or soon. But whether it is to camouflage the financial need of the government or not, there is much chatter to the effect that the mining industry must henceforth work out its own salvation, that any tendency to lean on the government for support must be discouraged, and that the lightening of the tax burden, though temporary, should have enabled the operators to readjust themselves to the changed conditions. In other words, the industry must paddle its own canoe, even if its paddling is confined to the bath tub.

An official of the Department of Industry and Commerce is quoted as saying: "It must be recognized

that the mining industry cannot claim exclusive rights to be carried when it is known that all the other industries of the country are having their individual problems in the general reorganization of economic conditions." The official further expresses his belief that tax exemption as a medium of relief is an economic error and that the companies will let the government do the worrying if permitted to lean on it.

Whatever the cause, there is nothing in the situation to alarm the operator. It is better in the long run that the industry should stand on its own feet. Conditions are actually improving gradually. We believe that the majority of operators in Mexico expect to pay their fair share of taxes and that they ask nothing more than to be permitted to work out their own salvation unhampered by the social disorder that so long disturbed their country and its relations with the other nations of the world.

Wages and Commodity Prices

IT IS INTERESTING to watch certain applications of the so-called "law of averages." We refer particularly to a condition, which may be regarded as a ratio, that exists between wages and commodity prices. Generally speaking, in sections where a particular industry is the mainstay of a community, it is possible to draw comparisons between these two which will be of more value than those made in districts having a number of varied industries. Those of us who have at some time or other cast our lot in certain of the mining regions for extended intervals have been aware of periods of inflation or deflation of wages and salaries (increases and cuts are perhaps the more polite terms). It was always, of course, with a feeling of pleasure that we learned of a blanket 10 per cent increase; and accordingly made our plans to spread out a little more, supply ourselves with some of those things that we had felt were beyond us, and get a bigger and broader outlook on the world in general. But immediately we found that the baker, the butcher, and the candlestick maker had anticipated this new addition to our fortunes and accordingly had tilted their prices. So we immediately began to figure just what proportion of the increase was our allotted share.

During the last year, practically all of the metal-mining districts have been experiencing the reverse process, and wages have been retreating rather than advancing. In many communities commodity prices have dropped commensurately with the deflation of wages. Such communities are indeed fortunate; and the retailers, if they have the foresight to realize that they can better afford to make small profits with sales than attempt to hold out for high prices with the possibilities of no sales at all, are consequently on a more stable business basis.

As a general thing most of us cut our coats to fit the cloth. Sometimes we attempt an elaborate system of bookkeeping in keeping track of expenses, and again we may view the outgo from the corner of our eye and merely feel when we have paid the monthly bills that we are striking a fair average—so much for this, so much for that, and the check-book shows the balance, if any. The former system is most commendable, and by means of it we can make the fairest estimate of what the actual ratio is between wages and commodity prices. One of the advantages of such a plan is that we are less apt to jump at the conclusion that an increase in

the price of one commodity means that our entire expense is proportionately raised.

We recently heard of a miner who declared that his expenses had doubled because the price of beans had jumped from 9c. to 18c. since the pre-war days. And yet during the period included in this man's calculations, the rent on the house, which he secured from the mining company at \$12 per month, had not been changed, and several other items which totaled the greater portion of his living expenses had varied but little. Certainly if employees adopt such imperfect methods of calculation and draw corresponding conclusions, any attempt on the part of the company to keep pace in the matter of compensation will spell ruination.

It seems to us that there is an opportunity for mining companies to encourage systematic cost accounting among the employees. We hear a great deal of educational programs, the development of community interests, and the furtherance of loyalty of employees. Surely a better understanding of the relative percentages of expense items that go to make up the monthly or annual budget would be a valuable addition to such curriculums.

Small Profits and Many Sales

INDUSTRY, in its various ramifications, is like a linked chain. Extended, a pull at one end will cause an effect throughout the chain. Every link will respond. The present condition of industry is like a piled-up chain in a chain locker. Only a long sustained vigorous pull will extend it and draw it out from its rusty pile. During the war the industrial chain was extended to its utmost length, and the individual links were almost at the breaking point under the tremendous demand of war. Prices and the resultant profits became out of all proportion as compared with those prevailing during normal industrial growth. Along with this there were lost several merchandising principles, one of which should be recovered and nailed up where all who buy and sell can see it. It should be the head-liner over every business street. We refer to—yes, we venture to resurrect—this moth-eaten, worm-holed, and moss-covered business slogan that has carried many a merchant to success: "Small profits and many sales." It should rule in every line of business, small or large.

Our friends the metal producers have marked their goods down to the point where profits are like the pot of gold at the end of the rainbow; but they are waiting for the many sales. And they will wait until the building contractor, the city merchant, the country store, and the seller of goods, whether wholesaler or retailer, rediscover this vital principle of business. Increased volume of sales to the ultimate consumer, whoever he may be, is the only kind of a pull that is going to drag this industrial chain out of its locker. A long pull and a strong pull and everyone working on this fundamental principle and for the common good will do the trick.

This is not all, however; for the complement of the merchandising principle is maximum economy in federal, state, county, and municipal expenditures, to the end that taxes may be progressively reduced and every dollar made to earn its way. Nor yet is this all, for productive labor must also earn every dollar received. Then will the mining industry resume its stride along with all other industries.

WHAT OTHERS THINK

Asbestos Mining at Black Lake

In your issue of Sept. 3 appeared a four-page article by Wyant D. Hubbard, which casts serious and totally unwarranted aspersions on the Quebec asbestos industry. I don't know who Mr. Hubbard is, but as I know, in my official capacity, all the managers and most of the technical staffs of the various asbestos operating mines, I take it that he must be a visitor, who from casual observations on a hurried trip collected wrong and half-baked impressions.

He criticizes the management of the mines, and "wonders how long it will be before most managers will recognize that changes, making for a higher efficiency, are needed."

Let me quote figures from our official report, "Mining Operations in the Province of Quebec for 1920." In 1914, the total tonnage of serpentine mined and hoisted in the Quebec asbestos industry was 2,127,395, with an average content of 111 lb. of asbestos, representing a value of \$1.43. In 1917, these figures were 2,634,410 tons, with an average content of 109 lb., of a total value of \$3.08. In 1920, 3,123,370 tons, containing 109 lb. each, valued at \$4.53.

If the average manager can mine, hoist, and mill one ton of rock, and grade and bag the asbestos produced, and pay dividends, at costs of \$1.43 in 1914 to \$4.53, or less, in 1920, the inefficiency of the management is not apparent to me.

The greatest slur of the article, however, is on the French-Canadian labor, and I have no hesitation in stating that the majority of skilled workmen, foremen, mechanics, drillers in the asbestos industry are French Canadians, and that the aliens, Czechs, Russians, Austrians, and Italians, employed in the asbestos mines, and praised and vaunted by Mr. Hubbard, are practically all muckers.

THEO. C. DENIS,
Superintendent of Mines
of the Province of Quebec.

Quebec, Canada.

A Correspondent Concurs

I have just been reading your editorials on the tariff in the Aug. 6 issue of the *Journal* and your editorial on the War Minerals Relief matter in the issue of July 2. I want to say it is refreshing to see somebody stand up and talk common sense about the former and tell the truth about the latter. It requires some courage for a man in your position to place the general welfare of the country above that of a few interests, and you are to be congratulated on your stand. I happen to have put in considerable time during and after the war period in some of the manganese districts of the country, and consequently know a good deal about many of the manganese war mineral claims. About some of them I know a whole lot. Your editorial on the claims in your issue of July 2 was mild.

You are probably receiving so many kicks on your stand in these matters from the parties interested that I thought you might be interested to know that most thinking engineers agree with you.

This is a government by noise. As it is a fact that the manganese district which during the war pro-

duced 2 per cent and less of the country's production, and which at any time could scarcely produce enough to keep one fair-sized furnace going, now is making nearly 100 per cent of the noise for the tariff, so it is that the criticisms of your editorials on this subject which you have printed represent but the merest fraction of the thought of the fraternity.

I hope you will continue to stand for what you think is right and present the case for the other 98 per cent of us who are inarticulate and whose sense of values is not clouded by the pocketbook.

SATISFIED.

New York City.

Conditions Now Favorable for Mining In Bulgaria

At the end of the war Herbert Hoover arranged for American Technical Missions at various European capitals to study conditions and advise the governments as to the best plan of organizing transportation and developing resources. Commissions went to Belgrade, Vienna, Prague, Paris, and Warsaw.

The Belgrade commission went to Jugo-Slavia in September, 1919, and returned to the United States in September, 1920. It contained a number of railroad experts and one mining engineer, who has turned out voluminous reports on the mineral wealth of Jugo-Slavia.

I arrived in Belgrade in June, 1920. I soon saw the impossibility of doing anything in that country until the various provinces of the confederation were able to agree on and adopt some form of constitution and settle down to business.

I then went to Bulgaria, where I have accomplished a great deal during the last year. I was agreeably surprised to find Bulgarian conditions so unusually favorable for mining at the present time. (They really are, in spite of doubts I encounter among the uninformed.) The mining law is more favorable than that of any other country in the world. It was passed in 1910 after a thorough study of the various mining laws of the world, and the formulators have escaped the defects of most of the older laws, including those of the United States of America. Bulgaria being a very young nation, the same thing applies to most of the country's other laws. An American likes to think that perhaps the intelligence and sturdy character of the Bulgarian is due in part at least to an American college in Bulgaria, and the fact that a large proportion of the students of the American Robert College at Constantinople come from Bulgaria. Ground is now being broken for an American college in Sofia. Bulgaria has a public school system that compares favorably with that in this country.

During a year's work in Bulgaria, I accomplished a great deal, and did not give a penny of graft to anyone, which experience would be impossible in any of the neighboring countries. I sometimes think that the ever-present example of graft and rotteness among her neighbors has something to do with the thorough manner in which anything of the kind is stamped out in Bulgaria.

All foreigners are respected in Bulgaria, and given equal or more rights than the Bulgarians themselves. At the present time there are special inducements and protection for foreign capital.

Rolla, Mo.

PAUL R. COOK.

Decay of Timber in Return Air Courses

Fungus Growth Produced by Deposition of Spores on Moist Wooden Structures, Supersaturation Being Caused by Heated Air Coming in Contact With Cooler Rock Surfaces—Prevention of Decay by Creosote Treatment and Application of Gunite

BY D. HARRINGTON*

Written for *Engineering and Mining Journal*

AMONG NUMEROUS INTERESTING PROBLEMS which I have noticed in a study of metal-mine ventilation for the U. S. Bureau of Mines, extending over the greater part of the last five years, is that of the rapid decay of timber in a return air course of the North Butte mine at Butte, Mont., with some of the measures taken to overcome an abnormal situation.

During the late fall of 1916, the North Butte Mining Co. completed a long crosscut on the 2,000 level in hard Butte country rock ("blue" granite), connecting with the Rainbow shaft, and upon completion of this crosscut it was immediately made one of the main return air courses of the North Butte mine. An electrically driven fan at the collar of the Rainbow shaft pulled about 20,000 cu.ft. of air through this crosscut from the lower portion of the mine (2,000 to 3,000 levels), with numerous heavily timbered stopes, raises, drifts, and other workings, including many miles of workings in the North Butte as well as from those of adjoining mines.

This crosscut, which was of about 7 ft. by 7 ft. or 8 ft. original cross-section, though driven in hard country rock, intersected a number of fissures, and it was found necessary to timber about one-third of the distance, using 10-in. to 12-in. or 14-in. round-peeled Douglas fir sets about 5 ft. apart, sometimes with 3-in. or 4-in. top and side lagging, or, in places with only the top lagging. The crosscut was in virgin ground, with no workings above, below, or around it, and, though some water drippers were occasionally found, there were no unusual amounts of water, the water was not mineral impregnated, the rock was not hot or hard to mine or support, and, in fact, in the driving no unusual problems that would be considered worthy of mention were encountered.

REDUCTION OF AIR TEMPERATURE BY TRAVEL

The 20,000 cu.ft. of air per minute which entered this crosscut at the top of a raise from lower and hotter levels had a temperature 82 deg., wet bulb; 82½ deg., dry bulb; relative humidity, 98 per cent, and as it flowed at a velocity of from 400 ft. to 800 ft. per minute along the crosscut, which had a rock temperature of 72 deg., the air temperature at a point within 200 ft. of the top of the raise was reduced to 81½ deg., both wet and dry bulb, and deposited moisture along the timbers, sides, and other surfaces of the crosscut for its entire length, and entered the Rainbow shaft at the end of the half-mile of crosscut at 79 deg., saturated.

I obtained the above data on Nov. 15, 1916, soon after the crosscut had been put into operation as an air course, the connection to the Rainbow shaft not having been completed on my previous visit on Sept. 22, 1916.

Almost immediately after placing the crosscut in

operation as a return for the hot, humid air from the lower parts of the mine, the exposed rock in the crosscut began to "slough off," and numerous small falls had to be cleaned up, two men being engaged in this work on Nov. 15, 1916, soon after starting to use the air course. I had occasion to visit this crosscut again on April 9, 1917, to obtain ventilation data, and noticed that though all timber was distinctly wet, and there was still about 20,000 cu.ft. of air per minute, with the same temperature as before noted, moving through the crosscut at a velocity of about 400 ft. to 800 ft. per minute, the timber was decaying rapidly, as timbermen were even then engaged in replacing sets which had fallen of their own weight, and the timbermen pointed out timbers that had been newly placed less than a month previously that were already practically white with luxurious growths of fungus. At that time I entered the following in my notebook: "Why should new timber decay so fast or fungus form so fast in a crosscut with air velocity over 600 ft. per minute?"

LIFE OF TIMBERS OF SHORT DURATION IN AIR COURSE

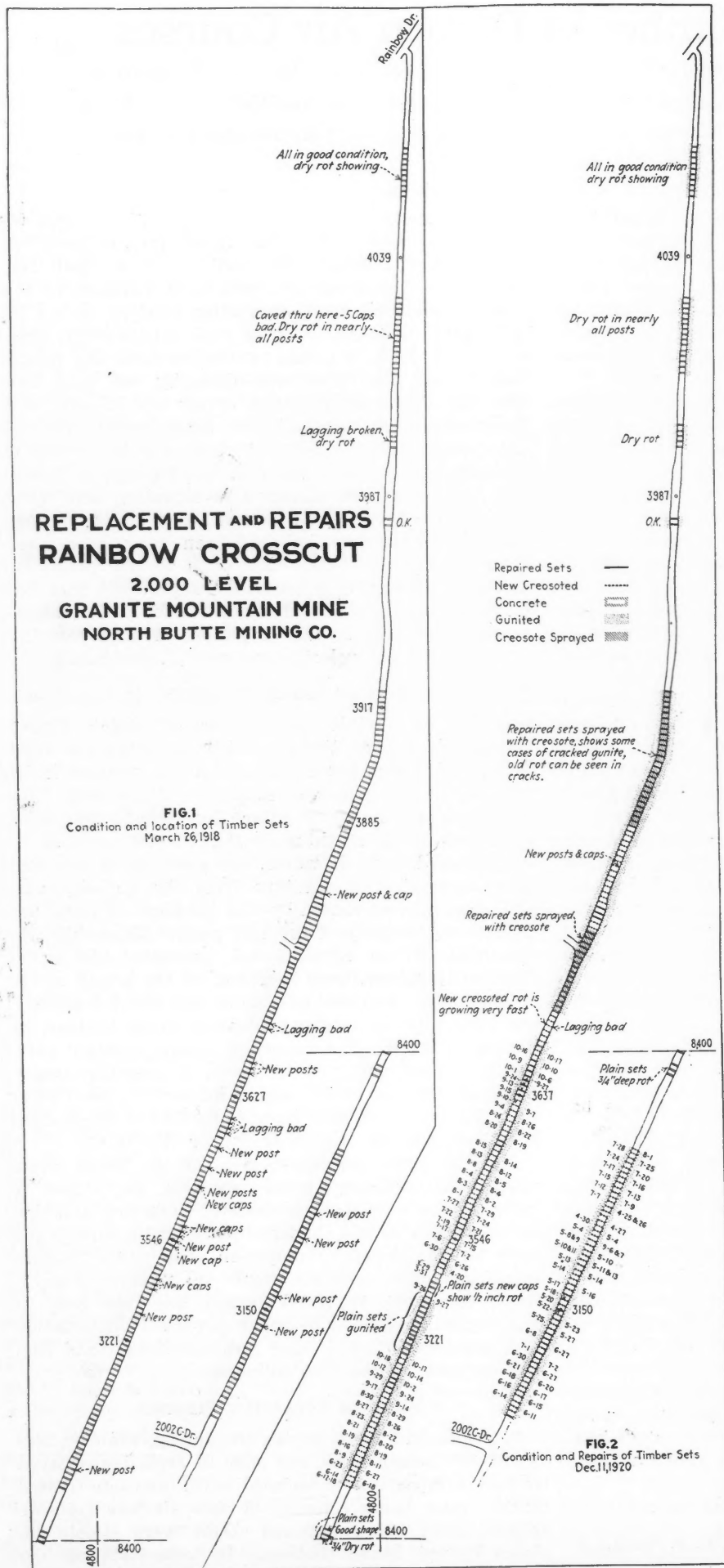
During 1917 this crosscut caused much trouble through failure of timbers, with accompanying small caves, and it was noted that sound new timbers lasted only from six to eight months. There was little weight or pressure, as after the timbers fell there would rarely be much more than a few carloads of rock to load out. However, the swelling of the rock upon absorption of moisture from the air did cause some pressure, as shown by side buckling of posts and later on by breaking of concrete posts. Meanwhile, the sloughing of the exposed rock compelled placing of additional timbers, until over half of the length of the crosscut was timbered, as against one third originally, and this, with the replacement of decaying timbers, by the beginning of 1918 compelled almost constant services from four repair men in order to keep this important half-mile air course open. Meanwhile, the timber being placed was largely creosote treated at the Rocker, Mont., plant of the Anaconda Copper Mining Co.

Early in 1918, the management of the North Butte mine, with customary progressiveness, determined to experiment with various methods of timbering and timber protection in this abnormal place, and a survey was made of the location, condition, and other factors affecting timber sets as shown in attached Fig. 1, dated March 26, 1918. A record was then kept of date, material used, and other pertinent information as to replacements and other measures taken, and Fig. 2 shows some of the data collected.

WORK OF REPLACING TIMBERS

As shown in Fig. 2, during the spring, summer, and fall of 1918 much work was done in replacing decayed timbers. Some were replaced with creosote-treated timber, some being replaced by new timbers creosote sprayed after being set, and others were simply replaced by new sound timbers. In some instances the

*Published with permission of the Director, U. S. Bureau of Mines.



**REPLACEMENT AND REPAIRS
RAINBOW CROSSCUT
2,000 LEVEL
GRANITE MOUNTAIN MINE
NORTH BUTTE MINING CO.**

FIG. 1
Condition and location of Timber Sets
March 26, 1918

- Repaired Sets ———
- New Creosoted - - - - -
- Concrete [stippled]
- Gunited [cross-hatched]
- Creosote Sprayed [diagonal lines]

FIG. 2
Condition and Repairs of Timber Sets
Dec. 11, 1920

newly placed timbers were almost immediately covered with guniting to a thickness of $\frac{1}{4}$ in. to 1 in. of cement mortar, and this included creosote-treated and creosote-sprayed timber as well as new untreated timber, and also timber treated and untreated which had been in place some months and which, though covered with fungus, was apparently sound. In addition, some timbers were newly placed but not covered with guniting, these being creosote treated, creosote sprayed, and some wholly untreated timbers thus left untouched by guniting to observe the effect as compared with the covered timbers. Two reinforced concrete sets were also placed at this time, and these failed because of side pressure. The concrete lagging, however, seemed to hold securely.

I accompanied N. B. Braly, general manager of the North Butte, into this crosscut in August, 1918, while the work was in progress, and did not again see it until Nov. 29, 1919, when, in company with Mr. Braly, a trip was taken and much interesting information gained. Also, on this trip, Mr. Braly took the accompanying photos illustrating conditions.

It was found that whereas the exposed untreated timbers had utterly failed in most instances in less than eight months, there was no instance of absolute failure of guniting-covered timber in less than a year, though photo No. 3 shows partial failure after slightly over a year of guniting covering of an untreated post, which had stood about three months before guniting, and though apparently sound when "gunned," was well covered with white fungus. Photo No. 4, taken of partial failure of a guniting creosote-treated post situated about ten feet from the post shown in photo No. 3, shows the effect of weight on this solid post as well as on the partly decayed post in photo No. 3. The creosote-treated post in photo No. 4 had been guniting just after being placed, and although its exposed surface showed white spots of fungus, the post was apparently solid after slightly over a year's standing.

Photo No. 1 shows in the foreground two guniting-covered posts apparently solid after over eighteen months' standing, and in the background is seen unprotected timbers badly decayed, fungus covered, and ready to fall, the uncovered top lagging between the guniting sets and those not so treated having already failed and let some loose material through to the floor.

Photo No. 2 shows some creosote-

treated gunited sets in the foreground apparently almost as solid as when they were placed, over eighteen months previously, and in the background is seen an untreated, uncovered set, showing the effect of decay, and the cave farther on shows the effect when the timbers fall out. Standing near one of the gunite-covered posts there is seen an untreated comparatively new girt completely covered with white fungus.

Photo No. 5 shows two creosote-treated girts which stood loose in this crosscut exposed for fifteen months to fungus attack from the hot, humid air. Though these are nearly covered with white specks of fungus,

bers appeared absolutely sound in all except a remarkably few places, though most of them had been in place more than two and a half years, and some of the timbers had not been previously treated with creosote or even creosote sprayed. In those places, however, where any kind of untreated timber (posts, caps, lagging, girts, or other timbers) had been left or set and not covered with cement, there was invariably abundant evidence of decay. However, instead of now having four men continually at work to keep this crosscut open, as in 1917 and early in 1918, repair men are now sent into the crosscut only on rare occasions.



TREATED AND UNPROTECTED TIMBERS AT NORTH BUTTE MINE

(1) Gunited posts in foreground apparently in first-class condition. Unprotected timber in the background so badly decayed as to be almost ready to fall out.

(2) Gunited sets, girts, and other parts, in first-class condition,

with unprotected, badly decayed sets in background and cave brought about by absolute failure of untreated sets. In foreground, prolific fungus on unprotected piece of loose timber standing against gunited post.

the sticks are apparently sound, and the fungus has been unable to penetrate to an appreciable distance.

Photo No. 6 shows a portion of the crosscut with creosoted gunite-covered timbers in place and in good condition after standing over eighteen months. A few white blotches show where fungus has attacked the creosoted timber in a few places where the gunite covering was thin. The ladder and spiling timbers on the floor were untreated and uncovered, and had been so badly attacked by decay as to be practically worthless.

Though there have been some instances of failure of gunite-covered timber sets in this crosscut, as far as can be learned these failures have invariably been of untreated sets which had stood some time exposed to decay before being covered with the gunite. In company with Superintendent Frink of the North Butte company I went through this interesting crosscut to its end at the Rainbow shaft on March 28, 1921, and though there were evidences of fungus growth occasionally through the gunite covering, the gunited tim-

There has been comparatively little variation in the air conditions in this crosscut since its completion in the fall of 1916. On Nov. 16, 1916, there was flowing in this crosscut at a point about midway between the raise from the 2,200 level and the intersection of the drift with the Rainbow shaft, about 20,000 cu.ft. per minute at a velocity 400 to 600 ft. per minute, and a temperature of 80½ deg. wet bulb, 80½ deg. dry bulb, and a relative humidity of 100 per cent. Samples of this air showed CO₂, 0.20 per cent; O₂, 20.45 per cent; CO, 0.00 per cent; CH₄, 0.00 per cent, and N, 79.35 per cent. At the same place on March 28, 1921, the quantity was still 20,000 cu.ft. per minute, with a velocity of 600 ft. per minute at the point of reading, and temperatures as follows: Wet bulb, 79½ deg.; dry bulb, 79½ deg., and relative humidity, 100-per cent. Air analysis was as follows: CO₂, 0.30 per cent; O₂, 20.25 per cent; CO, 0.00 per cent; CH₄, 0.00 per cent, and N, 79.45 per cent. Hence, it is seen that there has been little change in the air conditions, and as the fan



CONDITION OF TIMBER IN CERTAIN SECTIONS OF NORTH BUTTE MINE, BUTTE, MONT.

(3) Partial failure (after eighteen months) of post gunited over fungus growth, the post having been exposed to decay for about three months before guniting. (4) Partial failure of creosote-treated post, which was also gunited. (5) Section of crosscut practically without timber. Also shows method of

fungus attack on creosote-treated girts which have been exposed for fifteen months, standing against side of crosscut. (6) Gunited section which had stood well over eighteen months. Note occasional fungus growth through the gunite on creosoted timber beneath.

has been running practically continuously, pulling saturated air through the crosscut, the exposed timber has been kept moist or wet *at all times*, and hence there has been no question of alternate drying and wetting.

CHARACTERISTICS OF MINE FUNGUS GROWTH

The fungus growth is usually almost snow white, resembles cotton, generally is from one-half inch to one or two inches thick, and covers much of the surface of the timber attacked. In places it forms a species of inverted cone and hangs down twelve to eighteen inches. It may be found at the foot of a post or at the top of the post, on a cap or on a piece of timber lying on the floor. It is as likely to be found in a place with high velocity (400 to 800 ft. per minute) air striking it direct, as in a sheltered place with no velocity. And the decay is fully as rapid near the Rainbow shaft as it is near the raise from lower workings from which the air comes at the opposite end of the crosscut from the Rainbow shaft. However, there is not much decay in the timbered Rainbow shaft, which is *distinctly wet*, owing to falling water from super-saturated air cooled as it nears the surface.

The following are my conclusions, which also embody in large measure those of the management of the North Butte Mining Co., or which I have deduced from the data given to me by that management:

1. The excessive decay in this crosscut is caused by the circulation through it of comparatively hot, humid air, supersaturated, and hence depositing moisture. When the air comes in contact with lower temperature rock of the crosscut, the fungus spores are drawn with the air from decaying timber in the lower parts of the mine and caught or filtered from the air by coming in contact with the moist timber of the crosscut.

2. It is probable that these spores continue to come from lower parts of the mine now in almost the same quantity as when the crosscut was first used, though mine officials seem to think that exposed timber does not under present conditions decay as rapidly as it did three years ago.

3. Though, in general, unprotected timber in this crosscut, with comparatively pure air moving 400 to 600 ft. per minute, decayed completely in eight months or less, the covering of new sound timber (treated or untreated) with one-half inch or over of gunite results in increased life of timber to considerably over two and one-half years (the limit not being yet known).

4. Timber, even when not treated by creosote or otherwise, and even when covered to a considerable extent by fungus after two or three months' exposure in this crosscut, but apparently still solid, had its life prolonged to over a year (in some instances to over two and one-half years) by efficient guniting.

5. Timber treated with creosote by pressure process, or creosote sprayed immediately after being placed in this crosscut, though apparently attacked by fungus, seems to resist complete decay for over two years, even when not gunited, and appears to be almost as good as new after two and one-half years' standing when gunited; provided that the guniting is effective and that a condition producing undue weight does not destroy the guniting.

6. In guniting timber, it is necessary to cover first with some kind of metal lath or chicken wire, and the mixture of 1 part of cement to 2½ to 4 or 5 parts of fine sand should cover the timber to a thickness of at least one-half inch, and should be so "shot" as to exclude

air wholly from the timber. Spots of shallow thickness of gunite almost certainly show fungus growth, even when the timber beneath has been creosoted.

7. In working in this crosscut, two men would in general take out a decayed set, muck out the loose material involved, and place the new set in one shift. In guniting, three men operating a cement gun would, in general, complete the exposed surface in about thirty feet of crosscut each shift, or two sets per man per shift. Costs are not available.

8. In general, it appears to be the opinion that in this place, with its abnormal conditions, efficient, immediate guniting over new solid timber (treated or untreated) will prevent decay for at least two and one-half years, probably for several additional years, whereas uncovered, untreated timber generally lasts less than one year. In replacing timber now, however, creosoted timbers are used, as it is not convenient to gunite unless considerably more than one set can be covered at the same operation. The use of guniting is much safer from a fire prevention point of view than creosoting; moreover, it has not the objectionable odor of creosote, nor does it cause objectionable stains on skin and clothing when water drops from it.

