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ENGINEERING AND MINING JOURNAL

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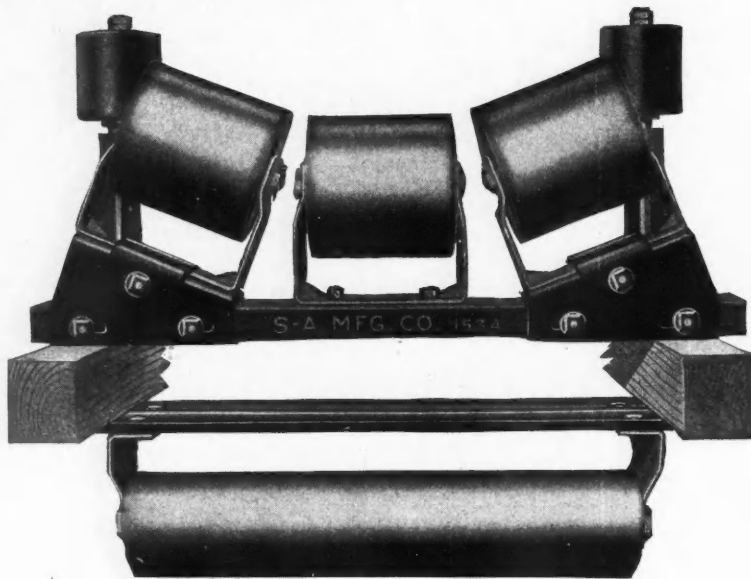
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A Weekly Journal of the Mining and Mineral Industries

METALS

NON-METALS

PETROLEUM

Volume 109

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Number 16

A Mines Building in Washington

THE greatest need of the mining industry in Washington is a separate and adequate building in which could be housed the Bureau of Mines and the Geological Survey. It is also a thing so obvious that it could easily be put through if the Senators and Representatives from the mining states, and the mining societies should get behind it.

The Geological Survey, in its old building on F St. (although a rented building), attained great individuality and influence. From its side sprang the Bureau of Mines; and both represent the mining industry in our Government. The old Survey building became inadequate, and there was long agitation for a new one. The plan, when finally accepted, was changed to one for a large, modern office building to take in all the bureaus of the Interior Department; and with the external change of moving into this great building came a subtle change in the position and morale of the two mining bureaus.

The old Geological Survey was almost an independent organization. Under the new arrangement it is one department in a department-store organization presided over by a secretary who has no more ability to direct its affairs than in the old days, but who considers it his business and pleasure to do so.

The lack of individuality has oppressed the genius of these organizations; the pigeonholing of distinguished geologists and mining engineers, sandwiched in between clerks of the Indian Bureau, Land Office, and the War Risk Bureau, has decreased their sense of dignity; and the gradual transfer of control from the directors to the secretary has had the same effect. The crowning stroke was the allotment of so many square feet per man, and putting two or three in one office. Rock collections and maps, which are the tools of the engineer and the geologist, all had to be dispensed with. It was a stroke in economy and efficiency on the part of Congress; but it really was most expensive economy.

Man does not live by bread alone; and you can tempt the average Government engineer more with good working facilities and the opportunity to work out a necessary solution to a problem than you can with an extra thousand a year or so. Much has been said about Government salaries, which are low; but it is not so much the low salaries as the loss of dignity and poor working conditions which have led to such wholesale resignations.

The remedy is in a separate Mines Building, with sufficient room for laboratories and collections, and adequate offices for the engineering and scientific officials. In this should be domiciled the Bureau of Mines and the Geological Survey—no more. Ideally, the combined organization should be under a Secretary of Mines; but if this is not attainable, then an Assistant Secretary of the Interior should be designated to take charge of both bureaus, and be domiciled in the Mines Building as a virtual Mines Secretary.

The Metric System

THERE is pending in the House a bill introduced by Representative Vestal to make the metric system compulsory in the United States. This bill has brought forth a great outcry against it and an opposition propaganda. The metric system is decried as a fad, whose adoption would ruin our industries and our trade, on account of the adjustments necessary. Where there is such organized opposition, we have come to look for considerable merit in the thing attacked, as in the anti-suffrage organization, the anti-prohibition campaign, and so on.

We assume that those who are alarmed have only a speaking acquaintance with the metric system—a remembrance of some tables in their arithmetic in the grade schools, and a general idea that the plan was foreign and unstable. They can expect little sympathy from engineers—least of all from mining engineers. To those of us who have used the metric system in Mexico, in France, or in Germany it has none of the terror of unfamiliarity, and we know it as a very practical and scientific labor-saving device, which, but for the inertia in reactionary peoples like the mercantile portion of the British and American population, would and should be adopted as swiftly as possible in place of the antiquated and clumsy English system of weights and measures. Scientists in this and other countries would not think of using anything else. American mining companies in Mexico use it; and there is no comparison between the systems. How satisfactory to estimate the tonnage of a mine by it, for example! You figure up so many cubic metres of ore, and to get the tonnage (as a cubic meter of water weighs a metric ton) you multiply by the specific gravity! There you have it, quickly and accurately. By the English system, you get the cubic footage, and generally hazard an improper guess that there are thirteen cubic feet to the ton, and so arrive at a hazard.

We do not advocate the compulsory adoption of this or any other sensible plan. We do not believe in leading a fool horse to water and trying to stick his nose into it. But we would say, to the wise, that they would do well to adapt themselves to it—if they wish to compete with France and Germany for Latin-American trade. A common system of weights and measures between North and South America would be perhaps the one greatest thing to bind all together from the economic and political standpoint; and it is useless to expect that the quick Latin mind, having discarded the old Spanish system, will ever adopt our hoary lack of system.

The argument against its adoption is the great changes that would have to be made—the same old argument against improvement in method since the world began. This does not worry the engineer, for he is used to throwing out old machinery where he can put more efficient devices in its place. Nor does the use of the metric system mean the consigning of all machinery to

the scrap heap—only a sensible and gradual introduction where feasible and economical.

The Government would do well to put the details of the introduction of the metric system into the hands of the Bureau of Standards, with instructions to forge ahead.

Taxation in Colorado

THE initial sinews of government are taxes, and why a democracy should make dodging them its favorite sport might cause a man from Mars to marvel until he became familiar with earthly conditions. Taxes have always been in ill repute, and the tax gatherer has been classed with sinners. True, the Collector of Internal Revenue is held in greater esteem than was Zaccheus the publican, this being due to the softening effects of time and the possession of the ballot. But taxes are classed with death, as something at once unavoidable and to be avoided, and it is the hopelessness of this situation that makes them so obnoxious.

When industry is taxed, mining will pay its share; but in determining how great this share should be there is always wide divergence of opinion. In some of our Western states, the farmer, the wool grower, and the cattleman apparently would have the miner pay it all or nearly all, evidently proceeding upon the theory that the latter's product is more of a gift of Nature than is their own. At the present time, the Colorado Tax Commission is contending that the metal-mining interests of the state are escaping their fair burden of taxation, whereas the mine owners maintain that they are already paying more than their just proportion, and that the industry cannot stand a heavier burden. The commission holds that "metal-mining property should be assessed at its actual value, the same as other property," but the mining men claim that any attempt to fix the "actual value" will not only be fruitless, but will lead to trouble and litigation.

With the idea, therefore, of drafting a bill to be submitted to the voters next November, for the purpose of revising the mine-taxation laws of the state, a committee was appointed some time ago consisting of a representative each from the State Tax Commission, the Association of County Commissioners, the Association of County Assessors, the Colorado Metal Mining Association, the Live Stock Association, and the State Grange. This committee has held its first meeting, and the work of drawing up the new bill has been started.

It is undoubtedly the increased price of silver that has influenced the Tax Commission in this direction. But for a long time mining has been languishing in Colorado, and conditions at times have been, perhaps, worse than operators were willing to admit. It is most inopportune, then, to talk of making the tax load heavier.

One well-known way of killing an industry is to tax it to death. The student of the future may well wonder, in his efforts to puzzle out word derivations, if assessor, assassination, and asininity are not all derived from a common root.

The Future Automotive Industry

THE tremendous increase in the aggregate horsepower of internal-combustion motors, the enhanced annual rate of increase due to the wider use of automobiles, auto trucks, tractors, and other automotive appliances, together with the growing difficulties of maintaining an adequate supply of gasoline and distillate,

may well raise the question as to the solution of the problem in the future. It is an almost foregone conclusion that the supply of hydrocarbons derived from petroleum will be inadequate. The development of a shale-oil industry affords some promise of partially meeting the ever-growing demand.

It looks as if, within comparatively few years, an equilibrium is to be established, with premium prices for hydrocarbon products suitable for internal-combustion engines. Naturally, the question arises, What is to satisfy the future demand for a power agent for automotive purposes? Some form of "canned power" is the answer. The only form of "canned power" is the electric-storage battery. Storage-battery vehicles have slowly made their way into industrial applications. For underground transportation in mines, particularly metal mines, the electric-storage battery locomotive has demonstrated its usefulness and economy. Under centralized conditions, the electric-storage battery truck has established itself in competition with the internal-combustion engine-driven type.

An improved type of storage-battery vehicle has been developed that gives promise of greatly extending the field now occupied by electric-driven vehicles. We venture to predict progressively greater use for road transportation of electric-driven vehicles, both of the storage and trolley type. Along with this will be an extensive development of central power plants, hydro-electric, steam, and Diesel engine, together with transmission lines, and a system of charging stations on important road traffic lines.

Urban transportation of the kind served by the ordinary auto truck must meet the competition of the improved storage-battery vehicle, and increasing automotive fuel prices. It is impossible to predict how equilibrium between the types will be established, but it is fair to presume that the electric vehicle will dominate in cities and contiguous areas, and that the other type will serve the more distant regions not so well favored by central power plants and transmission lines.

Internal-Combustion Engines For South America

SOUTH AMERICA presents a peculiarly interesting problem from the standpoint of power. Primary sources of fuel are scanty, and though considerable development of petroleum has taken place, and the conditions are favorable for further development, there will be a sale for foreign crudes and intermediates for power purposes for a long time to come. Ultimately, the South American petroleum industry may be expected to take care of a considerable part of this market.

Manifestly, one of the most economical methods for the utilization of petroleum products for power purposes is the Diesel and the semi-Diesel engine. Before the war a great number of power plants of the locomobile type were sold by a German firm to South American industries. The unit was a steam unit, consisting of a compact boiler and engine combination of high economy and arranged to burn different kinds of fuel.

It is obvious that except in those localities in close proximity to streams presenting possibilities of hydro-electric development (and this includes a considerable part of the Andes), whatever call for power there may be will in most cases require a compact, high-economy unit that admits of convenient transportation both of itself and for the fuel needed for its operation. Ameri-

can manufacturers of internal-combustion engines and electrical equipment should find South America a good market for their products.

Sportsmen in Ontario

IT IS INTERESTING to note the extent to which mining companies of Ontario are seeking new investments outside of the province. Nipissing is drilling for oil in Texas, and has also recently investigated mining properties in Arizona. The Mining Corporation of Canada was recently conducting work in British Columbia on the Pioneer mine and on the Proserpine Mountain claims in the Barkerville district. The company also has an option on the Yankee Girl mine, in the Ymir district. It has an interest in some drilling that is being done for coal in China, and has also been investigating properties in Russia and South America. The Crown Reserve company has been working the Reward mine, in California. The Hollinger is interested in oil in Kansas, and the O'Brien is now investigating properties in Mexico. Both the Temiskaming and La Rose did work in the last year in British Columbia.

When asked as to the significance of this, an engineer of Toronto recently said: "It is probably chiefly because we want as far as possible to perpetuate our jobs. One important factor, however, is that the Cobalt mines make money fast and have a short life. They usually pile up big surpluses while paying big dividends. This is more noticeable than with other mines, and they are rather like the inexperienced gambler who makes a killing the first time and thinks it is easy to do it again."

Administrators and Engineers

NOW that the political buzzsaw has commenced to whirl, and we can prepare ourselves for the usual thrust and parry which occur in that period previous to balloting time, it is to be expected that the reading public—wastebasket and serious—will be flooded with various forms of publicity matter. Thus far, we have not been disappointed, for already we see signs that show that at least one of the candidates is taking time by the forelock. In this instance, we are at a loss to understand the particular "slant" taken by the chronicler, who quotes, in the article to which we refer, the record of Leonard Wood during his incumbency as Military Governor of Cuba. The article, however, deals principally with the sanitation and general fumigation of Cuba—an engineering project—and immediately the discerning reader raises the question, How about the engineer who handled this job; how much did he do to put it across?

Engineers, as a class, have been prone to retire to the background, taking satisfaction in the thought that their work was well done, and stopping there, only to see at a later date that in the eyes of the world their part in the project was but a small one, while some one else "skimmed the cream," but this condition is rapidly changing. The engineer, before the Great War, was regarded by the politicians as a necessary evil, and now it appears, in this particular instance, that engineering, as a means of showing a nominee's administrative ability, is one of the greatest of assets. This is indeed encouraging, and having previously thrown our hat in the ring as advocating the candidacy of one Herbert C. Hoover, we take considerable pleasure in calling atten-

tion to his record, as an engineer first of all, and then as an administrator. "He who would command must first obey," and engineers will agree that the early years in the "University of Hard Knocks" serve a worthy purpose. Truly, the old order is changing, and who will say that it is a backward step?

War Minerals and Latin America

THE quest of gold and silver first brought the Spaniards across the Atlantic, and today the lure of Latin America as a storehouse of the precious metals is as great as in the day of Cortes and Pizarro. It was the age of bronze, or copper, in the New World, when the conquistadors landed, and this yielded to the age of iron. Iron against copper made Aztec and Inca alike submit. Copper triumphed again, however, as the prosperity of Cerro de Pasco, Braden, Chuquicamata, and the various camps of Mexico bears witness.

But in spite of its riches in gold and silver and the baser metals of copper, lead, and zinc, Latin America today stands prominent in the Western Hemisphere through its possession of nitrate, vanadium, tin, and platinum. Aside from that obtained from the air, Chile is the source of the world's nitrate, Peru of the larger part of its vanadium supply, Bolivia is the only important producer of tin from the Yukon to Cape Horn, and Colombia as a source of platinum occupies a similar position.

Of nitrate, 500,000 tons is imported annually into the United States, and it was recently pointed out by Secretary Baker that, even with such production as may be obtained from the plants at Muscle Shoals, it will still be necessary to bring in a large supply from Chile. Vanadium is of greater importance than ever, and is used wherever a steel of high physical properties and capable of withstanding severe duty or fatigue is required. About 90 per cent of that consumed in this country last year came from the mines at Minasragra, Peru, and normally this locality furnishes over half of the world's requirements.

Colombia's output of platinum in 1919, estimated at 26,500 oz., was a valuable addition to the world's supply, as during the war, at a time when the normal productivity of Russia was crippled. Bolivia in 1919 shipped over 27,000 tons of fine tin, besides which the trifling outputs from other scattered localities in the Western Hemisphere are negligible.

The situation may change as new sources are developed; but at present Latin America possesses in comparative abundance the four war minerals, nitrate, vanadium, tin, and platinum, which gives it an importance all its own, as far as the rest of the Western Hemisphere is concerned.

The Flotation of Coal?

MINERALS SEPARATION stock is booming on the London Stock Exchange, the price having approximately doubled in the last few weeks. The reason is said to be the application of the company's flotation process to the concentration of coal. The English coal dumps can be worked over at a good profit, according to the expectations, the product being sold in the form of briquets. This phase of Minerals Separation activities has not yet reached this side of the water, but, if it does, we hope that the company's operations will be attended with less ill-feeling than has marked its activities in the field of metallic mineral concentration,

WHAT OTHERS THINK

Pointing the Way

Herbert Hoover's clean-cut acceptance of the nomination to the Presidency, if offered to him under conditions clearly and concisely set forth in his masterly telegram to the president of the Hoover Republican Club of California, is the first real safe-and-sane declaration of hope held forth to this politics-ridden nation as to national and international solutions of impending political, moral, and economic issues. No other living man today has that grasp of present world issues, or that knowledge of them which has come to him by reason of direct personal dealings with these issues in ways which by wide publicity are known or should be familiar to every living American seeking enlightenment today as to his present duty in the impending political crisis.

It is inconceivable that anyone, in view of Mr. Hoover's widely known personal sacrifices thus far in the Great War, can question for one moment the sincerity of his statement that he is not seeking and does not want the responsibilities which will inevitably come of his election to the Presidency.

From the sound business elements of America who are desperately seeking dependable promises made or to be made by aspirants to this high office, on down through the manhood of America who fought its desperate battles and are fearful lest their sacrifices shall have been in vain, to the saddened wearers of the Gold Star whose beloved fathers and sons rest "among the poppies in Flanders fields," this great nation is looking, and heretofore vainly, for some one that its people can trust to handle the impending crisis, and no living man can handle it unless he knows, as Herbert Hoover does, what these issues mean, wholly apart and distinct from political bias.

The weighing of moral issues as inter-related to responsibility for economic domestic and international business, and the multitude of other questions of vital moment imperatively demand a man who has been clearly proved to possess in extraordinary measure not only the necessary financial ability, but, with it, the heart and conscience and unswerving moral rectitude, as well as the self-denial and reconstructive genius, possessed only by the man who fed the world under impossible conditions, and contributed more than any other one man or group of men toward winning the Great War.

If Herbert Hoover is willing to continue to make the sacrifice of the best years of his eminently successful business life, it will be a sad commentary on the citizenship of America if his candidacy be not appreciated at its proper worth by the business elements of America, who are paying for present inefficiency and for unnecessary continued national loss, with prospects of still further chaos.

Now that the issue is clearly drawn, it is fervently to be hoped that ways and means will be clearly pointed out by the responsible press, through which true Americans will be able, and will know how, to work efficiently,

by personal influence and by example, for the election of Herbert Hoover to the Presidency.

It would seem eminently proper that, if consistently possible, the valued columns of your paper, the official publication of the mining engineers of this country, be for the time being in some measure devoted to enlightenment propaganda and educational service along this line.

The temporary reduction of valuable technically filled space in some degree should most assuredly meet with favor from the great majority of subscribers to the *Engineering and Mining Journal*.

The influence of this representative body of men, foremost in industrial work and in large development, if directed and consolidated, can hardly fail to count heavily in forming essentially sane public opinion and in creating a sense of personal responsibility, in lieu of leaving such vital issues, as customarily, to machine politicians.

As we have before us the most vitally important cause ever presented to this country, and the only man in view as yet who is, by education and qualification, wholly competent to uphold it successfully, why not help real Americans, the sustaining power of this nation, financially, morally and otherwise, to sweep everything else aside for once and rule? If we do not, our fate is richly deserved, and what that fate may be, in the usual, and now threatened ordinary course of events, God only knows: probably not either the restoration of sound stable business conditions, or that elusive peace for which so many American lives have been sacrificed.

GEORGE H. CLARK.

Birmingham, Ala., April 1, 1920.

The Government of Canada

In the March 6 issue of *Engineering and Mining Journal*, page 595, under the title "Canada's Alleged Autonomy," I note with interest the statements made regarding Canada's status as a nation, and as many of the statements are incorrect, I take the liberty of writing you on the subject.

There is still considerable misconception in republican countries on the Canadian system of government, and, among uninformed sections of the people, a fairly general opinion still exists that the dominion, forming part of the British Empire, with a monarch at its head, is necessarily subject to autocratic rule, or, at least, very much at the dictates of the Colonial Office in London. Nothing is farther from the truth, as residents of the dominion who have come from all quarters of the globe could testify, and though maintaining her place as an integral part of the Empire, Canada is absolutely self-governing, and its government second to none in its democratic traits. Canada is a nation, and her status, as such, was plainly asserted and recognized at the Peace Conference, and she is accorded a voice among the nations of the earth. Though spontaneously her loyalty to the Empire took her into the war immediately upon

England's declaration, she entered as an independent nation, and was under no compulsion to enlist her forces or resources.

Canada is a self-governing British dominion, with a responsible government, which means that the will of the people is absolute in the matters of government, and that the Governor General, the King's representative in the country, must form his executive council or cabinet from the members of Parliament who can command the support of the majority of members of the House of Commons, the house which, in practice, has sole control of the powers of taxation and appropriation. It means that the political executive of the day resigns its executive functions whenever it ceases to possess the confidence of the people.

The Dominion of Canada is under responsible government in the fullest meaning of the term, and in the internal affairs of the country there can be no uninvited interference by Great Britain, whether by Parliament at Westminster, the Colonial Office, or the Governor General. Recognition of this fact is one of the fundamental principles of the relations between Great Britain and the overseas dominions. The imperial Parliament has far less to do with the internal affairs of Canada than, for instance, Congress has to do with the internal concerns of the several states of the Union. Relations between Great Britain and Canada are not those of domination on the one hand, of subserviency on the other, but as between nations equally free to do as they will.

Before the confederation of the dominion in 1867, there was a Governor General, established at the capital of the United Provinces, and a Governor in each of the then other provinces of British Columbia, Nova Scotia, and Prince Edward Island. They were all appointed by the crown at the recommendation of the Colonial Office. By the British North America Act, however, though the office of Governor General was continued, governors of the separate provinces ceased to exist, and for them were substituted lieutenant governors—invariably Canadians—appointed by the Governor General in council.

The Governor General and the lieutenant governors of the provinces are the sole representatives of the King in Canada, and the appointment of the former, which is always done with the approval of the dominion government, is the only civil designation made by the crown. These men have absolutely no influence on the government or its policies, and, directly or indirectly, do not affect the every-day political life of the dominion, its policies, standard, or ideals, as much as, for instance, any Canadian newspaper editor. The Governor General is the material link with the imperial government, and is only interested in the smooth and continuous running of the government. The only voice of the country is that of public opinion as expressed at the polls at the periodical elections.

The people of Canada elect their own governments, make their own laws, and control all their own political affairs. All matters of taxation are entirely in their own hands, and Great Britain has no more control over them in this regard than it has in the imposition of a tax on the people in the United States. Canada, though a loyal dominion of the British Empire, as the recent war most clearly evidenced, maintains her place among the nations as responsible and self-governing; and pursues the way of democracy untrammelled by autocratic bonds or extraneous hindrances to her popular government.

In this connection, it is interesting to read the Prince of Wales' remarks at a recent banquet tendered him in Ottawa. Speaking on his relations to Canada, he says:

"Canada, like the other British dominions, played such a big part in the war that she has in consequence entered the partnership of nations and has affixed her signature to the peace treaties. This means that the old idea of an empire, consisting of a mother country, surrounded by daughter states, is entirely obsolete and has long been left behind by the British Empire. Our empire has taken a new and far grander form. It is now a single state, composed of sister nations of different origins and different languages. The British nation is the largest of these nations, but the younger nations have grown up to be its equals, and Great Britain, like the dominions, is only one part of the whole."

In view of the facts, as set out in the foregoing, I trust, in fairness to this country, you will be disposed to publish this letter, as you have published statements of Mr. Thompson, in the article referred to.

NORMAN S. RANKIN.

Montreal, Canada, March 27, 1920.

Futility of International Monetary Conference

In regard to the desirability of an international monetary conference to devise some plan for stabilizing exchange, permit me to call your attention to the fact that we have had a great many monetary conferences, some of them notable, particularly the conference held in Brussels in 1892. All of these conferences adjourned *sine die*, without being able even to report progress.

Political economists all agree that a stable, non-fluctuating monetary unit is the most beneficent element that a government can bestow upon its people. But they overlook the fact that in every country there is a powerful class of men who, masquerading under the name of "financiers," are, in fact, gamblers in money. These men do not want the people to have a stable medium of exchange, because they cannot gamble on an element the value of which is fixed and known to everyone.

In an international conference where every nation counts *one*, these men always have and always will control. To ask such men to devise a scheme for the benefit of the "common people" is absurd.

But there are other objections even more serious than this. The burden of sustaining any system that might be agreed upon by such a conference (if it were possible to reach any agreement) would fall upon the nation or nations which transact the world's business, and thereby create a demand for the money provided by the system.

Upon whom would the burden of supporting such a system fall? What position would the United States occupy in respect to such a system?

As far back as 1895 Thomas B. Reed showed that at that time the people of this country not only produced but consumed more than half as much of all the products of industry as all the rest of the world combined, and five times as much as Great Britain, our next greatest competitor.

A little later the *Railway Age* showed that at that time the total transportation of the world, measured by a ton carried 100 miles, was 1,400,000,000 tons annually, of which the railroads of the United States carried 800,000,000 tons and the railroads of all the rest of the world and all the ships and boats on ocean, lake, and river (our own included), carried 600,000,000 tons. We

hear much about the foreign commerce of Great Britain, and yet the commerce which passes from Lake Erie through the Welland Canal exceeds the total foreign commerce of Great Britain by more than \$100,000,000 annually, and the commerce which passes Detroit during the summer season is vastly greater than that, and the tonnage that passes through the Sault Ste. Marie Canal during the eight months when it is free from ice is nearly three times as much as passes through the Suez Canal during the whole year. Mulhall's Dictionary of Statistics, issued in 1914, a short time before the war broke out, gives an estimate of the accumulated wealth of the great nations as follows:

	Billions
United States, (exclusive of Alaska, the Philippines, and Porto Rico).....	\$228
Great Britain	85
Germany	80
France	50

The wealth of the United States at that time exceeded that of the next three nations combined by thirteen billions of dollars.

These nations would be represented in such a gathering by the money gamblers, the bankers of those countries. It is too much to expect from human nature that they would agree to any system that would be good for us. What the real, substantial, legitimate business interests of this country need is a dollar the purchasing power or exchange value of which, as measured by all the products of human energy and industry, will remain stable from decade to decade. Congress now has the power to give the people of this country a dollar which will not fluctuate 1 per cent in a hundred years. Why it hesitates to do so is incomprehensible. All this talk about getting the "other great commercial nations" to assist us is the silliest sort of twaddle. This country stands in a class all by itself; the other so-called "great commercial nations" are comparative pigmies.

Spokane, Wash., March 19, 1920. W. C. JONES.

Thinking Quantitatively

Engineering and Contracting has called attention to Herbert Hoover's remark that engineers are trained to think quantitatively, rather than qualitatively in the manner of the ordinary politician. Instead of living by catchwords, as Stevenson facetiously said that most of us do, a well-trained engineer is likely to judge a problem on its merit, to recognize that generalizations cannot be applied to all cases in the high-handed manner of a medieval schoolman. An engineer, of course, does not disregard all principles and carry pragmatism to opportunism. More specifically, Mr. Hoover does not vacillate in his opinions, as does, say, Lloyd George, who, A. G. Gardiner says, "lives by spasms of emotion" and "runs like quicksilver over the political field." Nor does Mr. Hoover strive to be all things to all men, as do the Hearst papers, which are for war on one page and against it on another; or as does Viscount Northcliffe, of whom Lloyd George said, "I would as soon depend on a grasshopper."

Mr. Hoover, as a typical engineer, makes up his mind slowly, after reading widely and thinking carefully, and holds his opinion until conditions alter considerably. However, he avoids that prevalent habit of the times, which G. K. Chesterton has spoken of so sarcastically, of linking unlike issues together. That is, because Mr. Hoover agrees with some of the Republican principles,

it does not follow that he agrees with them all and sees no good in any Democratic principle. As Mr. Chesterton puts it, if a voter favors a conservative England, why should he be compelled to vote for British imperialism simply because the Tory leaders have linked the two policies.

The engineering mind, trained to think quantitatively, prefers not to commit itself too far in advance. Quantities might shift largely. Costs and profits, which *Engineering and Contracting* suggests as the usual criteria for quantitative thinking in an economic sense, are constantly shifting.

Why should an engineer, anxious to judge correctly after knowing all the facts, tie himself to vague and changing policies? Was not Hoover's slow but solid declaration of political beliefs an eminently proper application of quantitative thinking?

One of the great fallacies of the nineteenth century was the tendency for disproportioned qualitative thinking. A brilliant idea advanced by Mill, Darwin, Carlyle, Ruskin, Newman, Arnold, Morris, Spencer, or Disraeli was taken up too unreservedly by eager disciples and applied too promiscuously as a panacea. It may be argued that a man has to exaggerate an argument to make his point, and that people dislike a fence-straddler, preferring to follow a leader who has enthusiasm; which is all very true. But an executive and engineer should not be too much of a doctrinaire. Men in control of important public affairs should be sufficiently impressed with the seriousness of their power to keep from thinking too qualitatively and not enough quantitatively.

Mr. Hoover, as the possessor of a typical engineering mind, has not hesitated to state explicitly certain key convictions that he has reached after much thought and experience. He does not believe in socialism, because men will not toil for altruistic motives; he believes that a democracy should exhibit a constant flux to permit each individual to do the work for which he is fitted and to be rewarded for doing it well; he believes that President Wilson went too far in entangling the United States in European affairs, but he is in favor of an increased participation in world politics over the old policy of American parochialism.

Certain members of Congress have tried to jeer at particular long and somewhat abstract sentences picked from Hoover's recent speeches. One of them commented that these sentences should help to fool the voters. Members of Congress should be well informed on this point, as any casual reading of the *Congressional Record* shows. But, as a wiser Senator pointed out, the people like Mr. Hoover's style of English better than the politicians like it.

The other evening as I descended in the elevator in the Brooklyn Academy of Music, I noticed that several thousands of people in the main auditorium were being addressed by Senator Hiram Johnson, who is one of the most strident denouncers of Hoover. "Recreant to succeeding generations . . . a treaty you had never seen" greeted my ears. I listened for a few minutes to the salvos of oratory that the stumpy figure was delivering to the cheering audience. It was qualitative thinking of the usual Congressional variety. I compared his wild utterances with the quiet and thoughtful address of Hoover that I had heard a month ago in Carnegie Hall—and I felt for my string of subway tickets and came away. There's something wrong somewhere.

P. B. McDONALD.

New York University, April 1, 1920.

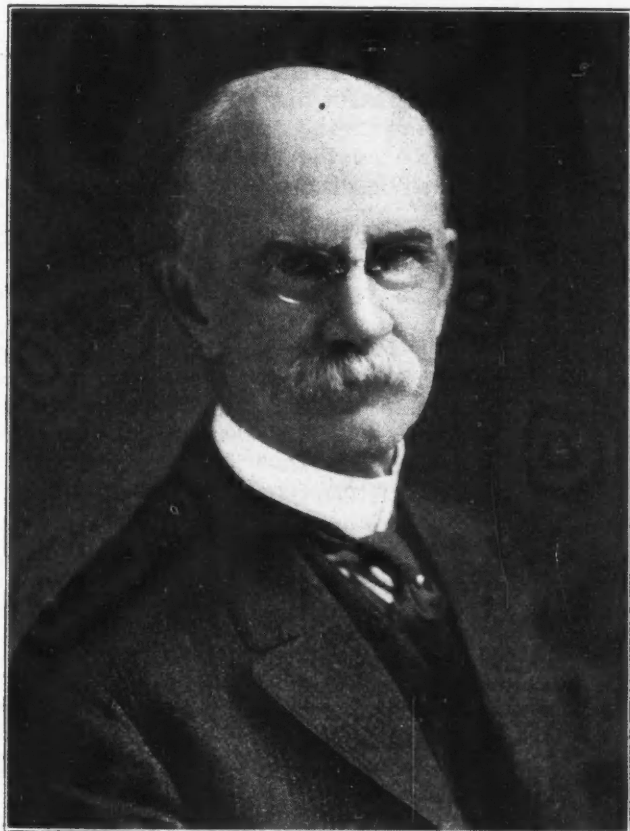
Rehabilitation of Silver

International Financial Stability Necessitates Nations' Agreement on Monetary Systems—
Currency Deflation and Increase of Money-Metal Basis Advocated as a
Remedy for Existing World Crisis

BY SENATOR CHARLES S. THOMAS

Written exclusively for *Engineering and Mining Journal*

ON MARCH 20, within twenty-four hours after the Senate cast its final vote upon the treaty, Monsieur Tardieu informed the world that "President Wilson had agreed to the principle that the League of Nations would be the agency for the establishment and maintenance of world financial as well as world political stability, and that, the treaty once ratified, he planned a campaign to advocate these conditions."



SENATOR CHARLES S. THOMAS

Whatever one's opinion as to the wisdom of such a policy may be, it is evident that the Versailles Conference was thoroughly convinced that "financial stability" was quite as essential to world affairs as the need for a permanent peace, and that without the one the other was not attainable. They are, indeed, so indispensable, each to the other, that they may well be classified as distinct and essential expressions of the same thing; for without financial stability there can be no enduring peace, and without peace there can be no stability, financial or otherwise.

Hence, all plans for peace must involve an adjustment of fiscal affairs, although requiring a revolution in monetary systems. This is especially true of the present, for all the world has been at war, all agencies have been mobilized for its prosecution, and all the processes

of civilization have been profoundly disturbed by its long duration and its holocausts of sacrifice. Currencies and credits have been inflated to the last degree; debts of appalling magnitude have been contracted; and insolvency hovers about the vanquished and some of the victor nations.

The obligations of the Allies and the indemnities imposed upon the Central Powers are payable in gold. Their aggregate is many times the sum of the world's stock of that metal. Specie payments are lawfully suspended in many parts of the world and actually suspended everywhere. Falling exchanges are demoralizing international trade, and mounting commodity prices are reaching heights which the laws of commercial gravity cannot tolerate. Peace is not consistent with such conditions. Their early adjustment is therefore imperative. Indeed, it is not extravagant to assert that this adjustment must attend all covenants for treaty settlements or Leagues of Nations. It is a huge task; one which will tax the wisdom, conscript the experience, and enlist the statesmanship of the time. A vicious monetary system, like a physical malady, must be corrected and driven out of the system, or dissolution is inevitable.

CURRENCY DEFLATION AND INCREASE OF MONEY BASIS

I know of but two remedies for the financial ills of the world. One is currency deflation; the other, an increase of the basis of redemption. Both should be applied wherever possible, the former slowly and cautiously, with due regard for the painful consequences of undue haste; the other promptly and to the fullest extent permissible with the means at hand. It is with the second factor of the problem that this article is concerned.

The world's supply of gold available as coin is estimated at \$7,000,000,000; its volume of paper money, exclusive of Russia, at \$51,000,000,000. To this vast sum must be added the public debts of the nations. These in round numbers are \$200,000,000,000. The German indemnity, payable in gold, although not fixed, will be not less than \$25,000,000,000. The base of this inverted pyramid, constantly expanding at the top, cannot long sustain the burden, much less satisfy it. Gold is to currency as 15.8 to 100; it is to the public debt as 3.1 to 100. It is at a premium. Measured in currency it will continue rising. Its production is a diminishing quantity. Gold miners clamor for stimulating government bounties, under the delusion that such methods of encouragement will lead to the discovery of new deposits. But were the production quadrupled the supply would be woefully inadequate to the monetary demands made upon it. Gold, as the sole money of redemption, is therefore out of the question. Theoretically the doctrine may be sound; practically, it is like putting the world on quarter rations.

Indeed, the world never did and never can function financially upon a single standard. The nations success-

sively adopted it after Germany set the example in 1871; but, outside of Europe, the United States and Canada, it never prevailed. England's experiment with India, and its ghastly failure, are known to every intelligent man familiar with financial affairs. Asia, South America, Mexico, the Straits Settlements, comprising three-fourths of the human race, never have abandoned, never can, and never will abandon their ancient standard, all legislation to the contrary notwithstanding. Because of discriminations against it during the last fifty years, resulting in fluctuations and falls in exchange, their export trade has flourished, and their manufactures have increased. Europe and America depend more than ever upon them for many of the raw materials essential to their commerce and industry.

China has recently announced her purpose to construct a new system of currency, and, with the silver dollar as its unit, to build mints and coin her own money. England must in the very nature of things again open her Indian mints for rupee coinage, if she would retain her gold reserves. Her insensate effort to impose the gold standard upon that vast dependency has cost her £1,365,000,000 of her precious gold supply, and India's appetite is still insatiable. She can persist in this fatuous purpose only at the cost of her own solvency; and that will not avail her. She has learned by a bitter and ruinous experience that it is as easy to change the tides as to tear a vast and unprogressive people from their ancient moorings and set their course upon another direction under new commanders, however intelligent. As well try to wean them from their customs of caste, their centuries of religious faith, their time-honored superstitions. But for America's reserves of silver, and her prompt response to England's cry for aid, Britain's financial bark would, in April, 1918, have foundered on the shoals and reefs of India's desperate requirements.

The immediate need of the world is steadiness of exchange. The rate is important, of course, but fixity is vastly more so. How to secure it is a tremendous problem, involving many factors. But one of these is obvious. The situation needs the stimulus of a larger specie basis. If the world's supply of gold could be doubled over night, financiers would be vastly relieved, exchange would rise with a bound, and international trade would escape much of its present embarrassment. But that is impossible; so impossible, indeed, that nations hoard their supplies of gold with all a miser's avarice.

But this great boon can be accomplished, if we will, through the rehabilitation of silver, and the restoration of its monetary function by fixing some ratio of international exchange between itself and gold. The specie basis is thus doubled without the slightest impairment of its quality. The process requires the opening of no mint to its coinage, if that be an objection. Coinage, indeed, is nowadays of little consequence. Gold better serves the modern monetary world in bars than in eagles and sovereigns. Moreover, it thus escapes abrasion. Except as fractional currency, which must be supplied, silver in bullion can be made quite as serviceable.

It is unnecessary to recount, much less to review, the merits of the old but always interesting controversy over bimetallism. It will suffice to remind the reader that its opponents have always concentrated their heavy guns upon its low commodity value when quoted in

terms of gold, and upon its relative abundance as compared with gold. The first is no longer true; the second never was. The demand for silver as money, ever increasing since 1914, has forced its value beyond its historic ratio with gold, and threatens to drive fractional coins of that metal into the melting pot. Its fixity of ratio by international agreement has therefore become quite as essential to gold as to itself. To do this, now that the ratio of bullion values is the virtual equivalent of coin values, is an easy task. No disturbance, direct or indirect, can now attend or result from such action.

The apprehension that the rehabilitation of silver would quicken its production, glut the market, force gold from circulation and demoralize finance never had any substantial foundation. Undue production of neither metal is possible save at rare intervals. More than ever is this statement now true. The big gold deposit and the silver bonanza are things of the past. The search for both metals is more insistent than ever; and the rewards of the prospector are few and far between.

Save Siberia, Central Africa, and some districts in South America, the earth has been pretty thoroughly explored for gold and silver. Annual accretions are becoming more and more the byproducts of the base-metal mining industry. Down to 1917 the world's aggregate supply of silver and gold is estimated at \$15,507,166,581 and \$11,993,824,211, respectively. This includes the coinage of silver, \$5,091,926,603, and of gold, \$8,383,977,928. The demand for both metals is equally insatiable.

Moreton Frewen, whose study of monetary systems, including the mechanism of exchange, covers a period of nearly forty years, declares the world's annual demand for silver equals 620,000,000 oz., as against a present annual output of 157,000,000 oz. He presents this table of the items comprising the demand:

	Ounces
New silver to liquidate India's annual balance of trade	250,000,000
Currency requirements of Nigeria, West Africa, German and British East Africa.....	100,000,000
Silversmiths' demand on pre-war scale.....	120,000,000
China, Hongkong, Malaysia, Philippines.....	50,000,000
American and European subsidiary coinage.....	70,000,000
Reimbursement Federal Treasury under Pittman act (for eight years).....	30,000,000
Total	620,000,000

The silversmiths' demand as given in this estimate is, I think, largely understated. But assuming the estimate to be approximately correct, it is obvious that, could silver production rise to the heights of the 1874-1890 period, it would fall far short of the world's needs. We cannot hope for this. We can stimulate production and also powerfully enhance the utility of the stock on hand by imparting the money function to it. But for the fatal decision of Sir James Westland in 1897 the great powers would have accepted the Wolcott proposition of that year. France unhesitatingly committed herself to it. England entertained it. India was permitted to defeat it. The Indian Government has garnered the harvest of Westland's error through the bitter experiences of two decades. England and France now await our initiative. The opportunity is here. Every condition favors the proposal. The monetary systems of the world are famishing for it.

Shall we longer hesitate?

Government Officials Who Influence Mining Representative Mahlon M. Garland

BY PAUL WOOTON

Written exclusively for *Engineering and Mining Journal*

WHEN Mahlon M. Garland, now Representative at Large from Pennsylvania and Chairman of the Committee on Mines and Mining, was a younger man, an incident occurred at the collar of the shaft of a Pennsylvania coal mine. This circumstance has since stood him in good stead in analyzing political and legislative propaganda. At that particular mine it was customary to keep the mules underground all the time, unless it became necessary to shut down the mine for a considerable period. Such a shutdown having become necessary, the mules were brought to the surface after they had been underground many months. He saw them brought to the surface with their eyes carefully bandaged, and noted the safeguards taken to prevent their too sudden exposure to the light of day. For weeks thereafter these mules revelled in a pasture. Then it came time to start working the mine again, and the mules were led up to the cage preparatory to being lowered for another long sojourn underground. They were keenly conscious of the fact that they were about

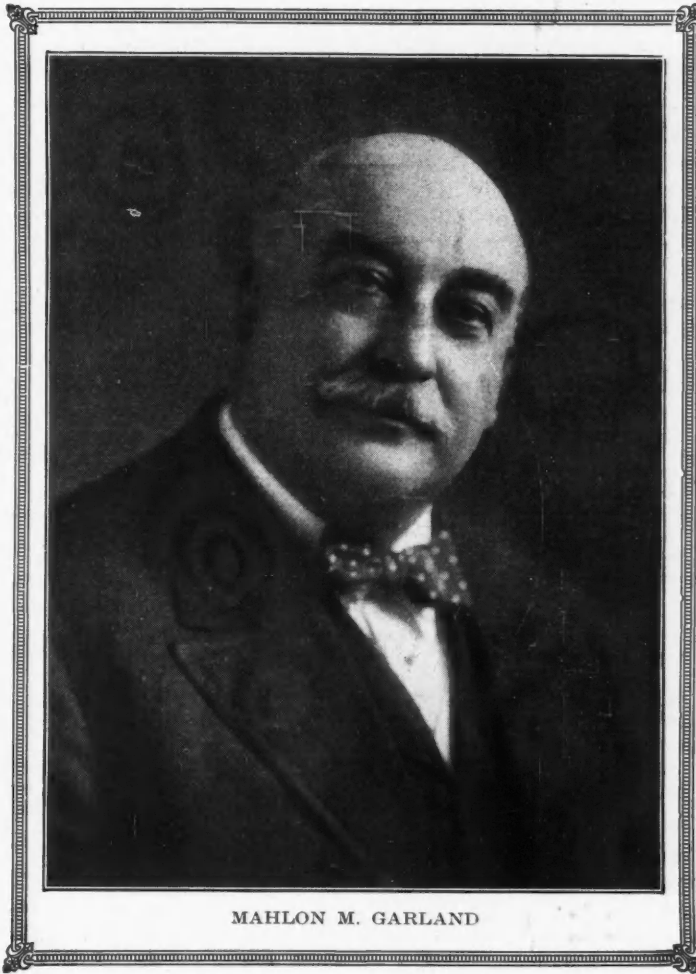
to be returned to surroundings less to their liking, showing all the obstinate determination for which they are distinguished, and declined to be led or driven on to the cage. Every expedient was tried without success, until the foreman conceived the idea of leading a blind mule on to the cage first. Despite the sense displayed previously, the mules, like sheep, followed their superannuated companion on to the cage, and soon were at their old task of providing traction in the darkness of the workings.

This incident was regarded by Mr. Garland as typical many times of human conduct. Despite the good sense of individuals, they frequently defeat their own desires for betterment through following improper leadership. In his long experience in adjusting differences between employers and employees, and during his career as a politician and statesman, Mr. Garland has found frequent use for the story of the mules as an illustration of the consequences of blind leadership.

Through his life-long association with the coal

industry Mr. Garland has been sufficiently interested in mining in general to follow closely the development in other lines of mineral production. He is much interested in mining legislation, and has just conducted a thorough investigation of the war-minerals situation.

He is particularly interested in the relationships between capital and labor in the mining industry. Mr. Garland formerly worked as a laborer in iron and steel mills, and has been prominently connected with the union labor movement. He at one time was the president of the Amalgamated Association of Iron, Steel, and Tin Workers, and served two terms as vice-president of the American Federation of Labor. As a labor leader who also enjoyed the confidence of employers he has frequently been called upon to advise labor and capital in cases of industrial troubles. During the anthracite strike Mr. Garland took an important part, and was selected by John Mitchell as labor's member of the arbitration commission, which, however, did not function, owing to the reaching of an agreement without having to refer the matter to an arbitration



MAHLON M. GARLAND

board. Mr. Garland was born in Pittsburgh in 1856. After twenty years' work as a laborer in the steel mills he embarked in politics, and served for many years as Collector of Customs at Pittsburgh. He has served as a member of the City Council of Pittsburgh and as a member of the School Board. He has also been prominent in the affairs of the Loyal Order of Moose.

When quite young Mr. Garland's parents moved to Alexandria, Pa., where he began at an early age to assist in the support of a large family. Between the years of nine and fourteen he was employed on a farm, in the steel mills, and drove mules on a canal-boat towpath. He learned the trade of puddling and heating. Mr. Garland was appointed collector of customs at Pittsburgh by President McKinley, being subsequently appointed to the same office by President Roosevelt and again by President Taft.

As chairman of the Committee on Mines and Mining Mr. Garland is confronted with a variety of legislation which has an intimate relationship to mining.

A Pack Train of Eagles

Use of Aircraft in Mining Operations Where Roads and Trails Are Absent Suggested—Unexplored Regions Offer Possibilities for Investigation by Means of Airplane and Dirigible

BY EUGENE SHADE BISBEE

Written exclusively for *Engineering and Mining Journal*

A CERTAIN mining company had received several reports from different engineers about a property in a remote part of Idaho. Practically all of the reports were in favor of the property, which the company seriously considered buying. As a final precaution, the president sent a young mining engineer to report. After a month or more, this telegram was received: "Vein all right; samples correct; ore is there. To get the stuff out would take a pack train of eagles." This story was told a long time ago, and the acumen of the young engineer was admired, his reference to a "pack train of eagles" exciting a hearty laugh wherever the story was told. Times have changed. What then appeared an absurdity has now passed beyond the air-castle stage. A "pack train of eagles" may not elicit much surprise in the mining industry in the course of a few years. In this day of keen competition the man who says "It can't be done" awakens some morning to discover that somebody has done it.

I have shown before the value of the airplane in preliminary mining operations, the saving of time and money and the greater accuracy of the work. Since that article appeared several American airplanes have been put to work in Peru; and down in Mexico an American mining operator has petitioned the Carranza government for permission to use an airplane in his work. Therefore, it has been demonstrated that aircraft possess a unique usefulness in this field. They not only can be used to survey and map the significant area, but also to carry men in and out and to transport supplies, material, and high-grade ore. They are destined to play a part in mining development, but they will co-ordinate with the prosaic mule in transportation and never wholly replace him in certain fields that are all his own. In fact, if a mine needs the services of an extra mule it will be the airplane that will carry the mule in, transporting the animal fifty times as fast as his own sure feet would take him there and taking his feed along to boot. For the airplanes that are going to be used in mining will be built to carry not less than 1,200 lb. of useful load.

For this new work both the airplane and the dirigible will be used, as the lighter-than-air craft needs less landing space than the plane, and will, generally, be called upon to transport the more bulky freight, leaving the lighter packages, the high-grade ores and bullion for the speedier plane. In carrying vanadium, uranium and radium ores at present from Paradox Valley to Placerville, in Colorado, four-horse teams are used, and from two to four days are required for the trip of about seventy miles. An airplane would take 1,000 lb. of the ore, winter or summer alike, over the mountains, in less than an hour, making not less than half a dozen trips a day and keeping it up, regardless of ground conditions of snow, ice, land-slides, or anything else, as continuously as may be necessary. Returning to the mine from the railroad shipping point, the airplane can take in

men and emergency supplies; it will take the superintendent or other officials back and forth on business; it will keep the operators in continuous touch with both ends, thus making for higher efficiency and greater production and rapid delivery of the product to the base of final disposition.

Very rich ores may be transported in small compass, but an airplane will carry in four days—the time required by a horse or mule team to go one way—not less than twelve times the weight of ore brought out by the animals during a like period of time. And it must not be overlooked that it will make twelve return trips, taking in all kinds of necessary supplies or men.

Although it has been said that the airplane will never entirely supersede the mule or the horse in the field where those animals have been pioneers, certain comparisons between draught and pack animals and the airplane throw an interesting light by contrast. After the location has been made by the airplane exploration, and the mosaic maps have been prepared and the ore uncovered, tools, men, and supplies must be sent in. The lighter of these tools and supplies can be transported by plane, the heavier by team. Consider the saving in time by the assurance that every bit of smaller machinery, every tool, all supplies, and every man, will be on the ground and ready for action by the time the heavy material has arrived by mules, because they have been taken in by plane, at a speed more than twenty times that of the animals that plod over the rough ground, while the plane darts to and fro above them; the whole circumambient blue being its magnificent roadway. Dwell for a moment upon the toiling string of llamas that pursue their course down the slopes of the Andes, their backs laden with precious ore. All day long they trudge onward, urged by their drivers, who, by the way, are ever careful not to get within "spit-shot" of an irate llama. For there are at least two things that start a fight in South America; one is a llama that believes itself to have been abused, the other is a man whom the llama believes has abused him and into whose eye, from a distance of fifteen or twenty feet, the llama has violently spit. The insult is eradicable only by the near-death of the llama, which can only be saved by the interposition of someone in authority.

While the llamas are covering the distance from the mine to the railroad or seaport the airplane is ever speeding above, back and forth, with mineral and supplies, and even men, doing every day the combined work of not less than thirty llamas, and neither complaining of treatment nor spitting in one's eye!

Statistical details may be made less uninteresting by showing that a pack train of sixty mules can carry, approximately, 24,000 lb. some twenty-odd miles over mountain roads in a day of eight hours. Six men will be required to drive sixty mules, and six men will draw, again approximately, \$36 per day in wages. Add to this the cost of the rations for the men and the animals.



(Copyright by Underwood & Underwood)

A PACK TRAIN OF EAGLES
Airplane over Mount Lassen, California

For the last named the cost will be, based upon the present price of oats and hay at Atlantic tidewater, \$1.06 per day, as a healthy, hard-working mule will need sixteen quarts of oats and twenty pounds of hay daily, if you expect the animal to work. The men will eat up more money, if not an equivalent weight in food.

While the mule train is making its twenty-odd miles per day, with 24,000 lb. of useful load, the airplane is hurrying to and fro at eighty miles an hour, as against the three miles of the mules, and taking with it on each trip about 1,200 lb., or at the rate of a round trip from the mine to the railroad and back, the distance being assumed to be twenty miles, in half an hour, not allowing for time to load and unload. During a day, there-

conjectured, but much of it is inaccessible on account of absence of roads and trails. The Chilean nitrate fields could have been reached by exploring parties in no better way than by airplane.

The west coast of Mexico, the Sierra Madra country, and other parts of Mexico, indifferently served by roads, present an inviting field to the prospector-aviator.

The Arctic regions, Canada and northwestern Canada, Siberia, China, and Africa are countries in which ordinary means of transportation and travel are indifferent or almost wholly inadequate. The desert regions of Australia form a vast area presenting possibilities for exploration by flying machines.

As an example of the excessive time consumed in cer-



IN THE SIERRA MADRES, NEAR OCAMPA, CHIHUAHUA, MEXICO

Although apparently an airplane would have considerable difficulty in landing, the tops of the "mesas" shown in the distance offer some promising places to land.

fore, the plane could carry back and forth over such a line sixteen loads of 1,200 lb. each, or something better than half of what sixty mules could transport. At the end of the second day the plane would have equaled the work of the sixty mules for the first day, and from then on there would be no contest—just a runaway for the plane.

Considering the cost of the two factors in this work, the mules and their drivers would consume more than one hundred dollars per day in food and wages; the plane would eat up 160 gallons of gasoline and the pilot would cost \$10 each day. Depreciation of both airplane and mules is not considered, but both depreciate proportionately in value as carriers.

The Andes in South America offer a suitable field for the use of aircraft. There are not many roads and there are few trails. Both prospecting and development could be served in almost inaccessible situations. Tools and food supplies could be brought in at a saving in time and with a sureness that could not be equaled by any other means. Bolivia, Peru and Brazil embrace considerable areas of promising mineral ground, it may be

tain features of mine-examination work, mention may be made of a copper region east of the Mackenzie River, in northwestern Canada. It possesses many of the characteristics of the Michigan copper country. To visit this region and complete an examination would require two years, one year to go in and another to come out. With an airplane it is probable that the trip could be made from Dawson in a day's time.

There are certain inherent limitations on the use of airplanes and dirigibles. Both are dependent upon a gasoline supply. In the case of using such appliances in prospecting, the conditions are much the same as would apply to an ocean steamer with but a single base for its fuel supply. The maximum outward trip mileage is equal to but 40 per cent of the fuel supply. This leaves only a 10 per cent margin on both the outward and return voyages. Further, it would indicate that, if the gasoline supply in the case of an airplane would be sufficient for 500 miles at economical speed, and with a normal load of freight and passengers, the extreme safe radius of action would be 200 miles. Thus, from a given center of gasoline supply, the area included within a

circle of 400 miles diameter could be served. With a mileage supply of gasoline equal to 1,000 miles, the radius would be 400 miles, and the area, a circle of 800 miles' diameter.

By establishing a supplementary supply point and dividing the trips into pairs, one for extra gasoline transport to the supply point and the other for freight service, the trip in any one direction could be doubled. This computation is based on the assumption that the weight of gasoline carried as freight would be equivalent to the 500 or 1,000 miles assumed respectively for such case. These figures assure to a considerable extent that territory within a practicable distance could be served, although special arrangements would be necessitated for trips from 500 to 1,000 miles in length. These would, of course, require gasoline-supply points at suitable landing places en route. The handicap would be the necessity of bringing gasoline to the supply points. By employing two machines, one could be used for supplying stations with gasoline and the other for freight and passenger service.

With the use of airplanes, the practical difficulty would be to find suitable landing places. Necessarily, the first trip would be the most hazardous, but after marking and mapping the landing points, the continuation of service would not be supremely difficult. It is worthy of note that in regions containing a number of lakes, as is the case in many parts of Canada, the hydroplane would be especially adapted for utilizing the lakes for landing places.

In the case of the "blimp" or dirigible, the radius of action would be greater and would admit of reasonably close calculation. There would be a nice division between fuel weight and freight weight. Once a definite route had been established, the proportions of freight and gasoline would be constant. As in the case of airplanes, longer voyages could be attempted by establishing supply stations. As the dirigible could land in a limited area, the pioneering trip of the dirigible would be less hazardous than that of the airplane.

The weak point of the dirigible is the difficulty of adequately protecting it at terminals. Some kind of a structure would be required, at least at the starting terminal, and, where established service ensues, also at the distant terminal. Unlike the airplane, the dirigible could travel at night. The expense of a terminal shed would be almost prohibitive.

Probably the most vital question would be the one of safety, and, after that, the cost. The construction of both airplanes and dirigibles has advanced to the point where both types are safe structurally and mechanically for normal conditions. The danger lies in operation and abnormal weather conditions. Experienced operators could undoubtedly be obtained, and by confining actual flying to periods when weather conditions are suitable the risk could be minimized. Transportation through the air would probably never be as safe as ordinary travel. Hidden defects in mechanical equipment might easily force landing in unsuitable and dangerous places; particularly so where it is proposed to use such devices over mountainous country, as would most certainly be required in prospecting. A highly specialized class of skilled labor would have to be employed, and, for service over a long period, an organization with headquarters and repair shops would be necessary.

The cost of operation, as previously indicated, would be high, but in the aggregate it is doubtful if it would

exceed the cost of trails or roads. A 100-mile trail at \$500 per mile would equal \$50,000; a wagon road of the same length at \$2,000 per mile would be \$200,000. Road and trail cost would of necessity be comparatively figured in any actual case. Considering the saving in time, as pointed out before, the number of cases where flying machines could be used for prospecting and development would not be negligibly small.

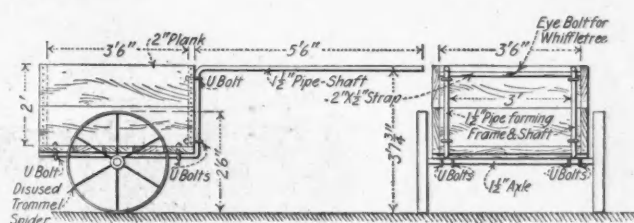
Already the airplane is a common sight in the oil fields of the West, and the skies of California are never clear of its gauzy wings. It has conquered the Atlantic and is about to venture the Pacific for a \$50,000 prize. It has flown from England to Australia, and is even now on its way from Cairo to the Cape of Southern Africa. Airplanes are no dream; they are one of the hardest of hard facts; they are the carriers, the fleet messengers, the fighting wasps and the unconquerable servants of man, who has created and harnessed them. Soon they will swarm in every sky, and the mining man who has not adopted them for his purpose will compare with the farmer who, on his way to market with his horse-drawn produce, is passed by the other chap in the motor truck, on his way home with the cash in his pocket.

A Useful Mine Cart

BY DOUGLAS LAY

Written exclusively for *Engineering and Mining Journal*

AT MINES in mountainous regions trucking of miscellaneous supplies over the surface trails from one point to another is inevitable. The conditions are generally such that it is hardly possible to avoid this, and at least one light horse or mule is kept for the purpose. The "go-devil" is the conveyance used. This is excellent in the winter, but a clumsy contrivance in summer, when it is preferable to use a small cart. A very serviceable cart can be readily made by any mine blacksmith out of a couple of diamond trommel spiders, a few 2-in. planks, and some 1½-in. pipe. Strap-iron bands, about 3 in. wide, are shrunk on over the spiders to form tires.



CONSTRUCTION DETAILS OF MINE CART

The body of the cart is made of 2-in. plank of any desired size. The shafts are made of pipe, bent twice at right angles, such that the end extensions of the pipes form the frame on which the body of the cart rests, and to which it is bolted by U-bolts, as shown in the figure. A piece of 2-in. plank is spiked to the bottom of the body, between the pipes, in the center, and a suitable axle is attached by U-bolts, which extend through the two thicknesses of plank. A piece of strap iron, ½ x 2 in., is bolted to the front of the cart, close to the top, and behind the pipes. An I-bolt through this serves for attachment of a whiffletree. The dimensions may be varied, but for a small horse or mule, the length of shafts should be about 5½ ft. and the distance between shafts 3 ft.

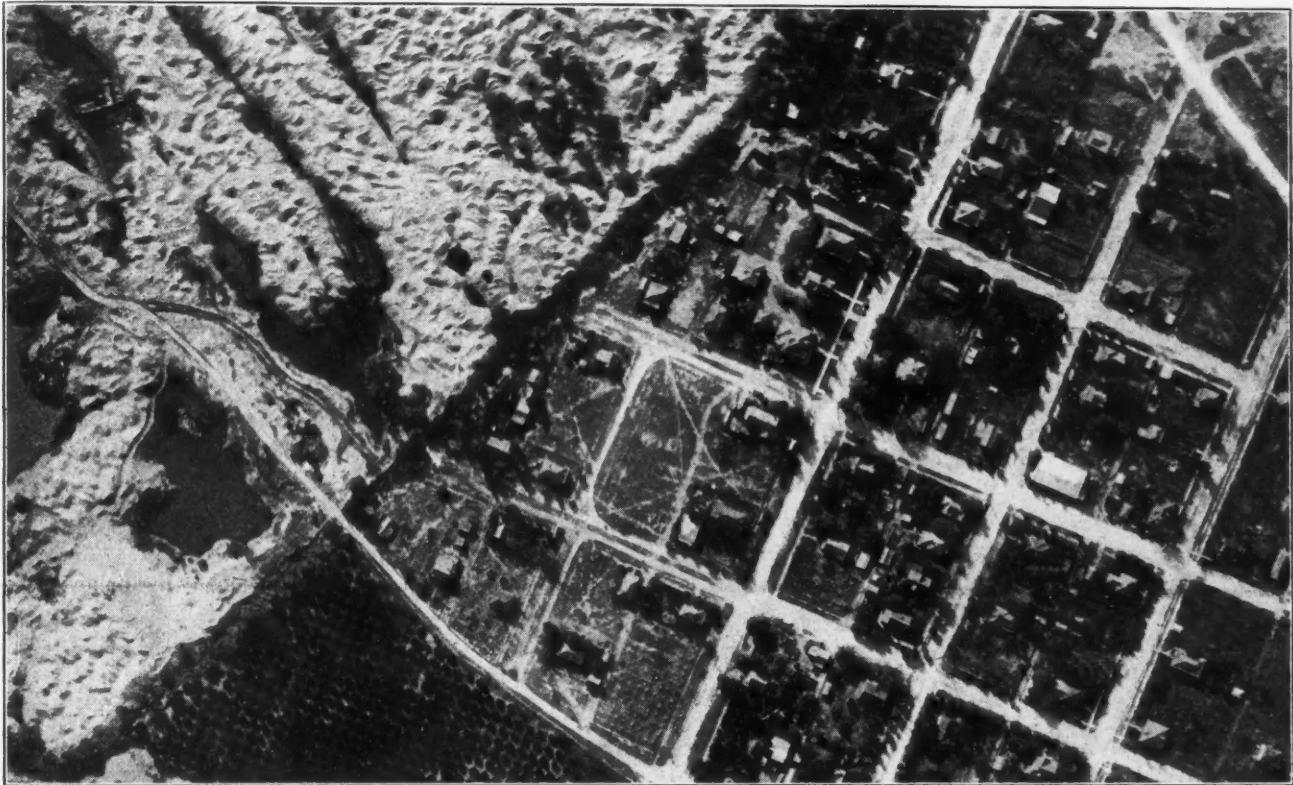
The Birdman's Views of Dredging



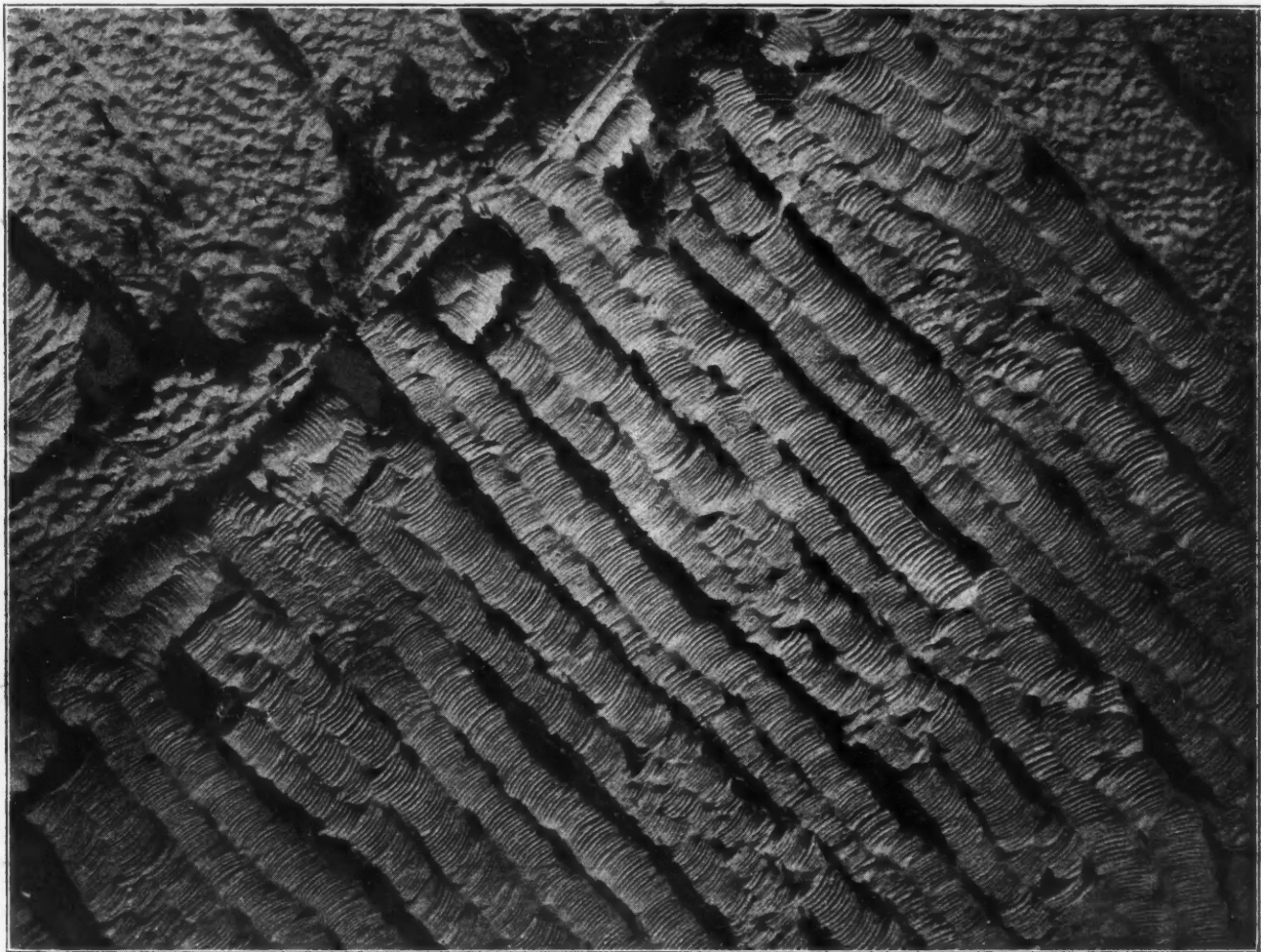
YUBA RIVER VALLEY, CALIFORNIA, AS SEEN FROM AN ALTITUDE OF 6,000 FT.



GOLD DREDGING ON THE FEATHER RIVER, CALIFORNIA. THE DREDGE IS CLEARLY DISTINGUISHED IN THE LEFT FOREGROUND



SNAPPED FROM AN ALTITUDE OF 6,200 FT. NOTICE THE DREDGE IN THE UPPER LEFT HAND CORNER



DREDGED AREA IN YUBA RIVER VALLEY, AS VIEWED FROM AN ALTITUDE OF 5,800 FT.
The poker-chip appearance has been produced by the stackers of the dredge, which discharge the gravel in curved ridges, each district ridge (poker-chip edge), representing an advance to a new digging position.