I wish to acknowledge the numerous courtesies extended me by the management of the North Butte Mining Co., not only in the making of this study, but at all times during the last five years in connection with the making of many kinds of underground investigations and inquiries.

Dust Prevention and Ventilation Decrease Lead Poisoning

The metal-mining camps of Utah furnished in 1919 264 cases and in 1920 184 cases of lead poisoning, or 71.2 per cent and 82.1 per cent respectively of all cases of lead poisoning reported in that state, according to Serial No. 2274 of *Reports of Investigations*, U. S. Bureau of Mines. These figures do not take into consideration the cases of lead poisoning sent to medical centers for treatment or cases which were removed to farms or ranches with a view to recovery. It is probable that could all the cases be traced to the source where contracted, the metal mines would account for approximately 90 per cent of all cases of lead poisoning in Utah.

The principal controlling factors in lead poisoning in mining, namely, the nature of the lead ores mined, the dryness of the mine, dust in the atmosphere, and the ventilation, naturally have a great influence on the number of cases of lead poisoning produced. The carbonate and oxide ores are much more prone to cause lead poisoning than sulphide ores, hence, although a mine may produce considerable lead, if the relative proportions of carbonates and oxides to sulphides are low the resulting disabilities due to lead poisoning will be fewer.

Testing Non-Metallic Minerals as Fillers

An investigation of various deposits of clay, mica, schist, slate, marble, talc, and kaolin in Alabama, Georgia, Tennessee, and North Carolina with regard to their suitability for use as mineral fillers is being undertaken by the Southern Experiment Station of the U. S. Bureau of Mines at Tuscaloosa, Ala.

War Problems in Minerals

II—Overseas War Mineral Movements. A Record of Activities Of the Committee of Mineral Imports and Exports

BY C. K. LEITH.

OF THE MANY serious disturbances in the mineral industry during the war, there were perhaps none so unexpected and far-reaching as those caused by shortage of ocean shipping. A hundred years had passed since wars had profoundly changed overseas trade. During that interval, and especially in its last quarter, the ocean movement of minerals had reached huge dimensions. Minerals had come to constitute perhaps a little less than one-third of the international trade of the world. More minerals had been consumed throughout the world in the last twenty-five years than in all preceding history; more varieties of minerals had been used; more distant sources had been drawn upon; more countries had been using large quantities of minerals; the world's per-capita consumption had multiplied—in the United States fifteen times in thirty-five years.

Nature seems to have concentrated its principal mineral resources so irregularly over the globe as to make no country entirely self-supporting in regard to all minerals and to require great overseas movements in order to insure each country of its quota. High-grade ores so restricted as to be easily and cheaply mined and transported have been available from far distant sources at a lower cost than domestic supplies disadvantageously circumstanced for one reason or another. It is estimated that approximately one-third of the world's mineral resources move between international boundaries. Of this third a considerable fraction is ocean borne.

When, therefore, the German submarine campaign caused an acute shortage of shipping, it became necessary for the Allies to take careful stock of the purposes for which ships were being used, with a view of eliminating cargoes not vitally necessary to the prosecution of the war. Where domestic supplies of minerals could be secured, even though of lower grade and higher cost, these were substituted for importations from abroad. Where transoceanic supplies could be located near at hand, these sources of supply were drawn on rather than more far-distant sources.

The problem, reduced to simplest terms, was, first, to ascertain what minerals and what quantities were needed for the prosecution of the war—a difficult problem with the ever-changing and widening demands of the Army and Navy; second, the canvass of domestic sources, with their possibilities of rapid development, and to ascertain the possible changes in metallurgical and manufacturing practice allowing use of domestic supplies, and possibilities of substitution; third, to the extent to which domestic supplies fell short of requirements, to arrange for importation of needed amounts from the nearest or most available foreign source, and, as a corollary, to eliminate all other overseas mineral shipments.

The rapid development of the mineral industry in the last two decades before the war had brought economic geologists and mining engineers into wide and diversified service, and they had become used to calls

from most unexpected sources. When, however, they were charged by the Shipping Board with the duty of presenting a specific list of mineral tonnages to be eliminated from transoceanic shipments, and this within a few weeks, they were confronted with a task for which data and previous preparation were meager. Neither business nor professional men had been thinking broadly along these lines. Information as to overseas trade in minerals had not been brought together. The story of the effort made to meet the complex and ever-changing problem thus presented constitutes an interesting episode in the history of the mineral industry and in the new participation of the United States in world affairs. The scope and diversity of this work were far greater than the routine of any one of the existing Government agencies. Thus it was that a special agency was created, the Committee of Mineral Imports and Exports, working officially and unofficially with all of these organizations. As only a part of this story has been told in the reports of war-time activities issued by the several official agencies, it seems desirable that a record should be made of the work of this committee.

THE COMMITTEE OF MINERAL IMPORTS AND EXPORTS OF THE U. S. SHIPPING BOARD

The U. S. Shipping Board recognized in the latter weeks of 1917 the necessity of curtailing imports and exports as a means of ship saving. A preliminary survey of the problem was undertaken by the Division of Planning and Statistics, under the able leadership of E. F. Gay, Dean of the Graduate School of Business Administration of Harvard University. Later he was also made a member of the War Trade Board, with a view to facilitating action on embargoes; still later, Director of Planning and Statistics for the War Industries Board, and, finally, Director of the Central Bureau of Planning and Statistics, operating through all the special war boards and some of the permanent departments.

On Jan. 7, 1918, Mr. Gay called on C. K. Leith, Professor of Geology at the University of Wisconsin, to take charge of the investigation of the possibilities of mineral embargoes. He was given a free hand in the selection of a staff. It was the impression of the Shipping Board that the exigencies of the situation required immediate organization of a large professional staff outside of the existing Government departments. Knowing, however, the personnel of the U. S. Geological Survey and the Bureau of Mines, and the scope of their work, Mr. Leith decided it was unwise to attempt to develop a large new organization, which would duplicate so much of the work done by these agencies. They were ready and anxious to co-operate in every possible way, and did so throughout. Mr. Leith, therefore, confined his organization to a small committee of qualified men, with a view of utilizing the various existing agencies both within and without the Government.

The first selection was Mr. J. E. Spurr, now Editor of *Engineering and Mining Journal*, who had a long record of successful business and professional experience in the mineral field in various parts of the world. Later Mr. Pope Yeatman, Chief of the Section on Non-Ferrous Metals of the War Industries Board and a mining engineer of world-wide experience, joined the committee. Mr. Hennen Jennings, of Washington, acted in an advisory relationship. Mr. Leith was chairman. From time to time technical assistants were taken on to meet special problems. The personnel of this force was: F. W. Paine, F. F. Grout, D. A. Hall, C. M. Farnham, H. H. Porter, R. S. Schultz, E. A. Kronquist, and Paymaster C. P. Storrs (Navy). In addition to these men, the committee was able to use a considerable part of the valuable services of E. C. Harder, E. S. Bastin, B. F. Hewitt, and others, through a co-operative arrangement with the U. S. Geological Survey.

The sixty-seven mineral commodities to be investigated were divided among this group, it being the duty of each man to ascertain the status of the group of minerals under his charge. Geologists, mining engineers, and business men connected with the industry were called on for data, reports, and advice. Before the end of the war perhaps one hundred people had been engaged directly or indirectly in this effort for a considerable fraction of their time.

The committee started as a Shipping Board agency, and its principal power throughout came from its connection with the control of shipping. However, the field covered by the committee soon reached into the War Trade and War Industries boards, and even into some of the permanent Government departments. Though the Shipping Board had the power to control the situation by its allocation of ships, the War Trade Board also had power through its control of embargoes. The War Industries Board was charged with securing the necessary supplies for the War and Navy departments, and, therefore, overseas shipments could not be eliminated without ascertaining from the War Industries Board what their requirements were. The result was that the Committee on Mineral Imports and Exports soon had official relation with the War Trade and War Industries boards.

The method of procedure was this: The Committee on Mineral Imports and Exports would investigate a mineral commodity figuring in international trade, and call on the experts of the Geological Survey and Bureau of Mines for reports on domestic supplies and possibilities and for such information as to foreign sources as they could supply. Concurrently, section chiefs of the War Industries Board were consulted to ascertain their estimates of war requirements. With this information in hand, other specialists were called in for consultation both from within and without Washington. Then the principal people in the trade involved were called in for conference, with a view of getting as broad and accurate a view as possible of all the possibilities in the situation and agreement as to the proper course of action.

There was investigation, also, of shipping needs on the particular routes affected by possible changes, the time lost in loading and unloading ballast cargoes, the question of return cargoes or "back haul," deviation from shortest routes, and other commercial and military considerations, and such factors were balanced against needs of mineral shipments.

Having ascertained, then, the requirements and the possible sources of supply, the committee wrote a report on the given commodity, indicating the nature, location, and amount of domestic and foreign supplies, the overseas movements, the war requirements, and ending with a specific recommendation either for the reduction of overseas shipments by specified amounts from certain localities, or for the maintenance or increase of overseas shipments.

The next step was to secure the personal approval of Mr. B. M. Baruch, Chairman of the War Industries Board. This he gave only after consultation with his section chiefs. He was responsible for supplies to the Army and Navy, and no embargo could be put through until he was satisfied that it did not interfere with maintenance of necessary supplies.

Effort was then made to find out whether the proposed step ran counter to existing international agreements as embodied in treaties, trade agreements, or special war understandings. This was done usually by consultation with the State Department.

The recommendation, thus fortified, went forward to the Division of Planning and Statistics of the Shipping Board, where it was considered in relation to similar recommendations relating to non-mineral commodities. After approval, the recommendation finally came up through Mr. Gay for action in the War Trade Board, where it was embodied in official embargo and restrictive orders.

The enforcement of these measures lay in the field of the War Trade Board. As a matter of fact, however, even before they were formally embodied in official acts of the War Trade Board, they had in some cases substantially gone into effect through the inability of the Shipping Board to supply necessary cargo space. Also, throughout the life of the restrictions, there were various modifications of the program arising from the inability of the Shipping Board to allocate ship tonnage to the precise amount necessary to cover the War Trade Board wants. For some routes and for some commodities, extraneous conditions of back haul, ballast, and retention of ships on the route for a variety of reasons made it possible to carry amounts of minerals in excess of those indicated by the War Trade Board rulings. For other routes and commodities the shipping was short of the required amount.

Though the Committee on Mineral Imports and Exports had no authority to issue executive orders, its recommendations, as a matter of fact, were almost always accepted and put into effect, with only such modifications and delays as were inevitable in a complex situation of this kind.

After embargoes and restrictions were officially in effect for a given commodity, the committee was by no means relieved of its responsibility, for the situation was in rapid flux, and all factors required current scrutiny and revision to prevent evasion of orders, and to see that minimum requirements were being met. Where reductions of shipments were made, on the assumption of a given domestic output, it was necessary to watch the progress of this output to see whether it was running on schedule. Where it ran behind, every effort was made, through conference with the trade and with various experts connected with it, to find out what the difficulties were and the possible remedies. The domestic movement of manganese, for instance, was often hindered by embargoes and re-

restrictions of the Railway Administration, due to misunderstanding of the vital importance of this mineral in the war. Conferences with the Railroad Administration usually resulted in elimination of these difficulties, though sometimes after vexing delays. Shortage in output of Cuban manganese, which was depended upon for a certain amount, was traced to embargo orders holding up certain machinery or supplies for the mines on order in the United States, and the situation was remedied by representation to the War Trade and Shipping boards.

The erratic movement and distribution of ships furnished another difficult problem. When the needed minimum quantities from overseas failed to arrive on schedule, it was necessary to look into the situation to see what ships had been allocated, and for what time, and under what conditions. There was an astonishing complexity of factors in this field, which in itself would furnish material for monographic treatment. Often commodities would continue to arrive, in spite of restrictions, in quantities greater than needed, due to the plea of ship managers that the material could be carried back as back haul and ballast, without delaying the ship movement. Investigation of these cases sometimes developed the fact that this was largely a matter of habit and inertia, not to be justified under war conditions. For instance, salt cargoes were brought back from the Mediterranean on the plea that loading this commodity for back haul and ballast involved no delay in ship movement. Investigation disclosed the fact that such ships often required a week or more to load and two or three weeks to unload.

One of the considerable difficulties was in the loading of ships. A cable would arrive from some far-distant port saying a ship of certain tonnage was ready to load and asking what selection of tonnage should be made from the considerable variety available. This required hurried conference with the Food Administration and other Government agencies to see which commodities were most needed, and then consultation with shipping experts to see what combination of commodities was possible in a load. For instance, it was impossible to load manganese or chromite on a half cargo of wheat or coffee, and some other combination had to be found. It was necessary through Shipping Board connections practically to watch the schedule of every boat carrying minerals, in order to be sure that schedules of amounts to be imported should be even approximately met. Specially interested importers were naturally vigilant to secure maximum quantities, and these activities had to be watched and balanced in the interest of the net results sought. It must not be inferred that these special interests were always trying to get the better of the Government. With a few exceptions, they co-operated cordially, but there were naturally wide differences of opinion as to what was vital and what superfluous.

Changing war requirements had to be carefully watched. Although requirements were normally focused in the War Industries Board, so many boards were directly and indirectly concerned that requirements would sometimes be essentially changed by one agency without notification to others. Steps would therefore be taken in one organization based on a given assumption of needs, while the Shipping Board was operating on a schedule based on another estimate. For instance, the amount of nitrates necessary for explosive purposes was currently calculated by the War Industries Board

in co-operation with the Army and Navy departments, but the situation was often upset by demands of the Allies and by the action of Congress and the Secretary of Agriculture in setting aside certain amounts for use as fertilizers. There were interesting conferences of considerable variety of interests as to the amount and allocation of nitrates to be imported.

Another changing factor was in the utilization of the raw material by the manufacturer. In order to use miscellaneous domestic supplies, many of them of low grade, it was often necessary to urge the manufacturer to purchase and use these supplies in preference to the overseas commodities, which might be better adapted for his practice. Here, again, there was cordial co-operation, but sometimes an inevitable lag, due to the natural disinclination to change practice, and to the manufacturers' feeling that this particular corner of the field was more vital and less open to restriction than some others. For illustration, the steel manufacturers agreed to use a variety of low-grade domestic supplies of the various steel-alloy minerals, formerly imported, thus adding a considerable burden of cost and lowering efficiency of their plants. This involved changing many specifications and practices. In some cases it was found that these modifications were barred by unnecessarily rigid specifications of Government contracts. Conferences with Government agencies concerned were then necessary to change the specifications.

It is not meant to imply that the Committee on Mineral Imports and Exports had sole responsibility and exerted direct pressure in all these different directions. It worked through and in co-operation with a considerable variety of governmental agencies, principally the Shipping Board, the War Industries Board, Geological Survey, and the Bureau of Mines. The committee, however, was able to use the powerful leverage of the shipping situation, and was in a better position than any other of these organizations to visualize conditions in the entire mineral field and see what particular factors in the situation needed attention for the moment. It was often instrumental in getting action started at needed places at the right time. Where trade conferences were necessary, these were frequently called at the instigation of the committee by proper officials of the War Industries Board and Shipping Board, and the committee took part in the discussion and formulation of conclusions.

It should be apparent from the foregoing that the regulation of overseas trade was not a simple problem. The slightest interference with established movements had far-reaching consequences, many of them quite unexpected. It was not anticipated, for instance, that limitation of salt importations from abroad, in view of our domestic supplies, would bring protest from the dairymen of Wisconsin, from the pork packers of Chicago, and from the Gloucester fishermen, all of whom claimed that the particular varieties of foreign salts were essential for their industry. The Government agencies concerned in the restrictions were so many and variable that the imposition of the simplest restriction was not the routine work of smooth-running organization, but rather a constant battle and compromise with a great variety of interests, official and private.

After a few months, procedure had become sufficiently systematized to allow comparatively speedy action along established lines. This systematic proced-

ure did not lie within the field or any single governmental organization. Authority was much divided. Almost the only place in which the threads of information were brought together was within the Committee on Mineral Imports and Exports. Its position was officially more or less anonymous. Recognizing the difficulties from working within any one organization with set procedure, it remained to a considerable extent an independent unit, preserving freedom of action and getting results through the co-operative action with the many agencies with which it had contact. At no time did any of the war boards or departments have any real understanding of the scope and variety of the committee's activities, and though the official records of these board make various references to the committee, in no place is there any comprehensive account of its work. In peace times it would probably be impossible for any committee of this sort to act so independently in its official and semi-official relations. The urgency of war made it possible. Nevertheless, this experience indicated significant possibilities of co-operative effort through individual initiative, without modification of existing laws or bureau functions, which ought to be of value in peace-time activities, especially those relating to world reconstruction.

The great problem in a co-operative effort of this kind is the physical one of keeping in touch with the variety of interests concerned, even those near at hand in Washington. The first step was to ascertain who were interested official parties related to any mineral field. These differed for different minerals, and often after weeks or months of effort it would be found that some man working by himself in some department or bureau not nominally connected with minerals was almost in a key position with reference to certain aspects of the subject. Having found out where the work was being done and where the authority lodged, it was a matter of everlasting vigilance to keep in touch with the variety of activities and reports emanating from these different sources.

One of the interesting steps taken in this connection, in which the committee took a leading part, was the formation of a Joint Committee of Mineral Information (now the "Economic Liaison Committee"), an informal semi-official body with representatives from twenty-odd Government departments, which met every week to discuss the mineral situation. It was usually the custom at these meetings for some one or for two or three men to take up some such mineral as nitrate or chromite, and indicate the current situation as nearly as possible, and invite suggestions and criticism from all others concerned. In this way representatives present learned what was going on in other departments, supplied their own quota of information, and carried back to their own activities a broader view of the situation. Much duplication was thus unofficially and yet effectively stopped, and many gaps in the field were filled.

This expedient in administrative machinery was inadequate, however, under the stress of war conditions, because it was impossible to meet often enough and long enough to cover the great variety of questions pressing for attention. The Committee on Mineral Imports and Exports attempted to meet the situation by delegating to each of its technical experts the duty of keeping in touch with all of the developments in his particular field, or, where its own assistants were not available, to arrange with some expert in the Geological

Survey or Bureau of Mines or War Industries Board. When, therefore, as happened hourly, a request would come in for an immediate decision on some problem from some one of the war boards, the committee would call on these men for a quick summary of the existing situation. It would then if necessary get into personal contact with the men most vitally concerned and would attempt to reach a decision which would take full account of the considerable variety of activities and plans current at the moment. It was the purpose throughout to get agreement in advance from all parties concerned, including the trade, before making a recommendation for official action. This was not always possible; there were many causes of friction and controversy—but on the whole this purpose was accomplished.

NET RESULTS

The net results of the committee activities was the saving during 1918 of upward of one million tons of shipping and the promulgation of official acts, which, had the war continued, would have saved more than two million tons of shipping in 1919. The committee also aided in domestic developments which supplied considerable parts of the deficiency caused by shortage of imports which showed what might be possible in the way of utilization of domestic resources in peace times.

The information on overseas movement of minerals in relation to domestic and foreign supplies, assembled and caused to be assembled by the committee, was of such range and detail as to afford for the first time something in the nature of a general survey of the problem of world distribution and use of mineral resources. A considerable amount of this was brought into the files of the committee, but a greater amount was put together by the Geological Survey, the Bureau of Mines, the State and War Departments, and the several war boards. The committee made strenuous efforts to have this information correlated and recorded so that it should be available at the end of the war, but was only partly successful. A large part of it is being used and developed by the Section on Foreign Minerals of the Mineral Resource Division of the U. S. Geological Survey. On the other hand, important files of information are buried in the files of the Shipping, War Trade, and War Industries boards, to say nothing of the segregated depots of documents and reports in many of the permanent departments.

War experience disclosed our handicaps in the intelligent consideration of the mineral industry from the broadest national and international standpoint. To the people engaged in the work, it seemed to demonstrate beyond question the real necessity for a large-scale study and investigation of this field to meet post-war problems. Considerable efforts are now being made by individuals and departments in Washington along these lines, but, in common with many other valuable experiences gained from the war, it is being forgotten or lost sight of, perhaps temporarily, in the post-war reaction.

There is now vital need in high official quarters for the recognition of the existence of a unit mineral-resource problem, not confined to technical phases alone, but covering world distribution and trade, tariff, taxes, and conservation. These phases so vitally interlock that intelligent action in any one of them is scarcely possible without a survey of the entire field. At the present moment no individual or organization in Washington:

or out of Washington is in a position to marshal the information necessary to intelligent advice on the practical questions coming daily both to the administrative and legislative branches of the Government. In particular does it seem desirable to approach mineral tariff problems of the kind now pending with some of the same spirit and method used in the war treatment of mineral imports.

In May and June, 1918, the power exercised by the Committee of Mineral Imports and Exports had grown to such an extent as to require a change in official relations. Its activities cut across the functions of the different war boards to such an extent that it seemed desirable to centralize its authority more largely in one of them. Accordingly, on June 7 the committee on Mineral Imports and Exports of the Shipping Board went out of existence as an official committee of the Shipping Board. Mr. Spurr became War Minerals Executive of the Bureau of Mines, in special charge of the development of domestic resources to meet war requirements; Mr. Pope Yeatman remained as Chairman of the Committee on Non-ferrous Metals of the War Industries Board; Mr. Leith transferred his chief connection from the Shipping Board to the War Industries Board, where he became Mineral Advisor to Mr. Baruch, Chairman of the War Industries Board. The offices and technical assistants of the committee remained as before in the Interior Building, and thereafter the work was continued under Mr. Leith's direction as a function of the War Industries Board. At the same time Mr. Leith retained his connection with the Shipping and War Trade boards. The increasing scope and power of the War Industries Board in regard to mineral commodities made this shift inevitable. Mr. Baruch's approval was a prerequisite to any change in importation of needed commodities, although, as before, the exigencies of the shipping situation made it possible for the Shipping Board at any time to modify the program. The three original members of the committee, though now acting in different official relations, retained close personal connection and consulted frequently in the formulation of program.

The new arrangement continued until after the Armistice, wielding the full power of the previous committee. With more perfected arrangements and more centralized authority, effective results were secured. The method of procedure remained much as before, with the exception that Mr. Baruch and members of his organization played a larger part in the initial formulation of plans before they went forward to the Shipping and War Trade boards for appropriate action. The requirements and production factors had become better understood, and it was possible to follow the developments relating to each of the mineral commodities in much more detail than before. Particular attention was paid to the minerals of the ferro-alloy group in consultation with Mr. Repogle, chief of the Iron and Steel Section; Mr. McLanglin, in charge of pig iron, and Mr. Hugh Sanford, Chief of the Ferro-Alloy Section of the War Industries Board.

Though the United States was well supplied with iron ore of the commonly used kinds, it was unable to meet the requirements for special low-phosphorus ores, some of which were imported from Spain and Cuba, and was unable also to meet its requirements for a variety of alloy minerals necessary in making the great varieties of steel necessary to the war program. Of

these minerals, manganese and chromite figured most largely in overseas transport. In 1918 from six to eight hundred thousand tons of manganese ore and upward of one hundred thousand tons of chromite ore were to be imported. It was found possible to develop considerable supplies of both of these minerals in the United States and to cut the necessary importation about half. The story of these restrictions is a long and complicated one. The irregular receipt of imports, together with the irregular development of the domestic industry, created many anxious moments when the supply of one or the other of the commodities seemed to be short.

So vital were the ferro-alloy minerals to the entire steel industry that steel manufacturers on the whole wished to play safe by importing considerable amounts, and in the early stages there was considerable skepticism in these quarters as to whether the domestic industry could supply the deficiencies created by cutting down imports. For this reason it was not possible in the early stages of the program to lessen imports to the extent desired by the Committee of Mineral Imports and its successor. Later, this situation was completely reversed. The domestic production developed so fast and so far beyond expectations that further drastic cuts in imports were possible, but these could not be made fast enough to prevent the accumulation of considerable stocks.

The close of the war found an accumulation of stocks, both from domestic and foreign sources, far beyond the needs of the trade, and the consequent closing of many domestic mines, with great financial loss. This naturally led to complaints on the part of domestic producers that imports had not been cut so drastically as they should have been. This was undoubtedly true, but the conclusion fails to give recognition to the long and strenuous fight on the part of the mineral advisors of the Government, in the face of the early conviction of the steel trade that domestic sources were not to be relied upon and that the war conditions required a considerable margin of safety in the way of imports. Notwithstanding this early attitude of steel manufacturers, it is to be said that its leaders made every effort to help and encourage the domestic industry, and it was largely to these efforts that it developed so fast. The difficulty lay in the fact that for various official reasons it was not possible to cut down imports as promptly as the domestic situation developed. There was a lag of several weeks. Had the war continued a few months longer this situation would have been taken care of by orders already under way before the Armistice was declared.

One of the minor difficulties encountered in reducing imports of manganese were certain State Department agreements with Brazil and financial arrangements made by the United States Treasury, based on the assumption of a large movement of manganese from Brazil. In the case of chromite from New Caledonia it was frequently possible to move chromite in mixed cargoes in such a way as to take advantage of space otherwise not needed. Despite official orders limiting tonnage of New Caledonian chromite to be loaded, supplies still slipped in on one pretext or another. Situations of this sort often led to strong feeling and bitter discussions, in which the domestic producers charged importers with unfair methods. Sometimes the attention of the entire trade was focused on a single vessel like the "Betsy Ross," the loading of which with 5,000

tons of chromite occasioned many strenuous conferences in which War Trade, War Industries, and Shipping Board officials took prominent part.

For six or eight weeks after the Armistice, the advisory work on mineral exports and imports was closed as rapidly as possible. This was not merely a matter of closing files and offices and dismissing assistants; it necessitated recommendations as to the releasing of embargoes in such a manner as to create as little difficulty as possible in the domestic financial situation. Immediate lifting of all restrictions on mineral imports, in view of the large supplies accumulated in this country and the large development of domestic sources of production, would have meant considerable additional hardship.

The mineral advisory work in Washington here described ended early in 1919. Restrictions had by no means been all released, but the situation had become so chaotic and so lacking in orderly procedure that the kind of systematic information used in building up the restrictions was not being used to any large extent.

CONTINUATION OF MINERAL ADVISORY WORK IN PARIS

On Dec. 28, Mr. Leith went to Paris with Messrs. Baruch and McCormick, chairmen respectively of the War Industries and War Trade boards, to act as Mineral Advisor in the Economic Section of the Peace Conference. He acted when there as the mineral representative of the Central Bureau of Planning and Statistics, which had been designated by the President to collect and forward data from the Washington departments.

Though the mineral work in Paris is part of another story, it nevertheless was concerned in considerable part with problems of the same nature as those previously met in Washington, and should be briefly summarized to complete this account of mineral activities in the international field. Some of the major problems were: (1) The readjustment of the disturbed movements of international mineral trade, in relation to new conditions of shipping, new needs, and especially in relation to the liquidation of the large stocks held by various governments; (2) consultation in regard to damages on mineral properties in the war zone; (3) estimates of value of mineral resources in enemy countries and colonies as a possible basis for reparation; (4) the collection and correlation of mineral resource data in connection with the drawing of new and political boundaries; and (5) consideration of mineral resources in their relations to future international arrangements. This last question has not received much publicity, but as a matter of fact much time was given by officials in Paris to discussion of possible future economic relationships and especially of measures which would embody the spirit of one of President Wilson's fourteen points—freedom of economic opportunity for all nations.

Mr. Baruch was made American member of a drafting committee to formulate a general plan for international economic arrangements. In the formulation of this draft, conferences were held in which mineral resources came up for discussion. In the final outcome of the Peace Conference this plan was not put into effect. All concerned, however, had become convinced of the possibilities of better economic international arrangements, and this applied to the mineral field as well as to others. This attitude was taken more or less in self-defense as a means of meeting the overwhelming number of vital economic questions which were hurled at Paris for settlement. The existing machinery was found totally

inadequate, and even those of the Americans who came to Paris strongly opposed to any extension of international agreements found themselves working toward the formulation of some sort of an international economic organization.