Primitive Smelting

Old-Time Metallurgists Achieved Fairly Satisfactory Results by Means of Simple Apparatus And Methods—A Treadmill Blast Furnace—Ancient Type of Smelter Still Practicable in Remote Districts

By C. A. GRABILL

Written exclusively for *Engineering and Mining Journal*

ANYONE who has been interested in mining in Mexico has probably had his attention called to the many old slag dumps dotting old or abandoned districts. He has also probably sampled a number of them, only to find in most cases that the metallic values are too low to warrant shipping and re-treatment. There are exceptions to this condition, and from one dump on the site of the old city of San Juan Bautista, Sonora, I smelted about a thousand tons that contained



NATIVE BLAST FURNACE

nearly 2 per cent of copper and about 10 oz. of silver per ton. Considering, however, that the old-time metallurgist who made that particular lot of slag in the latter part of the eighteenth century was smelting a very high-grade ore, and producing bullion, not matte, and that the slag ran 40 per cent SiO_2 and 20 per cent Al_2O_3 , I cannot see that there was any reason to complain of the work; in fact, I would not care to try that particular slag in a modern water-jacketed furnace.

The old Mexican dumps are usually credited to "antiguas," probably because that seems to add to their attractiveness for the prospective buyer, but in reality the type of furnace which produced them has not yet disappeared, and as late as 1905 there were said to be sixty-eight in regular operation in the city of Matehuala alone.

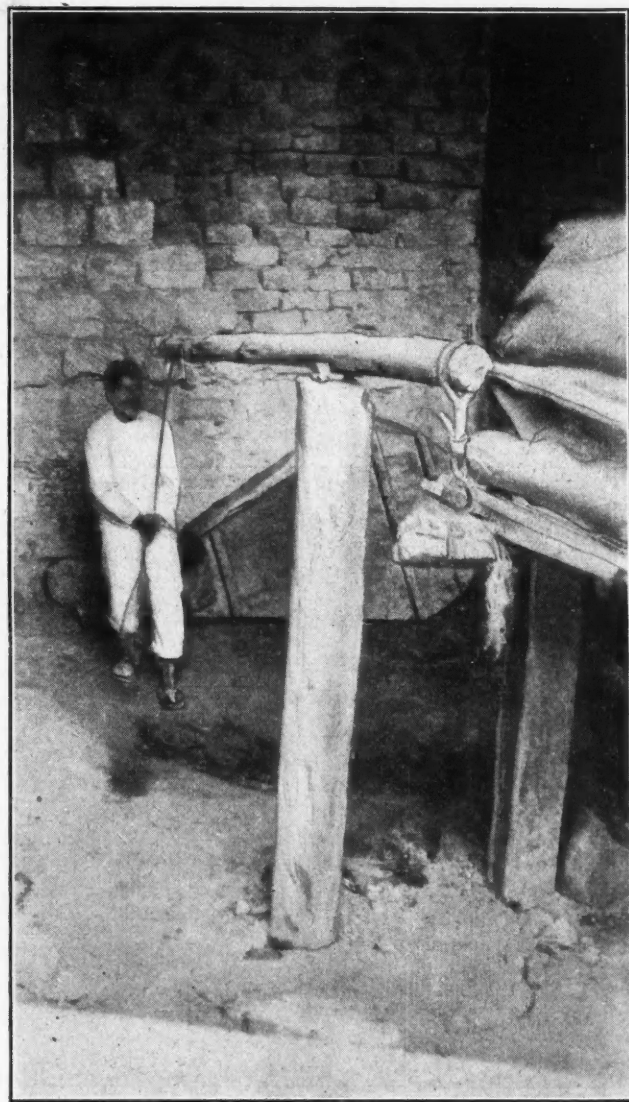
The demoralization of the Mexican transportation system and the closing of a number of the smelting plants doing custom work have revived a few of these old furnaces, and, having the opportunity of watching one in operation, I present some pictures of the installation, thinking that perhaps readers of *Engineering and Mining Journal* may find the description interesting.

The primitive furnace and the metallurgist with his tools are shown in the first picture. The furnace is in blast, and has just been tapped, the light spot on the floor being the hot slag and lead and the smooth place in the wall over the back of it is the front of the furnace.

The furnace had a cross-section one foot square with vertical walls, and was four and a half feet from tap hole to the top. The walls were of granite blocks, the front section being built separately, so that it could be pulled out for cleaning and repairs at the end of

the campaign. Originally, there were several of these in a row, the space between being filled in with rock and adobe brick, flush with the front of the furnace, as is shown in the picture. There was no chimney. The top of the furnace was open to the room, but the roof of the room was built as a large cone terminating in a chimney, which caused sufficient draft to keep the air fresh.

The power plant is shown in the second picture, though the power house was too small to permit of a photograph that would show the whole arrangement. The blast was furnished by a blacksmith's bellows, one-man power, which delivered the air to the furnace through a two-inch hole in the back wall of the furnace. A spare blower is leaning against the wall just back of the man.



THE "BLOWER" AND "ENGINE"

At another plant the operator had arranged two bellows side by side, and stood on them with a foot fastened to each, supporting himself by a horizontal bar, treadmill fashion. By stepping first on one, then on the other he kept up a more constant and uniform blast than in the single-blower type. The bellows were not connected to the furnace, but the nozzle was simply inserted loosely in the tuyère opening, so that there was considerable lost blast and the pressure was very low.

The material treated was a high-grade lead-silver ore, and was prepared for smelting by careful layering with a little flux and some old slag in a mix bed two or three feet wide, six feet long, and about ten inches deep. Operations were continuous, and the charge consisted of one wash basin full of mix and one full of charcoal.

The lead and slag were tapped into a small circular forehearth excavated in the earth floor just in front of the tap hole. The slag was chilled by throwing water on the tap, and was lifted off in layers, much as Schnabel describes the practice in some of the German smelters. When sufficient lead was accumulated it was tapped into another basin in the floor, shaped like the pans of a Kilker matte car.

The slag was thrown outside, to be sorted for any adhering pieces of matte or metal, and then broken



"PLANILLA" USED IN WASHING CRUSHED SLAG FOR THE RECOVERY OF METALLIC SHOTS AND PIECES OF MATTE
CUPEL HEARTH

up and washed on a planilla. In the third picture the breaking up is shown in the upper right corner and the planilla on the left. The operation is conducted by placing the pounded slag on the upper side and throwing water over it with a scoop, thus washing the light clean particles to the lower side and leaving the metallic shot behind. The operation is not nearly so crude as it appears.

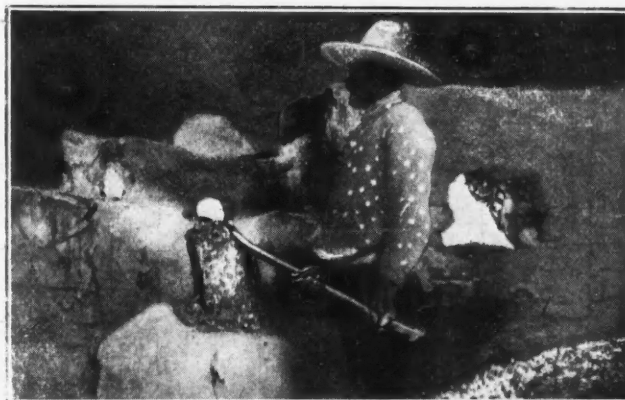
When sufficient lead is accumulated it is cupelled in the small furnace shown in the last picture. The photo is a poor one, but with care the arrangement can be seen. The large rectangular mass occupying the right half is the fire box. It was wood-fired, and the light spot is the open fire door.

The lead is cupelled in the small reverberatory, which will be seen to be about half the size of the fire box. The attendant is drawing off the litharge through the small circular tap hole in front of him, the shiny mass on which he rests his bar being the litharge. The litharge is shipped to Guadalajara, Guanajuato, or elsewhere, for use as a glaze in the pottery industry, and the bullion is sold as opportunity offers.

Another form of cupelling furnace has a roof consisting of two concentric hemispheres of clay, the flames from the fire passing first through the laboratory

and then through the space between the two shells, finally escaping from a chimney on top. The object is, of course, to conserve heat by reducing radiation losses, and as a means of attaining high temperatures with poor fuel is not without merit.

The capacity of these furnaces is about one ton per twenty-four hours, and they are not expensive to build.



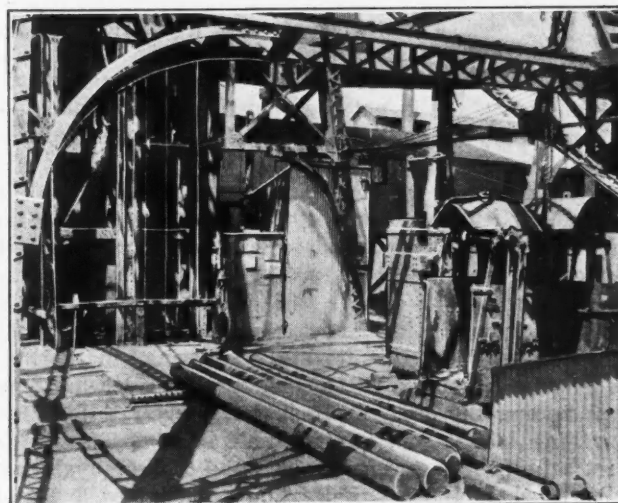
NATIVE SMELTERY IN MATEMALA, S. L. P. MEXICO

The crew operating the one described consisted of a metallurgist, an assistant, and three laborers.

At various times advertisements have appeared of small water-jacketed furnaces for prospectors. Their day has pretty well passed, if it ever existed, but it does seem as if these adobe furnaces can still be used in out of the way places with a reasonable amount of success, even if they have to be built, like the modern concentrator, on the unit system.

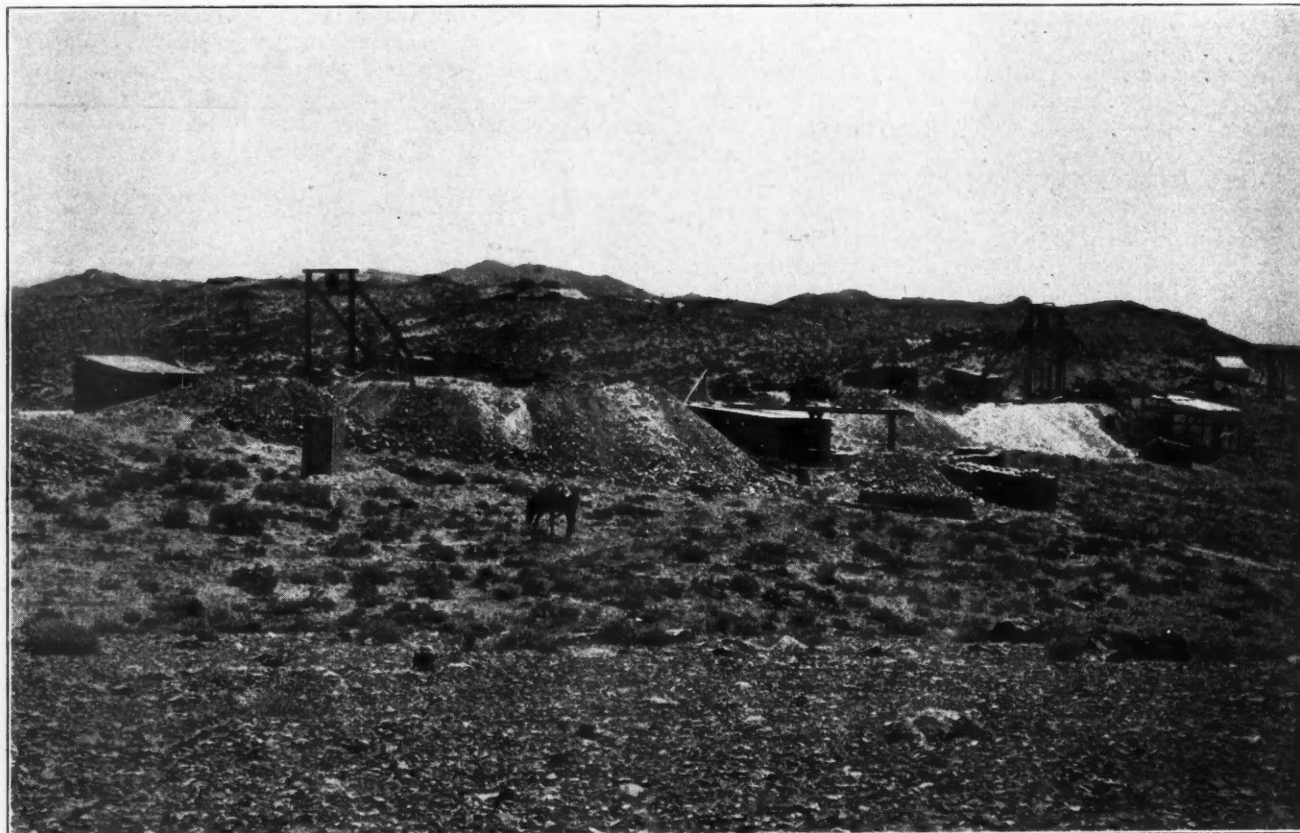
Handling Stull Timbers

Stull timbers are frequently of inconvenient length, and facilities for handling them rapidly at the shaft mouth are essential. An efficient arrangement will save time and materially reduce the cost of handling. At the Belmont mine in Tonopah, Nev., the timbers are laid at right angles to the major axis of the shaft, one end being supported by a train of rollers, which



SHAFT COLLAR, BELMONT MINE, TONOPAH, NEV.

are shown in the photograph. When a cage is ready to be loaded, the timbers are easily pulled to the cage, ready for up-ending. The rollers are supported at short intervals so that each will move independently.



EARLY DAYS IN GOLDFIELD, NEV. LESSEES ON THE JUMBO CLAIM

Old-time prospectors, Harry Stimler and William Marsh, discovered float gold on Columbia Mountain, north of the point shown in the picture. On May 24, 1903, the Combination lode was located and gold ore soon afterward discovered.

Systematic Prospecting

Employment of Experienced Geological Engineers, in Connection With Well-Trained Younger Engineers, Operating Under an Organization Well Financed, Is Believed Necessary To Maintain the Supply of Mines

BY WILBUR H. GRANT

Written exclusively for *Engineering and Mining Journal*

PROSPECTING is a necessity to the mining industry. It is not the romantic occupation of a visionary miner to acquire great riches with little effort. In the economics of the world there are two basic industries upon which most activities of life depend. Without either of these, the present methods of living, as they are found in organized society, could not exist. The industries are agriculture and mining.

Prospecting for ore is the first step in mining. Following prospecting comes exploration, development, mining, transportation, milling, smelting, marketing, and manufacturing. All succeeding steps depend upon first finding the ore. Let mankind express a need for anything made from an inorganic substance, and the first call is for the prospector to find the raw material. Why, then, should not the finding of such raw material in nature be organized so that results can be obtained with the greatest efficiency? Why should the finding of the ore be given less well-directed thought than the other steps in the process of delivering the finished product?

Inherent in man there is a gambling spirit, the desire to take a chance. This gambling spirit manifests itself

in varying degrees in different individuals. Its influence in the same individual varies in intensity at different times. Prospecting is one way in which this spirit manifests itself in some men. Since the beginning of recorded history, there has been a desire in man to find metals and other inorganic substances. The reasons for this are legion, and self-evident. Each man who prospects has his own individual incentive, whether it is clearly formulated in his mind or not.

Most prospecting has probably been done by miners who have been devoting more or less of their time to that business. The way in which the miner carries out his prospecting is determined by his own particular ideas formulated through the preceding years. His preparations for prospecting are usually incomplete. He does not accurately know the rocks and minerals in all their forms. He has to be guided by the limited knowledge he has gained in the particular camps where he has worked. The methods which he uses are usually as inefficient as one would ordinarily expect methods to be when formulated by men of a similar degree of training in other businesses. It is commonly the case that the prospector answers the "call of the wild," an in-

definable passion in man; and frequently he desires more to find the ore than to possess the riches which follow from finding it. If all the facts could be summarized, it would probably be found that the number of successes following such efforts are almost nil compared with the number of failures.

Occasionally a prospector makes a "strike." Immediately following a "strike," there is a "rush" of other prospectors to the district where the "strike" has been found. The personnel of such a rush is often a polyglot of men and women. A large number of such people are tenderfoot prospectors, who have never known anything whatever about mining, but have been attracted to the district by the surcharged atmosphere, which has excited beyond their control their sense of romance or desire for wealth. Following or accompanying these numerous kinds of people, who intend to do the real prospecting, are abundant parasites on society, who expect to make more from the good- and ill-fortune of the real prospector than from doing any actual prospecting themselves. The net results of such rushes are strikingly a multiplication of effort and inefficiency in all activities. The experience derived has been, and probably always will be, fine subject matter for fiction as illustrations of the primitive human passions.

More conservative incentives for prospecting are the economic needs of political units to make each unit self-supporting in times of war and the higher price of metals. An example of the latter is presented in the case of chrome, tungsten, manganese, and pyrite during the war, and in the high price of silver at present. Prospecting which has been brought about by these incentives has been conducted along more rational lines.

As long as there is an abundance of metals and materials in developed reserve, there will probably be the same lack of system in prospecting for new ore deposits as there has been in the past. When the present deposits approach exhaustion, there will be an increasing tendency to place prospecting on the same systematic basis as other branches of mining. As that time approaches, necessity will force mining men to lay plans to meet the situation. Far-sighted investors will inaugurate new systematic methods to avoid waste of time, effort, and money, and to receive benefits from such efforts before urgent necessity forces them to it.

PROSPECTING PROBLEMS DIFFICULT TO DEFINE

The line of demarcation between exploration and prospecting is not sharp. Exploration usually includes the steps taken in developing into mines the mineral deposits which have been found by prospectors. Prospecting is the finding in virgin country of mineral deposits which are capable of being developed into mines. On account of the close relationship between these two branches of mining, a prospector often performs both functions.

The experience of exploration companies has been that about one mineral deposit in 400 coming to their attention has developed into a productive mine. The average success of prospectors has been in a much lower ratio than this. As a consequence, the problems of the prospector are difficult to define. The chances of finding mineral deposits which can develop into mines are few. There is no infallible method of finding them. All that can be done is to assemble existing facts and give them to a capable individual to work out a method of procedure best calculated to find mineral deposits with the

least energy, time, and expense. Even with the best of methods, the desired results may not be forthcoming. That is the chance that all interested will have to take. The best that can be done is to adopt what appears to be the most feasible method when starting the work, and profit by experience as the work proceeds.

The prospector has to contend with most difficult transportation problems in the roughest kind of country. He must endure extremes of climate and solve problems of shelter. All of these entail time-consuming routine. He first has to find the country favorable for deposits, as most of the earth's surface contains no mineral deposits of commercial value. He has then to discover the mineral in the district when he has found promising country. This is also a difficult problem in itself, as much of the favorable country is covered with soil and vegetation, which obscures the mineral in place. After finding the mineral, the prospector is under the necessity of determining whether it is of the right character to develop into sufficient quantity and high enough in grade to be of commercial value. The obstacles he has to overcome are so numerous and difficult that he cannot be expected to find profitable deposits in a short period of time.

A prospecting enterprise, to be successful, must be organized in such a way as to continue over several years without discouraging the organizers if commercial deposits are not found promptly. Sufficient finances should be available so that the field man will not be handicapped in any of the work he has to do. In other words, the actual prospecting is of greatest value to the organizers, so that all arrangements should be made to cut the routine efforts of the field man to a minimum. Persistence is also a necessity for success.

FACTORS OF SUCCESSFUL PROSPECTING

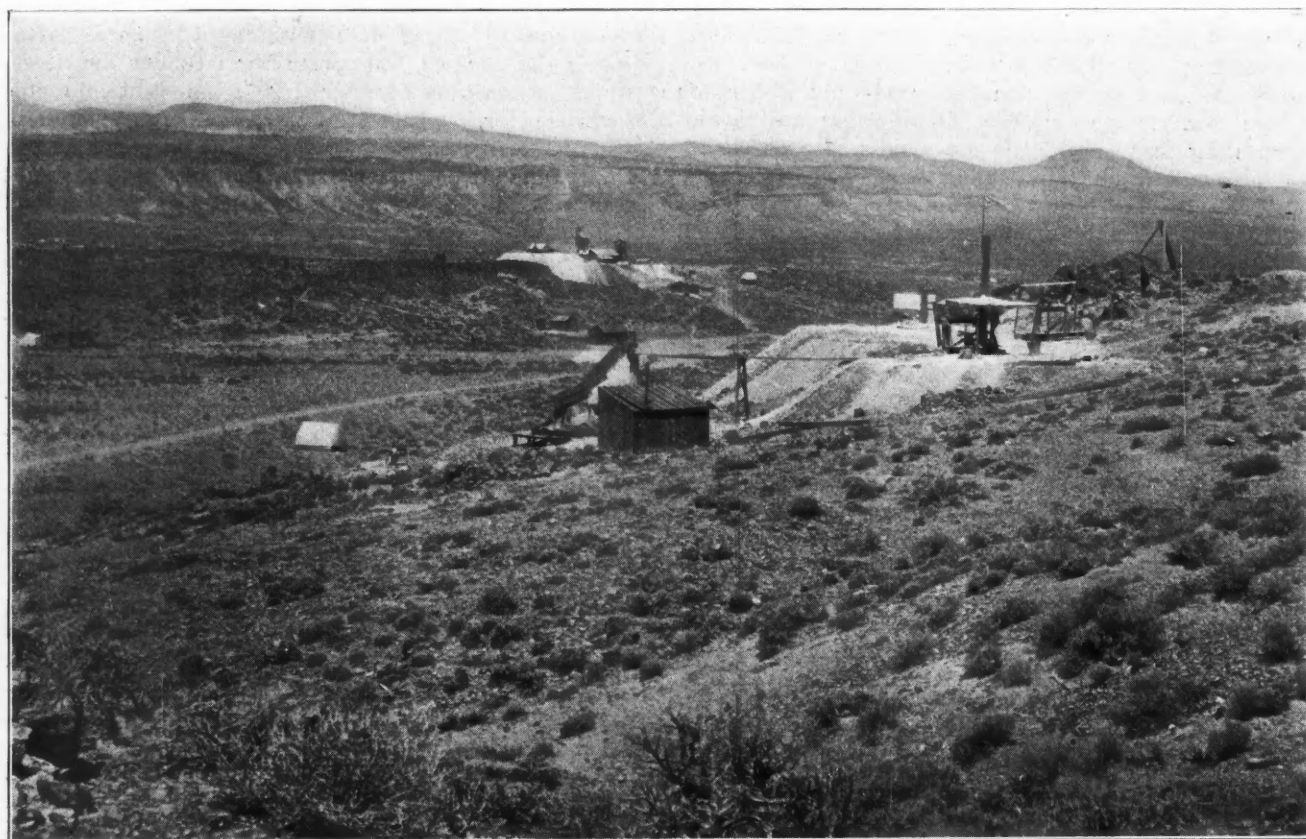
If any man wishes a suit of clothes, it is natural for him to engage a tailor to make it. If there is something the matter with his eyes, he consults an oculist and not a physician. If he wishes to organize a corporation, he engages a corporation lawyer, and not a lawyer in general practice. In each of these cases, as a rule, the lower the price he pays the cheaper the result. The same accepted business principles should guide organizers when they attempt to systematize prospecting. The organizers should, therefore, not go to a miner to direct the field work, as the miner's knowledge may be and usually is limited, and his experience is local. He should not go to young men just out of college, as they have theory but little experience. He should not go to college professors, as such professors are supposedly more inclined toward research, and are less likely to have a commercial point of view. He should not even go to a general mining engineer, as that individual's knowledge of mining costs is often greater than his knowledge of ore deposits. The most logical thing for the organizer to do is to go to the geological engineer, whose life work has been devoted to finding orebodies of commercial value. Such a man knows the theories of ore deposits, and their distribution and is familiar with the cold-blooded point of view of the intending investor. The greater the experience of a geological engineer, the more capable he is of organizing and directing prospecting to get the results that the investor seeks—that is, the finding of mineral deposits capable of being converted into profitable mines.

The geological engineer possesses an intimate knowl-

edge of the way ore occurs in the earth's crust. He knows, or should know, the detailed characteristics of numerous widely scattered mining districts as a result of his personal observation. As a rule he will know mining men who are familiar with other camps which he himself has not visited and from whom he can get reliable data. He knows the geological literature, and how to find in the mass of it, with the least effort, the information he most needs. He is often familiar with the qualifications of many younger men, who would fit in advantageously with the routine of the work. Such a man should have a geological imagination well developed, but an imagination guided by practical experience. He should have good judgment, so as not to waste time, though he will not overlook possibilities.

thought to let the worker share in the profits derived from his work; to make the technician in an organization an officer of the company and a member of the executive council which decides the policies of the organization; that business methods require that an organization be built up around the particular characteristics and qualifications of the individuals composing the organization, rather than to try to find individuals who will fit into a theoretical plan of organization.

In addition to the foregoing factors, the resources of the investors, political conditions in the country to be prospected, the character of the metals or materials sought and their market prices (reflecting man's need for the commodity) must be considered. These, how-



EARLY DAYS IN GOLDFIELD, NEV.

In the distance is the Combination mine, the first important development. In the foreground are lessees' shafts

He should have a knowledge of nature, so as to be able to utilize her products and work with her forces rather than against them. Above all, he should have that indefinable power which, for want of an accurate term, can be called the instinct for finding ore.

In addition to finding the man qualified to organize prospecting investigations, the investor should make it sufficiently attractive to induce such a man to undertake the work. Here the knowledge of psychology will have an important bearing. It can be assumed that a man of this kind will be willing to take the chance of placing his knowledge and time against the investor's money. It can also be assumed that he will not be rich, so that it will be necessary to furnish him and his field assistants with funds for all necessary expenses, and to provide a nominal salary to cover the necessary personal obligations of each.

It seems to be the tendency of present-day economic

ever, would tend to effect only the detail of the general scheme of systematic prospecting.

The business of mining is increasingly showing the desirability of systematic prospecting, even though there are sufficient reserves already developed to meet practically all present needs. The probabilities are that the future will show the necessity for systematic prospecting. While the idea of systematic prospecting is developing, it is worth while to offer constructive suggestions regarding the best method of organizing it. The plan presupposes that the organizer has the characteristics and qualifications already described. With different material, human and otherwise, the plans would have to be correspondingly modified.

The first step in organizing systematic prospecting is for the interested investors to select a geological engineer to direct the field work. This should be done with care, as much of the success of future activities

will depend on his personal and professional characteristics and qualifications. After the engineer has been selected he should be given as free a hand as possible in directing the field activities. He should lead in discussing plans for organizing the work. Some of the questions which will have to be initially decided are: The kind of metals or materials desired; the territory in which the prospecting is to be done; the time necessary in which to do the work; the amount of capital necessary to finance it; the plan of organization for financing the work; the plan of conducting the field work.

The members of the conference should make the geological engineer manager of the field work and an officer in the company, particularly a member of any board (of whatever name it may be called) which decides on the policies of the organization.

The traditional practice of prospecting has been developed around what has been known in mining parlance as the "grub stake." By this method the investor puts up his money against a prospector's time. In other words, the investor gives the prospector all the money he needs for living expenses, but no salary. The usual and customary plan of sharing in the results of the work is for each to share equally in the profits obtained from whatever is found, though this arrangement is, of course, subject to modifications. This old and well-established practice can be incorporated in a plan of systematic prospecting in the following manner:

The geological engineer will agree to devote his whole time to the work of the organization and take full responsibility for the field work, the investor to agree to pay a minimum living salary to the geological engineer and all expenses incurred in connection with the work.

If the enterprise fails to find remunerative deposits, the investor will lose what money has been advanced, and the geological engineer will lose the time which he has devoted to the work. If the enterprise succeeds, the investor should receive all net profits derived from the enterprise until all the money he has advanced has been returned. After that, the investor and the engineer should share equally in the profits of the undertaking.

The plan does not mean that half of the profits would go to the geological engineer and half to several investors, as the geological engineer would probably organize his work in such a way that he would have to share his half with his field assistants. The plan matches money equally with talent, and is a sound basis for getting additional profits in mining for the man with money, as well as wholesome, enthusiastic cooperation of the talent in this particular line. For the man with money to do prospecting himself, or for him to secure a low-priced geologist on a salary, would be like the same man doctoring himself, or employing a quack, if he is ill. Where life is involved the best services are the cheapest. Why is it not also true that the services of a man with the best qualifications for prospecting are also the cheapest for getting results?

Systematic field prospecting has been done with astonishing success. Iron deposits in Lake Superior districts and Canada have been found by the use of the dip needle in the hands of trained engineers. Oil in many parts of the globe has been found by systematic prospecting. Other examples might be given to show its practicability. The plans which I suggest are not wholly new. The suggestions are intended to crystallize

some of the best practices into concrete form. Special methods have to be used for each particular type of deposit. However, certain principles apply to all.

Instead of using the prevalent practice of sending out inexperienced men to do scouting, the geological engineer who has been selected to direct the activities of the organization should himself do the first work in locating the areas favorable for detailed study and prospecting. After he has located favorable areas, he can place his younger assistants, who have already been trained by him, to do the detail work in the area. As each group of assistants completes an area, they can be moved to another one, which has been located in the meantime by the geological engineer. If the assistants find nothing of interest in an area, the geological engineer need not return to that area. If the assistants do find something showing possibilities, the geological engineer can return to the area and devote all the time necessary to determine the possibilities, and report to the organization, with recommendations for future operations.

One of the important necessary features for directing the field work is for the geological engineer to work out the needful details as that work progresses. It is assumed that the geological engineer, as directing head of actual field operations, will be versatile and equal to any emergency that arises. It would be futile to go into details as to how the field work should be done. The results which the investors desire to get will guide the geological engineer in outlining the details of that work in a way to get the greatest efficiency.

The problem of successful prospecting is, needless to say, the selection of the right man to manage the work.

A "Green" Stone in Demand

BY S. H. HAMILTON

The makers of artificial roofing find a strong demand for greens. Crushed green slate has been used, but is not bright enough and soon deteriorates. Epidote rock has recently been used, but owing to the toughness of the original rock, and the included impurities, the most objectionable of which are sulphides, it is not entirely satisfactory. The mill that has been grinding and sizing epidote rock for the trade at South Mountain, Pa., has been burned, and will not likely be rebuilt. The olivine rocks of North Carolina are about to be examined for their suitability for this purpose.

Wash Day Twice a Year

A phase of mining practice based upon the degree of patience possessed only by a Mexican is reported from Rich Hill, an Arizona eminence wherefrom in 1864 some hundred of thousands of dollars' worth of nuggets and coarse dust was taken by the Pauline Weaver party. The gold was from a depression on the peak that still is combed over by hopeful prospectors. One of the latter-day miners, a Mexican of long residence in the locality, has evolved a scheme of gold washing in which Dame Nature does most of the work. He dumps the gravel into a rocky ravine near by that carries a torrent of water twice a year, but usually is dry. Most of the material is washed away, and the gold thereafter is looked for in natural pockets below. The process is slow, but appears to provide the patient one with enough for beans and tobacco.

BY THE WAY

A Pioneer of the Cœur d'Alenes

At the recent meeting of the directors of the Consolidated Interstate-Callahan Mining Co. in New York it was the unanimous decision that the company should discard its unwieldy name, both as a matter of convenience and to avoid the confusion caused by the tendency of those whose time is too valuable to say the full name to call it the "Interstate" and others the "Callahan." As a further reason, it was the desire of the directors to honor the man who discovered the great zinc-lead mine, who devoted the best years of his life to its development, and who is now the largest individual stockholder in the company, James F. Callahan, of Wallace, Idaho. Following the action of the directors, steps were taken at the annual meeting of the stockholders, which was held on April 12 at Phoenix, Ariz., to change the name to the "Callahan Zinc-Lead Co.," a designation that will at once be distinctive and a merited tribute to the pioneer prospector of the Cœur d'Alenes who discovered it and through long years of effort made it a mine.

What Do You Think?

Is the ouija board to come into its own as an aid to discovering ore deposits? Divining rods and similar devices do not always work, but there should be no such hitch with ouija. The advantages of it, when it works, are great. The money saved by doing away with fruitless underground prospecting will more than pay for the first cost of installation. Every prospect drift, crosscut, raise, or shaft that is avoided means money for the stockholders. Money saved is money earned—money earned means dividends. Furthermore, think of the orebodies now passed by that would not be overlooked, if ouija were employed. Every abandoned mine, prospect, or hole in the ground presents untold possibilities, as any promoter knows. Ouija at once shows up these possibilities. Do not be fooled. You won't, if you use ouija. Think of ore that has been missed by almost a hair's breadth, as it were, only to be found later after the bottom had fallen out of the metal market? Who would own the Premier today, if the engineer who skirted the body so nicely with his tunnel had used a little ouija on it? The matter is one that deserves careful consideration, and members of the profession are urged to express their opinion on it.

(BY SROLIVER LODGE.)