Whatever may be done in this direction in the future, the trend of affairs as disclosed at the Paris Conference and since has in my view shown beyond question that national self-interest requires us to make a comprehensive study of the economic elements of international relations. Mineral resources are not the least important of the problems under this general head. At the present time our Government is not continuing this study in any broad and systematic way, though significant starts have been made in the Geological Survey, State Department, Commerce Department, Tariff Board, and elsewhere.

Just before and following the Armistice, Messrs. Leith, Spurr, and others took part in an interesting series of discussions which disclosed the foresight of the British government in regard to questions like those above indicated. Members of the British Embassy and British War Mission were earnestly engaged in an effort to find out exactly where the Allies and Central Powers stood with reference to essential imports and exports of raw materials. It was found after a series of conferences that the Allies controlled upward of a dozen of essential commodities needed in normal times by the Central Powers. Of these about half were mineral commodities. There were then further discussions as to the ways in which this commanding situation could best be used in formulating the Peace Treaty. One of the suggestions put forward prominently by the British group was that some arrangement be made among the Allies to distribute their exportable surplus of key commodities in a manner to be mutually agreed upon.

This objective consideration of the world use of raw materials was used as a guide by Mr. Leith in preparing his data for the Peace Conference. For each of the important mineral commodities a world balance sheet was made, showing the needed imports and exports of every country and comparing the position of the Allies and that of the Central Powers. These charts practically summarized all of the world data previously assembled by the Committee on Mineral Imports and Exports. During negotiations in Paris this information was repeatedly called for and discussed, but the Allies were not able to agree on anything of the nature of a post-war control of commodities. An effective weapon—by some regarded as almost the only one—available for use in enforcing reparation against Germany was therefore not used. Such information is, however, essential to intelligent consideration of a great variety of international questions now pending. It is of interest to note that high officials of the British government then saw and probably still see the significant relations of raw materials to world peace. There is indication that the British government is using such information intelligently in guiding its own course in world affairs.

In closing I would emphasize the fact that this is a brief account of the activities of the group of mineral advisors belonging originally to the Committee of Mineral Imports and Exports, and that as such it does not bring out in proper perspective the work of many others who played important parts in this field. Both professional and business men in large numbers gave their time freely, and many of them in their official connections took large part in the results accomplished.

Mine Safety Engineers of Note

C. L. Colburn

ON APRIL 1, 1921, in response to a desire on the part of the Mining Section of the National Safety Council that a mining engineer of the Bureau of Mines be detailed for co-operative work at mines in the various districts, C. L. Colburn was appointed. The choice was a particularly excellent one, for in addition to a substantial experience in mine operation, Mr. Colburn possesses the enthusiasm necessary to the successful carrying out of such a co-operative arrangement, and he has already accomplished results that have justified the beliefs of those who were instrumental in bringing about the appointment. Clare Lorimer Colburn was born in Memphis, Tenn., on Oct. 5, 1881, and in 1896 moved with his parents to Denver, Col., where he was educated in the public schools. He then entered the Colorado School of Mines and was graduated in the class of 1907. While an undergraduate he found employment during the vacation periods in the mines at Cripple Creek and Breckinridge. After graduation he held several "jobs" around mines, and for six months was assayer and chemist for the Colorado Assaying & Refining Co.

In June, 1908, Mr. Colburn formed a partnership with Carl A. Allen in Denver, Col. Soon afterward Mr. Colburn was sent to Luning, Nev., by the Lodi Mines Co., where he remained for several months, surveying the mining property and laying out the mining town and smelter site.

In the spring of 1909 Mr. Colburn surveyed part of the Dives-Pellican mine, at Georgetown, Col. Later in the same year he made a mine examination near Breckinridge, Col., and represented his client as an expert witness in a mining suit which followed. In October, he was sent to Bradshaw Mountain to examine the Crown King mine and several prospects in that vicinity.

The firm of Allen & Colburn subdivided a large tract of land and were the engineers for the construction of an irrigation system at Lisco, Neb. Irrigation systems were also planned during 1910 and 1911 for

the Lodge Pole Valley of Nebraska, the Republican Valley of eastern Colorado, and western Nebraska.

In 1911 Mr. Colburn went to Butte, Mont., to accept a position on the engineering staff of the Butte & Superior Mining Co. After several months he

was made superintendent of the Stonewall Bryan group of claims, in North Butte, which the Butte & Superior were developing. In 1912 he was made chief engineer for the Butte-Duluth Mining Co. He successively held the positions of superintendent and manager for the same company. The Butte-Duluth company was carrying on underground operations at the Montgomery mine and also mining oxidized copper-bearing ore from an open pit which was treated in a sulphuric-acid leaching mill. This was the first large sulphuric-acid leaching operation in this country. In 1913 Mr. Colburn returned to Denver to resume his engineering practice. In 1914 he took over the management of the Cumbre Mining Co. in that company's operations of a lease on the Junietta and Country Boy mines, in Breckinridge, Col. He repre-

sented the New Queen Gold Mining Co. in its suit with the Duncan mine regarding extralateral rights.

In partnership with Mr. Allen, Mr. Colburn did considerable leasing in Breckinridge and Leadville and also examined molybdenum deposits near Climax, Col., and the Fryer Hill district of Leadville for clients. In the fall of 1917 he was made a member of the Speakers' Bureau of the Colorado Council of Defence. After spending several months with this bureau, he secured a position with the U. S. Bureau of Mines, sampling coal for the Navy. In July, 1918, he took the examinations for the Army, was commissioned a captain of engineers, and assigned to Camp Humphreys, Va., for training. He was then assigned to the 140th Engineers at Camp Shelby, Miss., and served with his company until discharged.

Early in 1919 Mr. Colburn returned to the Bureau of Mines as a mining engineer in the Mining Division, later being made assistant chief mining engineer under George S. Rice.



C. L. COLBURN

CONSULTATION

No Instruments To Locate Gold and Silver Deposits

"I have been told that you could tell me where I could get an instrument for locating or finding gold or silver hidden in the earth if brought anywhere near it. If so, please let me know if you have any, or where I can get one. I have looked in a few issues of *Engineering and Mining Journal*, but don't find what I want as yet. Please let me know if you can give me any information."

Engineering and Mining Journal frequently receives inquiries from prospectors and others as to the merits of devices reported to have been invented and used for locating ore deposits. We know of no instrument that will successfully locate gold and silver. The magnetic compass is used in the location of iron-ore deposits, and *Engineering and Mining Journal* recently published articles on European attempts to determine subsurface orebodies by means of electrical currents. The divining rod has also been commented upon both editorially and by our subscribers. Many persons are firm believers in the possibility of inventing an ore-finding instrument, but no such device of practical value has so far been developed.

Wilfley Table Twenty-Six Years Old

"In a recent conversation with a party from the West the question came up as to when the Wilfley table patent was obtained. If you are in a position to give me this information it would be greatly appreciated."

The Wilfley table was invented by Arthur R. Wilfley and patented by him in 1895. The first table, we believe, was used in May, 1896, by the maker in his mill at Kokomo, Col. The first table sold was installed in August of the same year, in the Puzzle Mill, at Breckenridge, Col.

Commercial Value of Mica Flakes

"I have a deposit of mica, in which the mica occurs in small flakes, too small to be used for sheets and similar purposes. I believe it also carries some impurities, and would like to know whether there is any practical method of separating the mica from them. Is this grade of mica of any value?"

Mica is of no commercial value as sheet mica if it appears only in very small flakes. Small pieces of mica may be utilized for the manufacture of ground mica used in wall paper, as a lubricant, and in the roofing industry. The material must not contain much impurity in the form of quartz, feldspar and other foreign minerals. We have no information, at the present time, indicating that it is possible to separate mica from such waste material, on a commercial and profitable scale. Practically all of the ground mica now used in the country is manufactured from scrap that results from trimming and cutting of sheet mica. Such cuttings consist of mica only, and, therefore, the grinding companies are not confronted with the problem of separating the mica from impurities. As mica has about the same specific gravity as its impurities, a gravity concentra-

tion method such as is employed with the heavy ores cannot be used. The opinion is ventured, therefore, that one would have difficulty in constructing equipment which would successfully separate, on a commercial scale, the mica from the other minerals present.

The Use of Titaniferous Ores

"Can you give me any information relative to the use and users of titaniferous ores, especially rutile? Also, any information you may care to furnish as to concerns most likely to be interested in securing quantities of this high-grade material will be highly appreciated."

Rutile (titanium oxide) and ilmenite (iron-titanium oxide) are the two chief titaniferous ores, and have limited uses. During the war rutile was used for the manufacture of titanium tetrachloride for use in smoke screens, but its chief application normally is in the manufacture of ferrotitanium alloys. Titanium is a common constituent of the earth's crust, but as a metal finds small employment, owing to its infusibility. Titaniferous iron ores present metallurgical difficulties in the recovery of their iron constituent, and are not mined extensively for their iron content.

Only two companies in the United States are engaged in the manufacture of ferrotitanium: the Titanium Alloys Manufacturing Co., which operates a plant at Niagara Falls, N. Y., and uses ilmenite as a raw material, and the Metal and Thermit Corporation, of Jersey City, N. J. Ferrotitanium, being a powerful deoxidizer, is used to cleanse molten steel.

Assessment Work and Abandonment

"In your journal of July 23, 1921, you have an article with regard to assessment work. Will you please inform me how a mining claim in the possession of the owners on July 1, and on which work was being performed, disregarding entirely the question of whether the assessment work for 1920 had been completed, could come within the condition which requires that a mining claim subject to relocation must have been abandoned by its former owner?"

The condition which requires that a mining claim subject to relocation must have been abandoned by its former owner is a statement that does not seem to be in accordance with the mining law. Referring to "Lindley on Mines," it is stated:

"Abandonment is always a question of intent. In forfeiture, the element of intent is not involved. It (that is, forfeiture) rests entirely upon the statute, and involves only the question whether the terms of the law have been complied with."

A claim holder forfeits all rights to his claim by failing to perform the required amount of assessment work within the stipulated time, even though he had no intention of abandoning the claim.

It seems, therefore, that it is incorrect to say that a mining claim subject to relocation must have been abandoned by its former owner. We find nothing in Lindley's work to this effect.

HANDY KNOWLEDGE

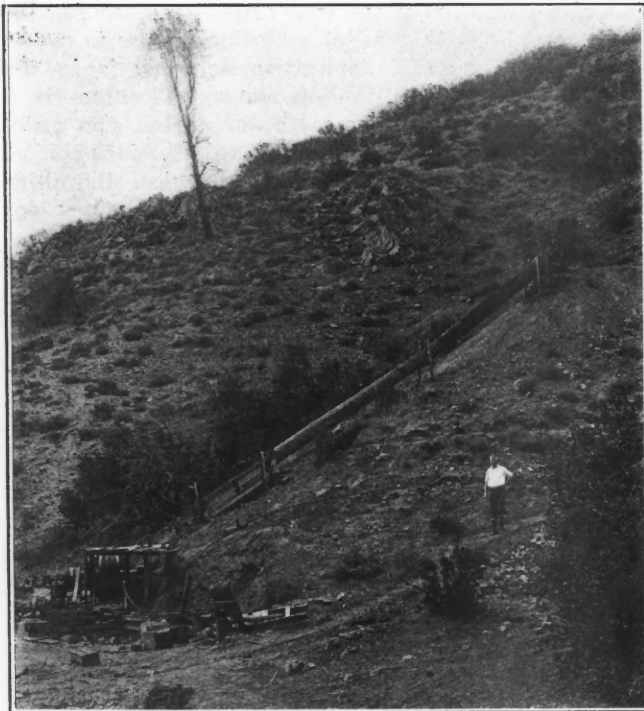
A Small but Profitable Mill

By S. F. GODFREY

Written for *Engineering and Mining Journal*

A gold property is being worked on a small scale near Neenach, Cal., by C. B. Cherbbono. The ore is taken from a cut on the hillside in an ordinary car and run to a chute, at the end of the dump, which is made from a discarded boiler stack. This discharges into a two-ton bin or box equipped with a crude but efficient feeder of the drag type, which had been made from the scrap of an hay baler.

The feeder discharges into a 3 ft. x 15-in. ball mill and is operated by an arm attached to the ball-mill scoop. A hose line from a small reservoir furnishes the water, and the run-of-mine ore is scooped up wet.



CHUTE AND GAS ENGINE-DRIVEN BALL MILL
ON GOLD PROPERTY, NEENACH, CAL.

The mill is driven by a 5-hp. gas engine and discharges peripherally through a forty-mesh screen on to a baffle plate, from which it is run over amalgamated apron plates and thence by launder to the tailings pond.

The mill is started at 5 a.m. One man is employed on night shift in order to have ore in the bin when the mill starts. The mill is shut down at 9 p.m., thus getting a sixteen-hour run with an average output of eight tons. The plates are cleaned at noon and at night, the amalgam being stowed away in a trusty lard bucket.

The ore is an iron-stained granite carrying free gold and the plate recovery is from \$5 to \$15 per ton. Instead of depending on assays to determine what is pay ground, a half ton or so of doubtful material is put through the mill. The tailings are carefully panned

and show no free gold. The milling expense is estimated at \$3.20 per day, or 40c. per ton milled. Several hundred tons of tailings are in the pond. Single jacking is employed in breaking ground.

Dressing Amalgamated Plates With Potassium Amalgam

By CHARLES FLURY

Written for *Engineering and Mining Journal*

Upon starting up a stamp mill in Korea that had been shut down for six months, the plates were found to be in very bad condition. Before operation was resumed, they were cleaned with wood-ash extract, sand, and mercury, but the surface of the copper was oxidized and the mercury kept rolling off into the launders and on to the Wilfley tables between each dressing, which was done at six-hour intervals. For the first month only the first apron plates amalgamated properly. The fact that the temperature of the water (approaching the hot season) was rising steadily and that a low-grade ore of about 0.4 oz. gold per metric ton, giving normally only 20 per cent amalgamation, was treated, made it difficult to get the plates into good condition. The amalgamation at the end of the first month was only 5.8 per cent. Resilvering the plates would have meant a delay of months because of the particular situation of the property.

To avoid such a delay I experimented with potassium amalgam with the object of getting a firm deposit of amalgam over the whole plate-area, to precipitate the mercury on the plates. I proceeded as follows:

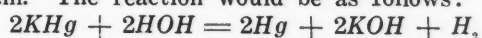
Two grams of metallic potassium, thoroughly freed by means of filter paper from adhering oil, which serves to preserve it, was added in small portions to 200 grams of dry mercury at 40 deg. C., the mercury being in a porcelain dish. There was an immediate reaction, with the development of heat, the potassium dissolving and the mercury brightening to a clean surface. Specks of potassium carbonate and caustic potash floating on the surface were removed carefully with filter paper. The reaction took ten to fifteen minutes. The potassium amalgam thus formed had a strength of 1 per cent potassium and was poured into the dry atomizing bottle.

After the battery which was to be dressed was stopped and the remaining pulp washed into the trap, the apron plates were broomed and the potassium amalgam was sprinkled over the plates. There was a violent reaction the moment the amalgam came in contact with the plate. Gas was apparently evolved, and the copper film disappeared, being covered immediately with mercury. The mercury thus precipitated spread out like water and was made to cover the plates with sand. This last procedure was rather difficult, as the mercury was solidly attached to the plate and only by repeated treatment could the whole plate be covered uniformly. After applying the potassium amalgam for a week the plates became bright and spotless. Instead of feeding only 1.8 grams of mercury I was able to feed 7 grams per metric ton of ore per day, without

having the mercury roll into the launder. The amalgam treatment was then stopped and the usual mercury feed applied.

The lower plate area which receives but little amalgam was washed twice a day with wood-ash extract containing 0.2 per cent of sodium cyanide to keep it clean. Within one month the amalgamation was thus raised to 12.5 per cent.

The efficiency of the potassium amalgam treatment is due, as far as I can see it, to the hydrolysis of this amalgam. The reaction would be as follows:



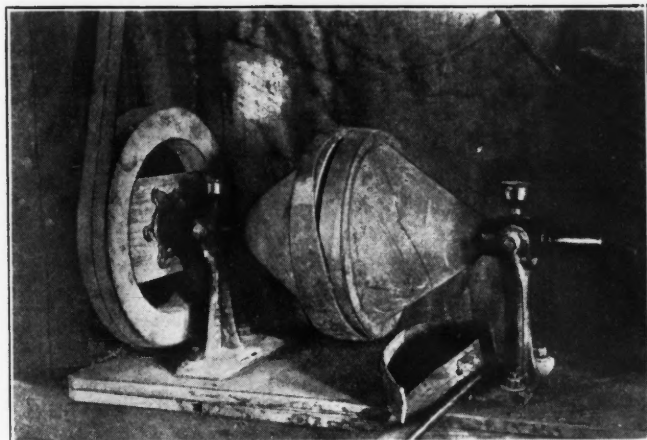
The nascent hydrogen thus produced reduces the oxide film on the copper plate, cleaning the surface.

A Convenient Laboratory Ball Mill

BY A. W. FAHRENWALD

Written for *Engineering and Mining Journal*

Labor-saving devices in the laboratory are as important as in the mine or mill. Many tests are made daily with equipment that is neither convenient nor efficient. A good deal of all laboratory work is routine, and often this routine work is hard and monotonous, which fact reduces the efficiency of an experimenter greatly.



BALL MILL WITH PERIPHERAL DISCHARGE SLOT, CLOSED WITH RUBBER BAND WHEN RUNNING

The preparation of ore samples where much testing is being done should be both simple and easy. It, however, is usually not so and is looked on by the experimenter as a hard and dirty job.

At the ore-testing laboratory of the School of Mines, University of Idaho, where the U. S. Bureau of Mines is co-operating with the Idaho State Bureau of Mines and Geology in studying ore-dressing problems, many samples daily had to be prepared to all degrees of fineness and both dry and in solution. The mills available were of the type that had to be handled both in charging and discharging. Considerable time and patience were required to clean the balls after grinding a charge.

A suitable mill, one that could be easily charged and discharged without handling, and that could be cleaned and conveniently used for grinding either dry or in solution, could not be found listed in the catalogs of any of the firms handling laboratory equipment. I then designed a mill embodying these features, which is shown in the accompanying illustration. It consists of two funnel-shaped castings with their bases bolted firmly together but separated from each other a distance of $\frac{1}{2}$ in. by four lugs. This provides a peripheral slot, as shown in the illustration, where the band is

pushed to one side. This slot is closed by a strong rubber band when a charge is being ground. The band is made of a piece of an automobile inner tube. For 2 in. on either side of the slot the mill is turned so as to be perfectly cylindrical, affording a close fit when the rubber band is stretched around the mill and over the slot. The band affords a perfect seal of the slot when grinding, either dry or in solution.

To discharge the mill the rubber band is slipped off and the mill revolved for two or three minutes as in grinding. The ore content is completely discharged in this length of time. The mill shown is 10 x 12 in. inside diameter and reduces 2,000 g. of —8-mesh ore produced from rolls to —65-mesh in forty to fifty minutes. The balls used range in size from a little more than $\frac{3}{8}$ in. in diameter to 1 in. They should not be small enough to slip through the peripheral slot.

This mill has made the preparation of ore samples in flotation and cyanidation testing a pleasure and has reduced the time for the preparation of a single sample from one and one-half to two hours by the older method to about fifty minutes.

The discharging operation and the cleaning of the mill by grinding sand or other suitable material in it can be done while the testing engineer is engaged in other work about the laboratory.

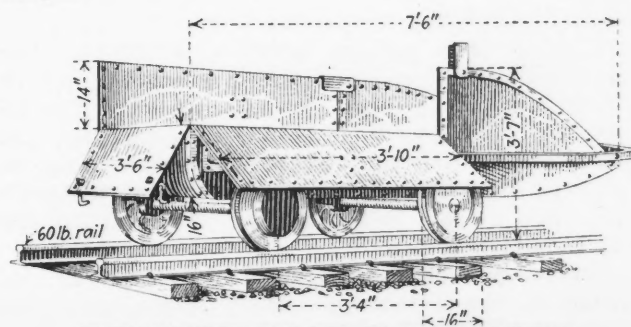
Altering Incline Skip for Use in Shaft Sinking

BY H. H. HUNNER

Written for *Engineering and Mining Journal*

Two incline skips that had previously been used to hoist ore from a pocket were fitted with new axles for standard-gage track and put into service on a 29-deg. slope, sinking in trap rock. As seen from the sketch, the top edge of the box above rail was 3 ft. 7 in. This being found too high for mucking with ease, the sides and back were cut off by burning 14 in. from the top as shown. The cut-off pieces of the two sides and back were fitted with two strap hinges on the bottom edges. A hook and an eye-bolt, placed so as to fit snugly, held the back corners together when closed. The forward end of the skip ahead of the upright strap was left intact and a U-clasp was bolted to it on each side to hold the doors in place when closed. This arrangement permitted two-thirds of the load to be shoveled in before the sides were closed, and made it easy to load the large chunks.

In lowering caps, which were 21 ft. long, the rear door was dropped, giving a point of support at the rear about the same height above the rail as the top side of the bale in the forward end. In lagging up the back, a level staging was made by laying short planks in the bottom of the skip, the lower ends resting on the back hinges.



SKIP ALTERED FOR USE IN SHAFT SINKING

THE PETROLEUM INDUSTRY

Deadlock in San Joaquin Valley Strike

SAN FRANCISCO CORRESPONDENCE

The oil workers' strike in the lower San Joaquin Valley oil fields has entered its third week. Newspaper accounts credit the strikers with having built up a military organization which maintains patrols on all the roads, operates a wireless system for communication, and has finally secured an airplane for scout purposes. The strikers have been enabled through some of the county authorities to swear in a number of deputies, and thus have secured a certain legal status in supporting their position. Their organization is headed by a "law and order" committee, whose definite purpose appears to be to picket the properties of the operators and prevent the entrance of any workers who might be brought in to take the place of the strikers.

Until recently all autos were stopped and the occupants were questioned as to their business in the district. This practice has been since discontinued, however, according to reports, but the patrols and picketing continue. The operators have made no move to bring in workers. The strikers are willing to accept the wage cut recently made and waive union recognition and the closed shop, but insist on the operators signing an agreement with the Government representatives that they will make no further wage cuts for the period of one year.

The operators want "less government in business and more business in government" and contend that the agreements which were made during the last four years were the result of war-time expediency. They contend for the right of each company to negotiate future agreements with its own employees and without respect to union rule of Government boards. They say that the "law and order" committee of the strikers is for the purpose of preventing the employers by force from employing other men to take the place of the strikers. They contend that each employer has the right to employ any person he desires to operate his properties. The present status is a deadlock, with the strikers in apparent control of the properties.

New Oil Wells in the Texas Fields

SPECIAL CORRESPONDENCE

A new gusher was recently completed in the Mexia field, Limestone County, making from 15,000 to 25,000 bbl. per day, flush production. This is the No. 1 well of the Kirby Petroleum Co. The flow started from a depth of 3,050 ft., after having been drilled 74 ft. into the sand. The storage facilities, which had been prepared in anticipation of a good production, are not nearly large enough for this enormous flow. The well is 1,500 ft. northwest of the Dusenberg gusher, completed a short time ago. The Kirby Petroleum Co. has acquired a considerable acreage around the well. The well itself is said to be lower on the anticline than the Dusenberg well.

Two deep wells of importance have also been completed in the Texas Gulf Coast fields. At Pierce Junction the Gulf Production Co. brought in its No. 2

Taylor well, making 3,000 bbl. of pipe-line oil from a depth of 3,950 ft. This well was a work-over, having previously been drilled to 3,200 ft., where it produced about 100 bbl. daily. Deeper drilling resulted in the larger production. The other is the No. 9 Schilling well of the Turnbow Production Co., at Goose Creek. This well blew in at 4,336 ft. and is flowing at the rate of 2,000 bbl. of pipe-line oil daily.

Oil Struck Near Lewiston, Mont.

SPECIAL CORRESPONDENCE

Oil has been encountered at a depth of 400 ft. in a well being drilled on the Swallow's Nest structure, at Lewiston, Mont. Although the showing is not a large one, it is regarded as encouraging, as it comes from a small sand from which little was expected. The well is being drilled deeper to encounter larger sands from which production is expected.

The development has created considerable excitement locally, as it has been generally held that this section is unfavorable for oil, on account of overlying basalt.

Oil Shale Reported in Tarapaca, Chile

Discovery of a large area of petroleum-bearing schist or shale has been made at Chucumata, a small local port about twenty-four miles south of Iquique, Chile, according to a recent newspaper article, announces U. S. Consul Homer Brett. Samples weighing about 300 lb. were analyzed by the Nitrate Industrial School in Iquique, and it was found that the petroleum content was large.

Twenty-one mining claims of fifty hectares each have been filed, and a company called the Compañia Nacional Petrolifera Luz de Chile has been organized, of which Don Miguel L. Marquez, of Iquique, is president and general manager.

Dominican Central R. R. to Use Oil as Fuel

A recent report from U. S. Consul W. A. Bickers, at Puerto Plata, states that the Dominican Central R.R. had received during the month a cargo of fuel oil and will hereafter use oil as fuel instead of coal. This road has oil tanks and is converting its engines into oil burners. Formerly it required between 5,000 and 6,000 tons of coal per year. The railway intends to supply fuel oil at cost to the small factories in the republic, which will enable them to purchase oil in larger quantities at lower prices.

Americans Seeking Oil in Panama

In a report dated July 30, 1921, U. S. Consul George Orr, at Panama City, states that concessions have recently been obtained by two American oil companies for carrying on operations in Panama. Considerable exploration work has been done, but no oil deposits have yet been located. Legislative enactments canceling certain privileges originally granted to the concessionaires have resulted in practically suspending active operations.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

Tenth Annual Safety Congress of the National Safety Council Held at Boston, Sept. 26-30

Sectional Meetings of the Industrial Groups Include Papers and Discussions Relating to Safety Practices—Mining Section Holds Sessions on Underground Transportation, Fire Fighting and Prevention, Safety Co-operation and Mine Hygiene

STAFF REPORT

FOR THE FIRST TIME in its history, the State House at Boston opened its doors for convention purposes, which indicates the high opinion that the Commonwealth of Massachusetts holds of the work which is being done by the National Safety Council. The Tenth Annual Safety Congress opened on Sept. 26. Headquarters were situated on the third floor of the State House, and most of the section meetings were held in adjoining rooms, others being held at the Massachusetts Institute of Technology and at the Harvard Medical School.

Following a custom established by the National Safety Council at its annual meetings, Boston held a "No Accident Week," and this was also extended to other cities in the state. The attendance was good, about 2,500 members registering. In addition to the regular section meetings, a number of other interesting features were arranged, including motion pictures, safety demonstrations, and trips to various parts of the city.

Monday was largely given over to registration, meetings of officers and committees, and the transaction of the regular business. The section meetings began on Tuesday and included the following branches: Automotive, Chemical, Construction, Drop Forge, Education, Electric Railway, Engineering, Health Service, Metals, Mining, Packers and Tanners, Paper and Pulp, Public Safety, Public Utilities, Rubber, Steam Railroads, Textile, Women in Industry, and Wood Working. A report of the mining section meetings, which were well attended and created great interest among coal- and metal-mining engineers and operators, follows:

The first session of the mining section was held on Tuesday morning, Sept. 27. B. F. Tillson, in making his report as chairman, detailed the past history and the present work of the section and referred to the increasing interest which is being taken in its activities. He called special attention to the co-operative work now being done by C. L. Colburn as safety engineer representing the U. S. Bureau of Mines and the Mining Section of the

National Safety Council. Owing to the late arrival of many of the delegates, it was necessary to omit the report of the secretary and the reports of some of the committees.

USE OF STORAGE BATTERIES IN UNDERGROUND TRANSPORTATION

The first paper, "Storage-Battery Locomotives in Metal Mines," by E. V. Daveller and R. E. Renz, was read by Chairman Tillson. In this paper it was stated that the use of the storage-battery locomotive for haulage in the metal mines of the West has been on the increase steadily since 1913 until the recent depression in the mining industry.

Trolley locomotive haulage is well suited to long hauls underground where there is a large tonnage and ample head room in ground that is readily held in place. The storage battery has its particular field in that it can operate in drifts or haulageways with a minimum of head room, it has a wide range in amount that can be hauled, and can easily be moved from one level to another when mining operations demand it. It can fit into any of the particular fields of the three other common methods of underground haulage.

In the Butte & Superior Mining Co. mine at Butte, Mont., underground haulage with storage-battery locomotives has been very successful. The mine is being, or has been, operated down to the 2,300 level, with mining operations being carried on from the 800 to the 2,300 level in the last nine years. The orebodies are wide and the ground is heavy, causing a continual shifting of the grade on the haulage levels and making it unfavorable to maintain economically a constant height of the haulageways. Owing to this condition, all haulageways are narrow and low.

One big advantage of storage-battery locomotives is almost entire freedom from electrical troubles such as grounds and shorts in armatures and field coils. Because the voltage is only 75 to 80, there is little danger from accidental contracts. During the entire operations at the Butte & Superior mine there has been no accident of the locomotives that

could be attributed to electrical causes.

The following statistics for the year 1919 at the Butte & Superior are of interest: Number of locomotives operating, 9; cars of ore hauled, 605,372; cars of waste hauled, 132,415; average haul of car of ore, 800 ft.; average haul of car of waste, 747 ft.; cost of power per car hauled, \$0.0041; cost of repairs for locomotive per car hauled, \$0.03205; cost of motorman and helper per car hauled, \$0.0690; Total, \$0.10515.

In Butte both the Elm Orlu Mining Co. and the Anaconda Copper Mining Co. are using storage-battery locomotives with good success. At the Alaska Gastineau mine, at Thane, Alaska, a large type of locomotive has been adapted with great success.

F. W. Whiteside, in his paper, "Advantages of Trolley Locomotives for Underground Haulage, From a Safety Standpoint," found fault with some of the other types of motive power, and by a process of elimination endeavored to prove the superior features of the trolley locomotive. With correct installation, ample weight of tracks, proper bonding of rails, avoidance of sharp angles and rough trolley frogs, and protection of wires, the danger in the use of trolley locomotives can be greatly reduced.

COMPRESSED-AIR HAULAGE AT HOMESTAKE

Guy J. Johnson, safety engineer of the Homestake Mining Co., Lead, S. D., read a short paper on "Compressed Air Haulage," which included an interesting account of the experiences of his company with this type of apparatus. Its adoption was started at the Homestake mine in 1904, and by 1908 had completely supplanted animal haulage. The high-pressure compressor installation consists of an Ingersoll Sargeant four-stage, cross-compound Corliss, converted from steam to electric driven (Dodge rope drive), with a piston displacement of 2,060 cu.ft. per minute, rated to deliver air under 900 lb. pressure at a 5,000-ft. elevation; and one Fraser & Chalmers steam-end Ingersoll Rand air end, four-stage, cross-compound Corliss, with a piston displacement of 860 cu.ft. per minute, rated to deliver air under 900 lb. pressure at a 5,000 ft. elevation. On the surface, to deliver ore to the five mills, there is one fourteen-ton locomotive, with 9 in. x 14 in. cylinders and a 165-cu.ft. air capacity, and two eight and one-half ton locomotives with 7 in. x 12 in. cylinders and 70-cu.ft. air capacity. These operate on 22-in. gage tracks, and haul bottom-dump cars of 77½ cu.ft. capacity.

Underground, they are operating on fifteen levels, with thirty locomotives,

over approximately sixty miles of 18-in. gage track, using both end and side dump cars of 19-cu.ft. capacity. Of these locomotives, seventeen are five ton, with 6-in. x 10-in. cylinders and 40 cu.ft. air capacity; three are five ton with 6-in. x 10-in. cylinders and 28½ cu.ft. air capacity; and ten are three and one-half tons, with 5-in. x 8-in. cylinders and 20½ cu.ft. air capacity. All receive their air charges at approximately 800 lb., and deliver it to their cylinders at 150 lb. Their "cruising radius" is 2,000 ft. with full load, and return. Their charging period is less than a minute, so they can operate continuously without more than the normal stop at the end of each haul. In spite of the evident mechanical losses in compressing air above 800 lb. and using it at 150 lb., the power cost is 2.1c. per ton-mile. Maintenance and repair of compressors, locomotives, pipe lines, charging stations and so forth costs 1.77c. per ton mile, or 0.768c. per ton.

In presenting his paper, "Storage-Battery Locomotives as Applied to Mine Haulage," Charles E. Stuart stated that the first storage-battery locomotives for mine haulage were manufactured in 1897 and were tried out in the Pocahontas coal field. The early types were hardly satisfactory, being insufficiently motored, and other circumstances prevented their adoption at that time. Recent improvements, however, have shown this type to be highly successful, especially in coal mines, and among the advantages that are claimed are the following: They require no trolley wires or bonding of tracks; the personal risk of contact with trolley is eliminated, and there is no dependence on substation or power plant during idle days. The failure of the storage battery at any mine, according to Mr. Stuart, will be accounted for by one of the following reasons: A duty cycle in excess of battery capacity; misapplication, or, in other words, the effort to use the storage-battery locomotive where mule power is cheaper or where man power in conjunction with the strictly haulage type of locomotive would be cheaper; failure to select a locomotive which will stand the abuse of mine practice, and failure to give a reasonable amount of care and attention. Several diagrams showing the performance of storage-battery locomotives under various conditions were shown.

Following the reading of Mr. Stuart's paper there was considerable discussion concerning the query by Mr. Stuart as to the reason for high costs of transportation per ton-mile in metal mines as compared with those in coal mines. This seemed to be due principally, in instances where comparisons could be made, to the variable conditions met in the removal of ore or coal from the working face. There was a difference of opinion as to the advantage of large cars, both from a safety standpoint and with relation to the tonnage handled. Charles W. Goodale, W. H. Patton, J. W. Reed, Carel Robinson, D. B. Wilcox, Guy Johnson, R. L. Kings-

land, E. L. Solomon, and Mr. Tillson took part in the discussion.

ANIMAL HAULAGE IN COAL MINES

During the afternoon session the meeting was presided over by D. E. A. Charlton, in the absence of Mr. Tillson. The first paper read was that by E. L. Solomon on "Animal Haulage at Anthracite Coal Mines." In connection with this paper several slides were shown, illustrating various devices that are being used to simplify the work which is required of the mine mule. Under proper conditions, and given the right sort of care, said Mr. Solomon, the mule will respond and render excellent service. Lieutenant Colonel J. A. C. Ritson, in the discussion following this paper, stated that, owing to the thin beds of coal in England, the use of mules in transportation had not found favor there. Shetland ponies have been used to a considerable extent and have proved quite satisfactory.

R. H. Seip read R. M. Magraw's paper, "Animal Haulage in Coal Mines." Mr. Magraw covered somewhat the same ground as did Mr. Solomon in his paper, and also pointed out several features relative to the transportation problems in coal mines.

Following this paper, suggestions as to possible candidates for officers of the mining section for the ensuing year were requested by Charles W. Goodale, chairman of the nominating committee. Mr. Goodale stated that it was the intention of the committee to make selections so as to cover the metal and coal fields as well as to secure geographical representation.

A paper, "Block Signal and Dispatching Systems," by R. T. Murrill, was read by Mr. Charlton. It was unfortunate that it was impossible to show slides of the photographs and diagrams accompanying this paper, for these were well selected and served to illustrate several points mentioned. Descriptions were given of the manual block and the automatic block-signal systems, the latter being particularly interesting, as the author describes the method used on the 600 level of the Inspiration mine at Inspiration, Ariz. This system is an adaptation of the standard equipment used for high-speed surface railway traffic. The level is divided into a number of blocks, and at the ends of each block and at other prominent points on the main line signal lights are placed. The signal lights are operated by means of track circuits; lights are changed automatically by the passing of a train or the throwing of a track switch lever, and different colored lights are used.

SESSION OF FIRE FIGHTING AND PREVENTION

The third session, that on Mine Fire Prevention and Fighting, opened Wednesday morning under the chairmanship of Mr. Tillson. Papers on this subject as applied to anthracite coal mines were read by W. L. Jacobus and by Mr. Tillson, the latter presenting H. H. Otto's paper. Both of these related to the

causes, precautions taken, and methods of fighting fires in anthracite mines. The former dealt with conditions at the mines of the Susquehanna Collieries Co., and the latter with those of the Lehigh Coal & Navigation Co. Fires in bituminous coal mines were discussed in the papers of Joseph W. Reed and G. M. Gillette, these relating to the practices at the mines of the Consolidation Coal Co., in West Virginia and Kentucky respectively. Both of these papers were illustrated by lantern slides.

Mr. Tillson read H. M. Wolfkin's paper on "Fire Prevention and Fighting in Metal Mines," and this was of considerable interest to metal-mining men, as it brought out several points that have had comparatively little consideration. An interesting account was given of a fire in a California mine at which liquid carbon dioxide was used as a means of stopping the conflagration. In introducing the carbon dioxide into the mine the following method was used: A 2-in. pipe was run from the surface through the bulkhead in the main shaft. This was connected to another section of 2-in. pipe that had a series of twenty connections, to each of which a carbon-dioxide cylinder could be attached, so that a battery of twenty cylinders could be discharged at one time. The cylinders in the battery to be discharged were placed in old 100-lb. carbide drums filled with water. A steam line was arranged so that a ½-in. pipe containing steam at a variable pressure of 10 to 40 lb. per sq.in. gage could be turned into the water in each carbide drum to heat the cylinders as they were being discharged. The carbon dioxide was started into the mine at the rate of approximately forty cylinders (15,000 cubic feet) per hour. The time required to empty a battery of cylinders was from seventeen to twenty-five minutes, averaging twenty minutes, varying with the quantity of steam available. The maximum pressure in the 2-in. pipe carrying the carbon dioxide when twenty cylinders were being discharged was 55 lb. per sq.in. gage.

Following the reading of all of these papers, Messrs. Colburn, Jacobus, Gillette, and Tillson discussed several features relating to the coal papers. Guy J. Johnson, in discussing Mr. Wolfkin's paper, stated that the practice of taking frequent air samples during and following the fighting of a metal mine fire was to be strongly recommended. He also said that bracing was ineffective when the ground is caved. Mr. Goodale spoke briefly on conditions relating to fires in the Butte district, and referred to the flooding of the fire area with flotation tailings. He also brought out the fact that a stope filled with caved rock or refuse permits infiltration of air so that it cannot be regarded as being effective in checking a fire.

ELECTION OF OFFICERS OF MINING SECTION

At the completion of these discussions, the election of officers was held and resulted in a unanimous vote for

the following: Chairman, B. F. Tillson; secretary, R. H. Seip; first vice-chairman, G. M. Gillette; second vice-chairman, John L. Boardman; and third vice-chairman, William Connibear. Chairman Tillson announced the appointment of J. T. Ryan as chairman of the Committee on Membership and Publicity, and stated that he hoped the present chairman and subchairman of the remaining committees would continue. These are as follows: D. E. A. Charlton, Program and Publications; Prof. R. M. Raymond, Standardization; Orr Woodburn, Mine Rescue, First Aid, and Contests; W. W. Adams, subcommittee on Accident Statistics; Rudolph Kudlich, Ropes and Safety Devices; Prof. H. H. Stoek, Mine Haulage; Dr. R. R. Sayers, Mine Hygiene and Sanitation; Joseph W. Reed, Mine Fire Prevention and Fighting; Major M. J. Shields, Standardization of First Aid Methods, and D. J. Parker, Standardization of Mine Rescue Training. Following the reading of an invitation extended to the section to co-operate with the A. I. M. E. at the February meeting in New York, and an announcement of the tentative program for that meeting, the session was adjourned.

CO-OPERATIVE SAFETY METHODS

Considerable interest, as evidenced by the discussions, was shown at the session held Thursday morning on the subject of maintaining interest in safety. Guy J. Johnson, safety engineer of the Homestake Mining Co., presided. The first paper, read by Mr. Tillson, was by W. H. Moulton and William Connibear, on "Maintaining Safety Interest Among Executives." This paper outlined in a general way the plan adopted by the Cleveland-Cliffs Iron Mining Co., in which a central safety committee, composed of men in executive positions, acts as a legislative body upon safety devices and recommendations. It was stated that a well-defined policy, consistently worked out, would enable an executive to feel the same degree of satisfaction in safety work as in all other features incident to production. Mr. Seip read a paper by Thomas Cowperthwaite on "Maintaining Interest Among Foremen and Bosses." At the mines of the Calumet & Arizona Mining Co., for which Mr. Cowperthwaite is safety engineer, the shift bosses, foremen, and other employees constitute the safety committee, and they are held responsible for such accidents as occur to the men in their charge. Complete accident records are kept, monthly meetings are held, and a competitive system, which is made the basis of a bonus plan, is maintained.

SAFETY BONUS AT FRANKLIN, N. J.

"Getting the Safety Message to the Individual Miner," a paper by N. D. Hubbell, was read by Mr. Johnson. This related to the work being done in the bituminous coal regions and brought out the particular need of personal contact between those charged with the safety of the men and the men them-

selves. Inspections, meetings, the use of bulletins and letters, first aid and mine rescue classes, and the use of moving pictures were among the suggestions offered for the furtherance of the safety idea. John T. Bradley's paper was read by Mr. Tillson, and it made further suggestions in the same directions. Following the reading of these papers, Mr. Seip outlined a bonus system now in use at the mines of the New Jersey Zinc Co. for the prevention of mine accidents. Bonuses are paid monthly, semi-annually, and annually, and are based both on the number of accidents and the time lost. Under this system, which has been particularly successful in keeping down the number and lost time of accidents at their mines, each of the bosses receives \$5 monthly provided there are no accidents among his men during that month. A semi-annual bonus of \$20 is paid provided he has during the half year not more than $\frac{1}{2}$ an accident per 1,000 shifts worked. Also, annual bonuses on the same terms are allowed. With a standing that shows a loss in time of less than 0.4 per cent of total possible working time, he can further receive an additional \$20 semi-annual bonus. The system has the advantage that if a boss loses his bonus for the early part of the year, he can still retrieve in the later part, and the inducement remains for him to hold down accidents. In discussion, several features advantageous and disadvantageous to the bonus system were mentioned.

COLBURN RECOUNTS TRAVELS

F. J. Bailey, assistant to the Director of the U. S. Bureau of Mines, in introducing the next speaker, C. L. Colburn, spoke briefly of the co-operative work of the Bureau and the National Safety Council which has been in operation for six months. Mr. Colburn, in his paper, "Observations of a Safety Engineer in Various Coal and Metal Mining Camps of the United States," outlined several of his experiences at various coal and metal mines and told of the work that is being done along safety lines. Several excellent slides, showing devices, right and wrong practices, and plant installations, were shown.

There was no afternoon session, and several of the visitors availed themselves of the opportunity to view some of the places of historic interest in and about Boston. In the late afternoon a boat trip to Pemberton Beach was made, followed by a shore dinner there, and an entertainment and dancing.

HYGIENE, SANITATION, AND SAFETY

The session on mine hygiene, sanitation, and safety was held on Friday morning, with Mr. Tillson presiding. The first paper read was that of R. H. Seip, on "Traveling Ways and Signs." Mr. Seip outlined the system in use at the mines of the New Jersey Zinc Co. for pointing out roads of travel underground, and showed several slides illustrating the signs in use. Reference was made in his paper to the standards and specifications of mine ladders and the

need of providing safe means of travel. At the New Jersey Zinc Co. properties at Franklin, N. J., three regular routes are prescribed. Mr. Tillson called attention to the standard danger sign—a solid red circle surrounded by a black square on a background of white—which was developed by a special committee of the National Safety Council and adopted by the council. Richard Maize, one of the Pennsylvania state mine inspectors in the bituminous region, called attention to the fact that it was essential that danger signs be placed only where there was actual danger; otherwise, their value would be discounted. Mr. Colburn suggested the use of "caution" signs in many places where danger signs are now used.

DRINKING WATER AT HOMESTAKE

The next paper was that of B. C. Yates, on "Provisions for Drinking Water at Mines," which was read by Mr. Johnson. The system of supplying drinking water at the property of the Homestake Mining Co., at Lead, S. D., was explained, and sketches illustrating the distribution of the system throughout the mine were shown. Mr. Goodale spoke briefly on the Butte methods of supplying drinking water at the mines. Mr. Reed stated that no attempt to pipe water into the mines of the Consolidation Coal Co. had been made, excepting for such supplies as were needed for the mules.

REFUGE ROOMS ADVOCATED

Considerable discussion followed the reading of Dr. R. R. Sayers' paper, "First-Aid Dressing Stations Underground." Dr. Sayers advocated the installation of special rooms underground where first-aid supplies might be kept and the injured men taken for preliminary treatment. Such rooms, said Dr. Sayers, would also serve as places of refuge where the men could go in case of a mine disaster. This point seemed to impress many of those present as being of more importance than the providing of the rooms for first-aid purposes only. The metal mining men expressed themselves as being in favor of having the first-aid station situated on surface. Another point which Dr. Sayers brought out was the lack of adequate first-aid supplies underground, and he stated that the installation of such stations would insure a dependable place for the storing of such material.

Dr. Sayers also read a paper by Dr. R. C. Williams on "Underground Toilets and Sewage Disposal," in which several systems now in use at metal and coal mines were outlined. The New Jersey Zinc Co. has recently designed a galvanized iron latrine which embodies many desirable details. This was exhibited at the meeting and occasioned favorable comment.

The concluding paper of the meeting was the "Report of the Committee of Standardization of First-Aid Methods and Contests," by Major M. J. Shields. In addition to the report, a list of qualified judges of first-aid contests was included.

Vocational Training of Miners Discussed

Committee's Report Considered by New York Section of Mining and Metallurgical Society—Officers Elected

Several hours were devoted to a consideration of the subject of vocational training for metal miners at the meeting of the New York Section of the Mining and Metallurgical Society of America, which was held at the Columbia University Club on Sept. 30. Immediately following the usual dinner, election of officers for the ensuing year resulted in the choosing of C. M. Weld as chairman, Sidney H. Ball, vice-chairman, and Louis D. Huntoon for another year as secretary-treasurer. An engrossed set of resolutions to be presented to F. F. Sharpless, the retiring secretary of the society, was displayed at the dinner.

The report of the committee on occupational training had already been placed in the hands of the members and was the basis of the evening's discussion. In presenting this report B. F. Tillson read a letter from H. H. Knox, the committee chairman, in which the difficulty of doing such work in small camps was pointed out and suggestions were asked. Mr. Knox also said that private initiative could scarcely do more than blaze the trail for the state to follow, referring casually to practice in Germany and Spain.

The principal speaker was Frank Cushman, representing the Federal Board for Vocational Education, who has made an intensive study of such education as applied to mining. Mr. Cushman sketched the development of the work of the board since the act making possible its creation was passed in 1917. In that year \$500,000 of Federal money was available for the work, he said, and by 1925 there would be \$7,000,000. To secure such Federal aid the state or community must "match a dollar of its own for every Federal dollar." As a result of the board's work there is today in every state a state board to promote vocational education. Time was required to organize such boards, he said, as they must have qualified staffs.

Mr. Cushman contended that the society's task was to provide adequate vocational training for the men in the ranks in the mining industry, something more easily stated than done. He doubted that any existing schools were going to function to help the society accomplish this result. "Suppose," he said, "the courses are available. Where will you get the men to teach them?" First, men must be obtained who actually know how to do the work, mucking, drilling, or whatever it might be. Such men almost invariably did not know how to impart their knowledge to others. The first task was to make these men conscious of themselves as teachers and to instruct them how to teach others. In every state where worth-while work was being done the most expert workmen were being taught to teach others what they knew.

Lectures were no good for this purpose, said Mr. Cushman. The work must be done "right on the job." Foremen could be made into instructors. A man trained in a state agency would not be able to teach miners, but a skilled foreman or shift boss could be taught to do this.

The first device found effective in promoting vocational training was to train the foremen. It must first be assumed that the foreman has a responsible position and that he should train his men, and, next, it must be recognized that usually he does not know how to train them, but must be taught to do so. Furthermore, the idea must be first "sold" to the foremen, for they can kill any program of the sort if opposed to it.

Mr. Cushman dealt with the provisions of the law briefly. The training given must be below that of college grade, otherwise Federal money could not be obtained. Every man in the class must actually be engaged in the occupation considered in the class. The training did not include instruction in English, Americanization, and similar subjects. The board did not conduct schools. Much of the work was being done in evening and part-time classes. A difficulty to be avoided was the tendency to branch off into technical lines, which was not the objective. In response to a question Mr. Cushman said that organized labor seemed heartily in favor of the work.

The states had the money to do this work, said the speaker, but many of them did not seem to know how to go about spending it. On the other hand, some states had spent far more than the Federal Government allowed.

A. Bruce Minear, of the Y. M. C. A., whose headquarters are in Denver, discussed the Americanization work that is being done in various Western camps. The best work was being done not in classes, he said, but, for example, by such things as pageants like those sometimes put on in Butte by the foreigners themselves. At the Sunrise iron mine, in Wyoming, three nations came together on a community basis. The attendance at the Central club house was over 50 per cent of the population. The promotion of thrift, in his opinion, had a direct bearing on vocational work.

Arthur Notman briefly sketched the development of the Phelps Dodge Corporation's educational course, upon the completion of which the miner receives a certificate. This certificate would be of advantage to the men wherever he might go, Mr. Notman said, and without it he was not in line for promotion. This was sufficient incentive to make the men interested in the course and the work involved.

A paper by E. A. Holbrook, assistant director of the U. S. Bureau of Mines, commenting on the committee's report, was read by M. W. von Bernewitz, of the Bureau. An obstacle in the way of vocational training, it was said, was the indifferent attitude of the miners. Mr. von Bernewitz concluded with a few remarks of his own, referring to work that

has been done in other communities.

Prof. Robert Peele, following Mr. Notman, said he recalled a time in Arizona when it would have been utterly impossible to conceive of the Phelps Dodge plan. In his opinion the way for vocational training had been paved by the introduction of standardization methods, without which he did not see how vocational training could be carried out. The stimulus to develop such a plan must come from within. Prof. Peele said that he knew it to be difficult to get together instructors capable of dealing with a class of men known to be conservative. He pointed out the essentials heterogeneousness of a body of miners which must be taken into account and that the conservatism of the men in such a group would present problems not found in schools of mines. It would not do, he said, to have a recent technical graduate attempt to teach foremen; men of practical experience were needed.

Mr. Tillson said that the safety movement might be regarded as an entering wedge tending to remove suspicion that such things as vocational training were primarily due to the selfishness of employers. In setting out to instruct a class of shift bosses how to teach others, he advised that the most wide-awake man be selected and taught how to tell his story and be given full credit for it. The other men would follow his examples. Lecturing was to be avoided, he said. The way to do was to "insinuate an idea into the other fellow's head and let him patent it." He also said that there was need of additional incentive, as there were not enough foreman positions.

Columbia Section of A. I. M. E. Holds Joint Meeting at Spokane

A joint meeting of Columbia Section, A. I. M. E., the Associated Engineers, the Northwest Mining Association, the Washington Metal Mining Association and the mining committee of the Chamber of Commerce was held at the Davenport Hotel, Spokane, Wash., on Sept. 21. Frank M. Smith, of the Bunker Hill smelter, presided. Guests of the evening were the Hon. Marion E. Rhodes, chairman of the House Committee on Mines and Mining; H. Foster Bain, director; D. J. Parker, Matthew Van Sielen, T. T. Read, Harrison E. Meyer, Daniel Harrington and O. C. Ralston, of the U. S. Bureau of Mines; J. T. Pardee and J. S. Holmes, of the U. S. Geological Survey.

Speakers were Congressman Rhodes, Dr. Bain, Mr. Read, Mr. Parker, Professor Thomson, of the University of Idaho School of Mines, and Professor Jenkins, of Pullman.

This meeting was followed by a meeting of Columbia Section, A. I. M. E., members, who were addressed by Dean Thomson, of Moscow, on the desirability of indorsing a candidate for the presidency of the Institute for the ensuing year. After considerable discussion, Arthur Thacher was unanimously in-

dorsed by the members present, and the secretary was instructed so to notify the members of the nominating committee of the Institute.

Tulsa Section of A. I. M. E. Favors Thacher as Next President

A copy of the following letter from the secretary of the Tulsa Section of the American Institute of Mining and Metallurgical Engineers has been sent to each member of the Nominating Committee:

"The Executive Committee of the Tulsa Section of the American Institute of Mining and Metallurgical Engineers, at a regular meeting, thoroughly considered the coming election of officers for the American Institute of Mining and Metallurgical Engineers for the year 1922. The Executive Committee of the Tulsa Section desires that a capable and nationally known man be selected as president of the American Institute of Mining and Metallurgical Engineers for the year 1922. It is the belief of the Executive Committee that the election of Mr. Arthur Thacher would be a very appropriate election, and, further, the Executive Committee of the Tulsa Section therefore urges that you give Mr. Arthur Thacher due consideration for the position of president of the American Institute of Mining and Metallurgical Engineers for the year 1922. The Executive Committee believes that it is expressing the opinion and desire of the Tulsa Section when it asks you to fully consider Mr. Thacher's qualifications. The name of Mr. Arthur Thacher is therefore proposed to you, and I am directed by the Executive Committee of the Tulsa Section to ask that Mr. Thacher's nomination be made and further that Mr. Thacher's name be placed on the ballot for election for the year 1922."

Executive Board of Federated Societies Approves Minerals Relief Procedure

The outstanding feature of the meeting in Washington on Sept. 30 of the executive board of the Federated American Engineering Societies was the willingness with which those in attendance discounted the obstacles that have arisen and their evident determination to make the organization an important factor in national affairs of concern to engineers.

The board recorded a unanimous approval of the policy followed by the original War Minerals Relief Commission, composed of former Senator Shafroth, of Colorado, Philip N. Moore, and Horace Pomeroy. The board registered its disapproval of the proposed liberalization legislation now before the House of Representatives.

Business Paper Publishers Establish Training Courses for Staffs

The New York Business Publishers' Association has completed arrangements to initiate on a large scale this fall a Course in Industrial Publishing for the staffs employed on publications issued by its members. The course

will last eight or nine months. Classes will be organized early this fall and will be carried on until late in the spring. In addition to classes for members of the New York Business Publishers' Association, arrangements will probably be made for classes for business paper organizations in Chicago, Boston, Philadelphia, Cleveland, St. Louis, and other cities where sufficient interest in such a course may be shown.

Further information and details about the course can be had from the Secretary of the Course in Industrial Publishing, 185 Madison Ave., New York.

MEN YOU SHOULD KNOW ABOUT

Wallace Lee has gone to Siam on an engineering expedition.

Arthur W. Jenks, of Berkeley, Cal., is in New York for a few weeks.

L. G. Mosburg has completed extensive studies in the oil field near El Dorado, Ark.

William F. Ward, who recently spent a month in Colorado, has gone to Philadelphia, Pa.

P. L. Foster recently visited the property of the Tomboy Gold Mines Co., Ltd., at Telluride, Col.

F. J. Nagel is in Michigan on professional business and will return to Mexico in a short time.

R. C. Moore has returned to Lawrence, Kan., after a map-making expedition in southern Utah.

Frederick W. Foote, who has been in Africa during the last year, was a visitor in New York last week.

William J. Loring, president of the American Mining Congress, recently left San Francisco for Chicago.

T. H. Jenks, of Los Angeles, is in the vicinity of Mazatlan, Sinaloa, Mexico, to report on mining properties there.

G. F. Moulton, M. N. Bramlette, and N. F. Bass are mapping parts of the Glendive anticline in eastern Montana.

H. W. Hoots, of the U. S. Geological Survey, has joined D. D. Christner in work on deposits of potash in the Texas fields.

Samuel W. Cohen has returned to Montreal after an examination of the Murray claims, at Elbow Lake, northern Manitoba.

H. C. Carlisle, who has been making examinations in the vicinity of Lordsburg, N. M., has left for Douglas, Ariz., and Los Angeles, Cal.

M. W. Hayward has been appointed head of the geological and exploration department recently created by the Compañía Minera de Peñoles.

K. C. Heald, of the U. S. Geological Survey, has completed his inspection of the field work of oil and gas divisions and has returned to Washington.