Amphibious Amphibole

There is something euphonious and appealing about the mineralogical term "amphibole asbestos," although the unfortunate buyers of stock in the "New Methods Moulding and Metals Company" have probably been too much fed up on high-sounding language in which the merits (or demerits) of their investment were couched, to thoroughly appreciate the designation. The machinations of this recent successful camouflage were brought to light upon the arrest of one Earl Victor Broughton von Brandenburg, who has been sentenced to a term of three years and six months at Sing Sing. In advertisements and circulars this concern was represented as the owner of an alleged asbestos mine at Tompkinsville, S. I. Drawing on his imagination—

and it should be mentioned that Brandenburg is known as a "free lance" writer under the *nom de plume* of Broughton Brandenburg (also euphonious)—this promoter also hinted that gems of several kinds were likely to be found in the proximity of this mine. The bubble burst when William A. Maxwell, owner of the property, returning from a western trip, found that someone had dug a hole on his grounds and had photographed a group near the "mine shaft" who purported to be the "operators and investors." And so it goes. There is no closed season for suckers.

The Old Silver King

One of the greatest "specimen mines" ever known was the old Silver King, in the early 80's. As most of the wire and native silver specimens were worth about \$10 a pound, an unfeeling superintendent denied the public access to the dump. So there was evolved the scheme of subsidizing one of the teamsters of the wonderful eight-mule teams that hauled the ore to the mill at Pinal, five miles distant. At certain remote spots on the road, the teamsters would often throw rocks at the leaders of the mule teams, and these rocks have formed the prize foundations of many a southwestern ore cabinet. In this connection, there was found lately, near the Silver King, under the adobe chimney of a cabin under repair, a substantial box filled with valuable specimens of wire silver, undoubtedly buried nearly forty years ago.

Shamrocks and Malachite

The *Verde Copper News*, of Jerome, Ariz., celebrated St. Patrick's Day by getting out a twenty-eight page "Republic of Ireland" edition printed entirely in green ink. The only inharmonious note in this number was the main headline of the news section, "Red Radicals Seeking Soviet."

Star Gazing

A new star has been discovered in the constellation Sagittarius by a member of the Harvard Observatory staff. Thus another world of geologic problems yet to be pointed out. But many of earth's mysteries are open secrets in the stars, and there are those who stand ready to explore the limits of space in person if some vehicle can be obtained. The other day, a venturesome person, finding life too tame since the armistice, volunteered to go to Mars in a rocket, provided communication with the planet were first established and a preliminary rocket, as a range finder, were landed on its surface. Some will say that this dare-devil was perfectly safe in making such an offer. But interstellar rapid transit may some day be an accomplished fact. Then one can have his ticket written for Archæan time or the Glacial Period at will. Sportsmen to whom earth has grown tame may hunt the Dinosaur or his stellar equivalent on its native heath, and trilobite *Triarthrus Becki*, or his cousin, may be found at home by all inquirers. Man will cover these magnificent distances with the speed of thought, assuming perhaps an astral form to do so. Space will then be explored not by the study of photographic plates but by search of space itself. The first explorer will be a sort of superman, but in the course of time, as wandering around the universe becomes commoner, earth's itinerant optimist, the prospector, will find a wider field than he has ever had before.

The Montanans are nery people. Now they are drilling in the Devil's Dome!

CONSULTATION

Oil and Gas Seepage

"Your opinion on an oil and gas seepage that I discovered in the northwestern part of — County, Ariz., is desired. While on a prospecting trip, I noticed along an old wagon road black greasy spots, and, upon investigation, saw vapor coming out of the ground which smelled like oil. I traced those spots for a mile or more across the formation, and one spot in particular measured 96 ft. across. I am not conversant with oil geology, and would like information on the surface indications of oil. The rocks in the vicinity are highly stratified, quartz, shales and sandstone predominating. In the early morning or evening the smell of oil is very distinct."

The "indications," such as they are, should be regarded critically, to determine if they are not possibly of artificial origin. If artificial origin is impossible, the alleged spots should be tested to determine whether soluble hydrocarbons or merely carbonaceous matter is present. Bituminous or carbonaceous matter does not necessarily indicate oil in commercial quantities. Dorsey Hager, in his "Practical Oil Geology," says:

"Oil signs, such as seepages, brea beds, and 'gas shows,' may or may not occur in a region that contains oil in commercial quantities. If the oil-bearing formations are thickly covered with alluvium or other non-productive beds, oil may not appear at the surface, though the underlying structure may be favorable to the accumulation of oil. One may, however, find oil in springs, or staining the small streams that cut through oil sands. Oil-stained rock and 'gas shows' are favorable signs.

"Light gravity oils do not form heavy asphalt beds, as the constituents are readily washed away by water.

"The best places to look for evidences of oil are in the beds of gullies and canyons, and on the steep erosion—scarps or cliffs that occur in many regions. Old mines and water wells are all good places to search for oil and gas indications, especially where the oil rises on top of the water.

"Cautions—Investigators have many times been called to regions where iron and manganese oxides, black alkali, or vegetable stain was thought to be oil. Sometimes gas escaping from springs gives clues to petroleum. Be sure, however, that the gas will burn, as many non-hydrocarbon gases, such as sulphur dioxide and carbon dioxide, are non-combustible. Marsh gas from old lake beds has many times been considered a good sign of petroleum and led to oil excitement, but marsh gas occurs in many regions where petroleum does not exist.

"Sometimes oil sands are almost white, due to sulphur stains, and one would scarcely suspect them to contain petroleum. Dig into such beds a few inches and chocolate, greenish, brown or black-colored oil sand may appear."

Louis S. Panyity says in his book "Prospecting for Oil and Gas":

"Seepages—In the course of field work one should always be on the lookout for seepages of oil and gas. In a country not previously prospected, and where the geological horizons are not well known, seepages are of

great value in determining the possible oil and gas-bearing horizons. Seepages may be either at the outcrop of the strata or may be at a fault, and thus in each case the conditions under which a seepage is found should be determined. Seepage may be from shale, and is, therefore, important only in determining the possible source from which oil may migrate into a suitable reservoir. A seepage at the outcrop might indicate that the stratum is petroliferous, and in following the stratum down the dip away from the point of seepage and under good structure it may become a good prospect. If the outcrop is well sealed by the residue of evaporated oil, the latter may be found close to the outcrop. A change in the lithological character of a rock may also permit accumulations a short distance away. There are a great many pools so located, near the outcrop, and, although generally small, yet commercially valuable, as they are shallow and, therefore, not expensive to operate. Outcropping sands may be analyzed to determine the presence of oil, by treating a crushed sample with ether; the hydrocarbons, if present, will be in solution, which upon evaporation will show an oil ring as a residue. Dark and black color will indicate an oil containing asphalt for a base, and a light color indicates paraffin.

"Do not be misled by floating of iron stain upon water. To the casual observer it is similar to a film of oil, but it is only iridescent films of iron hydroxide. The two may be distinguished simply by disturbing the film, and if it is iron stain it will break into irregular pieces, but in case of oil it will make round patches and will easily 'run-together' again. Many useless oil excitements have been caused by the finding of such an oil seep."

In oil prospecting, it should be noted that though seepages and other indications are of importance, the presence of sedimentary formations belonging to geologic epochs which have been found favorable for oil elsewhere are of equal if not of greater importance.

Testing Ores and Minerals

"I am sending you under separate cover a sample of mineral. Please advise me as to the value and possible market for this mineral."

Most of our readers appreciate the fact that it is out of the question to maintain a chemical laboratory as an adjunct to an editorial office. It is also known to experienced mineralogists that confirmatory tests, both physical and chemical, are essential for the accurate determination of most minerals. There are a number of common minerals which can be determined out of hand, as it were, but, despite this fact, we have made it an invariable rule not to determine mineral specimens, and have followed the practice of referring such inquiries to chemists, assayers, or to state organizations that exist in many of the Western states. In the Annual Review number of the *Engineering and Mining Journal*, on page 203, you will find a list of state geologists to whom you can direct an inquiry and from whom you will get information.

THE PETROLEUM INDUSTRY

Oil-Field Water Problems.* Part I

Chemical Analyses Play Important Role in Determining Source of Underground Waters and Enable Production Engineers To Control Water Infiltration Troubles — A System Of Chemical Hydrology Explained

BY A. W. AMBROSE†

OPERATORS in many oil fields have recognized the importance of a knowledge of the composition of the waters occurring in the sands underground, and they have often made profitable use of the results of water analyses as factors in solving oil-field production problems. Many operators, nevertheless, look on water analyses with apparent indifference. Their skepticism may be due to the fact that the usual report of a chemical analysis of water has been a bald statement of amounts of several substances or parts of substances contained in a given amount of the water examined. In other words, such a report is merely a summary of substances or parts of substances, telling nothing of their effect on a water and offering nothing to distinguish the items from one another, except their names.

Underground waters, like surface waters, are solutions of several inorganic salts, and their qualities or characters depend on the chemical nature and the proportional amounts of the substances contained in them. A solution of calcium sulphate is, for example, hard and saline; one of sodium sulphate is soft and saline. A solution of sodium carbonate is soft and alkaline; and a solution containing both sodium sulphate and sodium carbonate is soft, saline, and alkaline.

By simple inspection any one can understand that calcium causes hardness in waters, and that sodium does not; sulphates cause the property of salinity, and carbonates indicate alkalinity. The properties or qualities of solutions containing mixtures of salts dissolved in water can be determined as accurately as can those constituents which confer these properties on waters. Salinity and alkalinity are fundamental properties of natural waters, and therefore, if the chemist's report of an analysis of a water is intended to indicate the kind of water analyzed, his results should be stated in a form that shows the relative values of these properties.

A system of chemical hydrology based on the chemical nature and proportional amounts of the substances dissolved in natural waters has been established by Chase Palmer.¹ In this system, water analyses are interpreted in terms of the properties conferred on natural waters by the inorganic substances dissolved in them. The results

of water analyses therefore may now be used successfully in scientific investigations and may also be applied profitably to the solution of certain industrial problems.

In a chemical survey of river waters of the United States, Palmer shows the close relation of the properties of water to geological formations. He traces the changes in the properties of river waters caused by changes in type of rock material, and discovers the manner in which the water of an inland sea, like Lake Erie, is modified by the river waters discharging into it waste brines from the numerous oil wells of northern Ohio.

By means of the reaction properties of Western stream waters, Walton Van Winkle has made valuable contributions to geology. For instance, the underlying formations of the southern part of Puget Sound were formerly supposed to consist of sedimentary rocks. Van Winkle² observed the water of Wood Creek to be primary alkaline, indicating that the prevailing rock is of igneous origin. The evidence of his water analyses suggests that the glacial drift in the basin of Wood Creek was derived from the igneous rocks of the Cascade Range and not from the sedimentary rocks of the valley floor.

The properties of the water of Wallowa River indicate that the prevailing opinion regarding the rocks of northeastern Oregon is erroneous. The rocks were supposed to be volcanic. Van Winkle³ found the water to be secondary saline. Secondary salinity is characteristic of sedimentary formations, and he was thus led to suspect that in the upper part of the basin calcareous rocks would be found. Special investigations of that region disclosed the existence of several faults, and between them large deposits of sedimentary rocks resting on diorite.

By comparing the chemical properties of waters from interior and border walls of the Ozark Uplift, C. E. Siebenthal⁴ was led to discover the kind of water from which the enormously rich deposits of lead and zinc ores were formed, and thus afforded a solution to a most difficult problem in ore deposition.

These examples show clearly that by interpreting water analyses, according to the chemical properties of waters, geologists have already obtained important and definite results. They suggest, also, that the new inter-

*This excerpt from U. S. Bureau of Mines Bulletin No. 195, "Underground Conditions in Oil Fields," now in press, is published by permission of the Director of the Bureau, in order that it may be immediately available to the petroleum industry. Part II will appear in an early issue.

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¹Palmer, Chase, "The Geochemical Interpretation of Water Analyses"; Bulletin 479, U. S. Geological Survey, 1911.

²Van Winkle, W., "Quality of the Surface Waters of Washington"; Water Supply Paper 339, U. S. Geological Survey, 1914, pp. 39-40.

³Van Winkle, W., "Quality of the Surface Waters of Oregon"; Water Supply Paper 363, U. S. Geological Survey, 1914, p. 65.

⁴Siebenthal, C. E., "Origin of the Zinc and Lead Deposits of the Joplin Region"; Bulletin 606, U. S. Geological Survey, 1915, pp. 155-156.

pretation of water analyses can help the petroleum engineer to outline a better defence against the water menace.

INVESTIGATION IN COALINGA OIL FIELD, CALIFORNIA

Convinced that knowledge of the chemical qualities of oil-field waters would help to overcome difficulties caused by water in oil wells, I made a preliminary survey in 1915 of the waters in the East Side field, Coalinga, for the Shell Co. of California. The primary object of the investigation was to discover the sources of the various waters. In September, 1916, a report of the work was made to B. H. van der Linden, field manager of the Shell Co. The original report was based on analyses of forty samples of water carefully chosen from wells belonging to the company and from a few neighboring wells. The cost of the original campaign was about \$700, but the work has saved the company this amount of money many times over. In order to point out the advantages of such work, a short account of some of the findings of that report is included.

INTERPRETATION OF ANALYSES

The analytical results in the form reported by the analysts are not themselves used to compare and classify the waters; those results serve, rather, as a means to obtain chemical values now used generally by certain members of the staff of the U. S. Geological Survey and by other progressive hydrologists. The chemical interpretation of the water analyses, therefore, is based directly on the reaction capacities or functional weights of the constituents, as distinguished from the gravity weights reported by the analysts. It describes the water as a solution having a few special properties of which the general properties, salinity and alkalinity, are composed. This interpretation has been adopted for the following reasons: The fundamental character of a water depends on the relative proportion of salinity and alkalinity; a natural classification of water is thus obtained; different waters may be accurately and rapidly compared; results are expressed concisely.

PROPERTIES OF SOLUTIONS

The properties of a solution are the assembled properties of all the active parts of the substances contained in the solution, and therefore the properties of a water can be determined by measuring its action on other substances whose natures are known, or they may be derived by calculation from the statement of a water analysis. The cause of salinity and alkalinity is concisely stated by Palmer¹ as follows:

All the radicals of the alkalis and alkaline earths tend to form alkaline solutions, but only the strong acid radicals (sulphate, chloride, nitrate) can overcome this tendency and render an alkaline solution neutral or saline. The sum of the reacting values of the strong acid radicals is therefore a measure of the salinity (saltiness) of a natural water which is a solution of salts of strong and weak acids. The sum of the reacting values of the metallic radicals in excess of the values of the strong acids is a measure of the alkalinity of water.

Palmer's interpretation of water analyses comprises two distinctly different expressions—a "character formula" and a statement of the chemical quality of the solution. The character formula shows in detail the relative reaction capacities of all the radicals determined

in a water, without regard to their effect on the solution. In this formula it may be seen that the values of the basic and acidic radicals are balanced. It is primarily a chemical formula for the mixture of dissolved salt; but it is also a character formula, because from it the chemical character or chemical quality of the solution may be derived.

The second expression is a statement of reaction properties conferred on the solution by all the radicals present in the water, according to their natural resemblances and differences, and the numerical relations of these reaction properties are derived directly from the reaction capacities of the radicals as shown in the "character formula." Both of these expressions should be used to obtain a comprehensive knowledge of the chemical quality of a natural water.

RADICALS AND THEIR REACTING VALUES

Many commercial chemists report an analysis of a water in grains of chemical compound per gallon. Each compound can be readily divided into radicals by considering proportional atomic weights. Thus, given 7.34 grains per gallon of sodium sulphide (Na₂S), atomic weight Na = 23; S = 32; $46/78 \times 7.34 = 4.32$ grains per gallon of Na; $7.34 - 4.32 = 3.02$ grains per gallon of S.

Factors for calculating the amount of the basic radical found in oil-field waters are given in Table I, the amount of acid radical being found by subtraction as just given.

TABLE I. FACTORS FOR CALCULATING BASIC RADICAL

Weight of Compound	Factor
Sodium sulphate (Na ₂ SO ₄)	x 0.324 gives Na
Sodium chloride (NaCl)	x 0.393 gives Na
Sodium carbonate (Na ₂ CO ₃)	x 0.434 gives Na
Sodium sulphide (Na ₂ S)	x 0.589 gives Na
Calcium sulphate (CaSO ₄)	x 0.294 gives Ca
Calcium chloride (CaCl ₂)	x 0.361 gives Ca
Calcium carbonate (CaCO ₃)	x 0.400 gives Ca
Magnesium sulphate (MgSO ₄)	x 0.202 gives Mg
Magnesium chloride (MgCl ₂)	x 0.255 gives Mg
Magnesium carbonate (MgCO ₃)	x 0.288 gives Mg

The product of the grains per U. S. gallon of each radical by 17.12 gives the parts per million of that radical in solution. However, if analysis is reported in grains per gallon, it is not necessary to change it in the computation to parts per million. This is shown in Fig. 3 (Part II), where the reaction coefficients are multiplied directly by the grains per gallon of each radical.

Natural waters usually contain the following radicals: Sodium (Na) and potassium (K)—alkalies (positive); calcium (Ca) and magnesium (Mg)—alkaline earths (positive); sulphate (SO₄) and chloride (Cl)—strong acids (negative); carbonate (CO₃) and sulphide (S)—weak acids (negative).

Upon the proportional reaction capacities of these four groups of radicals depend the properties which distinguish waters from one another. The reaction capacity of a radical is the quotient of the actual weight of that radical divided by its equivalent combining weight. This quotient is the reacting value of that amount of the radical. Instead of laboriously dividing these weights, it is more convenient to multiply the weights of the radicals by the reciprocals of their equivalent combining weights, called "reaction coefficients." The reaction coefficient of a radical, then, is the ratio of one part of that radical to the reaction capacity of eight parts of oxygen (eight equals the equivalent weight of oxygen). For sodium having an

¹Palmer, Chase, "A Deep Well at Charleston, S. C."; Professional Paper 90, U. S. Geological Survey, 1914, p. 92.

atomic weight of 23 and an equivalent coefficient equal to 1/23, the reaction coefficient is 0.0435.

The reaction coefficients of the active radicals usually present in waters are given in Table II.

TABLE II. REACTION COEFFICIENTS OF ACTIVE RADICALS

Positive Radicals	Reaction Coefficients	Negative Radicals	Reaction Coefficients
Sodium (Na)	0.0435	Sulphate (SO ₄)	0.0208
Potassium (K)	0.0256	Chloride (Cl)	0.0282
Calcium (Ca)	0.0499	Nitrate (NO ₃)	0.0161
Magnesium (Mg)	0.0822	Carbonate (CO ₃)	0.0333
		Sulphide (S)	0.0624

Conversion of physical weights into reacting values (a)

(a) See Fig. 3 (Part II.)

TABLE III. ANALYSIS OF WATER FROM WELL NO. 16, SECTION 26, T. 19, R. 15 E.,

Radicals	Parts per Million	Reactive Values (Equivalent to Milligrams of Hydrogen)	
		Positive	Negative
Sodium (Na)	1003.2	x 0.0435 = 43.64	
Calcium (Ca)	17.3	x 0.0499 = 0.86	
Magnesium (Mg)	8.7	x 0.0822 = 0.71	45.21
Sulphate (SO ₄)	230.4	x 0.0208 = 4.79	
Chloride (Cl)	54.5	x 0.0282 = 1.54	
Carbonate (CO ₃)	1067.0	x 0.0333 = 35.53	
Sulphur (S)	51.7	x 0.0624 = 3.23	45.09
		Total values	90.30

Sample "Q," Smith, Emery & Co., analysts.

The fourth column of Table III is a translation of the actual results reported by the analysts. As in the analysts' statement, the reacting values take into account the actual amounts of the radicals, but, unlike that statement, it discloses a balance between the positive and negative radicals, and thus forms a basis for a

logical interpretation of the quality of the water analyzed. The actual values naturally vary with the concentration, and, therefore, to compare waters of different concentrations it is necessary to refer all of these values to the same degrees of concentration. This is done by omitting the concentration factor altogether, and by expressing the reacting values in per cent, as has been done in Table IV.

TABLE IV. CHARACTER FORMULA FOR SAMPLE "Q"

	Reacting values	Character Formula
Sodium	43.64 ÷ 90.3 =	48.3
Calcium	0.86 ÷ 90.3 =	0.9
Magnesium	0.71 ÷ 90.3 =	0.8 50%
Sulphate	4.79 ÷ 90.3 =	> 3
Chloride	1.54 ÷ 90.3 =	1.7
Carbonate	35.53 ÷ 90.3 =	39.4
Sulphide	3.23 ÷ 90.3 =	3.6 50%

The statement of the analysis in percentage reacting values dispenses with all arbitrary units of physical measurement and retains only the reacting ratios of the radicals which together constitute a chemical system of dissolved salts. It is strictly a chemical formula. It is based on no hypothesis and no theory, but rests solely on the fundamental chemical law of equivalent combining weights. This formula is capable of wide application. It discloses not only the relative reaction capacities of all the radicals determined in a water, but shows at a glance very slight differences in the values of the radicals of different waters.

(To Be Continued.)

Oil Fields in Central Montana

Geology of the Region Around Lewistown Suggests That Important Sources of Oil Supply Will Soon Be Developed—Discovery of Oil in Montana Is to Be Credited Entirely to Applied Geology

BY O. W. FREEMAN

Written exclusively for *Engineering and Mining Journal*

FOR many years prospecting for oil in Montana has been without favorable results. Until last November the only oil found within the area of the state was in the Elk Basin field, on the Wyoming boundary. During the last few months development has been rapid in central Montana. First a 500-bbl. well that produced a good grade of heavy black oil was drilled in the Devil's Basin of northern Musselshell County. Then during the last of February, 1920, a 300-bbl. well of high-grade paraffin-base oil was drilled in the Cat Creek dome, in eastern Fergus County.

The geological formations of central Montana range in age from Pre-Cambrian to recent, and the stratigraphic column is almost complete, as is shown by the accompanying table. The Paleozoic formations outcrop in the mountains and are predominately composed of dense limestone; and, except for the Quadrant formation, are not considered probable sources of oil. The Quadrant is of Upper Carboniferous age, and consists of alternate beds of black, gray, and green shale, sandstone, thin beds of limestone, and sometimes a thick bed of very hard siliceous limestone. The oil of the Devil's Basin was struck in the Quadrant sands. The first well, of 500 bbl., was completed in November, and produced a good grade of black asphalt-base oil. The production of this oil should be profitable at the shallow depths, 1,000 to 1,200 ft., at which it is obtained. There

are several structures where the Quadrant oil sands can be struck at shallow depths in Fergus and Musselshell counties.

The Quadrant is variable in thickness. Around the Big Snowy Mountains it is over 1,000 ft. thick, but in the Shawmut dome it is only a few hundred feet thick, and in northern Fergus County is probably not over 100 ft. thick, consisting mostly of black shale.

The Ellis formation, of Jurassic age, consists of black shale, sandstone, limestone, and gypsum beds. Some oil was found in the Woman's Pocket in what was probably the Ellis. The Ellis is not a probable producer of oil in any considerable amount. The Morrison formation, of about 125 ft. of sandstone and varicolored shale, overlies the Ellis.

The Kootenai formation produces a high-grade paraffin-base oil on the Cat Creek dome, in Fergus County, and is a probable producer in many structures that have not been eroded. The Kootenai consists of an upper and lower sand member, separated and overlain by shale, which is predominantly red in color. Coal beds usually underlie the lower sandstone. The upper sand at Mosby, on the Cat Creek dome, is water soaked, but the lower sand is oil bearing. The lower sand is 30 to 40 ft. thick. It has no special name, and might well be called the Lupton sand, after the geologist who located the well. The Kootenai is about 500 ft. thick.

The Colorado shale is 1,700 to 2,000 ft. thick, and is mostly composed of black shale, with a sandstone member at the base. Small pockets of gas have been struck in it, and seeps of shale oil occur above the basal sandstone. This sandstone is an important source of oil in Wyoming, but has unfortunately been waterlogged in central Montana, where it has been tested by the drill.

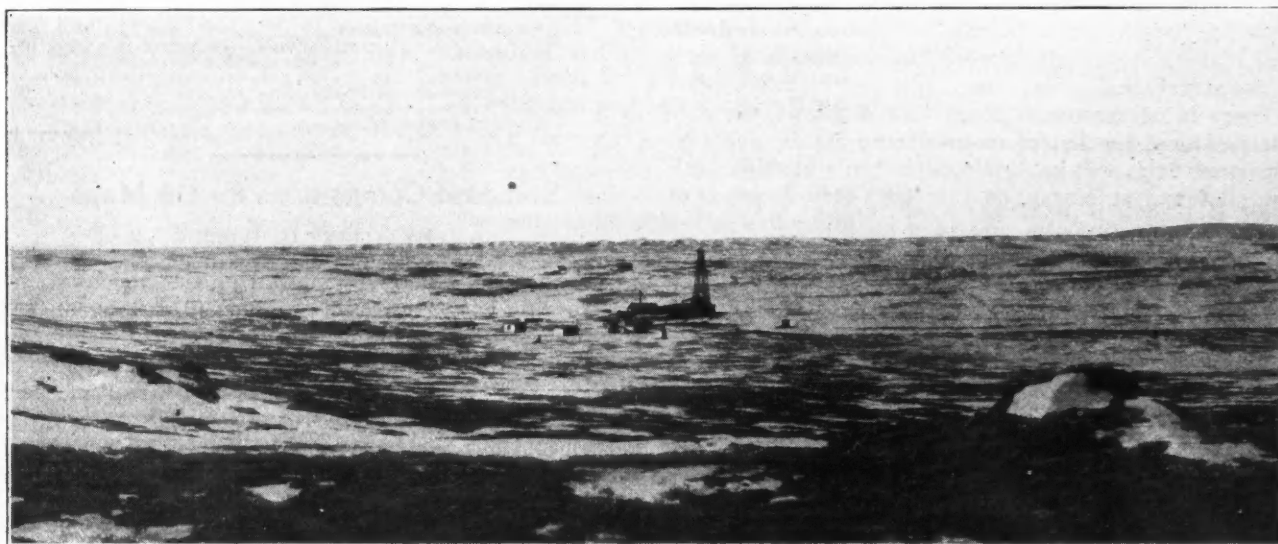
The Montana formation is a possible but improbable source of oil. The Eagle sandstone carries gas at Havre, and traces of gas and oil have been found in it in Fergus County. There is an abundance of black shale in the Bearpaw and Claggett shales, but a lack of sandstone strata to serve as reservoir rocks. The Judith River formation consists of sandstone and impure shale, together with thin beds of coal in many localities.

The Lance formation outcrops in northeastern Fergus County and southern Musselshell County. It consists mainly of cross-bedded sandstone and light-colored

half of T. 16 N. R 27 E., and then comes the immense Cat Creek dome, covering probably 35,000 acres, mostly in Fergus County, but extending a few miles into Garfield County across the Musselshell River.

Along the south side of the geanticline there is also a string of three domes. Devil's Basin is closest to the Snowy Mountains, and to the east are successively the Big Wall and Howard Coulee domes. The Flatwillow anticline is superimposed on the geanticline near its middle line. Apparently there is an absence of domes along the Flatwillow anticline, except near its western extremity, where the Button Butte dome covers approximately 10,000 acres.

The Kootenai formation is exposed in the Devil's Basin, on Box Elder, and the Jurassic on Button Butte, so that the possibility for oil in these domes is expected in the Quadrant. The Quadrant, in the Devil's Basin, is oil bearing, and probably will be at Button Butte and Box Elder domes. The Colorado formation is exposed



DEVIL'S BASIN, MONTANA

shale, and locally contains seams of coal and black shale. It is an improbable source of oil.

There are a large number of structures that would seem worth testing out for oil in Musselshell and Fergus counties. There are said to be ten favorable domes in Musselshell County and four or five in Wheatland County; and I know of a dozen in Fergus County, with a possibility of several others.

The domes that are attracting most attention at this time are in southeastern Fergus and northern Musselshell counties. An immense anticline, which it would be proper to call a geanticline, as other smaller anticlines are superimposed on it, covers this area. The northern side runs from Black Butte, near the Judith Mountains, eastward across the Musselshell River. The south flank of the big anticline runs from the Snowy Mountains through northern Musselshell County across the Musselshell River. The structure ends in southwestern Garfield County in a maze of highly inclined faults.

There are three well-defined domes along the north side of the big anticline. These began on the west just east of Wild Horse Lake, where the Box Elder dome covers eight to ten sections of ground. Next is the Brush Creek, or Upper Cat Creek dome, in the south

in the Brush Creek, Cat Creek, and Big Wall domes, and over half its thickness has been eroded from the first two. The lower Kootenai sand can be reached on these domes at from 1,000 to 2,000 ft. in depth, and is productive on the Cat Creek dome.

The Brush Creek dome will be immediately tested out. It no doubt contains oil, and, in all probability, the same green oil will occur in the Big Wall dome. Howard Coulee will require deep drilling, as the Claggett shale is the lowest formation exposed.

On the west side of the geanticline, near the divide connecting the Judith and Snowy Mountains, are several domes of a few thousand acres containing possibilities for oil in the Quadrant.

Drilling for oil is active in northern Fergus County near Winifred, and on Arrow Creek. The Kootenai sand can be reached on a dome close to Winifred at a depth of about 2,800 ft. and a hole has already been sunk 2,300 ft. deep. There are a great many faults in the Winifred field that are considered to be possibly favorable structures for oil accumulation, as gas was found at Havre along a sealed fault. The Arrow Creek dome covers an immense area north of Denton and has very low dips. The same is true of the Porcupine dome, in northern Rosebud County, east of the Musselshell River.

Both the Porcupine and Arrow Creek domes are being tested with the drill, and, should oil be obtained, large areas will be added to the possible oil fields. A good terrace structure will soon be tested with the drill at Garneill, south of Lewistown. If this structure proves productive, interesting opportunities for oil prospecting will be opened up in Montana.

There are good possibilities for finding oil in some of the structures in western Musselshell County, Wheatland County, and south in the Lake Basin country. Most of these structures will be tested for oil this summer. Drilling will soon start on Birch Creek, west of Chouteau, in the Great Falls country. North of the Missouri River, two big domes with low dips, the Bowdoin and the Poplar, will be explored this summer. Another similar structure exists south of the Missouri in northern McCone County.

The big Glendive anticline, in southeastern Montana, also will probably be thoroughly tested out this summer. Many other structures are being worked out. Water-deposited bench gravel sometimes hides the bedrock, thus making it difficult to work out the details of some of the structures.

There is no reason to doubt that Montana has definitely entered the list of oil-producing states, and that important fields will be developed in the state this year. The oil found at Mosby, on the Cat Creek dome, is of

twenty-five miles further to the Musselshell River near the Cat Creek dome. Wagon roads to the Cat Creek dome are being improved, and all that local residents can do to help legitimate companies is being done.

GEOLOGICAL SECTION IN CENTRAL MONTANA

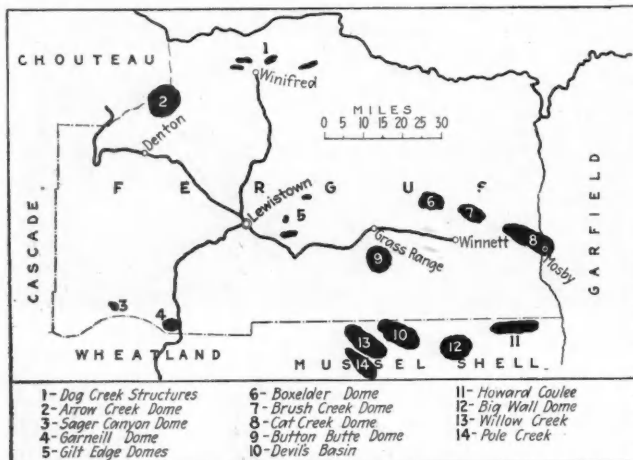
Quaternary (Travertine, terrace gravel, alluvium, glacial drift).				
Tertiary (Lance, shale and sandstone [700 to 800 ft.]).				
			Feet	
			1,100 ±	
Mesozoic	Montana	Bearpaw shale.....	700 ±	
		Judith River formation (sandstone and shale)...	250-500	
		Claggett shale.....	700 ±	
		Eagle sandstone.....	200-300	
		Gas sand at Havre.....		
	Cretaceous.....	Colorado	Shale with thin beds of sandstone (contains gas, possibly oil).....	1,800 ±
		Kootenai	Sandstone, coal and shale (lower sand oil bearing).....	500 ±
	Jurassic.....		Morrison shale and sandstone.....	125 ±
			Ellis formation, shale and sandstone.... (Possibly contains oil)	400 ±
	Paleozoic	Carboniferous	Pennsylvania—Quadrant shale and sandstone (oil bearing).....	100-200
Mississippian—Madison limestone.....			800	
Siluro-Devonian limestone.....		300		
Cambrian.....			Alternating shale and limestone.....	500-700
			Flathead quartzite and sandstone.....	100
Pre-Cambrian		Algonkian—Belt Series—Black and green shale....	1,000	
		Archean—Gneisses and schists—exposed only in Little Belt Mountains.....		

Standard Conventions for Oil Maps

By ALBERT G. WOLF

Conventional designs for indicating the various stages of progress and the results obtained in drilling oil and gas wells are used on practically every oil-field map. As there is no standardization of these conventions, however, one must constantly refer to a legend, if there is one, for information. A set of conventional designs for oil and gas wells that has been adopted by several oil companies is shown in the figure. It is worthy of general adoption.