H. L. Brown has been appointed consulting mining engineer of the Com-

pañía Minera de Peñoles, S. A., a subsidiary of the American Metal Co., Ltd.

Colonel Thomas Cantley, chairman of the Board of Nova Scotia Steel & Coal Co., has been elected a director of Oil & Nitrate Products, Ltd., of Nova Scotia.

Harold C. E. Spence, president of Oil & Nitrate Products, Ltd., has spent the summer in Nova Scotia in connection with the development of the torbanites and oil shales of Pictou.

T. F. Field, consulting engineer for the Iron Field Co., has returned to Duluth from a trip of examination to the Isle of Pines, where his company is conducting exploration for gold.

N. C. Grover, chief hydraulic engineer for the U. S. Geological Survey, is en route to Haiti in connection with the reconnaissance survey of the surface water resources of that republic.

Charles W. Goodale attended the meetings last week of the Mining Section of the National Safety Council convention at Boston. On Oct. 3 he addressed the Boston Section of the A. I. M. E.

Mortimer E. Cooley, dean of the Colleges of Engineering and Architecture of the University of Michigan, has been elected president of the American Engineering Council of the Federated American Engineering Societies, to succeed Herbert C. Hoover.

Frank Billings, president, and J. S. Lutes, manager of mines, of the Tod-Stambaugh Co., accompanied by D. P. Thompson, assistant to the president of the Inland Steel Co., recently visited the properties of the companies on the Mesabi iron range.

G. C. Martin and S. R. Capps, members of the staff of the U. S. Geological Survey, who have been in Alaska during the summer, have returned to Washington. Alfred H. Brooks was to have reached Seattle on Oct. 4. J. B. Mertie is expected to reach the Washington office Oct. 17.

M. J. Cavalier, professor of metallurgy in the University of Toulouse, has arrived at Columbia University to take up his work as French exchange professor and will be at Columbia from Oct. 1 to Oct. 30. He comes to America as the result of arrangements for an annual exchange of professors of engineering and applied science between French and American universities; and he will divide his time during the academic year among the co-operating institutions, Columbia, Harvard, Yale, Cornell, Johns Hopkins, Massachusetts Institute of Technology, and the University of Pennsylvania. The American universities have selected as their representative for the first year Dr. A. E. Kennelly, professor of electrical engineering at Harvard and M. I. T.

Mining and metallurgical engineers visiting New York City last week included J. M. Longyear, Jr., Marquette, Mich.; Walter M. Small, Cooperstown, Pa.; William F. Ward, Cartagena, Colombia; and Samuel S. Wyer, Columbus, Ohio.

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

The stockholders of the Arizona Copper Co., meeting at Edinburgh, have ratified the agreement of the directors to sell the company's holdings to the Phelps Dodge Corporation.

Better custom smelting terms have been offered to ore shippers of British Columbia by the Consolidated Mining & Smelting Co., of Trail. An outline of the proposal is given.

The Engineer mine, in the Atlin district, British Columbia, is involved in interesting litigation, the hearings of which have recently begun at Vancouver.

Henry Ford's operation of the Imperial iron mine, in Michigan, is causing other operators to speculate as to the effect of his high wage scale upon the district.

The mining industry in Alaska will grow but slowly,

in the opinion of George S. Rice, of the U. S. Bureau of Mines, who has just returned. Mr. Rice's impressions are recounted at some length by our Washington correspondent. An oil boom is not to be looked for, in his opinion.

Power shortage in the Porcupine district, Ontario, seems less imminent, owing to recent rains.

Another wage reduction has been made by the Mond Nickel Co. in the Sudbury district, Ontario.

Affairs of the Russo-Asiatic Consolidated are said to be in good condition. Leslie Urquhart has recently returned from Russia, according to advices from London.

John D. Ryan and Samuel Lewisohn constitute the metal-mining subcommittee of the Unemployment Conference at Washington.

Ford Visits Imperial Mine

Other Operators Speculate as to Effect of Manufacturer's High Wage Scale on District

Henry Ford, head of the Michigan Iron, Land & Lumber Co., paid a visit to his Imperial mine at Michigamme, Mich., recently. About seventy-five men are now employed there. The steam plant is in operation and the workings are being unwatered. The shaft is being widened to make room for an extra skip road. Five-ton skips will replace the old ones, which were of two tons' capacity. New buildings are being erected to house all of the machinery, and a number of new dwellings are being built. Tractors do all of the hauling on surface, Fordsons, of course, being the machines in use.

Mr. Ford stated that he was well pleased with the progress being made in getting the mine ready for production. He recently purchased 375,000 tons of iron ore in the Menominee district, and his ores from the Imperial will have to be mixed with other grades, those already found not being suited to the manufacture of the best steels. Mr. Ford has other iron lands also.

Some of the mine operators are wondering what effect Ford's high wages for miners and surface workers will have on the industry in Michigan. The wage scale is the same for all workmen, the man on top getting the same rate of pay as the miner.

Tasmanian Tin Mine Closes Down

By Cable from Reuters to "Engineering and Mining Journal"

Hobart, Oct. 1.—The Bischoff mine is closing down, owing to unfavorable conditions in the tin market.

Arizona Copper Co. Stockholders Agree to Sale

Directors' Proposal Ratified at Edinburgh Meeting Oct. 3—
Entire Undertaking, With Minor Reservations, Transferred to Phelps Dodge Corporation for Shares

STOCKHOLDERS of the Arizona Copper Co., Ltd., at a meeting held at Edinburgh, Scotland, on Oct. 3 ratified the proposal made by the directors to sell the company's entire holdings to the Phelps Dodge Corporation. The terms of the arrangement are set forth as follows in a circular sent to the shareholders:

"1. The whole undertaking (including the railway) is sold to Phelps Dodge Corporation, excepting the Edinburgh Office, for a sum of about £35,000, and the right (subject to making good if required certain expected federal tax recoveries) to certain British tax recoveries.

"2. The price is (a) Payment of the dividends on the A preference shares and preference stock and retirement of these shares and stock (at the expense of that corporation) within five years. (b) 50,000 fully paid shares of \$100 each of the corporation, of which the capital will then be 500,000 shares of \$100 each. (c) The purchaser assumes all the liabilities, other than undisclosed contingent liabilities, not incurred in the ordinary course of business. It is believed that all liabilities have been disclosed.

"3. The company is to have the right to nominate a director of the corporation.

"It will thus be seen that, while the "A" preference shares and the preference stock will in the meantime remain, the Phelps Dodge Corporation undertake liability for these shares and stock, and therefore in effect the ordinary shareholders of this company will own one-tenth of the capital stock of Phelps Dodge Corporation, and thus retain a

one-tenth interest in the mining properties of this company.

"In order that the shareholders may retain a free market for their shares it is proposed to keep up the present Arizona Copper Co., Ltd., but as it will practically be an investment company only, the expenses of management will be very considerably reduced.

"The arrangement is not one which under normal circumstances the directors would have submitted for approval, because it involves the transfer of the whole of the undertaking for an interest in an American corporation. Under existing circumstances, however, they unanimously recommend that the proposed arrangement be approved, for the following reasons:

"1. If the company is to continue a separate existence money will require to be raised to meet the losses down to May 31 last, as well as the further indefinite losses which will accrue before normal profit-earning conditions return. Even when that comes, provision would have to be made for the repayment of the money so borrowed out of profits, with, in all probability, a heavy loss on exchange as the expenditure has to be met on the other side.

"2. Further, after a few years the future of the company would in great measure depend on the treatment of large bodies of low-grade ore already ascertained to exist, and which it has been demonstrated recently can be profitably treated, but that only after suitable plant has been erected. That plant would involve an expenditure estimated at not less than \$10,000,000.

"3. By selling for shares and not for cash the shareholders retain the advantage of participating in the pros-

perity of the industry when, as is to be expected, the conditions of the trade improve.

"4. The Phelps Dodge Corporation is one of the largest copper-operating corporations in the world, of high business repute, and owning large and valuable mines. Its position is such that the resumption of dividends by this company (through dividends declared by that corporation) may be expected at an earlier date than would be practicable if this company continued as at present."

Mond Nickel Rumor Denied

There have been a number of rumors recently to the effect that the Mond Nickel Co., in the Sudbury district, had succeeded in completing a \$9,000,000 nickel deal with the Japanese government. No confirmation of this has been obtained, and, as a matter of fact, the rumors are denied by Japanese government officials in New York.

Cornish Tin Situation Stagnant

By Cable from Reuters to "Engineering and Mining Journal"

London, Oct. 3—The Cornish tin-mining industry is still stagnant. The manager of the Southercroft mine stated that his company would resume operations in the event of the price of tin advancing to £20, provided that the wage scale is so arranged that the company's loss would not exceed £500 monthly.

Belgian Furnace Companies Make Protest

By Cable from Reuters to "Engineering and Mining Journal"

Brussels, Oct. 1—The Association of Belgian Furnace Companies has lodged a vigorous protest against the ratification of the Belgo-Luxemburg Convention, asserting that its effects upon the Belgian iron industry would be disastrous.

Water Lily Shaft Sunk 801.7 Ft. In Sixty-Two Days

Further information regarding the advance made in sinking the Water Lily shaft of the Chief Consolidated Mining Co. at Eureka, Utah, is to the effect that the shaft was deepened 801.7 ft. in sixty-two consecutive days, beginning July 15, 1921, at 8 a.m. This work is being done by the Walter Fitch, Jr., Co., contractors, who, as already announced, have been credited with breaking the world's shaft-sinking record in sinking 427.5 ft. during the first thirty-one days of the period mentioned.

Gold in Rankin Township, Ont., Draws Prospectors

During the week ended Sept. 24 there was a considerable rush of prospectors into Rankin Township, near Elk Lake, Ontario, where a rich gold find was reported by an Indian. Many claims have been staked, and a number of men are going into the district, but it is understood that assay results of samples brought out have been disappointing.

Suit Over Engineer Mine Begun At Vancouver, B. C.

Plaintiff Questions Title of the Late Captain Alexander—Charges Fraud

Litigation over the ownership of the Engineer mine, in the Atlin district, B. C., began recently in the British Columbia courts at Vancouver. The property consists of a group of six mineral claims situated on the east side of Taku Arm, Lake Tagish, near Atlin, on which considerable development has been done disclosing an extensive body of ore. There also is a small stamp mill and other equipment. Action is being brought by the Engineer Mining Co. and the Attorney General of the province against J. A. Fraser as administrator of the estate of the late Captain James Alexander, who was lost on the "S. S. Sophia," and also against the administrator of the Allan I. Smith estate and the heirs of the Smith estate. The latter are heirs and successors of Captain Alexander, whose title is assailed.

The history of the mine dates from 1899, when the claims were located by two Swedes, Charles A. Anderson and Frank Nelson, representing the Aga Gold Mining Partnership. They were afterward taken over by the Engineer Mining Co., an Alaska company with headquarters at Skagway. Crown grants subsequently were applied for, but were refused by the Gold Commissioner and Mining Recorder, doubtless on the ground that the provisions of the law had not been fully observed. Meanwhile, it is alleged by the plaintiff, Alexander and his partners jumped the claims, restaked, and eventually obtained Crown grants.

The Engineer Mining Co. asserts that it expended \$40,000 on the development of the property. It admits that its free miner's license expired on May 31, 1917, but alleges it was not aware of this until 1918. It charges Alexander with making false affidavits when applying for title and alleges that he, to acquire the company's stamp mill and other machinery, arranged that judgment be obtained against the company in the County Court, Atlin. The company's mill, buildings, and machinery were valued at \$20,000 and were sold under process of execution to realize judgment of \$452. The property was bought in by Alexander, who, it is alleged, prevented competitive bidding at the sale by threat. The plaintiff company asks for a declaration that it is the owner of the mine and that Alexander and his associates fraudulently, deceitfully, and unlawfully obtained the Crown grants.

Iron-Ore Rate Hearing Oct. 10

Oct. 10 has been announced by the Interstate Commerce Commission as the date for resumption of the hearings on the iron-ore carrying rates in the Lake Superior district. The carriers will present their arguments in reply to the petition of the independent iron-ore operators of the district. The meeting will be held in Chicago.

Consolidated Smelter Offering New Terms for Custom Ores

Feels Itself Not Justified in Operating Another Lead Pool Unless Asked To Do So

A circular issued by the Consolidated Mining & Smelting Co. of Canada, Ltd., puts in more definite form the plan for improvement of conditions for shippers of custom ores, particularly silver and lead, in British Columbia. The matter had been discussed at a meeting of several of the more important custom ore shipping representatives held at Nelson early in September.

The proposition is to pay 95 per cent of the fire assay of silver at the average *Engineering and Mining Journal* quotation for foreign silver for the calendar week, including date of arrival, converted into Canadian funds at par. Minimum deduction from silver is to be one-half (0.5 oz.) ounce per dry ton of ore.

The contents of lead will be determined by wet analysis, deducting one and one-half units to determine the dry-lead assay. Ninety per cent of the lead will be accounted for on the dry-lead assay; provided, however, that in no case will the deduction from said dry-lead assay be less than one unit or 20 lb. per dry ton of ore.

The schedule diminishing the quantity of silver and lead to be paid for with zinc over 10 per cent is abolished.

The settlement price for lead to be London Metal Exchange spot quotation at the Bank of Montreal's sale price for sterling exchange, less 1½c. per lb. for refining and marketing.

The zinc penalty is to be decreased by making the charge per unit of zinc 50c. instead of 60c. The schedule diminishing the quantity of silver and lead to be paid for with zinc over 10 per cent is to be abolished. Ninety-five per cent of the gold is to be paid for at \$20 per oz. Gold under 0.03 oz. per dry ton will not be paid for.

An improved method of payment is assured by full payment in ninety days after date of arrival of shipment at the smelter. Negotiable drafts will be accepted for all or part of the value of shipment.

The company indicates that it does not feel justified in operation of another lead pool unless requested to do so, but if such request is made, the plan would be to start the pool on Oct. 1, 1921, with stocks in the smelter's hands which have not been delivered against sales; to add receipts from all sources and deduct deliveries against sales from month to month until the stock of Oct. 1 was accounted for; then the receipts in the month of October and so on. Each month's sales deliveries and each month's receipts would be treated as a unit. The net settlement price for each month's sales deliveries would be that obtained at point of delivery less freight and other charges incurred in effecting such delivery, and also less ¾c. per lb. refining; that is the actual delivery charges and the refining charge would be substituted for the usual 1½c. deduction.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Ryan Heads Unemployment Committee on Mining

Unemployment Data Discussed at Early Sessions—Subcommittees Formed To Consider Relief Plans

The Committee on Emergency Measures in Mining of the Unemployment Conference held its first session on Sept. 27 immediately following the general conference meeting which made the committee assignments. The committee, as selected, consists of John D. Ryan, Samuel A. Lewisohn, W. K. Field, E. M. Poston, John T. Connery, James B. Neale, John Moore, John L. Lewis, John P. White, and Miss Mary Van Kleeck. Of these Messrs. Neale, Lewis, and White have not been able to come to Washington. The executive secretary of the committee is David L. Wing. On organization of the committee, John D. Ryan was chosen chairman.

After holding sessions Sept. 27 and 28, at which the unemployment data were thoroughly discussed, it was found desirable, in order to expedite matters, to form subcommittees to go carefully over the various plans put forward for relief, and to report back later to the whole committee the result of their work. These subcommittees have not yet reported.

Some idea of the amount of work may be judged from the fact that the subcommittee on bituminous coal mining has been in almost constant session since its formation. In this industry the present emergency is so intimately connected with fundamental conditions in the industry that the problem of practical relief measures presents great difficulties. Mr. Ryan and Mr. Lewisohn constitute the subcommittee on metal-mining unemployment.

Metric System Bill Hearings To Begin Oct. 11

Hearings on Senator Ladd's Metric System Bill will begin Oct. 11 before a subcommittee of the Committee on Manufactures. Senator McNary, of Oregon, is chairman of the subcommittee. Other members of the subcommittee are Senator Weller, of Maryland, and Senator Jones, of New Mexico.

Government's Silver Purchases 73,679,866 Oz.

The purchases of silver by the Bureau of the Mint during the week ended Oct. 1 totaled 453,000 fine ounces. This brings the total purchases of silver under the Pittman Act to 73,679,866 fine ounces.

Mining in Alaska To Grow Slowly, Rice Believes

Oil Boom Unlikely—Geology Does Not Indicate Possibility of Many Rich Mines—Coal Drawing Attention

The upbuilding of the mining industry in Alaska necessarily must be slow, says George S. Rice, chief mining engineer of the U. S. Bureau of Mines, on his return from first-hand contact with the mining industry in the territory. Though he does not expect to see mining advance with rapid strides in Alaska, he believes that the gradual character of its growth will contribute to the stability of that industry there. Although it was physically impossible for Mr. Rice to visit all the mining regions of Alaska, he was able to absorb through contact with geologists, business men, and others intimately familiar with conditions, a comprehensive grasp of the present status of mineral development in the territory and to make some deductions as to the industry's economic future.

Mr. Rice discounts the view held by some that the territory is likely to experience the stimulating effect of an oil boom. From the information Mr. Rice was able to gather from geologists and others who have made careful studies of the indications of the occurrence of oil and gas, he concludes that the possibilities of the territory's becoming a large oil producer are not great. Though the formation is such as to make for superficial accumulations of gas, he does not believe the geology is such as to warrant the belief that large accumulations of oil are present. He would not be surprised to see the development of other small oil areas similar to the existing field. He points out, however, that even that would be a material local benefit.

Mr. Rice believes, also, that the metal-mining industry in Alaska cannot expect to have the stimulus of numerous mines of unusual richness. The geology of the territory does not favor the frequent occurrence of the phenomenal mineralization of the Copper River region. Opportunities for secondary enrichment do not exist in Alaska as in some of the other mining countries. Nevertheless he sees in the wide mineralization of the territory abundant opportunity for developing paying mines.

Transportation is the crying need of the metal-mining industry in Alaska, Mr. Rice states. The railroad to Fairbanks will be completed soon. This will be of incalculable benefit to both lode and placer mining. It will not be sufficient, however, to serve the needs of lode mining. Lateral highways con-

necting railroads with interior points are required if many of the large number of promising prospects in the territory tributary to the railroad are to be given an opportunity to become producers. The railroad, however, is going to give immediate benefit to the placer industry on the Yukon. Difficulties of transportation and the short season have made for long delays before the actual working of gravel could be undertaken. The presence of the railroad will make it possible to save a year's time at least in getting these properties under headway. Mr. Rice found that the railroad was well built and is being well managed.

The conviction now is general, according to Mr. Rice, that the railroad must look almost entirely to the mining industry for its tonnage. There is little prospect for the development of any large amount of agricultural tonnage. Mr. Rice declares that it is from the lode-mining industry that the principal freight must come. In view of the prospective completion of the railroad, a large number of prospectors are at work in the region north and west of the Government line. Though placer activities are not great producers of freight tonnage, their operation requires supplies and they will contribute in an important degree to the general prosperity of the region. The successful application of cold-water thawing and the bettering of the gold situation are factors operating toward the increased exploitation of the placer resources on the Yukon.

Owing to the activities of the Navy Department, coal mining in Alaska is attracting much attention. Though considerable development has been undertaken by the Navy Department, it has not been established, in Mr. Rice's opinion, that Alaska can be made the source of large supplies of coal of navy grade. That being developed at the Chickaloon mine is similar to that of the Pocahontas vein, and unquestionably is of very high grade. The difficulty is that it is badly mixed with wall rock, and there is the danger that the continuity of the beds, of which there are several, may be interrupted by eruptive intrusions. Owing to these conditions, extensive prospecting and development will be necessary to prove the value of these coal deposits. This prospecting is amply justified, Mr. Rice believes. The development of a naval coal supply on the Pacific Coast is of great strategic importance. Pocahontas coal must be transported many thousand miles to Pacific bases.

The Eska mine has been developed to a point where it can furnish the requirements of the railroad and the other demands along the railroad's line

NEWS BY MINING DISTRICTS

London Letter

Doubts As to Shetland Copper Discovery—May Work Welsh Gold Mines—Disposition of Enemy Kaffir Shares—Modderfontein B Less Popular—
—Leslie Urquhart Back
From Russia

BY W. A. DOMAN

London, Sept. 20—If rumor can be credited those who are financing the Shetland copper venture are not in a happy frame of mind. Early reports stated that about 500,000 tons of copper ore had been proved. Some one cast doubts upon the accuracy both of the quantity and of the metallic content. The people putting up the money, among whom is said to be a banker, became nervous and called to their aid the well-known firm of Bainbridge Seymour & Co. Colonel Yuill was consequently dispatched to the property, and although he has not reported, and nothing definite is known, I have seen people shake their heads when Shetland copper is mentioned. The intention was, of course, to float a public company, but if Colonel Yuill is not satisfied it is said to be likely that the venture will be abandoned.

There is talk of reopening some of the Welsh gold mines to give employment to local out-of-works. Gold exists in several places in the neighborhood of Dolgelly, and spasmodic mining has been carried on for many years. The veins are narrow, and the metal recovered is not sufficient to pay the costs of working and leave a surplus to remunerate capital. We are not likely to see a recrudescence of the old Pritchard-Morgan days when the gold was brought to London to stimulate the interest of investors. A good deal was apparently made out of manganese mining in Wales during the war.

The Public Trustee in London and the Custodian of Enemy Shares in South Africa have at last reached an agreement as to the best method of disposing of the Kaffir gold mining shares which were taken over by the respective governments during the war. Ordinary business men could have settled the problem in a few hours, but it has required two visits to London on the part of the Union government official. Harmony prevailing, it is possible that in the near future the Kaffir "houses" will put their heads and their resources together, and form a syndicate to purchase and hold the shares for better times. Both officials recognize that market conditions are so unfavorable that to offer stock for sale now would meet with little measure of success.

Modderfontein B has lost some of its popularity of late. The reason it is not easy to state, apart from rumors that developments are not as satisfac-

tory as could be desired. The latest figures are those for the June quarter. They show that of a total of 3,035 ft. sampled on reef, only 1,110 ft., or less than 37 per cent, was payable, the assay value being 43 dwt. over 17 in., or 731 inch-dwt. Though the value is good the percentage of payability is distinctly low. The report does not specify the part of the mine where the work was done. This is naturally an important matter, because the eastern is the known poor section. At the annual meeting of shareholders, held on May 26, it was stated that the results from January to April inclusive exhibited a consistent all-around improvement. One of the mine's troubles seems to be the high cost of working; the average for last year was no less than 26/1 per ton.

Leslie Urquhart, who has been visiting Moscow on behalf of the Russo-Asiatic Consolidated and other companies, has returned to London. Though he cannot be regarded as optimistic, he is certainly not depressed about Russian conditions. He seems to have been negotiating in connection with the affairs of British investors in general, and he is expected to make a statement on the subject soon. It is interesting to note that the officials of the mining and other companies constituting the Russo-Asiatic Consolidated met Mr. Urquhart in Moscow and reported what amounts to "all well" at the mines. This presumably means that no great damage has been done.

BURMA

Rain Hinders Burma Corporation's Smelter Operations

Namtu—The Burma Corporation's lead production for August was 4,261 tons gross; refined lead production 2,598 tons; refined silver production approximately 260,900 oz. Smelter operations were seriously interfered with during August by heavy rains, which interrupted traffic on the railway.

AUSTRALIA

South Australia

Medical Examination Insisted on at Port Pirie

Port Pirie—Until recently it appeared probable that Port Pirie would remain closed, but as the result of intervention by a member of the federal cabinet the strike has been settled and 1,000 men have been re-engaged. The federal government offered the services of Dr. A. J. Lanza, who has arrived from the United States in connection with the new health department to be created, as the medical adviser, and it is hoped that a mutually satisfactory agreement in regard to the proposed medical examination prior to employment will be reached. The company's insistence on such an examination is

due to the liability for claims that may arise in the future under the Workmen's Compensation Acts.

New South Wales

Broken Hill Proprietary's Steel Works Operations Expanded Last Year

Broken Hill—The resumption at Port Pirie will naturally facilitate the reopening of the mines at Broken Hill, but how soon this will take place is not now definite, as the Port Pirie Smelting Works has a fair tonnage of concentrates on hand, and naturally at present low prices the company is not anxious to resume operations on a normal scale.

Newcastle—Since the establishment of the iron and steel works by the Broken Hill Proprietary, Ltd., in 1915, strikes had caused a cessation of operations during about 30 per cent of the total period, thus severely handicapping the industry. These strikes were for the most part brought about by outside factors over which the company had no control. During the twelve months ended May 31, the output showed an expansion as compared with the preceding year, the figures being: pig iron, 227,533 tons; steel ingots, 209,458 tons; coke, 240,905 tons; sulphate of ammonia, 3,385 tons, and tar, 2,456,960 gallons. A plant for recovering motor spirit and naphtha is being built.

The manufacture of galvanized corrugated sheets and wire netting by associated companies is making good headway, and another company is expected to erect a plant for the manufacture of wire ropes. The company's net profit for the twelve months was £351,331. The surplus of liquid assets over liabilities amounts to £1,739,047, not including an investment of 200,000 £1 shares held in the Associated Smelters.

Tasmania

Mount Lyell's Operations Normal Once More

Mt. Lyell—Matters at Mount Lyell have settled down again and operations are proceeding along normal lines. Production at the North Mount Lyell mine is being maintained at the rate of 1,000 tons monthly, and at the Mount Lyell mine about 6,000 tons of pyrites is being raised.

Queensland

Mount Morgan Employees Wish To Vote Again as To Resuming Work

Brisbane, Aug. 28—A petition signed by 400 of the late employees of the Mount Morgan company is being presented to the Industrial Court, asking that another ballot be ordered to be taken on the proposals made by the company some time ago for resuming operations. Since those proposals were made copper has fallen in price another

£3 or £4 per ton, and if the company were to resume now it could only be at a greater loss than it was prepared to meet if it had restarted soon after the works closed down last Easter. Nevertheless, a report comes from labor circles that there is a good prospect of operations being resumed next month.

The cobalt mine, in the Cloncurry district, continues to develop very well at depths of 50 ft. and 112 ft. At both of these levels two good shoots of concentrating ore have been proved. Up to date 124 tons of ore has been sent to England, but nothing is yet known of the results of the two or three shipments dispatched. It is said that the rich patches of ore such as can be profitably sent away for treatment overseas do not extend below 50 ft.; that being mined lower down is a concentrating proposition, and must await the erection of the concentrating plant that has been begun.

It has been previously stated (in the Brisbane news letter of July 30) that the system adopted by the electrical "diviners" who have tried, and so far failed, to locate silver-lead ore at Indooroopilly, near Brisbane, consists of "improved apparatus and methods based on the Williams and Daft system." A reference to the *Engineering and Mining Journal* of May 7, 1921, p. 782, will show that the Daft and Williams, or telephonic, method is there described in an article on "Study of Underground Electrical Prospecting," by C. Schlumberger, who states that "lack of precision and the need for great experience on the part of the experimenter caused the method to be abandoned."

CANADA

British Columbia

Nickel Found in Gabbro Copper Mines on Vancouver Island

Victoria—George E. Winkler, president and manager of the Gabbro Copper Mines, Ltd., on the west coast of Vancouver Island, reports the discovery of nickel in the ores of that property. In a zone recently uncovered, having a maximum width of over 30 ft., there was shown considerable copper and a great deal of pyrrhotite. Unlike occurrences in the Sunloch Mine, nearby, where what is known as the Cave zone is in the basalt several hundred feet from the gabbro contact, the newly found zone of the Gabbro Mine is entirely in the gabbro. A pyrrhotite sample assayed at the provincial Bureau of Mines showed 5 per cent nickel. Check assays gave similar results. Specimens have been sent to the Canadian Geological Survey Branch, Ottawa, where they have created much interest.

The report of a gold discovery in the Lillooet district has, as usual, created excitement. There seems to be some confusion as to the exact location of the latest find. Statements have been made that it is on Gunn Creek, in the Bridge River section. That there is gold in the latter country is known, but it is not this that

has created the recent interest. The center of attraction now is the Taseko (Whitewater) River region and the recoveries being made from claims staked on Iron Creek, a tributary of the Taseko River. It is in this vicinity that the limonite deposits recently investigated by the provincial government are located, and it is reported that members of the exploratory party which spent the 1920 season on the Taseko were informed of the occurrence of gold in Iron Creek. H. Taylor, an old-time prospector, is credited with being the original staker. He and his associates are said to have been making considerable recoveries of gold, coarse and rough.