The advantages of this set of designs are, first, ease in drawing, and, second, no erasures are required to make the changes necessary to follow the progress of



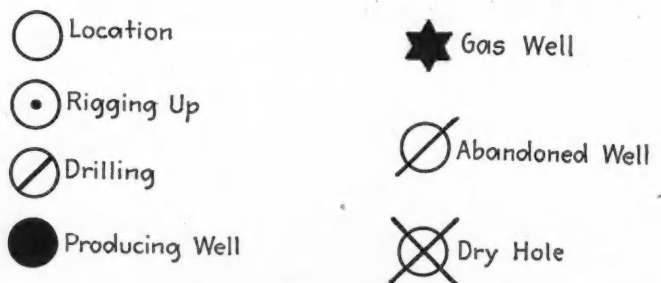
SKETCH MAP OF FAVORABLE GEOLOGIC STRUCTURES NEAR LEWISTOWN, MONT.

47 deg. Bé., and is extraordinarily high in gasoline. It is said to be the highest-grade oil yet found in the Rocky Mountain field. Present activity is concentrated in the neighborhood of Lewistown, a well-built, modern city of 10,000 population, which is the center of the productive and prospective oil fields, as well as being the geographic center of Montana and the county seat of Fergus County.

A great many large producing and refining companies have entered the central Montana oil fields from the Wyoming, California, and Mid-Continent fields, and several strong local companies are being organized. Many competent geologists are on the ground.

The discovery of oil in Montana is due entirely to applied geology.

As soon as spring arrives the oil boom will be on in earnest. It is expected that at least one hundred rigs will be brought into the Lewistown district alone this summer. A railroad extension is promised that will lengthen the branch line from Lewistown to Winnett,



SUGGESTED OIL-MAP CONVENTIONS

the work at the well. First, there is the location, an empty circle. When the rigging-up is started, a dot is placed in the center. One diagonal line is drawn across the circle when drilling begins. Any one of the next four designs is used, depending on the results of the drilling and the location of the well.

Some companies are rigidly differentiating between "dry" and "abandoned" wells by calling wells "dry" only when drilled in territory surrounded by producing wells, and yet found to be non-productive. All wells drilled in wildcat territory which are not found to be productive, and from which the equipment is subsequently removed, are "abandoned."

NEWS FROM THE OIL FIELDS

Oil Leasing Regulations

Representatives of Western States
Submit Changes in Proposed
Operating Rules

Operating features of the regulations applying to oil and oil-shale leases, under the Mineral Leasing Act, were the subject of a recent conference at the Bureau of Mines. Representatives of the operators and of the public land states had little criticism to offer of the regulations as drafted.

The operators have drawn up the changes in the regulations which they suggest and have submitted them to the officials of the department, where they are now being considered. Those who attended the conference as official representatives are as follows: M. L. Alexander, New Orleans, representing the State of Louisiana; C. F. Robertson, Worland, Wyo., individual operator; George Otis Smith, Washington, D. C., U. S. Geological Survey; W. C. Mendenhall, Washington, D. C., Land Classification Board; Fred W. Freeman, Denver, American Mining Congress; N. S. Wilson, M. G. Saunders, and C. A. Fisher, Denver, representing the State of Colorado; Mark D. Hoyt, Glasgow, Mont., representing the State of Montana; John McFadyen, and H. E. West representing the State of Wyoming. A. V. Andrews, Los Angeles, Chamber of Mines and Oils; R. L. Peeler, Los Angeles, independent oil producers' agency; I. N. Knapp and A. F. Lucas, representing the American Institute of Mining Engineers; W. A. Williams and A. F. Corwin, American Petroleum Institute; James A. Veasey, Tulsa, Oklahoma, Mid-Continental Oil & Gas Association; F. M. Manson and Senator Charles B. Henderson, representing the Reno Chamber of Commerce, and Clay Tallman, representing the General Land Office.

New Oil Companies Organizing in Montana

Formation of new oil-development companies is proceeding at a rate in Montana comparable with the oil booms in Texas and Louisiana. In Fergus County seventy oil corporations were organized since the first of the year. Musselshell County, in which are a number of domes, records thirty new concerns. Every day sees the entry of one or two additional companies. To date the only high-grade well brought in is that of the Frantz Corporation, in the Cat Creek country, near Winnett, the oil from which carries more than 40 per cent gasoline. In the Roundup country, where the first discovery well was brought in by the Van Duzen company, drilling has been resumed to find deeper sands.

Texas Oil Leases Taxable

Construction on Oil-Pipe Lines in Texas
and Northern Louisiana
Suspended

Oil leases in Texas are taxable, according to a recent ruling of the Attorney General's office. This will have two effects on the oil business of the state—one, greatly to increase taxes of the larger companies, and the other to curb the extravagant statements of wildcat oil companies. Heretofore it has been the custom with many such companies to acquire some practically worthless leases on land near an oil field, then place an excessive valuation on them in order to obtain a charter calling for a large capitalization based on this valuation. When taxes must be paid, the statement of valuation to the tax assessor must check that previously made for incorporation, or trouble will result.

The building of several pipe lines in Northern Louisiana and in Texas has been either indefinitely postponed or abandoned. Among these are the Standard Oil Co.'s line to Homer, the Simms company's line from northern Louisiana to the Mississippi River, the Sinclair Co.'s line from northern Louisiana to the refinery at Sinco, near Houston, and the White Oil Corporation's line from Ranger to Texas City. Other construction has also been curtailed. This is due in part to the fact that transportation facilities from the Homer field are adequate for present production, but that does not account for all the changes in plans.

Notes From Oklahoma and Texas

Fire at the refinery of the Constantin Refining Co., Tulsa, Okla., started from a leaky tar line on the morning of March 22, and, fanned by a stiff breeze, caused a loss estimated at \$500,000.

The case of Cordell Petroleum Co. vs. C. T. Taylor, et al, tried before Judge James C. Wilson, of the Federal District Court for northern Texas, at Wichita Falls, was decided recently in favor of the defendant. The suit was for possession of 643 acres of oil-producing land in the Burkburnett district. The land is said to be worth about \$25,000,000.

At the West Columbia field, Brazoria County, the Humble Oil & Refining Co. recently brought in its No. 18 Japhet well, flowing at the rate of 8,000 bbl. daily; in a few hours the flow increased to 15,000 bbl., and then rapidly subsided to the rate of 3,000 bbl. daily.

The Hull field, Liberty County, production has increased to over 11,000 bbl. In this field the Texas Co. has taken the leading position in production, followed by the Republic Production Co. and the Gulf Production Co.

Distillate From Oil Shale To Be Sold in Nevada

The commissioners of Elko County, Nev., have just closed a contract with the owners of the Catlin shale products plant for 10,000 gal. of a high-grade engine distillate to be used during the year. Sixteen motor trucks and two caterpillar tractors will be used on road work by the county, and a road will be built from the hot springs bridge to the Catlin refinery, which is only a short distance from the town of Elko.

The Catlin company has for several years been conducting experiments for the commercial utilization of the oil-shale beds near Elko. The installation of the new refinery plant is about completed, and it will soon be in operation.

A New Oil Pool Opened at Vernon, Tex.

The bringing in of the Sigler well, in Block 51, thirteen miles south of Vernon, and about fifty miles west of Wichita Falls, opens a new field ten to fifteen miles west of any appreciable production. The drill struck the sand at 2,020 ft., and penetrated only 18 in., when an 8-in. column of oil was thrown to the top of the derrick. The well was soon successfully capped.

The Sigler Oil Co., which is the successor to the Prescott-Peoria Oil Co., owns a large acreage on the Waggoner ranch, and has made arrangements to dispose of 8,000 acres. One important provision in each lease is that only one well can be drilled to every five acres. This is a step in the right direction, and will prevent excessive over-drilling, as was the case at Ranger and Burkburnett. Close-in leases are held at \$1,000 per acre, and real estate at Vernon has doubled in price. Plans are under way for a pipe-line extension and a railroad spur to the new well, as soon as a test flow can be made. Storage tanks are already under construction.

General Land Office Circular 676

A circular, No. 676, has just been issued by the General Land Office in which amendments, modifications and supplements to the recently issued circular No. 672, Regulations Concerning Oil and Gas Permits and Leases, are given. Oil land lessees will be interested in these changes.

Extensive new development of oil lands is predicted by the Federal Reserve Board in its monthly review of business, as the result of the passage of the Mineral Leasing Act. The board directs attention to the fact that there will be great increase in refinery capacity during the year.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

N. Y. Section A. I. M. E. Meeting Largest Attendance in History— Hoover, C. F. Kelley, Meyer and Darlington Deliver Addresses

The New York Section of the American Institute of Mining and Metallurgical Engineers, meeting on the evening of April 7 at the Machinery Club, brought together the largest attendance in the section's history. Over two hundred engineers from New York and its environs gathered at 50 Church St. to listen to Dr. Thomas Darlington, in charge of welfare work of the U. S. Steel Corporation; Cornelius F. Kelley, president of Anaconda Copper Mining Co.; Eugene Meyer, Jr., of the War Finance Corporation, and Herbert Hoover, vice-chairman of the Industrial Conference appointed by President Wilson.

Dr. Darlington reproached the members of the engineering profession with having been too retiring before present industrial problems, with having "kept within their shell" and not taking as active a part as they should have taken in solving the engineering side of these difficulties. Today stronger than ever is the call for "efficiency," but efficiency, the speaker emphasized, depends on health. When serious consideration was given to workmen's compensation laws, when they began to be put into effect, a new idea was introduced in industry and industrial relations. This was that the health of the worker was of prime importance to industry and to the capital invested in industry. The work of maintaining the health of the men largely devolves upon engineers, and consists not only in the prevention of accidents by mechanical means and by warnings, but includes the newest idea, which is to teach the people to take care of themselves. This has a direct bearing on the present great need for increased production, for certainly present production could be doubled if the people themselves chose to effect it.

The speaker referred to Dr. James Douglas and his ideal, which was to teach men to live better, and this his former superior had indeed done. He then went on to point out that of the three sources of help—what can be done by the Board of Health, by Industry, and by personal hygiene—it is the second agency that affects all engineers. Dr. Darlington cited numerous cases where industrial plants had been laid out entirely without regard to the health of its workers. Water supply, affecting health, cleanliness, flushing power, and the commonest carrier of contagion, is obviously as important as food. A cleanly, well-ventilated change-room, clothing appropriate to the work in hand, and the proper and

safe disposal of sewage, are engineering problems, and the sewage disposal problem is most important in planning the layout of mill or mine. Physical examination of employees, and the supervision of an adequate and proper food supply, also have their engineering side.

Eugene Meyer, Jr., was the next speaker. Mr. Meyer referred to his opinion, expressed two years ago, that the mining and metallurgical industries were peculiarly charged with the task of expanding and strengthening our position abroad at that time. There would be a resultant increased demand for American engineers, he said. This statement, he believes to be even more true today than when it was first published. The future is, of course, unknown, Mr. Meyer said. One can foretell very little with precision; but it is certain that great changes impend. Labor will live on a better plane than ever before, and the problem is put right up to the engineers to find out how to increase our production in the face of fewer hours of work per day and a greater production cost per piece. Engineers evidently must develop more scientific, more common-sense and logical methods, more perfect and perhaps larger mechanical appliances, develop United States industrial chemistry far beyond where it was and is, and fully utilize our water power. Greater capital outlay to attain all these ends is needed and justified.

It is incumbent on the A. I. M. E. to think ahead, to formulate and suggest the solutions of the great future problems, to watch the development of new countries and study the bearing of these problems on our economic structure, said Mr. Meyer. Hoover is a good man for engineers to study. Though they have done wonderful things already, the engineers of America have not done all they might, and they must study the problems of the future on the basis of today's facts, with a view to adjusting ourselves to the problems the future holds in store.

Cornelius F. Kelley, on rising, referred to Dr. Darlington's speech by expressing the opinion that rather than blame everything on the engineer we should consider what he has already done for the country, and asked where we should be today without his services of the past. He found the engineer a practical man who condemns blunders as unpardonable, and translates laboratory research into practical results. The engineer, declared Mr. Kelley, serves a jealous mistress in his profession, which demands all his time and thereby prevents him from developing into a broad man of business. Nevertheless Mr. Kelley found that the hour had arrived when the

engineer must interest himself in the problems of the day. The world would go on rightly, evolution, not revolution, would prevail, and the engineering profession of the world could do no better than to follow the example of that great engineer who seized the opportunity to render personal service, Herbert Hoover.

Mr. Hoover, having been detained, did not speak until 10 p.m. He disclaimed any intention of raking engineers over the coals, as engineering was a profession of which he was proud. Every successful engineer, he said, was necessarily a man of imagination, an idealist soaked with realism, and in the United States today more of such men were needed than of any other kind. The United States faces a period not of reform but of acute readjustment, and the engineer, as a leader in the school of intense realism, would be sorely needed to bring about the adjustment. Mr. Hoover said.

Being fresh from his labors on the President's Industrial Conference, Mr. Hoover paid some attention to the great problems and solutions presented to it. He expressed the opinion that the arbitration method between nationwide capital and nation-wide labor, as we saw it practiced in Kansas, for example, was the wrong way to handle and solve problems, which vary with the industry and even with the individual establishments of that industry. We must recognize the right of the workers in an establishment to conduct collective bargaining with the owners and operators, regarding conditions of labor and wages under circumstances which should be the common knowledge of all concerned, Mr. Hoover believes. But the labor representatives must be truly representative of and from the community involved.

Federal Department of Public Works Urged by Utah Engineers

The Utah Society of Engineers is giving its support to the movement to establish a Department of Public Works under scientific management, to do away with the present Department of Engineers. Lafayette Hanchet recently spoke on this subject before the Commercial Club of Salt Lake City, pointing out the advantages which would accrue from such a department and emphasizing the saving in time and money, as well as the greatly increased efficiency.

Dust and Ventilation Investigations by the U. S. Bureau of Mines have been carried out in the Miami mine at Miami, Ariz., and in the Inspiration mine at Inspiration, Ariz.

MEN YOU SHOULD KNOW ABOUT

Laurence Maxwell is now manager of the Gold Ore Mining Co.'s mine near Goldroad, Mohave Co., Ariz.

Harold B. Goodrich, petroleum geologist-engineer, announces the removal of his office to 111 West 4th St., Tulsa, Okla.

Herschel C. Parker, geologist of the U. S. Geological Survey, recently passed through Seattle on his way to reopen field work in Alaska.

Hugh T. Rippetto, of Salt Lake City, Utah, has been nominated by the President to be assayer in charge of the United States Assay Office at Salt Lake City. He succeeds Charles Gammon, who resigned recently.

Bruce Rose, of the Canadian Geological Survey, has resigned, to accept a position with the Pearson oil interests. Dr. Rose was for some years in charge of important geological surveys in the Canadian Rocky Mountain district.

J. E. Spurr addressed the graduating class of the Michigan College of Mines, Houghton, Mich., at its class day exercises on April 14. The exercises were held in the college gymnasium, where Mr. Spurr spoke on "The Mining Engineer's Future."

H. C. Parmelee, editor of *Chemical and Metallurgical Engineering*, left New York City April 7 on an extended trip, during which he will attend the chemical society meeting at Boston, and will visit St. Louis, Omaha, Denver, Salt Lake City, and San Francisco, Cal.

R. P. McLaughlin, state oil and gas supervisor of California, after attending the meeting of the petroleum geologists at Dallas, Tex., made a brief trip to Washington, D. C., and New York City on his way home. Mr. McLaughlin left New York for San Francisco on April 7.

A. W. Stickney, the American geologist reported captured by the Bolsheviks in Siberia, and for whose safety much concern was felt, is reported by the American Consul at Harbin, in a message to the State Department, to be safe and undisturbed in the Altai District of Siberia.

E. L. Bruce, geologist in charge of work in northern Manitoba, has resigned from the Canadian Geological Survey, and will be with the Whitehall Petroleum Co. during the coming summer. Next fall Dr. Bruce will go to Kingston, Ont., as professor of mineralogy in Queens University.

G. P. Bartholomew and John C. Emison have been elected to the board of directors at the recent annual meeting of the American Smelting & Refining Co. They succeed Karl Eilers and Leopold Frederick. Mr. Emison has been with the National City Bank, New York City, for the last fifteen years.

M. L. O'Neale, has opened an office as consulting mining engineer, at Morgantown, W. Va. Mr. O'Neale, who is a member of the A. I. M. E., has had a number of years' experience with coal and coke properties in Alabama and West Virginia, and also a year as superintendent of pyrite mines and concentrating plant.

James R. Jones, law examiner in the U. S. Bureau of Mines, has resigned his position with the Government and will leave the Bureau of Mines on April



JAMES R. JONES

19. Mr. Jones is going into petroleum work and has an engagement with the Rocky Mountain division of the Roxana Petroleum Corporation, Cheyenne, Wyo. It is to be hoped that work on his digest of the oil laws of Latin America will not be interrupted by this change in Mr. Jones' affiliations.

George E. Farish, mining engineer, manager of the mining interests of the Charles E. Butters estate in Salvador, arrived at San Francisco, Cal., April 6, on the Pacific Mail Steamship "San Juan" from La Union. Mr. Farish has been absent from the United States nearly two years, which he has spent in developing the Butters Divisadero Co.'s properties in El Salvador. He left there about March 15 last.

Milnor Roberts, Dean of the University of Washington College of Mines, has just returned to Seattle after completing a ten-day field trip in north-eastern Washington. Dean Roberts and twelve students visited the Loon Lake Copper Co., the United Silver-Copper, and the Electric Point Mining Co.'s mines; the quarries and calcining plant of the Northwest Magnesite Co., at Chewelah, and the Northport smelter at Northport, Wash.

OBITUARY

William Weston, discoverer of the Camp Bird mine, near Ouray, Col., widely known mining engineer and big game hunter, died recently at Denver, Col., of bronchial pneumonia. He was seventy-six years old. In 1881, Governor Frederick W. Pitkin appointed Mr. Weston state commissioner of mines, but his appointment was not confirmed.

S. C. Lake, for eighteen years a mining and smelter man in the Southwest, died lately in Douglas, Ariz., aged sixty-three. Mr. Lake went to Arizona in 1902 from New York to manage the mine and smelter of the Black Diamond company in the Dragoon mountains; but for some years he had been with the sampling department of the Calumet & Arizona Co. at Douglas.

William E. H. Carter, a mining engineer of Toronto, died April 9, at the age of forty-three, after a short illness. Mr. Carter was a graduate in applied science of the University of Toronto, and for some years was engaged in gold mining in British Columbia. He was inspector of mines for Ontario from 1900 to 1906, and was attached to the party that ran the provincial boundary line between Ontario and Manitoba.

Robert P. Burgan, seventy-eight, president of the Carnegie Lead & Zinc Co., and one of the founders and a former president of the Carnegie Coal Co., died at his home in Carnegie, Pa., March 28. He was a Cornishman, and came to the United States in 1864. His earliest affiliations here were with the Michigan copper-mining industry; but in 1865 he moved to Pittsburgh, where he soon became interested in coal mining as well. In 1915 Mr. Burgan secured the property of the defaulting Calumet-Sonora Mining & Milling Co., Mexico., and reorganized it as the Carnegie Lead & Zinc Co., Cananea, Sonora, Mexico. At the time of his death Mr. Burgan was also president of Carnegie National Bank, Carnegie, Pa.

George Mainhart, of Grass Valley, Nev., superintendent and manager of a number of mines in Nevada, died at Nevada City Sanitarium on March 29, after an operation to stop toxic absorption. Mr. Mainhart was born in Greensburg, Pa., in 1849, but went to Virginia City, Nev., at a very early age, and his first mining work was on the Comstock lode. Later he went to Eureka, and in 1870 moved to the Grass Valley-Nevada City districts. He was in charge of the Omaha Consolidated for fifteen years, resigning in 1899 to manage the Bullion mines south of Grass Valley. This work was interrupted by embarrassments due to the San Francisco earthquake and fire. Two of Mr. Mainhart's four sons are also mining engineers identified with large Nevada mining enterprises.

COURT DECISIONS IN MINING CASES

By Wellington Gustin

Royalty Payments on Gas Wells

When Is a Gas Well Not an Oil Well?
—When Royalty Applies to
Gas Well Under Lease

In a case carried to the Supreme Court of Oklahoma, the plaintiff had brought action against the Blackwell Oil & Gas Co. to compel delivery or payment of one-tenth of the gas transported from premises of plaintiff. In the lease granted to the Blackwell Oil Co. the right was given to "all the oil, gas, and other minerals" found in and under the described tracts, and the exclusive right to lay pipe lines necessary for production and transportation of "oil, gas, or other minerals taken from the premises, and reserves to lessors one-tenth of all oil or other minerals," providing that, "if gas only is found in quantities large enough to transport, then parties of the first part are to receive \$100 per annum for the product of each and every well so transported, and also free gas for heating and lighting purposes for a dwelling on the above-described land."

A well was brought in from which large quantities of gas were transported, and plaintiffs were paid \$100 a year for such gas. The oil company began to extract gasoline from the gas, paying the lessors one-tenth of such gasoline, but refused to pay for one-tenth of the gas.

The lessors contended before the Supreme Court that the paragraph providing for the payment of \$100 per annum for the production of each gas well had no effect after the production of the gasoline; that when gasoline was manufactured from the gas the well was no longer a gas well in the sense used in that paragraph; and that the lessors were entitled to one-tenth of such gas under the provisions of the paragraph reserving to the parties of the first part one-tenth of "all oil or other minerals," arguing that the term "other minerals" includes gas from any well except where gas only is found.

The rule laid down for the construction of a contract is that the language used therein must govern its interpretation, if the language is clear and explicit and does not involve an absurdity, and the whole of such contract is to be taken together so as to give effect to every part, if reasonably practicable.

The granting clause of the lease uses the language "all the oil, gas, and other minerals," the excepting or royalty clause, "all oil or other minerals." In a separate paragraph, the \$100 per annum royalty is provided for gas. It clearly appears the gas royalty was to be different from the royalty for oil or "other minerals."

The lessors contended that the language "if gas only is found in quantities large enough to transport" should be

construed to mean "if gas only is found on the premises in quantities large enough to transport." The view of the court was that this was meant to deal with each and every well in which gas was found and for which such gas was transported. To hold that the words "or other minerals," found in the clause fixing the royalty for oil, includes gas, would be to violate the foregoing rule. General words do not explain or amplify particular terms preceding them, but are themselves restricted and explained by the particular term. The general term "other minerals," following the word "oil," must be construed to be minerals of like character.

It appears that gasoline was caught in dripping pans as a byproduct of the gas. The court said the well would not be held to be an "oil well," within the meaning of the lease, merely because gasoline is produced as a byproduct of the gas. It was still a "gas well" within the meaning of the lease for the purpose of fixing the gas royalty.

That gasoline oil was included in the term "other mineral" it was unnecessary to decide, as the lessors received one-tenth of the value of the gasoline oil produced.

Ownership of Casing-Head Gasoline

Important Decision of a Case in Which
No Provision Was Made for These
Products in the Original Lease

An important decision in the oil industry was recently handed down in the Supreme Court of Louisiana, affecting both the lessors and holders of gas leases, wherein no special provision had been made regarding casing-head gas. Owing principally to the vacuum pumping system, this gas is heavily surcharged with a high quality of gasoline, which formerly escaped or was wasted. Since the discovery of processes for the extraction of this casing-head gasoline, the questions arise as to its ownership, who should pay for the plants and systems necessary for its saving, and the liability of the oil operator and the land owner to each other.

Barney Y. Wemple instituted an action against the Producers' Oil Co., a subsidiary of the Texas Co. Wemple is the owner and lessor of certain oil lands in De Soto Parish, Louisiana, and owns a half interest in other tracts near by. The Producers' Oil Co. acquiring the oil and gas lease covering the property. Wemple brought suit against the Producers' Oil Co., alleging that it had drilled sixteen producing oil wells on tracts of which he was the sole owner, and eight wells on

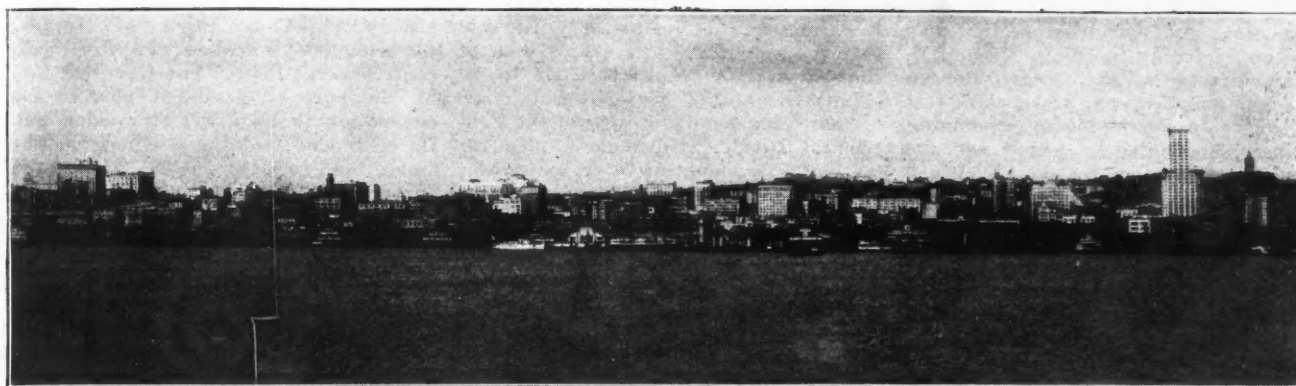
those of which he was part owner, and that up to May 1, 1916, it had delivered his proportion of the oil produced; that about this date the Producers' Oil Co. put into operation a device for saving oil emanating from the wells in the form of vapor, and has failed to account for his share in the proceeds to the value of \$12,000. The complaint provided that should the court hold that the product in question is not oil within the contemplation of the lease, then it should be held to be a mineral, not embraced therein, of which Wemple was the sole owner, the value of which was placed at \$96,000. Should the court hold such product to be gas, he claimed \$2,400 per year as his share under the lease.

The Producers' Oil Co. admitted putting in a plant for the saving of the oil known as "casing-head gas," but denied any accounting was due Wemple for such oil, claiming it property in which he had no interest. It contended that at the time of the execution of the oil lease there was no practical way by which oil in volatile condition, in gas known and designated as "casing-head gas," escaping from oil wells, could be commercially or profitably utilized, but that at such time "casing-head gas" had no value, except that part of it which could be used in the operation of the leased premises, as permitted by the lease, the remainder unavoidably escaping without profitable use to anyone.

In its opinion, the Supreme Court of Louisiana pointed out that in 1909, when the leases were executed by Wemple, neither of the contractants knew of the possibility of profitably extracting gasoline from casing-head gas, and, therefore, they included no specific provision relating to such gasoline in their contract. Also, although this knowledge was common in 1914, the date when the Producers' Oil Co. acquired the leases, it took the contract as it found it from its predecessors; and, as Wemple knew no more at that time than he did in 1909 about casing-head gasoline, there was no special understanding between him and the company concerning that product or its disposition.

At the bottom of the controversy, said the court, is the equitable doctrine that no one is presumed to give, and no one should be allowed to take, any product of value and give nothing in return. The court ruled that all rights in the lease claimed by the company which are not conferred, in direct terms or by fair implication, from those which are so granted, are to be considered withheld.

Judgment was handed down awarding Wemple a one-eighth interest in the oil that the defendant had extracted from the gas.



SEATTLE, WASH., SEEN FROM THE HARBOR

International Mining Convention at Seattle, Wash.

Mining Men From the Northwest Meet With Foreign Miners To Discuss Fuel Supplies, Water Power, Petroleum Industry, the Chemical and Electrometallurgical Industry and the Gold Problem

SEATTLE CORRESPONDENCE

ON WEDNESDAY, April 7, the International Mining Convention met in Seattle's Auditorium. This organization, which has grown up in the Northwest, has a somewhat similar function to that of the American Mining Congress, in that it brings all of the elements of the mining industry together and thus enables the industry to express itself upon fundamental problems.

The convention is not restrictive, but inclusive, as governors of states, provinces, and territories may each appoint ten delegates, state or provincial mining department, five; chambers of commerce and commercial bodies, five; county commissioners, five; mayors of cities and towns, five; universities and colleges, five; and any mining or oil company, two. Naturally, the principal attendance is from the local mining men of Washington, Idaho, British Columbia, Montana, and other secondary geographic divisions. At this meeting there were a larger number of mining men from foreign countries than usual.

EXHIBITS OF MINING MACHINERY AND ORES

A feature of the convention was the exhibit of mining machinery which was placed at one end of the Auditorium. Many of the larger mining machinery companies made displays. The southern end of the building was occupied by ore and mineral exhibits. Alaska, British Columbia, Washington, Idaho, and Oregon were represented in the exhibits. Both the Tacoma and Bunker Hill and Sullivan smelters contributed well-planned exhibits of their raw ores, fluxes, and finished products, copper and lead.

The formal meeting was called to order by Glenville A. Collins, chairman of the convention. Mayor Hugh M. Caldwell extended a welcome to the

delegates on behalf of Seattle. Governor Louis F. Hart in his address of welcome called particular attention to the importance of the mining industry in relation to the nation's prosperity. The Rev. P. T. Rowe, who had spent twenty years in Alaska, responded for Alaska. Louis H. Santander, Chilean Consul, discussed the parts played by American and English capital in the development of the mineral resources of South America.

Lew Gnkay, of Canton, China, addressed the convention on the subject of "Mining Development in China." The early superstitions of the Chinese interfered with the initiation of mining operations, but in recent years, he said, China has not only greatly developed its deposits, but has made a large production of antimony, tungsten, coal, and iron. Edwin Hodge, president of the British Columbia Chamber of Mines, followed Mr. Gnkay with a story of the first meeting of the convention, held at Vancouver in 1919.

IRON AND STEEL IN THE NORTHWEST

On Wednesday afternoon, Dean Milnor Roberts of the University of Washington spoke on "A Proposed Iron and Steel Plant on Puget Sound." He told about the history of the several small steel plants in the Northwest and pointed out the situation of the available iron-ore deposits both in the Pacific Coast States and in British Columbia. Efforts to establish a larger steel industry have, however, he said, not been limited entirely to reports and discussions, for, three years ago, a group of men made an extensive study of the situation, and an announcement was made, at the time, that large interests, both in the East and the West, would carry out the proposed plans. Certain Seattle men had been asked to join the enterprise, which was a private concern, and about which only general

features were permitted to be published. Mr. Roberts said that he was informed that the enterprise was to be taken up again, the war having interfered with the previous plans. By means of blueprints, Dean Roberts outlined a flow sheet which he had prepared to show the important features of a proposed iron and steel plant in the Northwest.

The magnesite industry in the State of Washington was described by E. N. Patty, mining engineer for the Washington Geological Survey. The industrial uses of magnesite were presented by G. E. Whitwell, professor of industrial chemistry, University of Washington. Professor Whitwell has been engaged in research work in connection with magnesite. He pointed out the possibilities for extending the uses of this mineral, and emphasized its high quality for refractory purposes. Hewitt Wilson, professor of ceramics, University of Washington, by means of a series of charts, illustrated the uses to which the various types of refractories are best adapted. He also discussed the possibilities that exist for the expansion of the ceramics and refractory industries in the Puget Sound region.

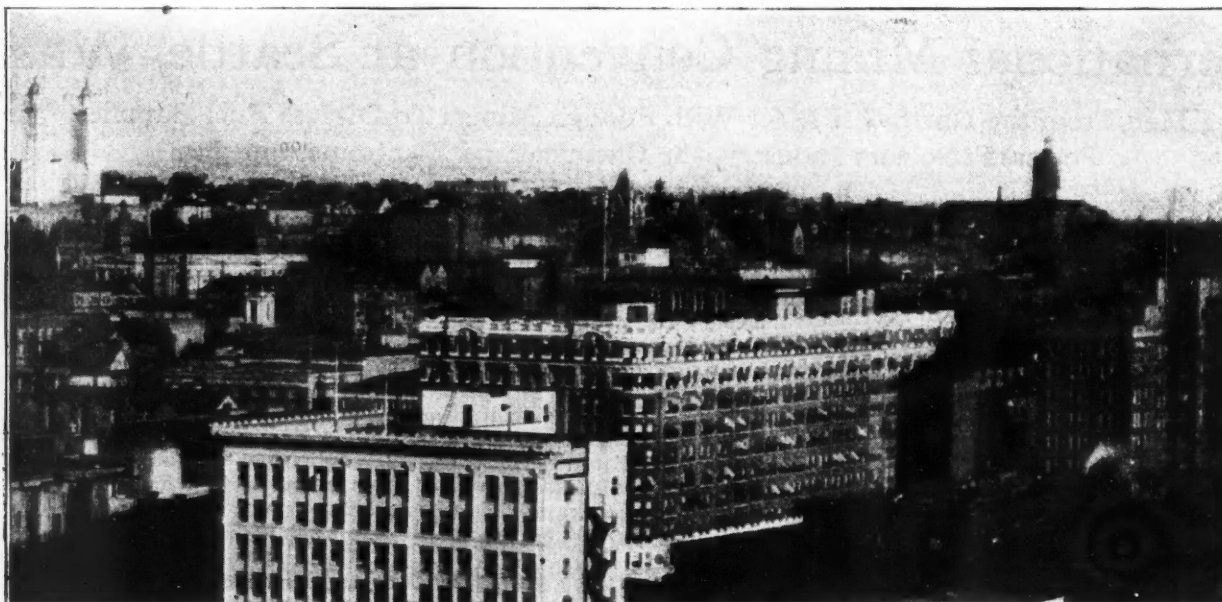
Late in the afternoon the members of the convention were conducted through the plant of the Pacific Coast Steel Co. An interesting address was given in the evening by T. A. Rickard. Mr. Rickard selected for his subject "The Romance and Philosophy of Mining Discovery." He transported his audience first to the famous mining camps of Alaska, then to Australia, and finally to the western United States. In a pleasing way he described the events that led up to the discovery of many famous mines, among which were the discovery of Broken Hill, the Treadwell, the Bunker Hill & Sullivan, the Comstock, and the United Verde Extension mines.