Stewart—Pat Daly is now planning the further development of the "Big Missouri" group of claims in the Salmon River zone, Portland Canal. The diamond drilling and exploratory work carried out under Sir Donald Mann does not convince Mr. Daly that this property is without a future. Mr. Daly explains that two companies have been formed, one a holding company incorporated in the United States and known as the Portland Canal Mines and another incorporated in British Columbia and known as the Daly Mines Co., Ltd. It is stated that necessary funds will be available for development.

Trail—Ore received at the Consolidated smelter during the week ended Sept. 21 totaled 4,575 tons, from the following sources:

Mine	Location	Wet Tons
Company Mines,		4,471
Champion,	Salmo,	20
Knob Hill,	Republic,	84

Ontario

Chances of Power Shortage Less at Porcupine—Mond Nickel Cuts Wages—Competition in Powder

Porcupine — During the last few weeks the possibilities were strong that there would be another severe power shortage in the Porcupine district this winter. Fortunately, very heavy rains have occurred recently and it is understood that, if the normal October rainfall is obtained, the power company should be able to continue its service. A few days ago the storage was 14 in. below normal, but in two days over 4 in. of rain fell. The power company is building a dam on Kenogamisee, which is planned to raise the main storage area by 10 ft., and thus assure a sufficient water supply during the winter, but the mining companies are doubtful if this work can be completed in time to help out the present season. In addition to the water shortage, the companies are using about 25 per cent more power than they were known to be consuming a year ago.

In view of the fact that the Hollinger is proposing to bring its capacity up to 5,000 tons per day, and the McIntyre has started a new 500-ton mill addition it is doubtful if the power company

will be able to develop sufficient power from its present sources to supply the camp. The total capacity of the company is taken by the Dome, Hollinger, and McIntyre, and, as a matter of fact, there is not sufficient power for them, so that the prospects for any other companies which desire power are not particularly rosy. There are, however, several other water-power sources within a reasonable distance, and to provide for present requirements and future extensions at least one of these powers should be developed.

The Dome has declared the regular dividend of 25c. a share, payable Oct. 20. Development on the new orebody in the east end of the property is satisfactory, and the ore is showing high values. No visible gold is to be seen, but the ore carries heavy sulphides.

It is understood that negotiations are under way for the control of the Schumacher mine, but even if these negotiations were successful it is doubtful if the power company could supply power this winter.

The McIntyre is delaying work on the new 500-ton mill addition in view of the possible power shortage mentioned.

Kirkland Lake—A special meeting of the shareholders of the Teck Hughes company will be called soon to ratify a proposed reorganization of the company. The company has a half million bond issue outstanding, on which the interest has been defaulted. The bond holders could have taken over the property, but did not want to do anything which would work against the interest of the shareholders. It is now stated, however, that the bond holders have formulated a plan which is satisfactory to the majority shareholders of the Teck Hughes company, and it is felt that the shareholders, as a whole, will find the plan acceptable and will ratify it. Conditions at the mine continue to be favorable, the average recovery being slightly over \$10 per ton, and the cost approximately \$6.

Cobalt—For the first time in several years northern Ontario is enjoying the benefit of a competition in powder. Several new brands of powder have recently reached the market, and competition is resulting in cheaper prices for the consumer. The Dome Mines has been making a test of "thompsonite," and on account of the absence of injurious fumes, has decided to use it in certain of the workings, and has bought a carload. "Burrowite" has been tried out in Kirkland Lake, and it is stated that the results have been satisfactory. Another powder company which was promoted by interests identified with the old Curtis & Harvey company will also soon have its product on the market. As a number of the mining companies are shareholders in this company, the concern should enjoy a satisfactory market for its product.

The ten-year old liquidation in connection with the Bailey Cobalt Mines recently came to an end, when at a special shareholders' meeting in Toronto

the directors were authorized to make application for the termination of the winding-up proceedings. The directors were also given the necessary authority to receive from the liquidator 425,000 shares of the capital stock of the Bailey Silver Mines, Ltd., and to hold this stock for the benefit of the Bailey Cobalt shareholders.

Nipissing costs are now down to about 35c. per oz., and there is some talk of the directors paying a bonus. The company has started its third diamond drill hole on the Rochester property, which adjoins the Hollinger, in the Porcupine district. No information regarding results is available.

Crown reserve is understood to be meeting with good success with its diamond drilling in Larder Lake. Three holes have been put down, of which two have cut the vein, which shows a width of 18 ft. and 35 ft., respectively, and it is expected that the third hole will cut the vein at a much greater depth, in a short time.

The Right-of-Way company is in liquidation, but it is expected that the property will be repurchased by the old directors.

Sudbury—Beginning Oct. 1 the management of the Mond Nickel Co. announced another cut in wages of 5c. an hour. This will bring the pay for drill runners to \$4.20 a day, with other classifications in proportion.

Ottawa—The government announces that during the coming winter the T. & N. O. Ry. will begin the construction of a seventy mile right-of-way from Cochrane to Tin Can Portage, on the Abitibi River. The estimated cost of the extension is \$3,500,000. In deciding upon the proposed extension, the government took into consideration the unemployment situation, as well as the country which the extension will serve. The line will tap large pulp reserves and will also open up some good farming land, and will lead to the development of the extensive kaolin and fire-clay deposits which have been found in that country. It will also put the railroad within reach of a large water power, which would immediately become available if the Government decided to electrify the line.

Yukon Territory

Season's Gold Yield Estimated at \$4,000,000—Frosts Stop Hydraulic Work

Dawson—The gold yield of the Yukon Valley, including Canadian and American territory, for the season of 1021 aggregates approximately \$4,000,000. It is estimated that the production of the interior of Alaska for the season will run to about \$2,675,000. The output of the Canadian Yukon will amount to about \$1,250,000 for the season. A million of this was produced within a radius of fifty miles of Dawson, and the bulk was shipped from that point. This makes a total for the two territories of \$3,925,000, to which may be added an estimated \$75,000 for the Atlin camp in northern British Columbia.

Following is the total season's yield, as estimated, by camps: Dawson, \$1,250,000; Fairbanks, \$800,000; Kuskokwim, \$550,000; Iditarod, \$500,000; Tolovana, \$250,000; Ruby, \$125,000; Bettles, \$85,000; Ophir, \$80,000; Marshall, \$50,000; Circle, \$50,000; Chandelar, \$40,000; Hot Springs, \$35,000; Rampart, \$25,000; Eagle, \$35,000; Forty Mile, \$40,000; Atlin, \$75,000.

Hydraulic operations around Dawson are shutting down, the first frosts forcing the clean-up. Several dredges around Dawson will run two or three months longer. These include two new dredges on Dominion Creek, one on Gold Run, and two on Klondyke Valley. A dredge on Highest Creek, tributary to Dawson, is also having an exceptionally successful season. The Old Glacier Creek district west of Dawson, which was discovered before the Klondyke, is producing over \$100,000 this year by the old steam-thaw and hoisting processes alone.

MEXICO

Durango

Guanacevi Affected by Poor Railroad Service

Guanacevi—A number of the principal mines of this camp are closing down owing to the lack of explosives and other mining supplies. The fault is said to lie with the railroads, which are unable to deliver freight or handle the ores from the camp.

The Esperanza mine, in Chihuahua, north of this camp, has closed down for the same reasons and will not attempt to resume operations until an improvement is made for handling the mine output.

Hidalgo

Resumption of Work Likely Following Rise in Silver

Pachuca—Preparations are being made to begin work at Pachuca and adjacent camps. It is said the Real del Monte, El Oro, and Tlalpujahu mines will resume operations after having been idle for several months.

Aguascalientes

Asientos—More mines in the Asientos region suspended during the week ended Sept. 24, throwing a number of miners out of employment. Some development work is being carried on, and a new mill is being projected for the camp, which will treat the ores from the near-by mines.

TEXAS

Back Taxes Claimed on Shipments of Union Sulphur Co.

Jefferson County, Tex., is trying to collect taxes for a period of fourteen years on sulphur shipped by the Union Sulphur Co., of Calcasieu Parish, La., to the port of Sabine, and thence by boat to other ports. A legal question of interest is involved in this claim for taxes, as the sulphur is mined in Louisiana. The commissioners of Jefferson County, however, contend that the sulphur at the docks on Jan. 1 each year is taxable. About \$75,000 in taxes, if allowed, will be collected.

ARIZONA

C. & A. Acquires Claims on Bitter Creek—Coronado Property To Be Sold To Satisfy Arizona Copper Co.'s Judgment

Duncan—It has been announced by some of the owners that the deal for the Belali group and Norman King group of ten claims, situated on Bitter Creek near the old Clear Lake mill, thirty miles from the railroad at Duncan, has been finally closed, the property going to the Calumet & Arizona Mining Co., which has had it under option for sixty days. This is a siliceous silver-lead property that has produced some high-grade ore.

Clifton—Notices were recently issued that the mining property of the Coronado Mining Co., situated in the Copper Mountain district near Clifton, would be sold by the sheriff at public auction to be held at the court house in Clifton, to satisfy a judgment obtained against the company in the Superior Court on August 31, by the Arizona Copper Co.

Big Bug—At the organization meeting of the board of directors of the Big Ledge Copper Co. held in New York recently, John Borg was elected president, Nelson Gray, vice-president and treasurer, and William C. Sherwood, secretary.

The board considered the recent report on the properties prepared by W. W. Lytzen, which indicates that present developed ore reserves represent only 5 per cent of the development possibilities of the Henrietta vein, and authorized the new president to prepare a plan for future development operations to be submitted to the full board at its next meeting. The advisability of constructing another 100-ton unit to add to present milling facilities will also be discussed then.

CALIFORNIA

San Francisco Mint Breaks Record in Coining Dollars

San Francisco—Twelve cars of freight, aggregating 450 tons, have been forwarded to Casal, Sinaloa, Mexico, and most of the shipment has been unloaded at its destination. The machinery and freight are for the construction of a gold dredge purchased by the Bacubirito-Sinaloa Gold Placers, Inc., in San Francisco.

A drilling party in charge of Ralph L. Van der Naillen will leave San Francisco early in October to explore certain concessions on the Sinaloa, Yaqui, Mayo and Fuerte rivers, in Sinaloa.

Mint records have been broken by the San Francisco mint, which is coining silver dollars at the rate of 260,000 per day. This rapid coinage is the result of an effort to save interest on short-term Treasury notes issued to replace the cancellation of silver certificates caused by melting down silver dollars into bullion.

Grass Valley—The North Star mine has 400 men on its payroll and is now

operating at full capacity. The Empire has 450 men and is operating its eighty stamps to capacity. Other local mines are active.

Shawmut—The destruction of the boarding house at the Belmont-Shawmut by fire has delayed the resumption of operations.

Oroville—Search is being made for platinum in the Magalia Ridge district. Platinum has recently been found in the sluice boxes of the Steiffer placers operated by the Evening Star Co., and as a result greater attention is being paid to its probable occurrence in other properties.

Engelmine—The August output of the Engels Copper Mining Co. approximated 1,040,000 lb. copper, 15,300 oz. silver, and 130 oz. gold from 27,000 tons of ore. Milling is proceeding at rate of 1,000 tons per day, with an average extraction of 86 per cent. The extraction of the sulphide copper is close to 90 per cent. New ore of better grade and quantity is being opened on the 7th level of the Engels mine. The deep adit has reached a length of 250 ft., and progress is at the rate of 300 to 350 ft. per month. Two years will be required to complete the 7,600-ft. adit. The adit will concentrate operations, eliminate pumping and hoisting at the upper mine, supply all water under gravity flow for the mill and open up ore reserves to a depth of 500 ft. below the present workings in the upper or Engels mine. One-third of the present production comes from the lower or Superior mine.

NEVADA

Much Activity in Comstock District—Tonopah Divide Creating Reserve Fund To Build Mill

Virginia City—There is considerable activity all along the Comstock Lode and adjacent territory. Many claim transfers are being made, and those familiar with the district and conditions predict a boom for the spring of 1922.

Sampling of the Middle Mines is being continued, and it is generally believed that the options held by Albert Burch and associates will be exercised, and that samples will show that a considerable portion of the vein can be mined by glory-hole method.

Divide—According to a recent statement by H. C. Brougher, president of the Tonopah Divide Mining Co., the company is clearing from \$5,000 to \$10,000 a month at present, and is building up a reserve fund to be used in the construction of a mill near the mine. Fifty tons of ore is being shipped daily to the Belmont mill at Tonopah, the hauling cost being \$1.75 per ton. No recent estimates of ore reserves have been given out, but Mr. Brougher states that in the past year more ore has been developed than mined. The main shaft is being sunk at the rate of 100 ft. monthly, and sinking will be continued until water level is reached.

The Divide Extension shipped 600 tons of ore to the MacNamara mill at Tonopah during the first twenty days of September. The ore is said to average \$50 per ton. Crosscutting to pick up the faulted segment of the vein on the 200 level is being continued.

Tonopah—Reported bullion shipments from this district, representing clean-up of operations for the first fifteen days of September, are as follows. Tonopah Belmont, \$97,000; Tonopah Extension, \$38,000; West End, \$55,000; and Tonopah Mining, \$65,000. The Belmont is shipping 450 tons of ore daily and doing extensive development work on all levels from the 700 to the 1,200.

The Extension reports 244 ft. of development during the week ended Sept. 24, with development from the 1,200, 1,540, 1,600, 1,680, 1,760, and 1,880 levels. The West End reports tonnage mined as 225 tons per day, with development work on all levels from the 500 to the 1,100.

The Tonopah Mining Co. is producing 200 tons of ore daily and doing development work from the Mizpah, Silver Top, and Sandgrass shafts. The Midway reports cutting quartz stringers in the crosscut on the 1,600 level, some of the quartz showing mineralization.

Ely—Development work is being pushed with a small force by the Nevada Consolidated on the high-grade copper orebody found some time ago in the Ruth mine. About 500 cars averaging over fifty tons per car have been sent to the smelter at McGill, where the ore is stockpiled pending resumption of smelting in the Ely district. This ore averages about 8.5 per cent and carries a small gold content. No definite announcement has as yet been made as to when operations will be resumed, and the town is quiet.

Shipment of the surplus copper stored at the McGill smelter to the refinery at Baltimore, Md., has been started. About 20,000,000 lb. is on hand at present at the smelter, and it is expected that shipments will be made at the rate of about forty cars per week. The shipments will be routed via Shafter and the Western Pacific to San Francisco and thence by water through the Panama Canal to Baltimore. A saving of \$5.50 per ton is reported to be made by this routing over the charges on the all-rail route east.

The Taylor mill will soon be treating ores from the Taylor district again. The plant has been completely overhauled.

UTAH

Utah Steel Corporation Gets Stock-Selling Permit

Midvale—The Utah Steel Corporation, which is planning important expansion and the utilization of iron deposits in the southern part of Utah, has been granted permission by the State Securities Commission to dispose of \$1,000,000 worth of preferred stock, this to bear interest at 8 per cent. The Utah Steel Corporation beginning in 1915 with a plant representing a cost of

\$175,000, has added to its equipment until it now has an investment of \$2,000,000. It has been producing iron and steel from scrap iron, and finding a market in the Western and Pacific Coast states. The company has made a contract with the Milner corporation for iron ore from the southern part of Utah, and it is understood that, as soon as it is ready to start work on the proposed new blast furnace, provision will be made by the railroad for the construction of a twenty-one mile branch line from Lund, on the Salt Lake Route, to the iron fields. The coal fields which are to supply fuel for the new industry are already tapped by railroad.

Park City—The shipments for the week ended Sept. 24 amounted to 1,436 tons. Shippers were: Judge allied properties, 593 tons; Silver King Coalition, 560 tons; and Ontario, 283. Considerable prospecting is going on in the eastern section of the camp, following the recent find at the Park-Utah, one of the Judge allied properties.

Construction of the new mill of the Coalition is progressing. Steel work has been started, and some of the machinery is on the ground. Excavation for the cement foundation for the large crusher has been started. This work is in solid rock.

Eureka—Ore shipments from the Tintic district for the week ended Sept. 24 amounted to 144 cars, as compared with 161 the week preceding. Shippers were: Tintic Standard, 38 cars; Chief Consolidated, 36; Victoria, 13; Eagle & Blue Bell, 11; Dragon, 8; Iron King, 8; Iron Blossom, 7; Swansea, 3; Gemini, 3; Mammoth, 2; Eureka Hill, 2; Colorado, 2; Silver Park, 1; Silver Park lease, 1; Sunbeam, 1.

The Mammoth mine, at Mammoth, has closed down, owing to the low price of copper and high costs. Lessees are continuing at the Grand Central. The South Standard has resumed shaft sinking. Drifting is being done on the 1,050 level of the Eureka Bullion.

COLORADO

Two Radium Companies To Resume—Rich Ore at Bull King Causes Rush—Gem Mining Co.'s Property Transferred

Montrose—Announcement has been made that the Radium Company of Colorado and the Radium Luminous Materials Corporation would both renew operations after a long period of inactivity. These companies are owners of large radium properties in the west end of Montrose County, the former company shipping its ore to Denver for reduction and the Radium Luminous company treating its output at a plant in the East.

The Standard Chemical Co., the largest radium-mining company in the country, is operating its plant at full capacity, and indications are that operations will soon reach pre-war activity, throughout the carnotite districts.

Denver—A big rush has started to a new district on the Utah and Colorado line, centering around a new camp known as Bull King. Exceptionally

rich ore is reported, and many new locations are being made.

Idaho Springs—New York business men have organized the Commonwealth Silver Mines Co., and have taken over the property of the Gem Mining Co. in this district. The new company will operate the Freighters' Friend, Silver Age and Franklin groups, through the Newhouse or Argo tunnel.

Cripple Creek—A 500-ft. shaft will be sunk on the Elkhorn property, and equipped with electrically operated hoist and air compressor.

MONTANA

Anaconda Denies That It Intends To Resume Mining—Tuolumne Co. Cuts New Milling Ore

Butte—Gossip is continuing of negotiations pending between the Davis-Daly Copper Co. and the East Butte Mining Co., but nothing is obtainable from an official source which might lend color to the rumors that some sort of consolidation is in the air. East Butte has resumed raising its shaft from the 1,800 level to the surface, and the work is now within 350 ft. of completion. The shaft will materially cut down the crosscutting distance to the ore zone of the Pittsmont properties.

The Tuolumne Copper Mining Co. has opened a fair-sized body of milling ore on the 1,600 level of the Main Range mine, which it is drifting upon westerly in the hope of uncovering ore which will grade into the commercial class, the present range of assays showing more than 6 oz. of silver and from 1 to 1½ per cent copper.

Butte & Superior is drifting upon its copper-ore showing on the 2,200 level of the Black Rock mine, with the grade holding and apparently giving indications of widening. The situation, according to the observation of those working in this drift, is improving.

The Davis-Daly drift to the northwest on the 2,700 level of the Colorado mine is showing about 3 ft. of high-grade ore. Crosscutting is being pushed on the 750 level of the Hibernia, and within a month's time, or possibly a week or two longer, the orebody should be reached.

The Anaconda Copper Mining Co., in a somewhat remarkable statement published in the last week in one of the local newspapers, said to be controlled by that corporation, stated that copper metal was practically unsalable. The statement published was in refutation that the company proposed any early resumption of copper mining, and painted the situation as not warranting the raising of any false hopes on the part of the people of Butte, or of unduly encouraging local merchants into the belief that better times were near. A full crew is now working on half time at the Anaconda's timber-framing plant at Rocker, Mont. An interesting item referred to the starting up of the timber-pickling plant at Rocker, but for how long a time is not known. This resumption has been in the nature of an experiment.

MICHIGAN

The Copper Country

The Problem of Recovering Copper From Amygdaloid Sands—Quincy in Good Condition—Mohawk Running at Capacity

Houghton, Mich.—Some of the mines, notably Copper Range, Mohawk, and Quincy, are working out their own problem in the further recovery of copper from waste amygdaloid sands. Copper Range "rock" is a free-milling amygdaloid, susceptible to fine grinding. The loss per ton is about 5 lb., but this can be reduced another pound by regrinding. Copper Range is convinced that the solution of its problem is finer grinding rather than leaching or flotation. Even if flotation could be successfully applied it is believed it would be too expensive, because of the relatively small metal content of the sands and the large outlay that would be required for equipment and handling.

Approximately 15 per cent of the Mohawk tailings are reground, and it is its policy to install additional regrinding processes whenever other equipment can be discarded to provide the necessary space. The conclusion has been practically reached that an addition to the mill, which would be required to house more tables and regrinding mills, would not be justified, owing to the comparatively low copper content in the tailings. As in the case of Copper Range, the loss is about 5 lb. to the ton.

All but one of the stamp head units in the Quincy mill have been completely equipped for regrinding. As a result, Quincy last year recovered nearly 2,500,000 lb. of copper that otherwise would have been lost.

Although copper losses in amygdaloid tailings average about 5 lb. to the ton, the percentage is much higher in conglomerate sands. In the older deposits of Calumet & Hecla tailings, the copper content will run from 12 to 20 lb., and in the newer sands the loss is 8 to 10 lb. Calumet is now recovering the greater part of this metal by flotation.

Although failing to "break even" at the present price of copper, Quincy is holding an organization together, and will continue to operate on approximately a 50 per cent basis throughout the winter. It has effected every possible economy, and production is down to the minimum. The mine is working a total of nine shifts a week, or four and a half days in its Nos. 2, 6, and 8 shafts. Metal sales have not kept pace with refined-copper production, and a larger surplus than usual is on hand. Just what this surplus is, however, has not been divulged.

Considerable mass copper continues to come from Nos. 2 and 6 shafts. The new No. 2 hoist, the most powerful drum hoist in the world, is working smoothly and has contributed materially to a lowering of costs in this shaft.

Quincy should be one of the first of the Lake mines to "come back" strong

when normal conditions in the metal market return. Not only is the grade of ore holding up at depth in all shafts, there being no diminution in the yield of mass copper, but improvements in all departments of operation have effected notable economies.

Mohawk continues to work to the capacity of its stamp mill. A full program of mining and development is under way throughout the mine, with little or no change from day to day in output of "rock," or yield of copper per ton. Daily "rock" shipments average about 2,600 tons, the yield being approximately 23 lb. of refined copper to the ton. Mohawk is now sinking, drifting, and stoping in No. 1 shaft, and some particularly good ground is being opened north of the shaft.

Work will continue in the two south drifts from the 1,700 level of Mayflower as long as mineralization continues. Both drifts are again in copper, with a fair grade of "rock" coming from the main drift, the copper appearing in both mass and barrel form. The improvement in the parallel or No. 2 drift is encouraging, the drift having passed through a "trappy" section encountered after it had gone through a long stretch in which the mineral values were quite satisfactory.

Seneca's drifts north from the 3rd, 5th and 6th levels toward the Gratiot continue in good ground. The mineralization also persists to the south, in the direction of Ahmeek. There will be no reduction of development work in Seneca this winter.

Marquette Range

Cleveland-Cliffs Shipping Stock Ore—Oliver Shipping From Section 16

Negaunee—The Cleveland-Cliffs Iron Co. has had steam shovels at work in the large stockpiles at the Maas and Negaunee mines. The same company is now shipping more ore from the Gwinn district, but little is going forward from the mines west of Negaunee in Marquette County. The Oliver Iron Mining Co. is making regular shipments from its Section 16 property, the only mine being operated by this company on the range. Some of the mines will have difficulty arranging stocking room for the coming winter.

MINNESOTA

Mesabi Range

Hill-Trumbull Mine Lays Off 125 Men

Nashwauk—All machinery at the Pearson mine, a property of Clement K. Quinn & Co., is being removed from the underground workings by a small crew. The property has not been operated for two years, but it is now rumored that the company plans to remove the remaining ore by open-pit mining and that stripping will be started next spring.

Marble—The Hill-Trumbull mine, operated by the Mesabi Cliffs Iron Mining Co., has completed its shipment of 300,000 tons of ore for this season, and all work has been stopped, except that of various repairs. In all 125 men are affected.

THE MARKET REPORT

Daily Prices of Metals

Sept.	Copper, N. Y., net refinery*		Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.	
29	12.25	26.25	26.50	4.70@4.75	4.45@4.50	4.45@4.50	
30	12.25	26.375	26.625	4.70	4.45@4.50	4.50	
Oct. 1	12.25	26.375-26.50	26.75	4.70	4.45@4.50	4.50	
3	12.25@12.375	26.50	26.75	4.70	4.45@4.50	4.50@4.55	
4	12.375@12.50	26.375	26.75	4.70	4.45@4.50	4.55@4.60	
5	12.50 @12.75	26.50-26.75	26.75-27.00	4.70	4.45@4.50	4.60	

*These prices correspond to the following quotations for copper delivered: Sept. 29, 12.50c.; 30th, 12.50c.; Oct. 1, 12.50c.; 3d, 12.50@12.625c.; 4th, 12.625@12.75c.; 5th, 12.75@13c.

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.

September Monthly Average Prices

Copper:

New York Electrolytic.....	11.948
London Standard	67.977
London Electrolytic	72.295

Lead:

New York	4.600
St. Louis	4.392
London	23.148

Silver:

New York, foreign	66.160
New York, domestic	99.250
London	40.082
Sterling Exchange	371.725

Zinc:

St. Louis	4.235
London	25.256

Tin:

99 per cent	26.280
Straits	26.680
London	156.750

Antimony 4.564
Quicksilver 42.660
Platinum 75.960

London

Sept.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3 M	Spot	3 M	Spot	3 M
	Spot	3 M							
29	68 1/4	69 1/4	72 1/2	156 1/2	158 1/2	23 1/2	23	26 3/4	26 3/4
30	68 3/8	69 3/8	72 1/2	156 1/2	158 3/8	23 1/2	22 7/8	26 3/4	26 3/4
Oct. 1									
3	68 3/8	69 3/8	72 1/2	157 1/4	159 1/2	23 1/2	23 1/2	26 3/4	26 3/4
4	68 3/8	69 1/2	73	156 1/2	158 1/2	23 1/2	23 1/2	26 3/4	27
5	69 3/8	70 1/4	73 1/2	155 3/4	157 3/4	23 1/2	23 1/2	26 3/4	27 1/4

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

Sept.	Sterling Exchange "Checks"	Silver			Oct.	Sterling Exchange "Checks"	Silver		
		New York Domestic Origin	New York Foreign Origin	London			New York Domestic Origin	New York Foreign Origin	London
29	371 1/4	99 1/4	71 3/8	43 1/4	3	372 1/2	99 1/4	70	42 1/8
30	372	99 1/4	70 3/8	42 3/8	4	373 1/4	99 1/4	70 3/8	42 1/2
Oct. 1	372 1/4	99 1/4	70 3/8	42 7/8	5	375 1/2	99 1/4	70 3/8	42 1/8

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. Sterling quotations represent the demand market in the forenoon.

Metal Markets

New York, Oct. 5, 1921

Copper and zinc were the most active metals during the week, the trading in each having an influence on prices. Although the lead market was not inactive, buying was not so heavy as last week, and prices show no change since the first of the month. The better feeling among producers which has been noted for the last few weeks exhibits no let-up, the rise in all the metals has been steady and regular, and there is little likelihood of any run-away market carrying prices to a level which cannot be held. It should not be forgotten that even at present levels prices are below pre-war averages.

Copper

The heavy buying of copper which was started by the brass companies has gradually gathered momentum, and other consumers have come into the market, particularly wire manufacturers and users. Public-utility companies have also noted the rising tendency and have been in the market for future requirements; in fact, the general inquiry for future copper which runs well into the first three months of next year has been one of the features of the market. Although trading was on a 12.50c. delivered basis last week, an increased activity in demand gave prices an upward boost. Yesterday some copper in fair-sized quantity was sold for 13c. delivered,

October and November delivery, but copper is still available at 12.75c. Future copper has been sold for about one-eighth cent premium per month. All producers and dealers report the market as strong, and many are of the opinion that the market will advance further. Export business has been lighter than last week, the price quoted yesterday being from 12.65 to 12.75 c.i.f. Interest has momentarily shifted from foreign trade to domestic business. It is noticeable that the London market has also shown an improvement.