The coal and petroleum section was held on Thursday morning. Henry M. Parks, director of the Oregon Bureau of Mines and Geology, presided at this meeting. Joseph Daniels, a mining engineer, presented a paper on the "Coal Resources of the Pacific Rim." His paper gave a summary of the coal fields of the Pacific Coast and the Orient, but he covered the Washington coal districts in detail. In discussing the progress made in the use of powdered coal, and briquetting fuels, he pointed out the importance of the coal resources of the Northwest. He said that coal would never be entirely supplanted by other fuels, but promises to be a staple

Resources of the Northwest." He said that the potential water power west of the Mississippi was estimated to be twenty-two million horsepower, thirteen million being available west of the Continental Divide. He made a plea for the early development of water power, and spoke of electro-furnace progress and its possibilities on the Pacific Coast. The electrification of trunk line railways was urged as an economic measure.

O. C. Ralston, superintendent of the Seattle Station of the U. S. Bureau of Mines, addressed the convention on "New Factors in Development of Electro-metallurgy and Chemistry on the

ernor Emmet D. Boyle of Nevada. Governor Boyle called the first gold conference at Reno. The Governor won his audience by a cogent plea to the convention to back the McFadden bill. He contended that the economist is the "historian of business," not the "prophet." The efforts of previous gold conferences were described. The position of silver early in the war was analogous to the present gold problem. Gold is used for monetary purposes as well as in the arts, and, the Governor said, "I do not believe that payment of a bonus on gold production is practicable at this time. I do believe that if a producer sells gold to a manufac-



A PORTION OF THE BUSINESS SECTION OF SEATTLE, WASH.

fuel in the future, as in the past. The present equipment of the industry is sufficient to produce coal 20 to 40 per cent in excess of the requirements. Of the present output, the railroads consume 28 per cent, the iron and steel industry 15 per cent, and the domestic trade 12 per cent of the coal mined. To overcome some of the present difficulties of the coal miner, the speaker recommended the stimulation of early seasonal buying, greater efficiency in fuel utilization, a central sales agency, and increased storage facilities near centers of consumption.

C. P. Bowie, petroleum engineer of the U. S. Bureau of Mines, was unable to be present, and his paper on the "Petroleum Resources of the Pacific Coast" was presented by Chester F. Lee. The petroleum development of various countries and the probable future developments were discussed, as was also the need for greater activity in the search for oil. The great number of test wells being driven in the Northwest and the oil excitement in Montana were also referred to by Mr. Bowie.

In the afternoon Nicol Thompson, chairman of the Vancouver Mining Bureau, presided. J. C. Ralston, a mining engineer of Spokane, presented an excellent paper on the "Waterpower

Pacific Coast." He discussed problems and conditions controlling the future developments of the chemical industry and the necessity of missionary work to open markets for new products. He reviewed competitive factors that determine the success of the industry and urged a careful consideration of production costs. He said that it was difficult to develop new industries until the world settles down to steady and continuous production.

THE GOLD CONFERENCE

The gold conference was opened by Vandever Curtis, of the University of Washington. Mr. Curtis said that from the viewpoint of the economist it was an unsound principle to reduce the amount of gold in the dollar. He spoke against tampering with the gold dollar, and recommended placing our currency back on a gold basis as speedily as possible. He maintained that gross inflation of credit was the principal cause of high prices. To stimulate the use of gold in currency, in his judgment, would do away with inflation, and our monetary problems would adjust themselves.

On Thursday evening, E. G. Crawford, president of the Portland Clearing House Association, presented Gov-

ernor Emmet D. Boyle of Nevada. Governor Boyle called the first gold conference at Reno. The Governor won his audience by a cogent plea to the convention to back the McFadden bill. He contended that the economist is the "historian of business," not the "prophet." The efforts of previous gold conferences were described. The position of silver early in the war was analogous to the present gold problem. Gold is used for monetary purposes as well as in the arts, and, the Governor said, "I do not believe that payment of a bonus on gold production is practicable at this time. I do believe that if a producer sells gold to a manufac-

turer as a commodity, he has a right to sell at a profit. More gold is used in the arts than is produced. A reliable average price of the jeweler's resale of gold is \$145 per ounce. To preserve the necessary amount of gold for credit purposes, its production must not be cut off. It is sound and practical business for commercial users of gold to pay an extra bonus for gold, and this would in no way affect the gold standard."

John Clausen, vice-president of the Union National Bank of Seattle, presented the banker's point of view, and took a position similar to that of Governor Boyle. At the prospectors' session on the morning of April 16, Sidney Norman, of Spokane, presided. Some time was devoted to reports made by prospectors on various mining districts, in which the need of financial backing was emphasized.

In the afternoon, J. W. Spangler, president of the Seattle National Bank, occupied the chair. The gold question was reopened by E. G. Crawford, a banker of Portland, Ore., who said that the best solution that he could see was to get behind the McFadden bill, unless substantial objections could be raised.

Over 2,000 were present when Frank

A. Vanderlip, of New York, spoke. Mr. Vanderlip told those present that their plan for increasing gold production was not sound, for the country already had too much gold. Increased production, he said, will mean further inflation; the rise in prices is attributed to inflation of credits, and gradual deflating is the only solution. Paper at present in circulation amounts to 25 times the gold, and this inverted pyramid will be further increased if more gold is produced. To make sudden demands for a change, according to Mr. Vanderlip, will endanger our position. He characterized the proposed legislation as subsidizing the production of gold.

After Mr. Vanderlip had finished speaking, various delegates spoke in rebuttal, some expressing the opinion that Mr. Vanderlip's remarks were made from the viewpoint of a banker who did not want the sanctity of gold disturbed. They held that their plan

does not affect the monetary system, for at present more gold is used in this country in the arts than is mined. Governor Emmet D. Boyle of Nevada, speaking in rebuttal, said that if bankers used the ingenuity that they displayed in inflating currency in dealing with the present problem of deflation, they could solve the problem. Governor Boyle inquired if it were not better to change the law permitting such gross inflation rather than to tell the gold miner to close down his mines. It must be recognized, said Governor Boyle, that gold has two uses—monetary and industrial—and the present bill affects only the industrial use of the metal. A resolution introduced by Governor Boyle, urging support of the McFadden bill, was then unanimously adopted by the convention.

Among other resolutions, one was adopted asking the Government to protect the interests and lives of American operators and engineers in Mexico.

Another provided for appointing a permanent executive committee to arrange for future conventions. Still another recommended that mining properties and business be placed on an equality with all other business by Dun and Bradstreet.

Portland was unanimously chosen for next year's meeting for the convention.

In the evening a smoker was held at the Arctic Club, and a theater party was arranged for the ladies accompanying the members. On the following day a visit was paid to the Tacoma smelter. The members were entertained at luncheon by the Tacoma Chamber of Commerce.

Locally, the convention was considered successful. Thirteen hundred mining men were present, and the various exhibits were visited by many of the business people of Seattle.

A large delegation from British Columbia took an active part in the convention.

THE MINING NEWS

LEADING EVENTS

Dwight-Lloyd Roaster Used on Flotation Concentrates

Consolidated at Trail, B. C., Pitting Two Test Mills Against Each Other To Determine Best Process

At the Consolidated Mining & Smelting Co.'s electrolytic zinc plant at Trail, B. C., where ore from the Sullivan mine is being concentrated either by magnetic treatment or by selective flotation, two mills are being run in competition with each other, one using magnetic treatment and the other flotation, in order to determine the best process for the large concentrator that is to be built at the mine. The combined capacity of these mills is approximately 900 tons daily.

A Dwight & Lloyd roasting plant is being erected to roast flotation copper concentrates. The transportation and preparation of flotation concentrates for smelting has always been more or less of a problem and the use of the Dwight & Lloyd plant is interesting.

Yukon League Asks Royalty on Gold Be Dropped

The Yukon Development League will ask the Canadian government to abolish the present royalty on gold, according to a press dispatch from Dawson. The league is composed of miners and merchants. It will also ask the Dominion government to amend the placer mining laws in the territory to permit extensive prospecting of low-grade placer creeks and valleys to induce gold dredging companies to extend their operations.

Bunker Hill & Sullivan Plans Experimental Plant for Zinc-Lead Ores

The Bunker Hill & Sullivan Mining & Concentrating Co., of Kellogg, Idaho., has a research department actively at work on an experimental plant for treating Coeur d'Alene zinc-lead ores. It plans to follow this up with a zinc annex to the Bunker Hill smelter adapted for treating local zinc ores; and, dependent upon the success of this venture, may eventually elaborate the annex for treating complex zinc ores from outside districts.

Swedish Engineer Claims To Make Electrolytic Iron Successfully

The successful refining of iron by an electrolytic process is claimed by the Swedish engineer, Konrad Werner Lindman, who, for the last six months, has been conducting a series of experiments at the Avesta Ironworks. Contrary to the marketable results obtained in the electrolyzation of copper, those of iron hitherto treated have contained a high percentage of hydrogen, and uneven floccose masses. Lindman, by his method, the details of which are a secret, claims that by a simple process which reduces costs to a minimum, both in respect of plant and labor, he has succeeded in obtaining a good, even and homogeneous iron plate, chemically free from impurities. The iron, it is claimed, is produced in plates down to the thinnest dimensions, with a greater magnetic capacity than the usual rolled plate, and requiring no after-treatment.

Tennessee Copper Co. Erecting Acid Phosphate Plant

Capacity Will Be 100,000 Tons Per Year—Company Now Selling Part of Acid in Open Market

The Tennessee Copper & Chemical Corporation, the country's largest producer of sulphuric acid, has become a selling factor in the open market. Shipments of acid have already been made to customers at current high prices. For the last nine years the company has shipped its sulphuric acid output under a long-time contract calling for a price of \$4.81 a ton to the International Agricultural Corporation. The Tennessee company now has the privilege of marketing a certain amount of its current acid production. It is estimated that this volume during the current year will reach between 75,000 and 100,000 tons.

The contract with the International Corporation does not expire until the end of 1920. Prior to that time the Tennessee company will have embarked in the fertilizer field, as it has under construction at Atlanta the first unit of its proposed acid phosphate plant. This will eventually have capacity for producing 100,000 tons annually. The new acid plant will probably be ready to start production by September, at which time a substantial part of the company's sulphuric acid will be diverted to company use. The Tennessee sulphuric acid plant has capacity for producing over 200,000 tons of acid a year. It is situated at Copperhill, Tenn., within a few hundred yards of the Georgia state line.

Silver King of Arizona Officers Announce Policy

In response to a request from stockholders of the Silver King of Arizona Mining Co. for information regarding the present and future policy of the company, the officers have announced that the company is following, and proposes to continue, a conservative but firm policy of mine development, with a view to bringing the property to the stage of profitable production as soon as possible.

During 1919, the company disposed of litigation involving the completion of title to certain mining claims considered valuable in connection with future operations, and incurred general and administrative expenses that were considered necessary, but which will probably not be duplicated.

The company has recently secured the services of Harry J. Wolf as consulting engineer, and under his general direction plans to follow a policy of economy in administration, and an aggressive scheme of mine development. Mr. Wolf was formerly chief mine engineer of the Camp Bird mine in Colorado, and has been actively engaged during the last seventeen years in examining mines, and in developing and managing mining properties in the West.

Arthur Hillebrand, president of the company, and his associates, have recently underwritten \$50,000 of the company's bonds to cover current financial needs, in addition to the \$150,000 in bonds which they had already purchased in the interest of the organization.

Labor Scarce in Idaho in Spite of Wage Increase

In spite of the fact that wages for underground men have been increased to \$5.75 per day in the Coeur d'Alene district of northern Idaho, mining companies are still experiencing much difficulty in getting men. Some of them have sent agents to the coast, to Salt Lake City and to other industrial centers for the purpose of obtaining men. Employees are constantly quitting for no apparent reason other than yielding to the spirit of unrest that seems to possess wage earners in all the mining districts of the West.

Gold Producers at Tonopah Urge Passage of McFadden Bill

At the meeting of gold producers recently held in Tonopah, Nev., it was decided to urge the passage of the McFadden bill providing a \$10 premium on gold. At the same time plans were laid for organizing a Nevada chapter of the American Mining Congress. Louis D. Gordon presided. Among the speakers was Bulkeley Wells, president of the American Mining Congress. Mr. Wells, in the course of his speech, announced that the jewelers' association had promised not to oppose the McFadden measure. A resolution endorsing the bill was adopted unanimously.

New Trial Ordered in Case of Presidio Mining Co.

U. S. District Court of Appeals Grants Sixth Rehearing in Twenty Years—Action for Minority Stockholders

The U. S. District Court of Appeals in San Francisco granted a petition on April 5 for a rehearing of the case of Captain W. S. Overton vs. the Presidio Mining Co., William S. Noyes et al., in which property valued at \$600,000 is involved. This is the sixth time in the last twenty years this court has granted a rehearing. The Presidio property is in Shafter County, Texas.

The suit was first tried before Judge Van Fleet. It was alleged that Noyes, as general manager of the Presidio Mining Co., had fraudulently acquired large sums of money and property that properly belonged to the company. Judge Van Fleet ordered that Noyes restore the property and moneys and that a receiver be appointed to take charge of the company's affairs.

On appeal to U. S. Circuit Court of Appeals this ruling was modified to the extent that the receiver was ordered discharged, though the court ruled that certain properties obtained by Noyes should be restored to the company. This decision was made last October. The court has now granted a rehearing of the case. Captain Overton acted for the minority stockholders.

Interstate-Callahan Changes Name to Callahan Zinc-Lead

At the annual meeting of the Consolidated Interstate-Callahan Mining Co., at Phoenix, Ariz., on April 12, stockholders voted to change the name to the Callahan Zinc-Lead Co. John Borg was elected a director, succeeding R. M. Fox. Other retiring directors were re-elected.

A. S. & R. Elects Officers

The American Smelting & Refining Co. on April 7 elected the following as officers for the ensuing year:

Simon Guggenheim, president; Edgar L. Newhouse, chairman of the board; F. H. Brownell, vice-president; C. W. Whitley, vice-president; Joseph Clendenin, vice-president; William Loeb, Jr., vice-president (new); H. R. Wagner, vice-president (new); H. A. Guess, vice-president (new); H. A. Prosser, vice-president (new); Roger S. Straus, assistant to the president (new); John C. Emison, treasurer (new); Frank W. Hills, comptroller; Lucius A. Chapin, assistant treasurer and assistant comptroller; W. E. Merriss, secretary; Charles Earl, assistant secretary; R. P. Reese, auditor, and J. F. Belford, vice-president.

The members of the executive committee as elected are: Simon Guggenheim, chairman, F. H. Brownell, Joseph Clendenin, Charles Earl, H. A. Guess, F. W. Hills, William Loeb, Jr., Willard S. Morse, Edgar L. Newhouse, H. A. Prosser, C. A. H. de Saulles, Roger W. Straus, H. R. Wagner, and C. W. Whitley.

Complaint Against Minerals Separation To Be Heard

The two-year old complaints of the Federal Trade Commission against the Minerals Separation, North American Corporation and others will soon be given a hearing. The complaints charged the Minerals Separation group with stifling competition in certain phases of ore concentration; discrimination as to royalties exacted from mine operations, between favored operators and others whom they desire to "discipline, punish and make examples of," and a number of other matters alleged to be detrimental to the industry.

The defendants were also charged under the Clayton anti-trust act with making exclusive purchase-selling contracts, fixing prices, rebates or discounts on condition the purchasers shall not deal in or use commodities of independent competitors. The defendants have entered denials to most of the charges in the commission's complaint.

Recent Production Reports

Greene Cananea produced 3,700,000 lb. copper, 144,750 oz. silver and 770 oz. gold in March, against 3,400,000 lb. copper, 146,620 oz. silver and 765 oz. gold in February.

Inspiration Consolidated produced 6,500,000 lb. copper in March against 7,200,000 in February.

Shattuck Arizona Copper Co. produced in March 344,938 lb. copper, 583,101 lb. lead, 26,084 oz. silver and 290.79 oz. gold. Production in January and February, previously unannounced, was 36,905 oz. silver and 697.15 oz. gold.

Calumet & Arizona's copper production in March was 3,164,000 lb. against 3,948,000 in February.

New Cornelia's copper production in March was 3,516,000 lb. against 3,518,000 in February.

Anaconda's March output was 18,450,000 lb. copper against 18,500,000 in February.

Arizona Copper produced 3,000,000 lb. copper in March. The February output was the same.

Butte & Superior in March produced 11,150,000 lb. zinc in concentrates and 210,000 oz. silver, compared with 11,000,000 lb. zinc in concentrates and 210,000 oz. silver in February.

Old Dominion's smelter produced 2,358,400 lb. copper in March against 2,103,000 in February.

East Butte's smelter produced 1,909,720 lb. copper in March compared with 1,460,360 in February.

Consolidated Interstate Callahan shipped 7,400,000 lb. zinc (in 51 per cent concentrates), 2,900,000 lb. lead (in 59 per cent concentrates), and 29,290 oz. silver in March compared with 8,020,000 lb. zinc, 3,080,000 lb. lead and 30,800 oz. silver in February.

Cerro de Pasco produced 5,778,000 lb. copper in March against 4,718,000 in February.

Backus & Johnston produced 958,000 lb. copper in March compared with 926,000 in February.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Zinc Tariff Reported to Senate Without Change

Efforts to Secure Two-Cent Duty Fail—
Senator Watson Describes
Situation Abroad

Despite strong pressure for a 2-cent duty on imports of zinc, the Committee on Finance of the Senate, after a delay to consider the merit of the claim for a higher duty, has reported out the bill which passed the House without amendment. Senator Watson, in reporting the bill to the Senate, called attention to the fact that the zinc-mining industry in the United States was in a situation demanding immediate relief. He further pointed out that the Joplin district employs from 12,000 to 15,000 men and accentuated the fact that there is no foreign element among the miners in that district. He pointed out the possibility of the United States becoming the dumping ground of zinc ore from all parts of the world owing to the destruction of smelter capacity in Europe as a result of the war. Senator Watson stated that 400,000 tons of zinc ore are piled on docks in Australia awaiting shipment. This ore, he pointed out, has accumulated due to the restrictions on the use of shipping, but that, as this restriction has been removed, prompt moving of this ore is anticipated. He called attention to the fact that the zinc in Australia is a byproduct of an ore from which lead and silver have been recovered.

In his report, Senator Watson placed special emphasis on the Mexican production of zinc ore, which he described as being a constant menace to the industry in the United States. He submitted figures to the Senate showing the differences in wages paid to labor in Mexico as compared with the usual wages in the Missouri-Kansas district.

The bill as passed by the House and as approved by the Senate committee provides that zinc-bearing ore containing less than 10 per cent of zinc is to be admitted free of duty; ore containing 10 per cent or more of zinc and less than 20 per cent is to be dutiable at one-fourth of one cent per pound on the zinc contained therein; ore containing 20 per cent and less than 25 per cent of zinc, one-half of one cent per pound; ore containing 25 per cent or more of zinc, one cent per pound. Zinc in blocks or pigs and zinc dust is to be dutiable at one and three-eighths cents per pound; in sheets, one and five-eighths cents per pound; in sheets, coated or plated with nickel or other metal, or solutions, one and three-fourths cents per pound; old and wornout, fit only to be remanufactured, one cent per pound.

Further Changes Made in War Minerals Relief Bill by House Committee

As Altered, Measure Provides for Review of Evidence by Court of Claims and for Appeal to Supreme Court—
Bond Not Required of Claimants

Convinced that the war-minerals relief bill, as reported to the House, cannot be passed in its present form, the Committee on Mines and Mining has made substantial changes in the measure. With these changes it is expected that the opposition of Congressional leaders will be met and the bill will be allowed to come to a vote. Chairman Garland of the committee expects to appear soon before the Rules Committee to ask that special permission be given for the consideration of the bill. Unless such permission is granted a considerable period will have to elapse before the measure would be reached on the calendar.

The principal objection to the bill as reported was the provision giving authority to the Court of Claims to hear all war-mineral cases *de novo*. The Congressional leaders, who just at this time have uppermost in their minds the matter of curtailing Governmental expenses, feared that this provision would entail a large expenditure on the part of the Court of Claims in seeking out evidence of its own in regard to such war-mineral cases as might be appealed. The bill, as altered, provides simply for a review of the evidence already submitted by the Court of Claims and allows either party the specific right to appeal to the Supreme Court of the United States. There is some question as to whether or not, under the general jurisdiction of the Court of Claims, there would be a right of appeal to the

Supreme Court in these particular cases. The change is meant to make it clear so that there will be no question about this.

Another change which has been made by the committee is to relieve claimants of the obligation of executing a bond to cover such portion of the award which may have been received. This precaution was inserted so that the Government would be protected in case the Court of Claims should find due a less amount than that already awarded. The committee's view is expressed as follows:

"All of the claimants who have received awards thus far have been forced to utilize the greater portion of this money in paying off obligations. None of the claimants has received an award so far which is enough to allow him to meet all of his obligations. The claimants are practically in a state of bankruptcy. They would be unable to give the bond required as the bill now reads. To force them to give such a bond would eliminate them from the benefits of the section and, therefore, it is suggested that the requirement of a bond be stricken out."

A further change, which has been agreed upon by the committee, is intended to give the Court of Claims authority to consider the same evidence and facts that were used by the commission. In that connection the idea of the committee is expressed as follows:

"This change is suggested in order

STATUS OF PENDING MINING LEGISLATION

Bills That Have Reached Committee Stage

Subject of Bill	Bill No.	Author	Present Status
Silver in coins.....	H. R. 11,226...	McFadden.	Before House Committee
Met. Min. on Ind. Res. S. 287.....		Ashurst....	On Senate Calendar
Timber for mining purposes.....	S. No. 1.....	Pittman...	Passed Senate Oct. 3, before House Committee
Anti-dumping.....	H. R. 10,918...	Fordney....	Passed House Dec. 9, on Senate Calendar
Laboratory glassware..	H. R. 7,785....	Bacharach..	Passed House Aug. 2, on Senate Calendar
Magnesite.....	H. R. 5,218....	Hadley....	Passed House Aug. 7, on Senate Calendar
Tungsten.....	H. R. 4,437.	Timberlake.	Passed House Aug. 21, on Senate Calendar
Zinc.....	H. R. 6,238.	McPherson.	Passed House Sept. 2, on Senate Calendar
War Minerals Relief	H. R. 13,091.	Garland....	Reported favorably to the House March 25.

to authorize the Court of Claims to use all testimony which has been considered by the War-Minerals Relief Commission. Claimants and the commission have introduced *ex parte* letters and other informal documents from Government officials and from others, tending to clear up the various points at issue. These would not be admitted, ordinarily, in evidence, but it is desired that the law be worded so that the Court of Claims may consider the evidence which was collected and laid before the commission."

Re-appraisal of Indian Lands Proposed

A bill granting permission to the Department of the Interior to re-appraise the segregated mineral land in the Choctaw and Chickasaw Nations in Oklahoma, has been passed by the Senate. Sales under an old appraisalment have been delayed by legislation owing to the increase in the value of the coal and asphalt lands included in the holdings of the Indian tribes that have been mentioned.

May Double Quantity of Nitrate To Be Sold

Nitrate of soda to the extent of 100,000 tons is to be taken from the War Department's reserve for sale to fertilizer distributors and users, if the opinion of the House of Representatives should prevail in the conference with the representatives of the Senate. The Senate had previously limited the quantity to 50,000 tons. Six cargoes of nitrate, or 28,744 tons, passed through Panama Canal the last week in March.

NEWS BY MINING DISTRICTS

ARIZONA

Hackberry Cons. and Senate Silver Merged—Vekol Mine Reported Sold—Old Planet To Ship Again

Hackberry—Consolidation of the Hackberry Cons. and Senate Silver companies has been effected. All work on the former is to be done through the Hackberry and provision has been made for \$225,000 working capital, if needed. The combined property now has about 1,000 ft. of proven ground on the Hackberry lode. The Senate section is the narrower, though richer. A large ore reserve will be built up before

developing its section of the Hackberry lode. A shaft will be sunk to 300 ft. and crosscutting started. Sam Martin is in charge.

Oatman—Leland-Mitchell is to be equipped with new machinery for deep exploration, according to Colonel S. R. Porter.

Tucson—In the Silverbell district, the Ohio-Arizona Co. is completing a 1,365-ft. tramway from the mine to the road below. Sasco will be the railroad shipping point. The shipping ore, carrying copper, gold and silver, was struck in a cave on the 210-ft. level.

The Silver Peak Mining Co. has acquired the Southern Cross property in the Baboquivari Mountains, 60 miles south of Tucson, and will start a small milling plant on dump ore.

In the Tucson Mountains, near Tucson, several prospects are under development. The Arizona Lead, Silver & Gold Co., represented by George Johnson, has started shipping. The Arizona-Tonopah has developed lead-silver ore of shipping grade. A. J. Harshburger is in charge. Pellegrin & Son are shipping galena carrying silver and gold from the Old Mission No. 3.

Casa Grande—The famous Vekol silver mine, 42 miles southwest of this point, is reported sold to a New York company for \$400,000. It is stated that the new owners will spend \$300,000 on mechanical equipment. Much good shipping ore is said to be available, though new workings are needed.

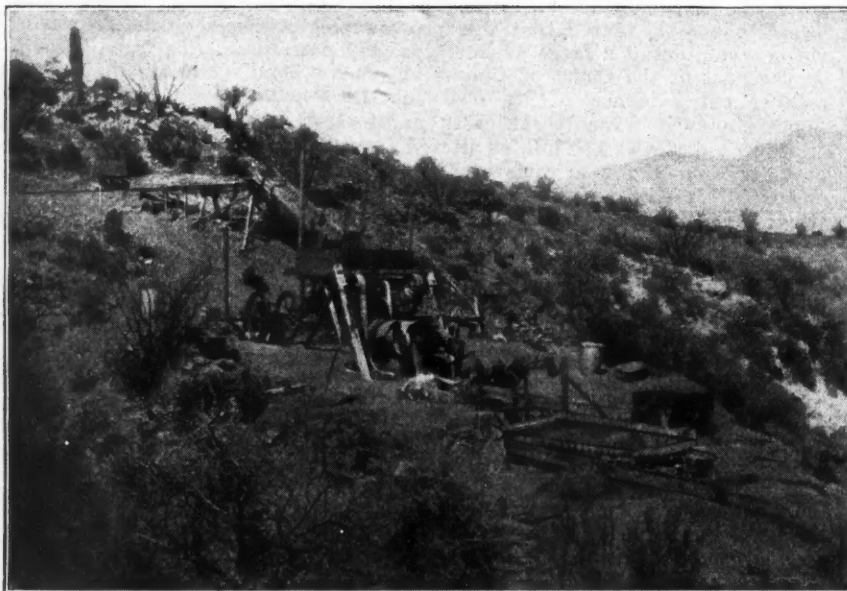
Swansea—The old Planet mine, the first copper property ever worked in western Arizona, is to begin shipping by motor truck soon, by way of Swansea. The ores are oxide and carbonate, lying in flat measures. There is an inclined shaft 1,400 ft. long.

Willcox—The Goldsmith Maid Copper Co. is planning a concentrator for handling a large body of low-grade gold ore developed on the 327-ft. level. There are occasional kidneys of rich ore and nuggets of free gold have been found. President T. F. Forester is in charge.

Work will be resumed soon on the Red Bird mine of the Cochise Gold M. & M. Co., four miles north of Cochise. Four-dollar ore amenable to cyaniding is said to be available in quantity.

Duncan—The results of the examination and sampling of the Ash Peak mine by the A. S. & R. Co. are reported (unverified) to be satisfactory and a deal has been closed with the Murphy interests for a lease and option. This will involve an expenditure of a large sum in mill and mine equipment.

Christmas—Wilson and Stone, who are operating the Cuttler and Bewater vanadium property on the west flank of Dripping Springs wash, are now run-



CUTTLE & BIWATER MILL NEAR CHRISTMAS, ARIZ., TREATING VANADIUM ORE CONSISTING PRINCIPALLY OF DESCLOIZITE. EQUIPMENT INCLUDES NO. 4 MOYLE ROLL JAW CRUSHER, 14-MESH TROMMEL, OVERSTROM UNIVERSAL TABLE AND 22-HP. WITTE ENGINE

the 200-ton flotation mill is started. Electricity is to be used in the workings to a large extent, this including an electric hoist, electric pumps and all lighting. The Hackberry workings are down 800 ft. and this level is to be extended through Senate ground.

Combination Silver has purchased machinery and will spend \$50,000 in

John V. Monahan, who organized the company two years ago, has returned to Columbus, Ohio, to promote another enterprise, and has been succeeded at Silverbell by Fred J. Siebert.

The Silver Virgin property, in the Quijotoa section, 85 miles southwest of Tucson, has developed 6,000 tons of \$30 lead-silver and lead-copper ore.

ning a small concentrating plant, which treats about five tons in eight hours. The crushing is done in a Moyle roll jaw crusher and the concentrating on an Overstrom table. The ore is principally descloizite.

Mohave County News

BY S. FORD EATON

Oatman—The United American was recently granted a permit to sell 100,000 shares of treasury stock at 40c. per share. The entire block was sold within eight days, 90 per cent going to Mohave County buyers. The station and skip pocket at the 500-ft. level are completed. The crosscut is now being driven to the north. It is estimated that the north vein will be reached in 200 ft. A south crosscut to a minor vein is also contemplated.

McCracken—F. A. Garbutt, of Los Angeles, is operating the Signal mine and is sinking the main shaft with a 40-hp. gasoline hoist. Drilling is being done by hand. The present depth is 520 ft. Plans call for continuation to the 700 level. The drift on the vein at the 500 level to the old McCracken mine has just been completed. A thorough examination and sampling of the McCracken and Alta mines for the same interests has been made by M. J. Keily. Both of these properties are under option to Garbutt.

COLORADO

Roosevelt Mining Co. To Remodel Mill at Alice—Dives-Pelican Mill at Silver Plume To Use Flotation—Rico-Wellington Strike Important

Georgetown—As weather conditions improve, scouts from prospective investors are coming to this district in increasing numbers. Old silver-lead properties long idle are being examined and in many instances have been taken on option. Lessees are also actively securing blocks of ground on silver-lead properties wherever obtainable.

The Georgetown Tunnel Co. has started its new mill. The Chasfield Mining Co. has been incorporated to take over the Silver Plume tunnel property, and the New Life Co. is overhauling its mill for test runs. After long idleness, work has been resumed on the Gold Metal in Gilson Gulch.

The Roosevelt Mining Co. has acquired the Reynolds and Kentucky property at Alice and will remodel the mill and tramway, install new compressors and extensively develop the property.

The Dives-Pelican property at Silver Plume has been sold to a New York Syndicate which will organize a company, and proceed with development work. The property is equipped with a 200-ton concentrator which will be remodeled and equipped for flotation.

Leadville—Ore receipts at the Arkansas Valley Smelter have increased to about 50 per cent more than the low point of last year. This tonnage has come in the main from small shippers who have been encouraged by improved

prices and labor conditions. Much new work is planned. A 5,000-ft. tunnel through Canterbury hill will be started about May 1. Work on the Roy group owned by the Thomas F. Walsh estate, will start, it is said, about the same time. Work on the Ready Cash and Big Chicago group will also begin next month.

Other properties expecting to reopen when the snow goes are the Continental Chief in Iowa Gulch; the Rattling Jack, near the Little Johnny; a group of claims on St. Kevin Mountain, and the Pawnolas in Big Evans Gulch.

Central City—The Hughes Consolidated Mining Co., recently organized to take over the Lillian group in Russell Gulch, has struck an orebody on the 450 level, apparently a continuation of a shoot worked with good results on the upper levels.

The Comstock M., M. & Exp. Co., recently organized by Youngstown, Ohio, men, has purchased the Comstock properties and is retimbering the shaft preparatory to sinking from the 400-ft. level.