Lead

The American Smelting & Refining Co. continues its official contract price at 4.70c., at which level most of the other New York business has been done. The New York market has been much more active than that at St. Louis, the demand seemingly centering in New England manufacturing establishments. The quietness of the market is not worrying producers, as lead still continues to be in excellent statistical position, and it is realized that a steady market is more to be desired than a widely fluctuating one. One producer feels that it would be unwise to see too much of a rise in lead, with a possible influx of foreign lead and other unwonted results.

Zinc

Zinc has continued its advance, and was sold today for 4.60c. East St. Louis. Buying is in good volume, and metal is steadily moving into actual consuming hands, chiefly galvanizers.

Shipments are making an inroad on the surplus which has been accumulated during the last few months, and the

healthy rise and strength of the market have made producers a lot more cheerful than for many days. As is usually the case, many consumers who had intended to remain out of the market have been drawn in by the advance in price. High-grade zinc is still selling for 6c., with freight allowance.

Tin

A better demand is reported, but prices do not show any pronounced changes. Although the London market is down today, the improvement in sterling exchange more than makes up for the decline. The tin-plate trade is improved, and a fair business has been done with this class of consumers. Forward deliveries of tin are quoted about $\frac{1}{2}$ c. higher than spot.

Arrivals of tin in long tons: Total September, 2,600; Oct. 3d, London, 50; Straits, 925.

Gold

Gold in London: Sept. 29th, 111s. 4d.; Sept. 30th, 111s.; Oct. 3d, —; Oct. 4th, 110s. 6d.; Oct. 5th, 109s. 8d.

Foreign Exchange

Foreign exchange rates have been moving irregularly, but the tendency is slightly upward. On Tuesday, Oct. 4, francs were 7.135c.; lire, 3.975c.; and marks, 0.805c. New York funds in Montreal, 10.995 per cent premium. Sterling cables continue to be quoted $\frac{1}{2}$ c. higher than the figure given on page 594.

Silver

Since our last report there has been selling by both China and the Indian bazaars, with a consequent fall in the price of silver. The rupee rate and China rates are off from last week, and unless an improvement occurs in these exchanges any material advance in silver seems unlikely. The market closes quiet and uncertain.

Mexican Dollars—Sept. 29th, 55; 30th, 54 $\frac{1}{2}$; Oct. 1st, 54 $\frac{1}{2}$; 3d, 53 $\frac{1}{2}$; 4th, 54 $\frac{1}{2}$; 5th, 54 $\frac{1}{2}$.

Other Metals

Quotations cover large wholesale lots unless otherwise specified.

Aluminum—List prices of 24.5@25c. are nominal. Outside market, 18@20c. per lb.; 18 $\frac{1}{2}$ c. for imports, duty paid.

Antimony—Chinese and Japanese brands, 5c.; market dull. W.C.C. brand, 5 $\frac{1}{2}$ @5 $\frac{1}{2}$ c. per lb. Cookson's "C" grade, spot, 9c. Chinese needle antimony, lump, nominal at 4c. per lb. Standard powdered needle antimony (200 mesh), nominal at 5.25c. per lb.

White antimony oxide, Chinese, guaranteed 99 per cent Sb₂O₃, wholesale lots, 6 $\frac{1}{2}$ @7c.

Bismuth—\$1.50@1.55 per lb.

Cadmium—Range \$1@1.10 per lb., in 1,000-lb. lots. Smaller quantities, \$1.10@1.25 per lb.

Cobalt—Metal, \$3@3.25 per lb., black oxide, \$2.35 per lb. in bbls.

Iridium—Nominal, \$150@170 per oz.

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

Nickel—Standard market, ingot, 41c.; shot, 41c.; electrolytic, 44c. Small ton-nages, spot, 35@38c. Market dead.

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

Osmium—\$70 per troy oz. Nominal. \$70, Los Angeles, Cal.

Palladium—Nominal, \$55@60 per oz.

Platinum—\$78 per oz.

Quicksilver—Market weaker at \$39@41 per 75-lb. flask. San Francisco wires \$43.75. Dull.

Rhodium—\$150 per troy oz.

Selenium—Black powdered, amorphous, 99.5 per cent pure, \$2@2.25 per lb.

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

Tungsten Metal—Wire, \$35@60 per kilogram, according to purity and gage.

Metallic Ores

Chrome Ore—Ore analyzing 40@45 per cent Cr₂O₃, crude, \$20@25 per net ton; ground, \$30; analyzing 45@50 per cent Cr₂O₃, \$24@26; ground, \$28; f.o.b. Atlantic ports. Quotations are nominal.

Iron Ore—Lake Superior ores, per ton, Lower Lake ports: Old Range bessemer, 55 per cent iron, \$6.45; Mesabi bessemer, 55 per cent iron, \$6.20; Old Range non-bessemer, 51 $\frac{1}{2}$ per cent iron, \$5.70; Mesabi non-bessemer, 51 $\frac{1}{2}$ per cent iron, \$5.55.

Magnetite Ore—F.o.b. Port Henry, N. Y.: Old bed 21 furnace, \$4.85; old bed concentrates, 63 per cent, \$5.75; Harmony, cobbled, 63 per cent, \$5.75; new bed low phosphorus, 65 per cent, \$8.50.

Manganese Ore—20@22c. per unit, seaport; chemical ore (MnO₂) \$50@55 per gross ton, lump; \$70@75 per net ton, powdered. Nominal.

Molybdenum Ore—85 per cent MoS₂, 50c. per lb. of contained sulphide, New York. Quotation purely nominal.

Tantalum Ore—Guaranteed minimum 60 per cent tantalic acid, 50c. per lb. in ton lots.

Titanium Ores—Ilmenite, 52 per cent TiO₂, 1 $\frac{1}{2}$ @2c. per lb. for ore. Rutile, 95 per cent TiO₂, 12c. per lb. for ore, with concessions on large lots or contracts.

Tungsten Ore—Scheelite or wolframite, 60 per cent WO₃, and over, per unit of WO₃, \$3, f.o.b. Atlantic ports.

Uranium Ore (Carnotite)—Ore containing 1 $\frac{1}{2}$ per cent U₃O₈ and 5 per cent V₂O₅ sells for \$1.50 per lb. of U₃O₈ and 75c. per lb. of V₂O₅; ore containing 2 per cent U₃O₈ and 5 per cent V₂O₅ sells for \$2.25 and 75c. per lb., respectively; higher U₃O₈ and V₂O₅ content commands proportionately higher prices.

Vanadium Ore—\$1 per lb. of V₂O₅ (guaranteed minimum of 18 per cent V₂O₅), New York. Nominal.

Zircon—Zirconium silicate, f.o.b. Pablo, Fla., 4 $\frac{1}{2}$ @13c. per lb., according to grade.

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

Zirkite—According to conditions, \$70 @ \$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. 1—Zinc blende, per ton, high, \$23.95; basis 60 per cent zinc, premium, \$23.50; Prime Western, \$22.50; fines and slimes \$20@18; average settling price, all grades of blende, \$22.09.

Lead, high, \$64.65; basis 80 per cent lead, \$60; average settling price, all grades of lead, \$58.27 per ton.

Shipments for the week: Blende, 5,477; lead, 1,256 tons; value, all ores the week, \$195,190.

Keen competition developed early in the week, with offerings \$1 above last week's closing. Another half dollar was added today for Prime Western, while premium was advanced to \$23.50, a gain of \$2.50 per ton. About 2,000 tons sold on the premium basis, the demand being for blende with little or no lead content.

Although settling prices for lead indicate over \$60 basis, all buyers deny that a higher basis is offered, and no seller was found who would admit having received over \$60 basis. The mines being restarted for lead production, it is shown by careful survey, have no more than offset in output others that have closed down temporarily.

Platteville, Wis., Oct. 1—Lead ore advanced to \$60 per ton. Shipments for the week: Lead, 112 tons. Shipments for the year: Blende, 8,461; lead, 1,283 tons. Shipped during the week to separating plants, 697 tons blende.

Non-Metallic Minerals

Asbestos—Crude, No. 1, \$1,500@2,000; No. 2, \$850@\$1,250; spinning fibers, \$350@\$850; magnesia and compressed sheet fibers, \$225@\$350; shingle stock, \$95@\$150; paper stock, \$55@\$70; cement stock, \$16@\$27.50; floats, \$8.50@\$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada.

Barytes—Crude, 88 to 94 per cent barium sulphate, \$10@\$12 per net ton; ground (white) \$23@\$24 in bags, carload lots; (off-color) \$21@\$22 in bags, carload lots; all f.o.b. South Carolina points. Foreign barytes, prime white material, \$25 per net ton, f.o.b. Atlantic seaports. Western grades are \$24.50. Crude quoted \$7@\$10 per long ton, f.o.b. Cartersville, Ga.

Bauxite—French bauxite, \$8@\$10 per metric ton, c.i.f. Atlantic ports. American bauxite, crushed and dried, \$8@\$10 per gross ton, f.o.b. shipping points; pulverized and dried, \$12@\$15 per gross ton, depending upon grade; calcined so as to remove most of the combined water, \$20 per gross ton, f.o.b. shipping point.

Borax—Granulated, crystals, or powdered in bags, carloads, 5 $\frac{1}{2}$ c. per lb.; in bbls. 5 $\frac{1}{2}$ c.

Chalk—English, extra light, 5c. Domestic light, 4 $\frac{1}{2}$ c.; heavy, 4c. per lb., all f.o.b. New York.

China Clay (Kaolin)—Crude, \$6.50@ \$8.50; washed, \$9@ \$10; powdered, \$12 @ \$20; bags extra, per net ton, f.o.b. mines, Georgia; powdered clay, \$13@ \$20, f.o.b. Virginia points. Imported lump, \$12@ \$20, f.o.b. American ports; powdered, \$25@ \$40, f.o.b., quoted at New York.

Emery—Turkish emery, 6c. per lb., depending upon fineness. Inferior grades, 3½c., f.o.b., from New England points.

Feldspar—No. 1 soap grade, \$7@ \$7.50 per ton, f.o.b. North Carolina points; No. 1 pottery, \$6@ \$6.50; No. 2, \$5@ \$5.50. Market dull. Large stocks are available and quotations are nominal. Producers report cancellations of orders. No. 1, Canadian, ground, \$23 f.o.b. Ohio points.

Fluorspar—Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, \$20@ \$22.50 per ton, f.o.b. Illinois and Kentucky mines; acid, glass, and enamel grades, \$40@ \$55; gravel, \$15; lump, \$12.50, f.o.b. Lordsburg, N. M. Ground, acid grade, 97 per cent CaF₂, \$30, New Mexico.

Fuller's Earth—16 to 30 mesh, \$21; 30 to 60 mesh, \$23; 60 to 100 mesh, \$19; 100 plus mesh, \$15, f.o.b. plants, Pennsylvania. California grades, \$15@ \$25, f.o.b. mines. Imported, English, \$24@ \$27, f.o.b. Atlantic ports.

Graphite—Ceylon lump, first quality, 6@ 7c. per lb.; chip, 4½@ 5c.; dust, 3 @ 4c. No. 1 flake, 5@ 6c.; amorphous crude, ¾@ 2½c.

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—Crushed, New York State shipping points, ¾ in. size, \$1.40@ \$1.75 per net ton; 1½ in., \$1.35@ \$1.70. Prices for other sizes practically the same. Agricultural limestone, \$2.50@ \$4.50 per net ton, f.o.b. eastern shipping points, depending upon analysis.

Magnesite, Calcined—Crude, \$12@ \$15 per ton. High-grade caustic calcined, lump form, \$30@ \$40 per ton. Plastic calcined, \$45@ \$50 in barrels, carload lots, f.o.b. California points. Atlantic seaboard, \$60.

Dead-Burned—\$33 per net ton, Chewelah, Wash.; \$58@ \$64, Chester, Pa. Austrian grade, \$53.80 per ton, f.o.b., Chester, Pa. (Magnesite brick—See Refractories.)

Mica—India block mica, slightly stained, per lb.; No. 6, 35c.; No. 5, \$1.20; No. 4, \$2.50@ \$3; No. 3, \$3.50@ \$4; No. 2, \$4.50@ \$6; No. 1, \$5.50@ \$6.50. Clear block: No. 6, 50c.; No. 5, \$1.75; No. 4, \$3.25; No. 3, \$5; No. 2, \$6.50; No. 1, \$8; A1, \$6.50@ \$8.50; extra large, \$25; ground, wallpaper grade, \$90@ \$160 per ton (depending upon quantity); ground roofing mica, \$25@ \$70, all f.o.b. New York.

Monazite—Minimum of 6 per cent thorium oxide, \$30 per unit, duty paid.

Footnote Mineral Co., Philadelphia, Pa.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, \$11.65; 75 per cent, \$10.65; 75@ 74 per cent, \$10.15; 70 per cent, \$6.25; 68 per cent, \$5.75; 68@ 66 per cent, \$5.50.

Pumice Stone—Imported, lump, 3@ 40c. per lb.; domestic lump, 5c.; ground, 5@ 6c., all f.o.b. New York.

Pyrites—Spanish fines, per unit, 12c., c.i.f. Atlantic seaport; furnace size, 13c.; Spanish lump, 13@ 14c.; domestic fines, f.o.b. mines, Georgia, 11@ 12c.

Silica—Glass sand, \$2.25 per ton; sand-blast material, \$2.25, both f.o.b. Indiana points. Amorphous or decomposed variety, soft silica, 250 to 500 mesh, \$16@ \$30 per ton. Ganister, crude, \$2.50 per ton, f.o.b. Illinois points. Molding sand, building sand, glass sand, \$2.25@ \$3, f.o.b. Pennsylvania points. Market reported dull.

Sulphur—\$16@ \$18 per ton for domestic, f.o.b. Texas and Louisiana mines; \$18@ \$20 for export, f.a.s. New York.

Talc—Paper making, \$11@ \$20 per ton; roofing grades, \$8.50@ \$13; rubber grades, \$11@ \$18; all f.o.b. Vermont. California talc, \$16@ \$35, talcum powder grade. Southern talc, powdered, carload lots, \$7.50@ \$11 per ton; less than carload, \$25, f.o.b. cars. Imported, \$30@ \$40; Canadian, \$18@ \$40 per ton.

Mineral Products

Arsenic—5½@ 6. per lb.

Sodium Nitrate—\$2.25@ \$2.30 per cwt. ex vessel, Atlantic ports.

Sodium Sulphate—For 95 per cent material, \$12.50 per ton, f.o.b. in bulk, Western mines, spot and six months' contract; \$20@ \$22 per ton, New York.

Potassium Sulphate—Powder, domestic, \$1.20 per unit, basis 90 per cent, f.o.b. New York.

Ferro-Alloys

Ferrotitanium—For 15 to 18 per cent material, \$200@ \$225 per ton, f.o.b. Niagara Falls, N. Y.

Ferrocerium—Per lb., \$12@ \$15.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 11c. per lb. of chromium contained; 4 to 6 per cent carbon, 11@ 12c., f.o.b. works.

Ferromanganese—Domestic 76 to 80 per cent, \$60@ \$63, f.o.b. furnace; resale, \$90, delivered; English and German, \$60@ \$63, c.i.f. Atlantic seaports. Spiegeleisen, 18@ 20 per cent, \$25@ \$27 per gross ton, f.o.b. furnace.

Ferromolybdenum—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, \$2.25 per lb. of contained metal, f.o.b. works. Imported material, \$1.70@ \$2.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, \$38@ \$40; 50 per cent, \$60@ \$65; 75 per cent, \$130@ \$135.

Ferrotungsten—Domestic, 70 to 80 per cent W, 40@ 45c. per lb. of con-

tained tungsten, f.o.b. works. Foreign, 50c., duty paid, f.o.b. Atlantic ports.

Ferro-uranium—35 to 50 per cent U, \$6 per lb. of U contained, f.o.b. works.

Ferrovandium—\$4.25@ \$4.50 per lb. of V contained, according to analyses and quantity.

Metal Products

Copper Sheets—Current New York list price, 20.50c. per lb.; wire, 14@ 14.50c.

Lead Sheets—Full lead sheets, 7½c.; cut lead sheets, 8c. in quantity, mill lots.

Nickel Silver—29.50c. per lb. for 18 per cent nickel. Grade "A" sheets.

Yellow Metal—Dimension sheets, 16.25c.; sheathing, 15.25c.; rods, ½ to 3 in., 13.25c.

Zinc Sheets—\$10 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter.

Refractories

Bauxite Brick—56 per cent alumina, \$50 per ton; 76 per cent, \$90@ \$95 f.o.b. works.

Chrome Cement—40@ 45 per cent Cr₂O₃, \$30@ \$32 per net ton, and \$31 in sacks, carload lots, f.o.b. eastern shipping points.

Chrome Brick—\$52@ \$55 per net ton.

Fire Brick—First quality, 9-in. shapes, \$35@ \$40 per 1,000, Pennsylvania, Ohio and Kentucky. Second quality, \$30@ \$35.

Magnesite Brick—9-in. straights, \$65 @ \$70 per net ton; 9-in. arches, wedges and keys, \$77; soaps and splits, \$98, f.o.b. works.

Silica Brick—9-in., per 1,000; \$35@ \$45 in carload lots, f.o.b. shipping points.

The Iron Trade

Pittsburgh, Oct. 4, 1921

In point of mill activity, the sheet branch of the steel trade is easily the leader, for the Steel Corporation last week operated its sheet mills at 84 per cent and has scheduled 89 per cent for the present week.

Bars, shapes, and plates are generally quotable at 1.60c., with higher prices on small lots and occasionally lower prices on particularly desirable orders. A number of producers have been making a special effort to gather in business.

Pig Iron—The Standard Sanitary Manufacturing Co.'s purchases of 5,000 tons of foundry iron each for the Allegheny and New Brighton plants, at \$21, Valley, remain the latest important transactions, 5,000 tons of southern iron at \$19, Birmingham, having also been bought, for the Louisville plant. It appears now that all the sales of basic iron lately have been at \$19.25, Valley, and neither at the former price of \$19 nor at the \$20 which has been the reported asking price of furnaces for more than a month. We quote: Bessemer, \$20; basic, \$19.25@ \$20; foundry, \$21, Valley, freight to Pittsburgh being \$1.96.

Coke

Connellsville—Furnace, \$3.25@ \$3.50; foundry, \$4.25@ \$4.50.

METAL STATISTICS

Monthly Average Prices of Metals

	New York		London		Sterling Exchange	
	1920	1921	1920	1921	1920	1921
January	132.827	65.950	79.846	39.985	367.082	372.650
February	131.295	59.233	85.005	34.745	337.466	385.932
March	125.551	56.023	74.194	32.479	370.870	38.806
April	119.779	59.337	68.848	34.250	392.438	391.784
May	102.585	59.810	60.010	34.165	383.360	396.580
June	90.957	58.510	51.096	34.971	393.663	377.236
July	91.971	60.260	53.736	37.481	385.538	362.565
August	96.168	61.597	59.875	38.096	360.404	364.505
September	93.675	66.160	59.476	40.082	350.370	371.725
October	83.480	.....	54.197	.....	346.460	.....
November	77.734	.....	50.952	.....	342.333	.....
December	64.774	.....	41.845	.....	348.101	.....
Year	100.900	.....	61.590	.....	364.840	.....

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

Copper

	New York		London			
	1920	1921	1920	1921		
January	18.918	12.597	118.095	70.964	123.238	79.119
February	18.569	12.556	120.188	70.925	126.950	75.925
March	18.331	11.976	109.533	67.565	118.348	71.190
April	18.660	12.438	103.025	69.381	111.500	71.786
May	18.484	12.742	96.750	73.196	109.200	74.298
June	18.065	12.697	87.864	71.852	101.909	75.682
July	18.576	12.170	90.148	71.155	106.455	75.286
August	18.346	11.634	93.935	68.614	111.143	72.705
September	18.144	11.948	96.381	67.977	111.905	72.295
October	15.934	.....	93.327	.....	104.905	.....
November	14.257	.....	84.807	.....	94.614	.....
December	13.188	.....	75.702	.....	85.905	.....
Year	17.456	.....	97.480	.....	108.839	.....

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

Lead

	New York		St. Louis		London	
	1920	1921	1920	1921	1920	1921
January	8.561	4.821	8.300	4.747	47.095	23.387
February	8.814	4.373	8.601	4.228	50.256	20.650
March	9.145	4.084	8.894	4.000	46.054	18.911
April	8.902	4.356	8.618	4.272	39.225	20.589
May	8.576	4.952	8.352	4.784	38.488	23.399
June	8.323	4.485	8.169	4.293	34.330	22.563
July	8.338	4.410	8.283	4.260	34.960	23.399
August	8.687	4.382	8.725	4.217	36.304	23.489
September	8.177	4.600	8.160	4.392	35.452	23.148
October	7.070	.....	7.018	.....	35.238	.....
November	6.159	.....	6.127	.....	32.489	.....
December	4.727	.....	4.717	.....	24.089	.....
Year	7.957	.....	7.830	.....	37.832	.....

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

Tin

	New York		Straits		London	
	1920	1921	1920	1921	1920	1921
January	61.596	36.000	59.932	32.142	376.512	190.464
February	58.466	28.534	59.932	32.142	395.750	166.250
March	61.037	27.296	61.926	28.806	369.489	156.024
April	61.120	28.990	62.115	30.404	345.450	163.905
May	53.230	31.431	55.100	32.500	294.813	177.411
June	46.125	28.514	48.327	29.423	250.614	167.506
July	45.798	26.755	49.154	27.655	261.886	164.530
August	43.856	25.662	47.620	26.301	274.048	155.318
September	41.940	26.280	44.465	26.680	270.120	156.750
October	39.310	.....	40.555	.....	258.190	.....
November	35.667	.....	36.854	.....	241.080	.....
December	31.135	.....	34.058	.....	212.440	.....
Year	48.273	.....	49.101	.....	295.866	.....

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

Zinc

	New York		St. Louis		London	
	1920	1921	1920	1921	1920	1921
January	9.133	5.413	8.708	4.928	58.643	25.262
February	8.531	4.737	8.708	4.928	61.338	24.850
March	8.184	4.747	8.531	4.737	53.467	25.077
April	7.588	4.848	8.184	4.747	47.388	25.530
May	7.465	4.421	7.588	4.848	45.088	26.923
June	7.720	4.239	7.465	4.421	41.193	26.750
July	7.855	4.186	7.720	4.239	41.886	26.262
August	7.661	4.235	7.855	4.186	41.220	25.068
September	7.150	.....	7.661	4.235	39.690	25.256
October	6.247	.....	7.150	.....	39.756	.....
November	5.824	.....	6.247	.....	35.028	.....
December	.....	.....	5.824	.....	27.762	.....
Year	7.671	.....	7.671	.....	44.372	.....

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

Antimony, Quicksilver and Platinum

	Antimony (a)		Quicksilver (b)		Platinum (c)	
	New York	1921	New York	1921	New York	1921
January	10.577	5.258	90.192	48.440	154.23	73.400
February	11.588	5.250	84.432	49.545	151.59	70.227
March	11.056	5.282	92.611	46.796	138.56	72.463
April	10.500	5.137	102.192	45.423	127.04	73.404
May	9.655	5.250	89.560	47.000	97.50	73.740
June	8.289	5.087	90.154	46.846	85.19	74.942
July	7.500	4.735	90.333	44.950	83.94	70.440
August	7.177	4.597	83.806	45.028	111.44	73.222
September	7.113	4.564	75.000	42.660	115.20	75.960
October	6.723	.....	67.200	.....	101.70	.....
November	6.109	.....	58.417	.....	84.75	.....
December	5.534	.....	49.577	.....	79.62	.....
Year	8.485	.....	81.123	.....	110.90	.....

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

Pig Iron, Pittsburgh

	Bessemer		Basic		No. 2 Foundry	
	1920	1921	1920	1921	1920	1921
January	\$40.47	33.96	\$39.88	31.96	\$39.86	33.88
February	42.95	28.96	42.61	26.96	43.40	30.25
March	43.40	28.16	42.90	26.46	43.40	27.85
April	43.72	26.96	44.22	24.46	43.90	26.77
May	44.00	26.21	44.88	23.84	45.36	25.36
June	44.89	24.96	45.41	22.66	46.40	24.38
July	47.21	22.84	47.42	20.76	46.56	22.36
August	48.90	21.96	49.88	20.29	49.35	21.53
September	50.46	21.96	50.46	21.21	51.96	22.82
October	49.21	.....	44.38	.....	48.58	.....
November	41.26	.....	39.20	.....	42.61	.....
December	36.96	.....	34.90	.....	37.73	.....
Year	44.45	.....	43.85	.....	44.93	.....

In dollars per long ton.

Monthly Crude Copper Production

	1921			
	May	June	July	August
Alaska shipments	4,216,920	3,234,693	3,019,812	4,407,434
Arizona Copper	2,000,000	(a)	(a)	(a)
Calumet & Arizona	(a)	(a)	(a)	(a)
Con. Ariz. Smelting	(a)	(a)	(a)	(a)
Inspiration	(a)	(a)	(a)	(a)
Magma	(a)	(a)	(a)	(a)
Miami	4,625,000	3,939,000	4,112,000	4,281,000
New Cornelia	1,327,415	1,300,000	1,502,927	1,511,964
Old Dominion	(a)	(a)	(a)	(a)
Phelps Dodge	(a)	(a)	(a)	(a)
Shattuck Arizona	(a)	(a)	(a)	(a)
Ray	(a)	(a)	(a)	(a)
United Verde	(a)	(a)	(a)	(a)
United Verde Extension	(a)	(a)	(a)	(a)
Calumet & Hecla	(a)	(a)	(a)	(a)
Other Lake Superior	4,500,000	4,500,000	4,250,000	4,250,000
Ansco	(a)	(a)	(a)	(a)
East Butte	1,641,176	1,350,000	1,000,000	1,278,000
Nevada C. ns.	(a)	(a)	(a)	(a)
Chin	(a)	(a)	(a)	(a)
Utah Copper	(a)	(a)	(a)	(a)
Others, estimated	7,000,000	10,300,000	8,150,000	7,520,000
Total United States	25,310,511	24,623,693	22,033,739	23,248,398
Imports: Ore and concentrates, matte, etc.	3,072,707	5,129,065	10,924,973	10,888,426
Imports of blister, unrefined	5,171,662	12,531,637	20,749,969	12,574,740
Imports of refined, etc.	7,517,134	3,306,349	595,835	662,885
Grand total	41,072,014	45,600,744	54,304,516	47,374,449
Granby Cons.	2,539,000	2,254,639	2,255,425	2,485,704
Boleo	727,098	1,433,804	943,740	770,096
Cananea	(a)	(a)	(a)	(a)
Phelps Dodge Mexican properties	(a)	(a)	(a)	(a)
Cerro de Pasco	4,444,000	4,012,000	4,346,000	4,630,000
Chile	3,999,016	4,008,000	4,000,000	.....
Katanga	6,275,430	6,032,880	7,031,745	.....
Bark & John ton	1,600,000	1,506,000	1,310,000	720,000
Hampden Cloncurry	(a)	(a)	(a)	(a)
Mun Lyell	974,400	902,000	892,000	940,000
Mount Morgan	(a)	(a)	(a)	(a)
Co. M. & S. of Canada	318,000	152,000	284,000	209,090
Falcon Mines	540,000	486,000	486,800	540,880
Furukawa	2,748,980	2,766,230	2,641,780	.....

(a) No copper produced during this month.

Comparative Annual Copper Production

	1919	1920	1921
January	135,733,511	121,903,744	90,586,597
February	111,649,512	117,450,000	86,632,941
March	102,040,460	120,309,316	91,046,345
April	98,808,998	116,078,871	46,946,523
May	92,652,975	114,964,207	25,310,511
June	95,856,570	116,107,856	24,623,693
July	100,369,247	109,729,510	22,033,739
August	107,994,040	116,460,654	23,248,398
September	108,703,075	104,919,262	.....
October	113,143,143	105,231,571	.....
November	117,289,735	106,700,178	.....
December	102,997,633	95,709,009	.....

MINING STOCKS

Week Ended October 1, 1921

Stock	Exch.	High	Low	Last	Last Div.
COPPER					
Ahmeek.....	Boston	54	48	52	Sept. '20, Q \$0.50
Alaska-Br. Col.....	N. Y. Curb	*45	*36	*43	.....
Allouez.....	Boston	†20	†18	19	Mar. '19 1.00
Anaconda.....	New York	41	37½	41½	Nov. '20, Q 1.00
Arcadian Consol.....	Boston	1	1½	1½	.....
Ariz. Con'l.....	Boston	8½	8½	8½	Oct. '18, Q .50
Big Ledge.....	N. Y. Curb	*30	*25	*29	.....
Bingham Mines.....	Boston	13½	12	13	Sept. '19, Q .25
Calumet & Arizona.....	Boston	.....	.....	45½	Sept. '21, Q .50
Calumet & Hecla.....	Boston	239	230	235	June '20, Q 5.00
Canada Copper.....	N. Y. Curb	*30	*25	*29	.....
Centennial.....	Boston	8½	8½	8½	Dec. '18, SA 1.00
Cerro de Pasco.....	New York	30½	26½	30½	Mar. '21, Q .50
Chile Copper.....	New York	12½	10½	12	.....
Chino.....	New York	40	39½	39½	Sept. '20, Q .37½
Columbus Rexall ..	Salt Lake	*19	*19	*19	.....
Con. Arizona.....	N. Y. Curb	.....	.....	*1	Dec. '18, Q .05
Con. Copper Mines.....	N. Y. Curb	.....	.....	1	.....
Copper Range.....	Boston	36	33½	35½	Sept. '20, Q .50
Crystal Copper.....	Boston Curb	*23	*21	*23	.....
Davis-Daly.....	Boston	7	6	6½	Mar. '20, Q .25
East Butte.....	Boston	9½	9	9½	Dec. '19, A .50
First National.....	Boston Curb	*98	*75	*95	Feb. '19, SA .15
Franklin.....	Boston	2	1½	1½	.....
Gadsden Copper.....	Boston Curb	.....	.....	*45	.....
Granby Consol.....	New York	20½	17	20½	May '19, Q 1.25
Greene-Cananea.....	New York	24½	21	24	Nov. '20, Q .50
Hancock.....	Boston	3	3	3	.....
Howe Sound.....	N. Y. Curb	2½	2½	2½	Jan. '21, Q .05
Inspiration Consol.....	New York	36½	33½	36	Oct. '20, Q 1.00
Iron Cap.....	Boston Curb	7	5	7	Sept. '20, K .25
Isle Royale.....	Boston	20	18½	20	Sept. '19, SA .50
Kennecott.....	New York	22½	20	22½	Dec. '20, Q .50
Keweenaw.....	Boston	†1	†*96	*98	.....
Lake Copper.....	Boston	2½	2½	2½	.....
La Salle.....	Boston	1½	1½	1½	.....
Magma Chief.....	N. Y. Curb	.....	.....	*3	.....
Magma Copper.....	N. Y. Curb	*22	*21	*22	Jan. '19, Q .50
Majestic.....	Boston Curb	*7	*7	*7	.....
Mason Valley.....	Boston	1½	1½	1½	.....
Mass Consolidated.....	Boston	2	1½	1½	Nov. '17, Q 1.00
Miami Copper.....	New York	22	21	22	Aug. '21, Q .50
Michigan.....	Boston	2½	2	2	.....
Mohawk.....	Boston	50½	49	50	Nov. '20, Q 1.00
Mother Lode Coa.....	N. Y. Curb	4½	3½	4	.....
Nevada Consol.....	New York	12½	11	12½	Sept. '20, Q .25
New Baltic.....	Boston Curb	.....	.....	3	.....
New Cornelia.....	Boston	14½	13½	13½	Aug. '20, K .25
North Butte.....	Boston	11	9½	10½	Oct. '18, Q .25
North Lake.....	Boston	*25	*25	*25	.....
Ohio Copper.....	N. Y. Curb	.....	.....	*6	.....
Old Dominion.....	Boston	23	21½	23	Dec. '18, Q 1.00
Oseola.....	Boston	27	27	27	June '20, Q .50
Phelps Dodge.....	Open Mar.	†160	†145	.....	July '21, Q 1.00
Quincy.....	Boston	38	36½	38	Mar. '20, Q 1.00
Ray Consolidated.....	New York	14	12½	14	Dec. '20, Q .25
Ray Hercules.....	N. Y. Curb	*20	*17	*17	.....
St. Mary's Min. Ld.....	Boston	38	38	38	June '20, K 2.00
Seneca Copper.....	Boston	.....	.....	13½	.....
Shannon.....	Boston	1	*90	*95	Nov. '17, Q .25
Shattuck Arizona.....	New York	7½	6½	7½	Jan. '20, Q .25
South Lake.....	Boston	†1½	†*50	1	.....
Superior & Boston.....	Boston	2½	1½	1½	.....
Tenn. C. & C. cfs.....	New York	8½	7½	8½	May '18, I 1.00
Tuolumne.....	Boston	*43	*40	*40	May '13, .10
United Verde Ex.....	Boston Curb	26½	24½	25½	May '21, Q .25
Utah Consol.....	Boston	3½	3	3½	Sept. '18, .25
Utah Copper.....	New York	52½	49	52½	June '21, Q .50
Utah Metal & T.....	Boston	1½	1½	1½	Dec. '17, .30
Victoria.....	Boston	.....	.....	1	.....
Winona.....	Boston	*50	*45	*45	.....
Wolverine.....	Boston	12	11	12	.....
NICKEL-COPPER					
Internat. Nickel.....	New York	14½	13½	14½	Mar. '19, .50
Internat. Nickel, pf.....	New York	80	80	80	Aug. '21, Q 1.50
LEAD					
National Lead.....	New York	75½	75	75½	Sept. '21, Q 1.50
National Lead, pf.....	New York	102	102	102	Sept. '21, Q 1.75
St. Joseph Lead.....	New York	12½	12	12	Sept. '21, Q .25
QUICKSILVER					
New Idria.....	Boston	†*50	.....	*50	.....
ZINC					
Am. Z. L. & S.....	New York	10½	8½	10½	May '20, 1.00
Am. Z. L. & S. pf.....	New York	31	26½	31	Nov. '20, Q 1.50
Butte C. & Z.....	New York	4½	4½	4½	June '18, .50
Butte & Superior.....	New York	15	14	15	Sept. '20, 1.25
Callahan Zn-Ld.....	New York	4½	4	4½	Dec. '20, Q .50
New Jersey Zn.....	N. Y. Curb	125	117½	117½	Aug. '21, Q 2.00
Success.....	N. Y. Curb	.....	.....	2	July '16, .03
Yellow Pine.....	Los Angeles	†*50	†*20	*55	Sept. '20, Q .03

Stock	Exch.	High	Low	Last	Last Div.
GOLD					
Alaska Gold.....	New York	1	.....	.....	.....
Alaska Juneau.....	New York	1	.....	.....	.....
Carson Hill.....	Boston	15½	14½	14	.....
Cresson Consol. G.....	N. Y. Curb	1	1½	1	June '20, Q \$0.10
Dome Extension.....	Toronto	*70	.....	*75	.....
Dome Mines.....	New York	19½	18½	19	July '21, Q .25
Florence Goldfield.....	N. Y. Curb	*50	*38	*48	.....
Golden Cycle.....	Colo. Springs	.....	.....	*67½	June '21, Q .02
Goldfield Consol.....	N. Y. Curb	.....	.....	*6	Dec. '19, .05
Hollinger Consol.....	Toronto	7.48	7.45	7.47	Sept. '21, 4 wks. .25
Homestake Mining.....	New York	58	57½	57½	Sept. '21, M .05
Kirkland Lake.....	Toronto	*38	*35	*37	.....
Lake Shore.....	Toronto	1.40	1.33	1.36	Aug. '21, K .02
McIntyre-Porcupine.....	Toronto	1.98	1.92	1.94	Sept. '21, K .05
Porcupine Crown.....	Toronto	*17	*14	*14	July '17, .03
Porcupine V. N. T.....	Toronto	*20	*18½	*19½	.....
Portland.....	Colo. Springs	*36½	*36½	*36½	Oct. '20, Q .01
Reorgan. Booth.....	N. Y. Curb	.....	.....	*4	May '19, .05
Schumacher.....	Toronto	*27	*25	*26	.....
Silver Pick.....	N. Y. Curb	.....	.....	*9	.....
Teek Hughes.....	Toronto	*16½	*15½	*15½	.....
Tom Reed.....	Los Angeles	*70	*68	*70	Dec. '19, .02
United Eastern.....	N. Y. Curb	2½	2½	2½	July '21, Q .15
Vindicator Consol.....	Colo. Springs	*22	*22	*22	Jan. '20, Q .01
White Caps Mining.....	N. Y. Curb	*5	*3	*4	.....
Yukon Gold.....	N. Y. Curb	1	*80	1	June '18, .02½
SILVER					
Arizona Silver.....	Boston Curb	*18	*17	*18	Apr. '20, M .03
Batopilas Mining.....	New York	.....	.....	.....	Dec. '07, I .12½
Beaver Consol.....	Toronto	*28	*26	*27	May '20, K .03
Coniagas.....	Toronto	1.65	1.50	1.65	May '21, Q .12½
Crown Reserve.....	Toronto	*14	*11½	*14	Jan. '17, .05
Kerr Lake.....	N. Y. Curb	3½	3½	3½	July '21, Q .12½
La Rose.....	Toronto	*34	*31	*32	Apr. '18, .02
McKinley-Dar-Sav.....	Toronto	*23	*18	*22	Oct. '20, Q .03
Mining Corp. Can.....	Toronto	1.20	1.00	1.10	Sept. '20, Q .12½
Nipissing.....	N. Y. Curb	5½	5	5	July '21, Q .15
Ontario Silver.....	New York	5½	4	4	Jan. '19, Q .50
Ophir Silver.....	N. Y. Curb	.....	.....	*11	Jan. '12, .10
Temiskaming.....	Toronto	*25	.....	.....	Jan. '20, K .04
Trethewey.....	Toronto	*14	*12	*14	Jan. '19, .05
GOLD AND SILVER					
Barnes-King.....	Butte	.....	.....	*60	Aug. '20, Q .05
Boston & Montana.....	N. Y. Curb	1½	*85	1½	.....
Cash Boy.....	N. Y. Curb	.....	.....	*5	.....
Consol. Virginia.....	San Francisco	*35	*26	*26	.....
Dolores Esperanza.....	N. Y. Curb	1½	1½	1½	.....
El Salvador.....	N. Y. Curb	*22	*15	*20	.....
Jim Butler.....	N. Y. Curb	*7	*7	*7	Aug. '18, SA .07
Jumbo Extension.....	N. Y. Curb	*3	*3	*3	June '16, .05
Louisiana Con.....	N. Y. Curb	.....	.....	1½	.....
MacNamara M. & M.....	N. Y. Curb	*16	*14	*15	May '10, .02
N. Y. Hond. Rosar.....	.....	.....	.....	4	Jan. '21, Q .30
Tonopah-Belmont.....	N. Y. Curb	1½	1½	1½	Apr. '21, Q .05
Tonopah-Divide.....	N. Y. Curb	*70	*62	*68	.....
Tonopah-Extension.....	N. Y. Curb	1½	1½	1½	July '21, Q .05
Tonopah Mining.....	N. Y. Curb	1½	1½	1½	Apr. '21, SA .05
West End Consol.....	N. Y. Curb	*87	*85	*87	Dec. '19, SA .05
SILVER-LEAD					
Caledonia.....	N. Y. Curb	*6	*6	*6	Jan. '21, M .01
Cardiff M. & M.....	Salt Lake	†1.15	†1.10	1.07½	Dec. '21, .15
Chief Consol.....	Boston Curb	2½	2½	2½	Aug. '21, Q .05
Consol. M. & S.....	Montreal	15	14½	15	Oct. '20, Q .62½
Daly Mining.....	Salt Lake	†2.50	†1.00	.....	July '20, Q .10
Daly-West.....	Boston	2½	2½	2½	Dec. '20, Q .25
Eagle & Blue Bell.....	Boston Curb	.....	.....	2	Apr. '21, K .05
Electric Point.....	Spokane	*6½	*6	*6	May '20, SA .03
Eureka-Croesus.....	N. Y. Curb	*49	*33	*49	.....
Federal M. & S.....	New York	.....	.....	7	Jan. '09, 1.50
Federal M. & S., pf.....	New York	22½	21½	22½	Sept. '21, Q 1.00
Florence Silver.....	Spokane	.....	.....	*10	Apr. '19, .013
Grand Central.....	Salt Lake	†*50	†*15	.....	June '20, K .03
Hecla Mining.....	N. Y. Curb	4½	4	4	Sept. '21, Q .10
Iron Blossom Con.....	N. Y. Curb	*17	*17	*17	Apr. '20, Q .02½
Judge M. & S.....	Salt Lake	†2.50	†1.50	.....	Sept. '20, Q .12½
Marsh Mines.....	N. Y. Curb	*3	*3	*3	June '21, I .02
Prince Consol.....	Salt Lake	7.75	7	7.75	Nov. '17, .02½
Rambler-Cariboo.....	Spokane	*2	*1½	*2	Feb. '19, .01
Rex Consol.....	N. Y. Curb	*9	*8	*9	.....
South Hecla.....	Salt Lake	†*35	.....	.....	Sept. '19, K .15
Standard Silver-Ld.....	N. Y. Curb	.....	.....	*8	Oct. '17, .05
Stewart Mining.....	N. Y. Curb	*4	*4	*4	Dec. '15, .05
Tamarack-Custer.....	Spokane	1.75	1.75	1.75	Jan. '21, K .04
Tintic Standard.....	Salt Lake	1.97½	1.80	1.82½	July '21, Q .05
Utah Apex.....	Boston	2½	2½	2½	Nov. '20, K .25
Wilbert Mining.....	N. Y. Curb	.....	.....	*2	Nov. '17, .01
VANADIUM					
Vanadium Corp.....	New York	32½	30½	31½	Jan. '21, Q 1.00
ASBESTOS					
Asbestos Corp.....	Montreal	47½	47½	47½	July '21, Q 1.50
Asbestos Corp., pf.....	Montreal	.....	.....	69	July '21, Q 1.75
MINING, SMELTING AND REFINING					
Amer. Sm. & Ref.....	New York	39½	36½	39½	Mar. '21, Q 1.00
Amer. Sm. & Ref. pf.....	New York	73	73	73	Sept. '21, Q 1.75
Am. Sm. pf. A.....	New York	.....	.....	66	July '21, Q 1.50
U. S. Sm. R. & M.....	New York	34	32	34	Jan. '21, Q .50
U.S.Sm.R. & M. pf.....	New York	42	42	42	July. '21, Q .87

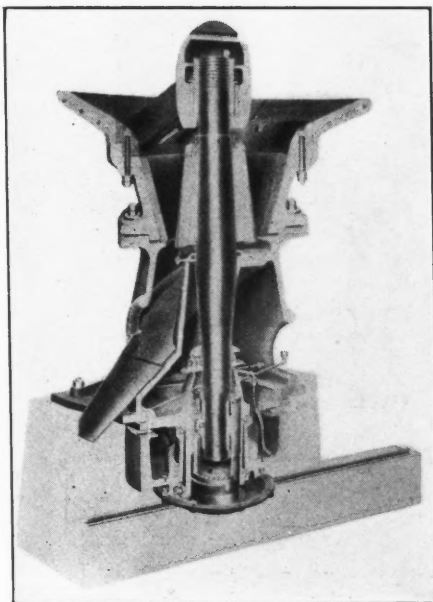
*Cents per share. †Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. K, Irregular. I, Initial. X, Includes extra.
 Toronto quotations courtesy Hamilton B. Wills; Spokane, Pohlman Investment Co.; Salt Lake, Stock and Mining Exchange; Los Angeles, Chamber of Commerce and Oil; Colorado Springs, The Financial Press, N. Y.

NEW MACHINERY AND INVENTIONS

A Gearless Standard Crusher With Ball and Socket Bearings

Industries that make use of rock-crushing machinery as an essential part of their operating systems are always interested in any development that promises either better results or lower costs. When a forward step is taken that insures both, there can be no doubt about the value of the improvement, nor any limit to the interest awakened.

The Kennedy gearless crusher is a highly developed secondary recrushing unit, designed to produce finely crushed rock at a rapid rate and at low cost. The gears, heretofore an essential part of all gyratory crushers, were eliminated, and the driving power was applied directly to the eccentric. This permitted higher crushing speeds with-



GEARLESS STANDARD CRUSHER

out adding mechanical complications to the machine; on the contrary, a greater degree of simplicity was attained.

The Kennedy crusher, shown in the accompanying illustration, contains the Kennedy ball-joint eccentric, which has been widely known as the most important single advance in gyratory-crusher design since the inception of the type, because it maintains perfect alignment of the main shaft and its bearing in the eccentric, elimination of the possibility of cramping or binding, and consequently preventing heating, high power consumption, rapid wear, and loss of eccentricity. The machine has the same highly arched spider, permitting the passage of any stone that will enter the machine; the same arrangement of spider ring clear of the top of the concaves, preventing breakage through expansion of the concaves; the same

dust collars; the same general design and construction found in the Kennedy gyratory crusher.

In addition to these important features, the direct drive, with its manifest advantages, is now embodied. The bottom plate sleeve acts as a support for the packed lower dust collar, and as this sleeve does not revolve, the wear on the collar is reduced to a minimum. This bottom plate sleeve acts also as a support in which the eccentric sleeve and ball are contained and for supporting the driving dogs. It also forms a journal for the driving pulley, which is equipped with ball bearings, reducing the friction to the lowest factor known. The bottom plate sleeve is shouldered on the inside to prevent the eccentric sleeve from moving upward. At the bottom it has a groove and shoulder for receiving the bayonet lock that supports the ball race and pulley.

The eccentric sleeve is made in two parts and is joined by bolts passing through at top and bottom. It has a pocket on the thick side for receiving the locking pin that connects the ball-and-socket bearing to the eccentric sleeve. This pin is flattened on the sides for providing ample bearing in the pocket, preventing wear. At the bottom, where the eccentric is joined together, it forms a male driving dog for fitting into the female seat.

The driving power is applied through a universal device that eliminates all friction and side-strain due to the driving of the eccentric and relieves that grinding and side thrust common to all gyratory crushers. The thrust due to pressure against the eccentric is delivered to the eccentric sleeve at the middle of the ball, and thus the eccentric sleeve floats without pressure from top to bottom.

The pulley is supported by the bayonet lock method, and is keyed in position. The eccentric is driven by a double male and female connection cast integral with the bottom plate. The bottom plate is bolted to the pulley and the joint is packed to prevent oil leakage. When the pulley turns, both the bottom plate and driving dog move, turning the eccentric directly, eliminating all pull and side thrust on the eccentric.

The oiling system is unique. Oil from the eccentric chamber can flow freely between the balls, over the top of the pulley hub into the oil well inside the pulley. From this reservoir it is scooped up by centrifugal force and delivered to the top of the eccentric and ball and sleeve.

An important improvement is made in the design of the bottom shell. The base is made square so that stone may be spouted in any direction. This enables the operator to set the machine in any position without having to predetermine whether it shall be right hand, left hand, or standard, as has formerly been necessary. Thus the crusher may be driven from a line shaft by belt or rope drive, universal rope sheaves or pulley for belt drives being supplied for leading belt or ropes from

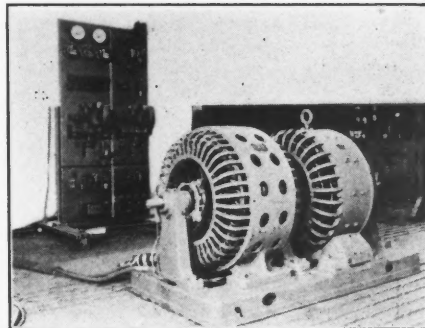
pulley or motor to the crusher. The drive pulley can be on the same horizontal plane or above or below the crusher, as desired. These features enable the crusher to be installed in any kind of position without difficulty.

The machine is made by the Kennedy-Van Saun Manufacturing & Engineering Corporation, 120 Broadway, New York.

A Demonstration of Automatic Switching for Mine Substations

A demonstration of unusual interest to the mining industry was recently conducted at the works of the Westinghouse Electric & Manufacturing Co. at East Pittsburgh, in the presence of a number of prominent engineers and mine operators from the Pittsburgh, West Virginia, Kentucky, Illinois, and the anthracite districts. The purpose of the demonstration was to show the applicability and operation of automatic substation equipment as particularly adapted to coal mines, this being the first attempt to apply the fundamental principles of automatic switching to mining conditions.

A 150-k.w. mining type synchronous motor-generator set, 275 v., with control panels, involving the latest use of the



MINING TYPE SYNCHRONOUS MOTOR GENERATOR AND CONTROL PANEL

principles of automatic switching, was used in the demonstration. The functions performed by the apparatus were as follows: Automatic starting and stopping by closing and opening the alternating current source of supply; automatic starting and stopping by pilot wire control; short circuit on direct current side, showing self-restoring feature; overload gradually applied, showing action of self-restoring contactor; attempt to start single phase; attempt to start with reversed phase; stopping and locking out by bearing thermostat, and demonstration of action with reversed direct-current polarity.

A thorough discussion of the economic reasons for installing this equipment brought out the fact that by its use the services of one attendant and in some cases two attendants could be obviated. Delays due to interruptions in service and dependent upon the human element for correction may be materially reduced or altogether prevented. The substation can be located at the most advantageous point of operation,

near the work to be done, thus avoiding transmission losses and the costly results of low voltage on locomotives, and without regard to other conditions which must necessarily be considered if an attendant is necessary.

Although the demonstration involved only the operation of a mine motor-generator set, the same principles have been applied to rotary converters used in mine service, with equally successful results.

New Type of Belt-Driven Air Compressors

A new type of belt-driven air compressor known as the "Imperial" type "XCB" has been announced by Ingersoll-Rand Co. and has incorporated in it several noteworthy features of construction, including Ingersoll-Rand plate valves, for both the air intake and discharge, and the five step clearance control for regulating the compressor's output. The plate valves used include the features which have been proved necessary to the successful functioning of this type of valve, the most important of these being that the valve is supported throughout its entire operation in perfect alignment without any form of wearing guide—a very essential feature in the life of the valve.

The clearance control has been used with great success on the larger direct-connected electric motor driven compressors and has been found most efficient where conditions call for more than 600 cubic feet of free air per minute and where direct-connected electric motor drive is used. Under average working conditions it is well known that the demand for air is seldom steady throughout the working day, and for this reason the performance of the compressor at underload is of primary importance. By means of the clearance control, the compressor is automatically loaded or unloaded in five successive steps, these steps being obtained by the reduction or addition of clearance space to the air cylinders. The compressor will operate at full, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{1}{4}$ and no loads, and the design of the clearance control is such as to secure efficient operation at any one step, the reduction in input power required being practically in proportion to the reduction in output capacity.

An extremely valuable feature of the clearance control is the fact that the clearance pockets are made integral parts of the compressor cylinder and the entire regulation is obtained by the control of the volume of air taken in and compressed. With this method of control there is no loss of power due to wastage of air and leakage. The clearance pockets in the cylinder are automatically thrown in communication with the ends of each cylinder in proper succession, the process being controlled by a predetermined variation in receiver pressure.

Another added feature of the control is the maximum demand stop which will prevent the compressor being op-

erated at any higher maximum load than is desired. This can be adjusted so that the compressor will operate on a maximum of $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ or full load and, under conditions where the load factor is comparatively low, it is of value in reducing the maximum demand, permitting a saving in the purchase of electric power—a feature found in no other type of control.

The Dallemagne Table

The American manufacturers of concentrating tables employ a much slower shaking motion than that used by Messrs. F. & E. Dallemagne, of Irun, Spain, in a table which has proved popular abroad. No riffles are used, and instead of 250 to 300 strokes per minute, the vibrations amount to at least 750 and may go as high as 1,000. Preliminary classification and careful screening are necessary for best results.

INDUSTRIAL NOTES

The Texas Gulf Sulphur Co. announces the removal of its New York office to 41 East 42d St. Telephone 6473 Vanderbilt.

The Universal Portland Cement Co. has announced a reduction in its selling prices for Universal portland cement, effective Sept. 15, of 20c. per bbl. at its Chicago plant and 15c. per bbl. at its Pittsburgh and Duluth plants. This is the second price reduction made by this company this year.

The American Sheet & Tin Plate Co., of Pittsburgh, Pa., has issued a new and revised set of weight cards covering black sheets, galvanized sheets, and formed products. These cards are 14 in. x 20 in. in size, and are clearly printed. They are of particular value to all engineers and contractors and will be sent on request.

Gus F. Ziv, formerly manager of the Chicago branch of A. Milne & Co. is now president and treasurer of the Ziv Steel & Wire Co. 4423 West Kinzie St., Chicago, Ill., which will engage in the handling of high-grade tool and solid drill steel and also high-grade hollow drill steel, made in Sweden. Norman J. Hyslip has been appointed general sales manager.

T. A. Jones has been elected president of the W. A. Jones Foundry & Machine Co., Chicago, to take the place of William A. Jones, deceased. Mr. Jones has been for many years associated with the company as secretary and treasurer. Other officers elected are, W. T. Jones, vice-president and treasurer; J. A. Sizer, secretary; G. W. Page, assistant secretary. The general policy of the company is in no way altered by these changes, and W. T. Jones continues as general manager in addition to his new position as vice-president and treasurer. This company also announces the appointment of Robert B. Moir as manager of its New York

branch. He will assume his new duties immediately, making headquarters at the present sales office and transmission warehouse of this company, at 20 Murray St.

The Denver Engineering Works Co., the Stearns-Roger Mfg. Co., the Colorado Iron Works Co. and the Queen City Foundry Co., all of Denver, and all for years intimately identified as leading manufacturers of equipment for mines, announce that they have consolidated their manufacturing facilities. This consolidation affects only the production of the equipment made by the four companies. Each of the four companies maintains its individual identity, with individual selling, engineering, and service staffs handling the products of the individual company. The new producing organization is known as the General Iron Works Co., and is a distinct step toward co operative production with a view to greater efficiency, a lower price, and better service to the ultimate consumer. A large new plant, thoroughly up to date, including iron and steel foundry, plate, pattern, forge, machine, and structural steel shop, will be erected in Denver.

TRADE CATALOGS

Drills—The Sanderson-Cyclone Drill Co., Orrville, Ohio, has issued its catalog B-45, "Big Blast Hole Drills." The publication is well illustrated, and shows the application of "Cyclone" equipment to quarry, open-pit mining and heavy rock excavation. Much operating and cost data are given, and many of the features of big-hole drilling are pointed out.

Wood Stave Pipe—Pacific Tank & Pipe Co., San Francisco, Cal., has issued catalog No. 14, "Pacific Wood Stave Pipe." The catalog contains, in addition to specifications and general information concerning "Pacific" wood stave pipe, illustrations showing installations, practical tables on the subject of the flow of water through pipes, and a description of several "Pacific" products closely allied to the manufacture of wood stave pipe.

Magnesite Brick—The Harbison-Walker Refractories Co., of Pittsburgh, has issued a small folder descriptive of Metalkase Magnesite Brick. These consist of soft steel containers of round or rectangular section, open at the ends, filled solidly with fine-ground, dead-burned magnesite. They are highly suitable for electric furnace linings, since they have the high melting point and slag-resisting qualities of magnesite, and in addition have superior resistance to spalling and are better able to withstand rapid temperature changes. They are made in the following stock sizes: 9-in. Keys, 9 x 2 $\frac{1}{2}$ x (3 x 2); 9-in. Straights, 9x2 $\frac{1}{2}$ x2 $\frac{1}{2}$; 13 $\frac{1}{2}$ -in. Keys, 13 $\frac{1}{2}$ x (3x2); 13 $\frac{1}{2}$ -in. Straights, 13 $\frac{1}{2}$ x2 $\frac{1}{2}$ x2 $\frac{1}{2}$; together with 9-in., 13 $\frac{1}{2}$ -in., and 18-in. Rounds, all 3 in. in diameter.