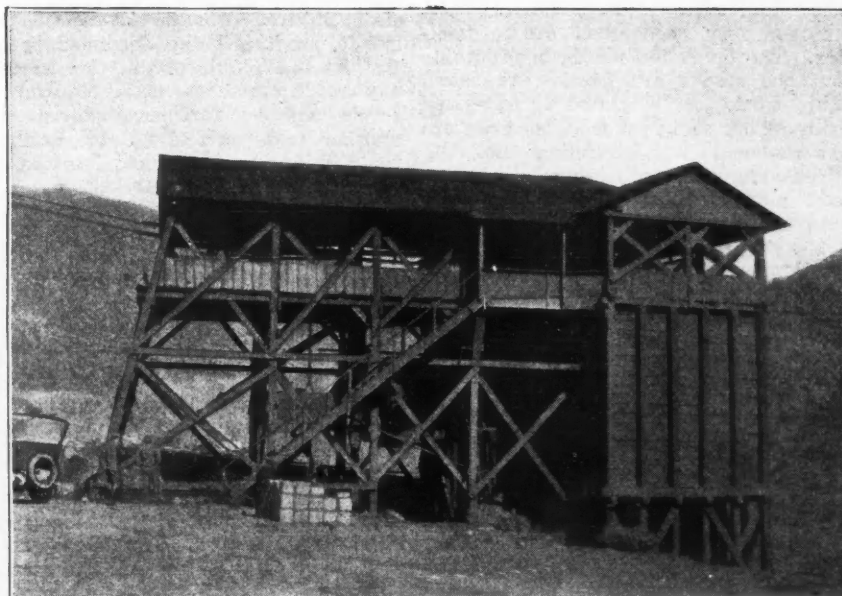
Encouraging progress is being made in the litigation to clear the title to the Fifty-Fifty properties near Black Hawk. A syndicate will take them over

California and the other in the San Juan in Colorado. It also holds the plants and business of the Ferro Alloy Co., which it purchased a year and a half ago.

Rico—Development of the recent strike on the Rico-Wellington indicates that it is important. Eighteen cars of ore from it netted upward of \$50 per ton at the Murray smelter. The ore occurs in limestone in a blanket formation about 9 ft. thick, the sides being undetermined. The property is now worked from the Mountain Spring bore, to which the head-house of the tramway has been moved, instead of from the Wellington tunnel, with resultant lowering of cost. Two other discoveries have also been made in this limestone and are being developed.

Telluride—The Tomboy and the Smuggler Union have a large tonnage of concentrates on hand awaiting the opening of the Rio Grande road. On the Silverton branch, the Sunnyside has approximately 60 cars of lead-silver concentrates ready. Shipments from the Gold King and the Iowa Tiger have also been impeded by snowslides.

Ouray—Stormy weather has retarded the spring opening. Roads and trails



DISCHARGE TERMINAL OF AERIAL TRAMWAY OF GILA COPPER SULPHIDE CO., CHRISTMAS, ARIZ.

as soon as legal formalities are completed.

Arrangements are reported completed whereby the Kansas group at Nevadaville will change hands. It is proposed to connect the old workings with the Newhouse tunnel, thereby draining a large area and opening up for development ground that has been flooded for years.

Cripple Creek—The Vindicator Con. is carrying on a campaign of development in an unexplored portion of the property and is concluding long-time leases and options on an extensive area adjoining. It has also undertaken the development, under bond and lease, of two silver properties, one in southern

are still unfit for anything but light pack-train work. Operators of the Golconda, Des Ouray, Early Bird, Wyoming, Guadalupe, and Hidden Treasure are compelled to defer operations.

The crosscut of the Silver Mountain Mines Co. will reach its objective in a month. Four veins have been cut. The latest, discovered on April 4, is over 4 ft. wide and shows excellent copper ore. It is probable that a mill will be required soon to handle the ore from the veins already cut.

The Hidden Treasure, under E. R. Baur, of Ouray, is opening its road from the Camp Bird mill to its mine. This is one of the early-day mines of Tom Walsh, now owned and operated

by his estate. It is close to the Camp Bird, has a large tonnage of silver-lead-zinc ore developed, and has been shipping good crude ore. Several hundred tons of this are awaiting shipment. It is expected by Mr. Baur that a mill will be erected this summer.

The assay office and old zinc mill belonging to David Foerster was destroyed by fire on April 3. This was the only local assay office. A new plant will be in operation under the same management very soon.

The Silver Mountain Mines Co., W. C. McGee manager, is driving its crosscut for the Kentucky Giant vein, with good progress. Unexpectedly several veins have been cut before reaching the main objective. The point sought will be reached in a month or six weeks and the Kentucky Giant vein then developed. It is likely that this company will be in the market for milling equipment; some of the ore is heavy pyritic ore, and it is possible that a small smelting plant will be erected—at least it will be desirable, and the company has it in mind, having already started investigating local resources as to fluxing ores.

Carney and Keleher are winding up their stope-drawing operations on the Wedge; for two years they have drawn the old stopes, sorted roughly and shipped very good silver ore to smelter. The operation has been profitable but the stopes are nearly exhausted. This work has disclosed a fair-sized body of ore still in place, also good ore on the end line extending into the Neodesha mine adjoining. The lessees plan to extract this ore in place and continue their operations under a lease on the Neodesha, driving into that mine from the Wedge. They are also seriously considering a milling plant of the oil flotation type; there are still large ore-filled stopes on the adjoining Bachelor mine, under the same management, which would pay well to draw as was done in the Wedge. Large dumps at these mines will furnish additional tonnage for milling.

MONTANA

Butte—Directors of the Barnes-King Development Co., it has been announced, on March 13 decided to enter the oil prospecting business and agreed to buy the remaining 17,500 shares of the treasury stock, at \$1 per share, in the Kansas Montana Oil & Gas Co., operating in Fergus County, Mont.

Barnes-King's February production was valued at \$42,376.94 as follows: North Moccasin, 1,799 tons ore yielding \$7.63 per ton; Gloster, 1,225 tons assaying \$9.10 per ton; and Shannon 2,209 tons assaying \$8.42 per ton.

Neihart—Ten feet of good ore is reported on the 700-ft. or deepest level of the Cascade M. & M. Co.

Elliston—The Monarch concentrator is treating about 50 tons of ore daily.

Whitehall District—Sinking of a two-compartment shaft to 300 ft. is expected to be started soon by the Jefferson Mines.

IDAHO

Senator To Use Great Eastern Tunnel—Callahan Zinc-Lead Co. Breaks Lead Shipment Record—Idaho-Carbonate Hill To Resume

Wallace—The Senator Mining Co. has secured an easement for the use of the Great Eastern Mining Co.'s lower tunnel, on Canyon Creek, through which it will develop the Flynn Group of claims, situated on the divide between Canyon Creek and Mullan. Heretofore it has prosecuted development on the Mullan side through the Star workings. The Great Eastern tunnel will enable it to explore the ground 1,000 ft. deeper than the Star. Its portal is within a few hundred feet of the railroad. This enterprise should not be confused with the operations of the Flynn Group Mining Co., which has adjoining ground and which is operating through the Black Bear tunnel, also on Canyon Creek. The Senator has two veins on its ground, one of which will be reached by extending the Great Eastern tunnel about 3,000 ft. where it will be about 2,500 ft. below the surface.

At the Chicago-Boston, about two miles west of Wallace, under option to John A. Percival, of New York, president of the Callahan Zinc-Lead, the 200-ft. shaft is being deepened to 400 ft. At the 400 level the vein already exposed in crosscuts on the 100 and 200 levels will be further explored, and another crosscut will be run south to the Kill Buck vein, an old location, included in the Percival option. The property is owned by Senator W. A. Clark, of Butte.

During March, in addition to the usual large zinc tonnage, the Callahan Zinc-Lead shipped 1,500 dry tons of lead concentrates, the highest record of lead shipments made by the company. This is credited to high efficiency of the mill in separating lead and zinc and also to a larger proportion of lead in the ore.

The Amazon-Dixie, across the Idaho-Montana State line, has let a contract for extending the main tunnel 1,200 ft. into the Leslie adjoining, which it has recently taken over. The company will also let a contract to sink the double-compartment shaft 420 ft. below the 1,100 level as soon as the new electric hoist now en route to the property is installed.

The North Bunker Hill Mining Co. at Wardner has started crosscutting from the bottom of its 500-ft. shaft and expects to cut the first of three veins in about 80 ft.

According to announcement by W. D. Greenough, of Spokane, president of the Idaho-Carbonate Hill Consolidated, work will be resumed on the property near Mullan about April 15. He also stated that the company had \$200,000 available for exploratory work. A shaft 400 ft. deep has been sunk from the main tunnel and a shoot of lead-silver ore 6 ft. wide exposed for 100 ft. Soon after opening up this ore last summer work was stopped through lack of funds. The company

owns a large group of claims. Unusual interest attaches to this enterprise, as it is in a section of the district with every indication of large mineral deposits, many identified, but as yet unproved.

The Giant Ledge, on Prichard Creek, is ready to install a 300-ton concentrator as soon as the O-W. R. & N. company rebuilds its railroad, according to a statement by W. W. Johnson, secretary.

MICHIGAN

Rail Strike Hinders Copper Shipments—Seneca Resumes Sinking—W. A. Cole, of Ironwood, Has New Loading Machine

Calumet—Calumet & Hecla shipped 1,500,000 lb. of copper by rail on April 6, and on other days has been shipping 400,000 lb. per day. Quincy is shipping two cars a day and Copper Range two cars. Included in these are carload lots for Ansonia, Conn., Kenosha, Wis., Detroit, and an occasional car billed for California. The railroad labor difficulty at Chicago is now interfering with shipments, as the smelters are waiting for empty cars.

Seneca resumed sinking in the main shaft April 10. The shaft is now down 2,100 ft. and will be sunk rapidly to 2,600 ft. There will then be eight levels. Resumption of mining work on the third level will start immediately, also drifting both north and south on the vein. The longitudinal work on the fourth level to tap the Kearsarge amygdaloid will not take long and then there will be two openings at that depth. Sinking of the Gratiot shaft will be started May 1.

Houghton—The Mayflower-Old Colony crosscut to the northwest is 90 ft. long and continues in good copper. The south drift is in 53 ft. The north drift is in 195 ft. and has opened a copper-bearing conglomerate which is the first conglomerate showing that has been found. This north drift has opened three different formations, first, the so-called Mayflower lode, an amygdaloid, a second amygdaloid, carrying some trap and copper, and third, this conglomerate.

Iron District

Gogebic Range

Ironwood—W. A. Cole, master mechanic for the Oliver Iron Mining Co., has received from a manufacturer the loading machine, which he invented, and is now trying it out on the coal dock at the Pabst mine. The machine is operated by two large air cylinders and an air motor. It is simple in design and compact, and should be well adapted to underground work. It should be possible to place the machine on the market soon.

The C. & N.-W. Ry. Co. will build a hotel in Ironwood to accommodate about 100 employees. Many train crews are required to handle the summer ore traffic from the mines and it has been difficult for these men to get board and lodging.

NEVADA

**First Ore from Arrowhead Reaches
Tonopah—Diamond Drilling at
Virginia City Nearing
Comstock Vein**

Carrara—A \$25,000 channeling machine has been recently installed by the Carrara Marble Co., near Beatty.

Eureka—Ten claims and fractions, in all 111 acres, on Adams hill, were recently bought by individuals identified with the Eureka-Holly Co., and the Bullwhacker Consolidated Mines Co. It is reported that the entire capital stock is in the treasury.

Copper Canyon—Ed Malley, state treasurer of Nevada, and associates, who were recently given title to valuable placer claims at Copper Canyon, near Battle Mountain, by Supreme Court decision, are planning to resume.

Como—The mine and mill of the Como Consolidated Co. are again in operation after a brief shutdown.

Willard—The Jose-Davis Company expects to keep its new 30-ton Gibson mill running on ore from development work at the Shepherder mine. The mill is supplied with warm water which was struck at the millsite on the edge of Lovelock valley at 30-ft. depth.

Sprucemont—A new compressor plant has been installed by the Spruce Monarch Mining Co. near Sprucemont in Elko County. Development work will be pushed during the summer. A saw-mill has been ordered.

Arrowhead—The first truckload of ore from the Arrowhead district has reached Tonopah and as soon as a full carload is received, shipment will be made to the smelter. This ore is from the Arrowhead Mining Co. Lessees on the Gold Hill property also have nearly 70 sacks ready for shipment. In spite of recent deep snows and storms the camp is active and several properties are under development.

Virginia City—Under a lease granted to Alexander Wise an ambitious plan to develop and work the ground above the 800 level of the Best & Belcher, Gould & Curry and Savage mines of the Comstock lode is about to be inaugurated. The lease is said to be for a term of years and calls for a flat rental of \$8,000 to each company. Wise and associates have been working the Exchequer, Alpha, Imperial, Consolidated, Challenge and Confidence for some months, and also have options on the Overman and Knickerbocker. A reduction plant will be erected, if milling ore hoped for is developed.

The diamond drill hole, which was started on the line between the Best & Belcher and the Gould & Curry, is now down 490 ft. at an angle of 45 deg., and is nearing the Comstock vein, according to H. L. Slosson, Jr., president of the Middle Mines Association.

Haystack—The Haystack Mines Co. will instal a small mill at its property in the foothills of the Antelope Range, 7 miles south of Jungo station on the Western Pacific. One shaft has been sunk 100 ft. on a vein of free-milling

gold ore, and richer ore has been found in another shaft 30 ft. deep. Several lessees will also begin operations soon.

Rocky Canyon—The 18-ton Gibson mill at the Tiger mine in Muttelbury Canyon, 7 miles from Lovelock, has been bought by the recently incorporated Rocky Canyon Mining Co. and moved to its property, northeast of Willard. On the dump of the company's mine and that of the Rusty Pick which it has taken over, there is enough ore to keep the plant running for some time.

Rochester—The Rochester Silver Corporation is the name of the new company that will take over and succeed the Rochester Nevada Silver Mines Co. Its capitalization will be \$2,000,000 instead of \$8,000,000, and the exchange of its stock will be in the same proportion as proposed for the original transfer.

Austin—Increasing interest is manifested in the Wedekind lease on the Herschell Consolidated close to the depot at Austin, where ore averaging 70 oz. silver and 40 per cent lead was found on the surface and is holding out with development. The property is in what is called the base-metal zone of the district. George D. Kilborn, of Reno, is developing the property.

Pioche—Work has recently been resumed on the old Hamburg mine, nine miles from Pioche. W. H. Pitts is in charge. The ore carries gold, silver and lead and is found in beds of limestone along the fissure.

The Virginia Louise Co. has contracts calling for 150 tons of ore daily to be consigned to the U. S. Smelter at Midvale, Utah, and for an additional 100 tons per day to be shipped to the Garfield smelter of the A. S. & R. Co. The principal part of the tonnage is coming from the Davidson orebody.

NEW MEXICO

Lordsburg—Ore shipments from this district for March amounted to 87 cars, of an approximate value of \$85,000.

Boyd Bros. will erect a 50-ton mill on the Ada-Etta claim. Two shafts have been sunk 30 and 40 ft. respectively showing a 10-ft. vein of siliceous lead-silver ore.

The Foster Estate, of Westerly, R. I., will once more work the Gold Range mines north of town, consisting of nine patented claims. Frank Klein will be superintendent.

Las Cruces—The Tortuga Fluorspar Co. is producing 10 tons of fluorspar daily from its property on Tortuga Mountain, near State College. Alfred Roos is manager. Ten men are employed. Shipments are going to Chicago where \$22 per ton f. o. b. cars shipping point is obtained. Freight is \$7 per ton. Analysis is 95 per cent CaF₂, 3 per cent SiO₂, and 2 per cent available lime. Base metals and coloring matter are said to be absent.

Mogollon—The newly organized American Silver Corporation expects to have a full force in operation soon. Road work and preliminary operations at the mine are being carried on.

UTAH

Milford—Stockholders of the Moscow Mining & Milling Co., near Milford, in southern Utah, have met and approved the proposed consolidation with the adjoining Beaver Combination and Red Warrior properties, and favorable action by the latter is expected soon. The new company will be called the Moscow Silver Mines, and arrangement for financing has been completed. Operations will probably be started from the 1,250-ft. level of the Cullen shaft, which is down 1,400 ft. The Moscow in the past produced lead-silver ore and paid dividends over a number of years. At the 1,200 level of the shaft it was found that orebodies on the Milford side of the property were faulted westward and could be expected vertically under the Beaver Combination, apexing in Red Warrior ground. The united properties will cover 300 acres of ground. The officers of the company will be: F. J. Leonard, president; F. J. Hagenbarth, vice-president; M. B. Johnson, secretary and treasurer; G. S. Wilkins, general manager. All of these men are of Salt Lake City. Angus Buchanan, of Long Beach, Cal., is also a director.

WASHINGTON

Keller—The 50-ton mill at the Iron Creek mine is expected to be completed by May 15, according to J. E. Angle, secretary and manager. Two hundred tons of ore are on the dump.

Loon Lake—Plans for refinancing the Loon Lake Copper Co. are under consideration.

Daisy—The Silver Mountain Mining Co. has ordered equipment for a 50-ton mill to be erected at the Daisy mine.

CANADA

Ontario

Cobalt—Minority shareholders of the University Mines, Ltd., have obtained a temporary injunction restraining the sale of the assets of the company to the La Rose Mines. The La Rose already owns 98 per cent of the stock of the University, the minority shareholders numbering about 40. Their share of the liability of \$61,000 of the University to the La Rose, which it is proposed to extinguish by handing over the entire assets, is about \$1,200. They claim that to wipe out their rights for this small debt would be unfair and that the value set on the assets is inadequate. The case has been adjourned until April 21.

Porcupine—The McIntyre has cut vein No. 5 on the 1,250-ft. level, where it carries 14 ft. of high-grade ore. Cross cutting is being carried on at the 1,375 and 1,500-ft. levels. The shaft is down 1,550 ft. and will be continued to 2,000 ft.

Kirkland Lake—Underground work on the Canadian Kirkland has been stopped, as after 200 ft. of crosscutting on the 150-ft. level, the vein, which the shaft had followed for 80 ft., was not found. Diamond drilling will be undertaken.

THE MARKET REPORT

Published in part in San Francisco and mailed from there to our Western subscribers as a special service pending the arrival of the *Engineering and Mining Journal*

Silver and Sterling Exchange

April	Sterling Exchange	Silver		April	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
8	397½	126	72	12	394	120	69½
9	398	123	69¾	13	392½	119	69¼
10	397	120½	69	14	395¼	119½	68¾

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.

Daily Prices of Metals in New York

April	Copper		Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.	
8	18.75	61	61½@62	9.15	8.75	8.30@8.35	
9	18.65	61	61½@62	9.00	8.75	8.30@8.35	
10	18.60	61½	62 @62½	9.00	8.65	8.30@8.35	
12	18.60	62½	63 @63½	8.90	8.60	8.30@8.35	
13	18.75	62½	62½@63½	8.90	8.60	8.35@8.40	
14	18.75	62½	62½@63½	8.80	8.50	8.35@8.40	

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 the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point. All prices are in cents per pound.

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

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

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

London

April	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3 M	Spot	3 M	Spot	3 M
	Spot	3 M							
8	102½	105½	112	335	335½	36½	39¼	46¼	49
9	100¾	103¾	111	332½	332½	36½	38¾	46	48¾
10	.....	.....	.....	.....	.....	.....	.....	.....	.....
12	102½	105½	111	345	345¼	37¾	40¾	48	50¾
13	104	106½	112	346	346	38½	41¾	49¼	51½
14	104½	107	112	350	349½	39	41¾	48¾	51½

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

Metal Markets

New York, April 14, 1920.

During the last week consumers have had other things of more immediate importance than their metal requirements to worry them. Export business, present and prospective, has been adversely affected by military developments in France and by continued violent fluctuations in foreign exchange. Domestic business has been hampered by the railroad strike, which has completely tied up freight shipments in the East. Sales of copper have been light; zinc has been quiet, and lead and tin fairly active. Transpacific freight rates remain unchanged at \$12 from Hongkong and Kobe to San Francisco.

Copper

The undertone of the copper market remains strong, although almost no

business was done last week by the large producers. The second-quarter production of the latter is well taken care of, and they are not inclined to cut prices to tempt buyers. They feel that, by sitting tight, the price is sure to tend to higher levels as soon as some of the domestic and international troubles are settled. The more distant the delivery, the higher the price asked; and orders for deliveries later than July are not invited.

Second-hands in the outside market were in some cases forced to offer their metal considerably below 19c., delivered, in order to find buyers. One figure as low as 18¾c. was reported. Second-hands, however, have little copper on hand, and it is likely that no large amounts of the metal can be bought for less than 19c., delivered. As no large sales were made, the second-hands virtually fixed the market.

Lead

The lead market is brisk but unsettled, and the price range is very wide. Some sellers have obtained as much as 9¼c., New York, for considerable quantities of metal for April-May-June delivery. A fairly large tonnage was sold in St. Louis at approximately 9¼c. On the other hand, some producers have had difficulty in getting more than 8¼c. in New York, and have offered metal at 8¼c., St. Louis, the last three days.

The London price took quite a drop last Thursday, the reason probably being that the Broken Hill strike was reported settled. The price in London has been slowly climbing since that time, however. Some lead is being exported, the total for the month up to Saturday, the 10th, being 591 tons.

Zinc

Prices for this metal have undergone but little change for the last two weeks, but may advance somewhat now that the London price has stiffened. With the latter down to £46 per long ton, as it was last Friday, the opportunity for a lucrative arbitrage business was evident, this price being equivalent to about 7.40c., St. Louis. With the London price advancing, the tendency to buy there and sell here will not be so great, and local offerings will probably decrease. Some producers have kept out of the market entirely with the recent low prices.

Tin

The tin market has been rather bullish, following the lead of London, where a rise of about £13 took place over the week end. Considerable business was done here on Thursday, Friday, and Saturday, which the higher prices of the last three days have somewhat lessened. Supplies in general are ample to meet requirements, but, on account of the railroad strike, spot delivery has in many cases commanded a considerable premium over the price at the dock.

Correction: March 31 London tin futures should have been £348 instead of £350.

Electrolytic tin was quoted as follows: April 8, 62½; April 9, 62; April 10, 62; April 12, 62½; April 13, 63½; April 14, 63½.

Straits tin for future delivery was quoted as follows: April 8, 61@61½; April 9, 61@61½; April 10, 61½@62; April 12, 62½@63; April 13, 62@62½; April 14, 62½.

Arrivals of tin, in long tons, since our last report; March 23, Straits, 275; March 24, Singapore, 400; March 25,

Batavia, 175; March 26, Straits, 20; March 30, Singapore, 675; Penang, 50; Liverpool, 75. Total for March, 4,300, less 65 exported, or 4,235 net, imported. April 1, Singapore, 25; Penang, 75; April 2, Liverpool, 5; April 3, Liverpool, 50; April 5, Liverpool, 5; Buenos Aires, 89; Australia, 100; April 7, London, 50; April 8, Penang, 100; April 9, London, 85; April 12, Batavia, 350; April 13, Liverpool, 50; London, 50.

Gold and Silver

Gold was quoted in London on April 8 at 103s. 2d.; April 9, 102s. 7d.; April 12, 103s. 5d.; April 13, 104s. 10d.; April 14, 104s.

Foreign Exchange—Conditions in the foreign exchange market are extremely interesting. Sterling has fallen again from last week's levels, but the retrogression is not serious, and a considerable recovery was made today. Yesterday francs and lire, in units to the dollar, were 15.9 and 23.0 respectively. The German mark continues to strengthen in the face of the fact that nearly two billion dollars in paper has been issued in that country since the first of the year. Last week, the mark touched 2c., and yesterday it was quoted at 1.74c. The temporary decline was probably due to the calling in, by the government, of all American securities held in Germany, at the price which obtained on Jan. 10. The Canadian dollar is still accepted only at a discount of 8 to 9 per cent.

Silver—Owing to the decline in the Eastern exchanges, the price of silver has recorded a material decline in the last week. London futures are quoted 3d. under the spot price.

Mexican dollars at New York: April 8, 96; April 9, 93; April 10, 91½; April 12, 91½; April 13, 90½; April 14, 90½.

Other Metals

Aluminum—Ingot is quoted at 33c., market firm and metal scarce; No. 12, 31½c.; sheets, 18 gage and heavier, 44.2c. Prices unchanged.

Antimony—Ordinary brands in fair demand; spot, 10½@11c.; futures, 11½c.; Chinese and Japanese brands, spot, 10½@11c. Market steady but dull; Cookson's, spot, 16c.

Needle Antimony—The market for Chinese needle antimony in lump form is firm at 8½c. per lb., with a rather quiet demand. Standard powdered needle antimony (200 mesh) is quoted at from 11@12c. per lb., according to quantity.

Bismuth—Unchanged at \$2.70 per lb. for 500-lb. lots.

Cadmium—No change. Quoted at \$1.40@1.50 per lb.

Cerium Metal—There has been no change from the price of \$8@9 per lb. in ingot form.

Cobalt—Metallic, per lb., unchanged, \$2.50@3.

Iridium—Quoted nominally at \$300; unchanged; metal still scarce.

Magnesium—Metallic, 99 per cent or over pure, \$1.60@1.85 per lb. Unchanged.

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

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c. Prices are established over long periods without change.

Osmium—Quoted \$150@165 per troy oz.

Palladium Metal—Quoted at \$115@130 per troy oz., 99 per cent pure. Little business.

Platinum—Little business; market not over-strong. Quoted at \$130@135.

Quicksilver—Fairly quiet, with good demand. Quoted at \$103 per 75-lb. flask. Stocks are still small. San Francisco telegraphs \$93@100, firm.

Ruthenium—Market value, \$200@220 per troy oz.

Selenium, black, powdered, amorphous, 99.5 per cent pure, continues to be quoted at \$1.75@2 per lb., depending on quantity.

Thallium Metal—Selling at \$18@20 per lb., ingot, 99 per cent pure, depending on quantity.

Metallic Ores

Chrome Ore—No change in price or demand. Quoted 60@85c. per unit for material containing 35-40 per cent Cr₂O₃ and 70c.@1.25 per unit for ore running 48 per cent Cr₂O₃ and over.

Iron Ores—Lake Superior ores, per ton delivered at Lower Lake ports, remain at prices fixed last year, as follows: Old Range bessemer, \$7.45; Old Range non-bessemer, \$6.70; Mesabi bessemer, \$7.20; Mesabi non-bessemer, \$6.55. Estimates of the Lake Superior iron-ore movement in 1920 range from 60,000,000 to 62,000,000 tons, or slightly under the average of the last three years. Car supply from Lower Lake docks to furnace yards promises to be the limiting factor.

Manganese Ore—Quoted at 75@80c. per unit ore containing 45 per cent Mn and over for early shipments. Freight situation remains difficult. Market firm. Chemical ore (MnO₂) quoted at \$80@90 per gross ton.

Molybdenite—Quoted at 75@85c. per lb. of contained sulphide for 85 per cent MoS₂.

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

Titanium Ores—Ilmenite, 2c. per lb. of 52 per cent TiO₂. Unchanged. Rutile, standard imported Norwegian grade, carrying a minimum of 95 per cent titanium dioxide, in the form of concentrates, is quoted at 11c. per lb.

Tungsten Ore—Market strong. Chinese wolframite is quoted at \$6.50@7; Bolivian, spot, nominal, \$8.50@9; scheelite, spot, \$15 per ton.

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

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

Vanadium Ore—\$6 per lb for 99 per cent of the vanadic oxide (V₂O₅) contained.

Zircon—Washed, iron free, continues to be quoted at 10c. per lb. Zirkite—In carload lots, \$90@100 per ton is quoted. Pure white oxide, 99 per cent, is quoted at \$1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., April 10—Zinc blende, per ton, high, \$53.70; basis 60 per cent zinc, premium, \$51; Prime Western, \$50; fines and slimes, \$47.50@45; calamine, basis 40 per cent zinc, \$35. Average settling prices: Blende, \$50.15; calamine, \$38.61; all zinc ores, \$51.11.

Lead, high, \$109.65; basis 80 per cent lead, \$107.50; average settling prices all grades of lead, \$106.40 per ton.

Shipments the week: Blende, 14,211; calamine, 72; lead, 2,358 tons. Value, all ores the week, \$966,280.

Purchases were about 2,000 tons less than last week, and shipments were 2,270 tons less. The short-haul ore that was purchased has been shipped, and with long hauls prevailing so much ore cannot be loaded.

The railroad strike menace weakened the ore situation after midweek. Notices of embargo on metal shipments were received, and this lessened the demand for ore. Eastern smelters shipped a much smaller tonnage.

Platteville, Wis., April 10—No sales of high-grade blende, owing to embargo on shipments east of Chicago. Lead ore, basis 80 per cent lead, \$105 per ton. Shipments for week: Blende, 1,390; calamine, 60; lead, 183 tons. Year to date: Blende, 22,411; calamine, 1,080; lead, 2,039; sulphur ore, 209 tons. During the week 2,415 tons blende was shipped to separating plants.

Non-Metallic Minerals

Asbestos—Quoted per short ton f.o.b. Thetford, Broughton and Black Lake mines, Quebec, Canada. Freight rate from mines to Sherbrooke, Quebec, over Quebec Central R.R., 20c. per cwt; from Sherbrooke to New York, 27½c., carload lots. Crude No. 1, \$1,750@2,000; crude No. 2 \$1,200@1,500; spinning fibres, \$500@750; magnesia and compressed sheet fibres, \$275@400; single stock, \$95@150; paper stock, \$60@75; cement stock, \$27.50@32.50; floats, \$15@17.50 per short ton.

Barytes—Pressure of heavy demand and difficulty in transportation have practically paralyzed this item. White floated is listed at \$35@40 and off-color at \$25@30 per ton.

Blanc Fixe (Barium Sulphate)—Dry, 4½@5½c. per lb.; pulp, \$30@50 per ton f.o.b. New York.

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

China Clay (Kaolin)—Imported lump, \$25@\$35 per ton; imported powdered, \$30@\$60 per ton; domestic lump, \$10@\$20 per ton; domestic powdered, \$25@\$40 per ton f.o.b. New York. Unchanged.

Feldspar—Unchanged, supplies are very tight and producers are way behind their contracts. \$13.50@\$18 still holds.

Fluorspar—Gravel, f.o.b. mines, is quoted at \$25 net ton. Nominal prices: Acid grade, lump, \$30@\$45; acid grade, ground, \$52@\$57, f.o.b. mines.

Fuller's Earth—Remains firm at \$25@\$30 for domestic and \$35@\$40 for foreign, with little material available at these prices.

Graphite—Present quotations for crucible flake are: 85 per cent carbon content, 7½c. per lb.; 86 per cent, 8c.; 87 per cent, 8½c.; 88 per cent, 9½c.; 89 per cent, 9½c.; 90 per cent, 10½c.; 91 per cent, 10½c.; 92 per cent, 11c.; over 92 per cent, 12½c. per lb. delivered. Mexican amorphous graphite is being sold at \$55@\$60 per short ton; Korean, 3½c. per lb., Madagascar, 9c.; Ceylon, 4½@16c., according to quality.

Gypsum—Wholesale price, plaster of paris in carload lots, is \$3.25 per 250-lb. bbl. Sufficient demand, but scarcity of material.

Magnesite—Dead burned, for refractory (see Refractories).

Calcined Magnesite—High-grade caustic calcined, in lump form, is selling at \$35@\$40 per ton in carload lots f.o.b. California points. The price of freshly ground calcined, suitable for the flooring trade, is \$60@\$65 per ton f.o.b. Eastern points.

Monazite—Product carrying a minimum of 6 per cent thorium oxide, \$42 per unit is quoted, duty paid.

Nitrate—Spot quoted at \$3.90 per cwt., ex vessel, Atlantic ports. Futures \$3.90@\$4.50.

Phosphate Rock—Prices quoted per long ton at port are: 68 per cent tricalcium phosphate, \$6.85; 70 per cent, \$7.35; 74 to 75 per cent, \$10; 75 per cent minimum, \$10.50; 77 per cent minimum, \$12.50. Unchanged.

Pumice Stone—Imported, 3@6c. per lb.; domestic, 2½c. per lb. Unchanged.

Pyrites—Spanish pyrites quoted at 16c. per unit for furnace-size ore, free from fines, c.i.f. Atlantic ports. Domestic pyrite, fine, 16c. per unit. The general situation is stronger.

Sulphur—Prices average \$18 per ton for domestic, and \$20 for export, f.o.b. Texas and Louisiana mines. No change.

Talc—Domestic, \$20@\$60 per ton; imported, \$60@\$70 per ton f.o.b. New York.

Ferro Alloys

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

Ferrocobalt—Conditions abroad continue to cause a reduction in price of the American goods, and this alloy is now selling at \$12@\$15 per lb.

Ferrenchrome—6-8 per cent carbon, 17@18c. per lb. of chromium contained; 4-6 per cent carbon, 19@20c. per lb. of chromium contained.

Ferromanganese—Domestic, 76 to 80 per cent, delivered, \$180@\$200 per ton for futures. Small lots, spot, \$225@\$250 per ton. English, c.i.f. tidewater, \$200.

Ferromolybdenum—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, are quoted at \$2.25@\$2.75 per lb. of contained metal.

Ferrosilicon—\$85@\$90, 50 per cent delivered, spot and contract. Electrolytic, delivered Pittsburgh Valleys, Cleveland: 50 per cent, \$80; 75 per cent, \$140. Bessemer, f.o.b. Jackson, Ohio, 10 per cent, \$59.50; 11 per cent, \$62.80; 12 per cent, \$66.10; unchanged.

Ferrotungsten—70-80 per cent W, 85c@\$1.15 per lb. contained tungsten.

Ferro-uranium—35-50 per cent U, \$7 per lb. of U contained. Unchanged.

Ferrovandium—30-40 per cent, \$6.50@\$7.50 per lb. of V contained.

Spiegeleisen—In the same position as was previously reported, the average sale ranging from \$65 to \$70 per ton.

Metal Products

Copper Sheets—No change since Jan. 1 price of 29½c. per lb.; wire, quoted 22½c.; strong.

Lead Sheets—Full lead sheets, 12½c.; cut lead sheets, 12½c. Unchanged.

Nickel Silver—18 per cent, 39½c. lb. Unchanged.

Yellow Metal—Dimension sheets, 26½c.; sheathing, 25½c.; rods, 8 to 3 in., 23½c. Unchanged.

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

Refractories

Chrome Brick—Unchanged at \$70@\$75 per net ton, f.o.b. Chester, Pa.

Chrome Cements—Unchanged at \$45@\$50 per net ton, f.o.b. Chester, Pa.

Clay Brick—First-quality fire clay, \$45@\$50 per 1,000, f.o.b. Clearfield, Pa.; second quality, \$40@\$45 per 1,000, f.o.b. Clearfield, Pa.

Magnesite—Dead burned, \$50@\$55 per net ton, f.o.b. Chester, Pa.; brick, 9 x 4½ x 2½ in., \$80@\$85 per net ton, f.o.b. Chester, Pa. Unchanged.

Silica Brick—\$50@\$55 per 1,000, f.o.b. Mt. Union, Pa.

Iron Trade Review

Pittsburgh—April 13, 1920

The iron and steel industry of the Central West is rapidly going out of operation, on account of the rail strike. Nearly all the Youngstown district is idle, but there remains considerable activity along the Lake front. In the immediate Pittsburgh district a

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

few blast furnaces are banked, their attendant steel works being idle. With those operating, it is usually a question of time before they close. The Jones & Laughlin Steel Co. expects to run the remainder of the week, but no longer. Some works expect to close sooner. Shortage of coal and coke is the chief cause of works closing, but inability to ship would eventually count.

By reason of these exciting circumstances no interest is manifested in the market, which is quiet, except for the business being done by the American Sheet & Tin Plate Co., which formally opened its order books today for second-half contracts in the case of manufacturing consumers and third-quarter in the case of jobbers, at 3.55c. for blue annealed sheets, 10 gage; 4.35c. for black sheets, 28 gage; 5.70c. for galvanized sheets, 28 gage, and \$7 per base box for 100-lb. tin plate, these being the prices in the Industrial Board schedule of March 21, 1919, to which all subsidiaries of the Steel Corporation have since rigidly adhered. Independent sheet manufacturers will probably ignore the matter entirely. Independent tin-plate manufacturers will sell at the \$7 price more or less, but hardly to as great an extent as they did for the present half year. It is easy to secure higher prices, and \$10 to \$12 can be done on exports.

If there were adequate machinery for the settlement of the rail strike by negotiation, the iron and steel trade would expect an early settlement.

Pig Iron—The market continues quiet, with no inquiry except for early deliveries. Prices are fairly steady, and we continue to quote: Bessemer, \$42; basic, \$41.50; foundry, \$42, f.o.b. Valley furnaces, freight to Pittsburgh being \$1.40.

March production of coke and anthracite pig iron amounted to 3,375,907 gross tons, or an average of 108,900 tons daily, as compared with 2,978,879 tons, or 102,720 tons daily in February. The output of pig iron in Great Britain in 1919 was 7,398,000 gross tons, or 617,000 tons per month. This compares with 10,260,000 tons in 1913 and 9,072,000 tons in 1918.

Steel—The scarcity of unfinished steel continues, but there is not as much inquiry. We quote the market for early deliveries at \$65 to \$70 for billets, \$75 to \$80 for small billets, \$70 to \$75 for sheet bars, and \$65 to \$75 for rods.

Charcoal and Coke

Charcoal—Large quantities sell as follows: Willow, 7c per lb.; hardwood, 4½c. per lb., in 250 lb. bbl.

Connellsville—Prompt furnace, \$11@\$12; prompt foundry, \$12@\$14; contract foundry, \$10@\$12.

New River—Furnace, \$11@\$12, and foundry, \$12 per ton.

Pocahontas—Furnace, \$12 per ton.

Wise County—Furnace, \$11@\$12 per ton; foundry, \$12@\$12.50 per ton.

COMPANY REPORTS

The North Star Mines Co.

Gold-Silver; California

During 1919, the total production of the North Star Mines Co. amounted to \$1,181,345.97, with total operating and development expenses of \$1,778,489.83, leaving an operating profit of \$102,856.14. Interest and dividends on invested funds amounted to \$36,808.76. One dividend of 4 per cent, amounting to \$100,000, was declared as a distribution of capital assets, and paid in June. General conditions under which the mines were operated remained unfavorable throughout the year. There was little decrease in the cost of supplies, and the labor situation was disturbed and uncertain.

At the North Star mine the cost of producing an ounce of gold was \$18.04 in 1919, as compared with \$9.51 in 1913, the disparity being due partly to a lower grade of ore, but chiefly to the adverse conditions with which the gold-mining industry is now confronted. The yield per ton crushed in 1919 was \$1.16 more than in 1918. Cost of development per ton was 61c., as compared with 9c. in 1918, although during the latter year development was practically suspended. In 1919, of the total production, 70.01 per cent was obtained in the mill by amalgamation, and 20.99 per cent was recovered by cyanidation. Development work at the Champion mines, amounting to 1,645 ft., revealed practically nothing of value, with the exception of the 2,700 Providence orebody, so that little encouragement is offered for further exploration. It has been decided, as soon as the ore now available above the 3,000 Providence has been removed, to discontinue the operation of this property.

Mass Consolidated Mining Co.

Copper; Michigan

The Mass Consolidated Mining Co., in the report for the year ended Dec. 31, 1919, states that 1,963,178 lb. of refined copper was produced. Receipts totaled \$429,845.31, and expenditures \$575,951.42, which, together with the balance remaining from the year previous, leaves cash assets on Dec. 31, 1919, as \$149,666.90. Rock stamped was 123,780 tons, producing 15.86 lb. per ton of rock stamped. Cost per lb. of copper, exclusive of depreciation, depletion, and construction, was 27.83c. Development work was as follows: Drifts, 1,864 ft.; crosscuts, 478 ft.; raises, 62 ft. Owing to shortage of labor and the reduced price of copper, operations have been suspended.

Superior Copper Co.

Copper; Michigan

The Superior Copper Co. reports for the year ended Dec. 31, 1919, that 563,935 lb. of copper was produced, at a cost of 36.84c. per lb. During the year 648,233 lb. was sold, at 18.67c. per lb. Tons of rock treated, 27,267; cost of mining transportation, stamping, and taxes was \$6.605 per ton of rock. At No. 1 shaft development was: Drifting, 1,557 ft.; crosscutting, 95 ft., and winze, 212 ft. No sinking was done. Current assets at the end of the year showed a balance of \$539,444.24.

Centennial Copper Mining Co.

Copper; Michigan

The Centennial Copper Mining Co., for the year ended Dec. 31, 1919, reports that 1,365,148 lb. of copper was produced, at a cost of 24.64c., per lb. Sales during the year were 1,185,113 lb., at 18.84c. per lb. Balance of current assets on Dec. 31 was \$377,150.14. Tons of rock treated, 87,688; cost of mining, transportation, stamping, and taxes, \$3.331 per ton of rock. Operations at No. 2 shaft consisted of sinking, 118 ft. and drifting 1,729 ft. No dividends were paid.

Mayflower-Old Colony Copper Co.

Copper; Michigan

Report for year ended Dec. 31, 1919, states that the work of sinking the shaft was carried to a depth of 1,760 ft., and disclosed the Mayflower lode at two points. Total sinking amounted to 766 ft.; drifting, 147 ft., and crosscutting, 29 ft. All openings on the 1,709-ft. level are of small cross-sectional area, 6 ft. wide and 7 ft. high. The shaft is complete and fully equipped for exploratory work. During the period of shaft sinking the total labor force, underground and surface, averaged forty-five employees. The following expenditures are reported: Mining expense, \$99,386.38; construction, \$522.46; equipment, \$1,061.67; taxes, \$8,819.10; general expense, \$9,147.08; total, \$118,936.69. This total deducted from receipts during the year, which amounted to \$133,759.52 and were obtained as interest (\$1,657.03) and assessment (\$108,336.00), left a balance on Jan. 1, 1920, of \$14,822.83.

New Idria Quicksilver Mining Co.

California

The annual report of the New Idria Quicksilver Mining Co. for 1919 states that the total production of quicksilver was 7,400 flasks, as compared with 10,700 flasks for the previous year. The new reduction plant, consisting of five rotary kilns and a condensing system, was completed during 1919. This new plant has a roasting capacity of from 400 to 500 tons of ore per day, with a mill unit which can be operated when required, and is the largest quicksilver reduction plant in America. Net proceeds from sales of quicksilver during the year amounted to \$560,179.66, and the increase in quicksilver inventory was \$56,577.98. Operating expense, depreciation, and depletion were \$615,686.83, leaving a net profit, after all charges, of \$1,050.81.

Kerr Lake Mines, Ltd.

Gold; Cobalt, Ontario

An interim statement for the six months ending Feb. 29, 1920, was issued March 16 by Adolph Lewisohn, president. The company has purchased control of a silver mine in Utah and a gold-dredging property in New Zealand. The Utah mine has reserves of 87,000 tons, averaging 18 oz. silver and 80c. gold. The New Zealand property, it is estimated, will yield a profit of \$3,436,000. The silver production at the Kerr Lake property for the six months was 610,231 oz. The company has on hand in cash and government securities, \$2,415,027.

Allouez Mining Co.

Copper; Michigan

The Allouez Mining Co. reports for the year ended Dec. 31, 1919, that 3,749,984 lb. of copper was produced at a cost of 21.55c. per lb. During the year 3,020,067 lb. was sold at 18.75c. per lb. Tons of rock treated, 235,312; cost of mining, transportation, stamping, and taxes, \$3.043 per ton of rock. Underground work consisted of shaft sinking, 384 ft. and drifting, 3,562 ft. Stopping was done from the 17th to the 20th levels at No. 1 shaft, and from the 13th to the 18th levels of No. 2 shaft. One dividend of \$100,000 was paid. Balance of current assets on Dec. 31, 1919, was \$850,743.93.

Judge Mining & Smelting Co.

Silver-Lead-Zinc; Utah

Annual report for the year ending Jan. 1, 1920, shows production of 410,307 oz. of silver, 6,989,908 lb. lead, and 1,262,760 lb. zinc, together with 276,926 lb. copper and 462 oz. gold. Receipts from all sources were \$724,897; against expenditures of \$648,692. A total of 40,396 tons of ore was milled. Dividends of \$60,000 were paid.

MINING STOCKS

Week Ended April 10, 1920

Stock	Exch.	High	Low	Last	Last Div.
COPPER					
Adventure.....	Boston			*75	
Ahmeek.....	Boston		69	70	Mar. '20, \$ 50
Alaska-B.C.....	N. Y. Curb	7	1 1/2	2	
Algolah.....	Boston				
Allouez.....	Boston	34 1/2	34 1/2	34	Mar. '19, 1.00
Anaconda.....	N. Y.	66 1/2	62 1/2	63	Feb. '20, 1.00
Aris. Com'l.....	Boston	13 1/2	12 1/2	13	Oct. '18, 50
Big Ledge.....	N. Y. Curb				
Bingham Mines.....	Boston	7 1/2	6 1/2	7 1/2	Sept. '19, 25
Boston & Ely.....	Boston Curb			*55	
Butte & Bal.....	Boston			*30	
Butte & Lond.....	Boston Curb			*10	
Calaveras.....	Boston Curb				
Calumet & Ariz.....	Boston	68	64 1/2	65 1/2	Mar. '20, 1.00
Calumet & Hecla.....	Boston	355	350	353	Dec. '19, 5.00
Calumet & Jerome	N. Y. Curb				
Can. Copper.....	N. Y. Curb	1 1/2	1 1/2	1 1/2	
Centennial.....	Boston			14	Dec. '18, 1.00
Cerro de Pasco.....	N. Y.	56 1/2	53	53 1/2	Mar. '20, 1.00
Con. Ariz.....	N. Y. Curb				Dec. '18, 05
Con. Copper M.....	N. Y. Curb	5 1/2	4 1/2	4	
Chile Cop.....	N. Y.	19 1/2	18 1/2	18	
Chino.....	N. Y.	37 1/2	36 1/2	37 1/2	Mar. '20, 37 1/2
Cop. Range.....	Boston	46 1/2	44	45	Mar. '20, 50
Crystal.....	Boston Curb	*28	*26	*26	
Crystal Cop (old)	Boston Curb	*9		*4	
Davis-Daly.....	Boston	12	11	11 1/2	Mar. '20, 25
East Butte.....	Boston	15 1/2	15	15	Dec. '19, 50
First Nat'l.....	Boston Curb	1 1/2		1 1/2	Feb. '19, 15
Franklin.....	Boston	4		4	
Gadsden Copper.....	N. Y. Curb	1	1	1	
Granby Consol.....	N. Y.	49	46	49	May '19, 1.25
Greene-Can.....	N. Y.	37	35 1/2	36 1/2	Feb. '19, 1.50
Hancock.....	Boston	6	6	6	
Helvetia.....	Boston	3 1/2	3	3	
Houghton.....	Boston Curb	*75	*40	*40	
Howe Sound.....	N. Y. Curb			4	Jan. '20, 05
Indiana.....	Boston			*75	
Inspiration Con.....	N. Y.	61 1/2	58 1/2	58 1/2	Jan. '20, 1.50
Iron Cap.....	Boston Curb	13	11	11 1/2	Feb. '19, 25
Ile Royale.....	Boston	35	34	35	Sept. '19, 50
Jerome Verde.....	N. Y. Curb			1 1/2	
Kennecott.....	N. Y.	33 1/2	31 1/2	31 1/2	Mar. '20, 50
Keweenaw.....	Boston	1 1/2	1 1/2	1 1/2	
Lake Copper.....	Boston	4 1/2	4 1/2	4 1/2	
La Salle.....	Boston			2	
Magma Chief.....	N. Y. Curb	*	*	38 1/2	Jan. '19, 50
Magma Copper.....	N. Y. Curb				
Majestic.....	Boston Curb	*20	*17	*17 1/2	
Mason Valley.....	N. Y. Curb	2 1/2	2 1/2	2 1/2	
Mass Con.....	Boston	5 1/2	5	5	Nov. '17, 1.00
Mayflower-O. C.....	Boston	9 1/2	8 1/2	8	Feb. '20, 1.00
Miami.....	N. Y.	25 1/2	23 1/2	24 1/2	Feb. '20, 50
Michigan.....	Boston	6 1/2	6 1/2	6 1/2	
Mohawk.....	Boston	69 1/2	68	68	Feb. '20, 1.50
Mother Lode(New)	N. Y. Curb	5 1/2	5	5 1/2	
Nev. Con.....	N. Y.	15 1/2	14 1/2	14 1/2	Mar. '20, 25
Nixon Nev.....	N. Y. Curb	22	20	22	
Nev. Douglas.....	Boston Curb	*18		*15	
New Arcadian.....	Boston	4 1/2	4	4 1/2	
New Baltic.....	Boston Curb	5	3	3	
New Cornelia.....	Boston	21 1/2	20 1/2	21	Nov. '18, 25
North Butte.....	Boston	19 1/2	16 1/2	18 1/2	Oct. '18, 25
North Lake.....	Boston				
Ohio Copper.....	N. Y. Curb				
Oncoco.....	Boston Curb	*100		*60	
Ojibway.....	Boston	2 1/2	2 1/2	2 1/2	
Old Dominion.....	Boston	34 1/2	34 1/2	34 1/2	Dec. '18, 1.00
Oceola.....	Boston	48	48	48	Mar. '20, 50
Quincy.....	Boston	61 1/2	61 1/2	61 1/2	Mar. '20, 1.00
Ray Con.....	N. Y.	20 1/2	19 1/2	19 1/2	Mar. '20, 25
Ray Hercules.....	N. Y. Curb			1	
St. Mary's M. L.....	Boston	51 1/2	48	48	Dec. '19, 2.00
Seneca.....	Boston	16 1/2	14 1/2	14 1/2	
Shannon.....	Boston	1 1/2	1 1/2	1 1/2	Nov. '17, 25
Shattuck-Aris.....	N. Y.	11 1/2	11 1/2	11 1/2	Jan. '20, 25
South Lake.....	Boston			*30	
South Utah.....	Boston	*17	*17	*17	
Superior.....	Boston	6	5 1/2	5 1/2	Apr. '17, 1.00
Superior & Boston	Boston	5 1/2	4 1/2	5 1/2	
Tenn. C. & C.....	N. Y.	13 1/2	12	12	May '18, 1.00
Trinity.....	Boston			1 1/2	
Tuolumne.....	Boston	*87	*82	*82	
United Verd. Ex.....	Boston Curb	*36 1/2	*35	*35	Feb. '20, 50
Utah Copper.....	N. Y.	80 1/2	76 1/2	77 1/2	Mar. '20, 1.50
Utah Con.....	Boston	8 1/2	8 1/2	8 1/2	Sept. '18, 25
Utah M. & T.....	Boston	2 1/2	2 1/2	2 1/2	Dec. '17, 30
Victoria.....	Boston	3 1/2	3 1/2	3 1/2	
Winona.....	Boston	1 1/2	1 1/2	1 1/2	
Wolverine.....	Boston	19 1/2	19	19 1/2	Jan. '20, 50
LEAD					
Hecla.....	N. Y. Curb	4 1/2	4 1/2	4 1/2	Mar. '20, 15
St. Joseph Lead.....	N. Y.	16 1/2	16 1/2	16 1/2	Mar. '20, 50
Stewart.....	Boston Curb	*18		*16	Dec. '15, 05
Utah Apex.....	Boston	2 1/2	2 1/2	2 1/2	Nov. '18, 25

*Cents per share. †Bid or asked Apr. 10.

Stock	Exch.	High	Low	Last	Last Div.
ZINC					
Am. Z. L. & S.....	N. Y.	20	18 1/2	18 1/2	May '17, 1.00
Am. Z. L. & S. pf.....	N. Y.	54	54	54	Feb. '20, 1.50
Butte C. & Z.....	N. Y.	10 1/2	9 1/2	10	July '18, 50
Butte & N. Y.....	N. Y. Curb				
Butte & Superior.....	N. Y.	29 1/2	26 1/2	27 1/2	Sept. '17, 1.25
Con. Interst. Cal.....	N. Y.	19	17 1/2	18	Mar. '20, 50
Natl. Z. & L.....	Boston Curb	*18		*16	May '17, 02
Success.....	N. Y. Curb	*6	*3	*6	July '16, 03
GOLD					
Alaska Gold.....	N. Y.	2 1/2	2 1/2	2 1/2	
Alaska Juneau.....	N. Y.	5	2 1/2	2 1/2	
Booth.....	N. Y. Curb	6	6	6	
Carson Hill.....	N. Y. Curb	3 1/2	3 1/2	3 1/2	
Cresson Gold.....	N. Y. Curb			2 1/2	Mar. '20, 10
Dome Ex.....	Toronto	*29	*27	*27	
Dome Lake.....	Toronto	*9	*6	*6	
Dome Mines.....	N. Y.	12	11 1/2	11 1/2	Jan. '20, 25
Goldfield Con.....	N. Y. Curb	*13	*12	*12 1/2	Dec. '19, 05
Hedley.....	Boston			4 1/2	June '19, 10
Hollinger.....	Toronto	6.70	6.60	6.60	Feb. '20, 50
Homestake.....	N. Y.	60 1/2	60	60 1/2	Mar. '20, 05
Kewanas.....	N. Y. Curb	*3 1/2	*2 1/2	*3	
Kirkland Lake.....	Toronto	*68	*64	*65 1/2	
McIntyre Porcupine	Toronto	2.13	2.07	2.10	Jan. '20, 05
Silver Pick.....	N. Y. Curb	*19	*18	*18 1/2	
Teck-Hughes.....	Toronto	*18	*15	*16	
United Eastern.....	N. Y. Curb	4 1/2	3 1/2	3 1/2	Jan. '20, 21
West Dome.....	Toronto	*10	*9	*9 1/2	
White Caps.....	N. Y. Curb	20	14	19 1/2	June '18, 02 1/2
Yukon Gold.....	Boston Curb	1 1/2	1 1/2	1 1/2	
SILVER					
Adanac.....	Toronto	*4	*4	*4	
Bailey.....	Toronto	*6	*5 1/2	*5 1/2	Apr. '16, 05
Beaver Con.....	Toronto	*59	*52	*52	
Coniagas.....	Toronto	3.20	3.10	3.10	Nov. '19, 12 1/2
Crown Reserve.....	Toronto	*38	*35	*37	Jan. '17, 05
Hargraves.....	Toronto	*3	*2 1/2	*2 1/2	
Kerr Lake.....	Boston	4 1/2	4 1/2	4 1/2	Sept. '19, 1.00
La Rose.....	N. Y. Curb			4 1/2	Apr. '18, 02
McKinley-Dar.....	Toronto	*68			Jan. '20, 03
Nipissing.....	N. Y. Curb	10 1/2	10 1/2	10 1/2	Jan. '20, 50
Ontario Silver.....	N. Y.	9 1/2	8 1/2	8 1/2	Jan. '19, 50
Ophir Silver.....	N. Y. Curb			2 1/2	
Peterson Lake.....	Toronto	*21	*19	*20	Jan. '17, 01 1/2
Sil. King Ariz.....	N. Y. Curb	*86	*42	*80	
Temiskaming.....	Toronto	*47	*43	*43	Jan. '20, 04
Trethewey.....	Toronto	*43	*41	*41 1/2	Jan. '19, 05
GOLD AND SILVER					
Atlanta.....	N. Y. Curb	*3	*2 1/2	*3	
Batopilas.....	Boston			1 1/2	
Bost. & Mont.....	N. Y. Curb	*68	*60	*60	
Cashboy.....	N. Y. Curb	*10	*9	*9 1/2	
El Salvador.....	N. Y. Curb	3 1/2	3	3 1/2	
Goldfield Merger.....	N. Y. Curb	*3 1/2	*3	*3	
Jim Butler.....	N. Y. Curb	*24	*22	*22	Aug. '18, 07
Jumbo Extension.....	N. Y. Curb	*8	*8	*8	June '16, 05
Louisiana Con.....	N. Y. Curb	*1 1/2	*1 1/2	*1 1/2	
McNamara Cr.....	N. Y. Curb			3 1/2	
Nev. Packard.....	Boston Curb	*25			Apr. '19, 02
Rochester Mines.....	N. Y. Curb			18	Oct. '18, 02
Tonopah-Belmont.....	N. Y. Curb	2 1/2	2	2 1/2	Jan. '20, 05
Tonopah-Divide.....	N. Y. Curb	2 1/2	2 1/2	2 1/2	
Tonopah Ex.....	N. Y. Curb	2 1/2	2 1/2	2 1/2	Jan. '20, 05
Tonopah Mining.....	N. Y. Curb	2	1 1/2	2	Oct. '19, 85
West End Con.....	N. Y. Curb	1 1/2	1 1/2	1 1/2	Dec. '19, 05
SILVER-LEAD					
Caledonia.....	N. Y. Curb	*35	*33	*34	Jan. '20, 01
Daly-West.....	Boston	4 1/2	4 1/2	4 1/2	
Fed. M. & S.....	N. Y.	15 1/2	15	15	Jan. '09, 1.50
Fed. M. & S. pf.....	N. Y.	40 1/2	38 1/2	39 1/2	Mar. '20, 75
Iron Blossom.....	N. Y. Curb			39 1/2	Jan. '20, 02 1/2
Marsh Mines.....	N. Y. Curb	*19	*17	*19	
Rex Con.....	N. Y. Curb	*9	*8	*8 1/2	
Simon S. L.....	N. Y. Curb			1 1/2	
Stand. S. L.....	N. Y. Curb	5 1/2	5 1/2	5 1/2	Oct. '17, 05
Wilbert.....	N. Y. Curb	9	4 1/2	5	Nov. '17, 10
NICKEL-COPPER					
Internat'l Nickel.....	N. Y.	24 1/2	22 1/2	22 1/2	Mar. '19, 50
Internat'l Nick. pf.....	N. Y.	87	87	87	Feb. '20, 1.50
QUICKSILVER					
New Idria.....	Boston	6 1/2	6 1/2	6 1/2	Jan. '19, 25
TUNGSTEN					
Mojave Tungsten.....	Boston Curb	*10		*9	
VANADIUM					
Vanadium Corpn.....	N. Y.	88 1/2	68 1/2	85 1/2	
GOLD AND PLATINUM					
So. Am. G. & P.....	N. Y. Curb			8 1/2	
MINING, SMELTING AND REFINING					
Am. S. & R.....	N. Y.	70 1/2	67 1/2	69 1/2	Mar. '20, 1.00
Am. S. & R. pf.....	N. Y.	95 1/2	95 1/2	95 1/2	Mar. '20, 1.75
Am. Sm. pf. A.....	N. Y.	83	83	83	Jan. '20, 1.50
Natl. Lead.....	N. Y.	93	83 1/2	92 1/2	Mar. '20, 1.50
Natl. Lead. pf.....	N. Y.	108 1/2	108 1/2	108 1/2	Mar. '20, 75
U. S. Sm. R. & M.....	N. Y.	72	69	69	Jan. '20, 1.50
U. S. Sm. R. & M. pf.....	N. Y.			47 1/2	Jan. '20, 87

CURRENT PRICES OF MATERIALS AND SUPPLIES

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

Blue Annealed	Large Mill Lots		St. Louis	Chicago	San Francisco	New York	
	Pittsburgh	Louis				Current	One Yr. Ago
No. 10	\$3.55-4.00	4.64	6.02	5.80	\$6.62-8.00	4.57	
No. 12	3.60-4.05	4.69	6.07	5.75	6.67-8.05	4.62	
No. 14	3.65-4.10	4.74	6.12	5.90	6.72-8.10	4.67	
Black:							
Nos. 18 and 20	4.15-4.80	5.24	6.80	6.75	7.80-8.80	5.42	
Nos. 22 and 24	4.20-4.85	5.29	6.85	6.80	7.85-8.85	5.47	
No. 26	4.25-4.90	5.34	6.90	6.95	7.90-8.90	5.52	
No. 28	4.35-5.00	5.67	7.00	7.05	8.00-9.00	5.62	
Galvanized:							
No. 10	4.70-6.00	5.79	7.15		8.25-10.00	5.97	
No. 12	4.80-6.10	5.89	7.20	7.30	8.35-10.10	6.02	
No. 14	4.80-6.10	5.89	7.35	7.30	8.35-10.10	6.07	
Nos. 18 and 20	5.10-6.40	6.19	7.65	7.60	8.65-10.40	6.37	
Nos. 22 and 24	5.25-6.55	6.34	8.05	7.75	8.80-10.55	6.52	
No. 26	5.40-6.70	6.49	8.20	7.90	8.95-10.70	6.67	
No. 28	5.70-7.00	7.04	8.50	8.20	9.25-11.00	6.97	

Acute scarcity in sheets, particularly black, galvanized and No. 16 blue enameled. Automobile sheets are unavailable, except in fugitive instances, when prices range to 15c. per lb.

STEEL RAILS—The following quotations are per ton f. o. b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh		Chicago	
	Current	One Year Ago	Current	One Year Ago
Standard bessemer rails	\$55.00	\$45.00	\$55.00	\$45.00
Standard openhearth rails	57.00	47.00	57.00	47.00
Light rails, 8 to 10 lb.	2.58 ¹ / ₂ @3.75	2.58*	2.585 ¹ / ₂ @3.75	2.835*
Light rails, 12 to 14 lb.	2.54 ¹ / ₂ @3.75	2.54*	2.54 ¹ / ₂ @3.75	2.79*
Light rails, 25 to 45 lb.	2.45 ¹ / ₂ @3.75	2.45*	2.45 ¹ / ₂ @3.75	2.70*

* Per 100 lb.
NOTE—The lower price is that of the U. S. Steel Corp., but the market is mostly speculative and higher prices prevail.

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

	Pittsburgh		Chicago	St. Louis	San Francisco
	Current	One Year Ago			
Standard railroad spikes, 3/4 in. and larger	\$3.35	\$3.25	\$3.62	\$4.44	\$5.65
Track bolts, 4.90-5.00	4.90	4.90	4.62	Premium	6.65
Standard section angle bars	2.75	3.25	2.75	Premium	4.90

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the \$2.55 places named:

	Mill Pittsburgh		New York		St. Louis	Chicago
	Current	One Year Ago	Current	One Year Ago		
Beams, 3 to 15 in.	\$2.45@4	\$4.47@5	\$3.47	\$4.04	\$3.97	
Channels, 3 to 15 in.	2.45@4	4.47@5	3.47	4.04	3.97	
Angles, 3 to 6 in., 1/2 in. thick	2.45@4	4.47@5	3.47	4.04	3.97	
Tees, 3 in. and larger	2.45@4	4.52@5	4.02	4.04	4.02	
Plates	2.65@4	4.67@5	4.17	4.24	4.17	

STEEL SHEET PILING—The following price is base per 100 lb. f.o.b. Pittsburgh, with a comparison of a month and a year ago:

	Current	One Month Ago	One Year Ago
	\$2.55@3.65	\$2.55@3.65	\$2.55

RIVETS—The following quotations are per 100 lb.:

	Warehouse		Chicago	St. Louis	San Francisco	Dallas
	Mill Pittsburgh	New York				
1/2 in. and larger	\$4.50	\$6.00	\$5.37	\$5.44	\$6.65	\$7.50
CONE HEAD BOILER						
1/2 in. and larger	4.60	6.10	5.15	5.47	5.54	6.75
3/4 in. and 1 in.	4.75	6.25	5.30	5.62	5.54	7.00
1 1/4 in. and 1 1/2 in.	5.00	6.00	5.55	5.97	5.54	7.25

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Hercules red strand, all constructions	20%
Patent flattened strand special and cast steel	20%
Patent flattened strand iron rope	5%
Plow steel round strand rope	35%
Special steel round strand rope	30%-10%-5%
Cast steel round strand rope	22 1/2%
Iron strand and iron tiller	5%
Galvanized iron rigging and guy rope	+12%

San Francisco: Galvanized, iron rigging and guy ropes, +17 1/2%; bright plow, 25% off.
Chicago, +12 1/2 on galvanized, 30 off on bright.

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill Pittsburgh	Cincinnati	Chicago	St. Louis	Birmingham
Straight	\$5.75	\$7.50	\$7.00	\$7.25	\$7.00
Assorted	5.85	7.50	7.15	7.50	7.25

BAR IRON AND STEEL—Per 100 lb. to large buyers at mill, Pittsburgh:
Iron bars \$4.00 Steel bars \$3.00

COAL BIT STEEL—Warehouse price per pound is as follows:

New York	Cincinnati	Birmingham	St. Louis	Chicago
\$0.10	\$0.16 1/2	\$0.18	\$0.11	\$0.15

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham
Solid	14c.	13c.	15c.
Hollow	16c.		

STEEL AND IRON PIPE—The following discounts are for carload lots on the Pittsburgh, basing card, discounts on steel pipe, applying as from January 14, 1920, and on iron pipe from January 7, 1920.

Inches	Steel		Inches	Iron	
	Black	Galvanized		Black	Galvanized
1/2 to 3	54	41 1/2	1 1/2 to 1 1/2	34 1/2	18 1/2
LAP WELD					
2	47	34 1/2	1 1/2	24 1/2	9 1/2
2 1/2 to 6	50	37 1/2	1 1/2	31 1/2	17 1/2
7 to 12	47	33 1/2	2	28 1/2	14 1/2
13 and 14	37 1/2		2 1/2 to 6	30 1/2	17 1/2
15	35		7 to 12	27 1/2	14 1/2
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 1/2 and 1 1/2	43	25 1/2	1 1/2	17	+40
1 1/2 to 1 1/2	48	35 1/2	1 1/2	23 1/2	6 1/2
2 to 3	52	39 1/2	1 1/2 to 1 1/2	28 1/2	15 1/2
	53	40 1/2	1 1/2 to 1 1/2	34 1/2	19 1/2
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	45	33 1/2	1 1/2	21 1/2	6 1/2
2 1/2 to 4	48	36 1/2	1 1/2	27 1/2	13 1/2
4 1/2 to 6	47	35 1/2	2	29 1/2	10 1/2
7 to 8	43	29 1/2	2 1/2 to 4	31 1/2	19 1/2
9 to 12	38	24 1/2	4 1/2 to 6	30 1/2	18 1/2
			7 to 8	22 1/2	10 1/2
			9 to 12	17 1/2	5 1/2

From warehouses at the places named the following discounts hold for steel pipe:

	New York		Black Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
1/2 to 3 in. butt welded	40%		40%		54%	
3/4 to 6 in. lap welded	35%		42%		50%	
Galvanized Cleveland Chicago						
1/2 to 3 in. butt welded	24%		31%		40%	
3/4 to 6 in. lap welded	20%		27%		37%	

Malleable fittings, Class B and C, from New York stock sell at list plus 22 1/2%. Cast iron, standard sizes, net.

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Hot pressed square	+3.00	\$0.25	\$1.00	\$1.90	\$1.25	\$1.28
Hot pressed hexagon	+3.00	0.25	1.00	1.90	1.25	1.08
Cold punched square	+3.00	2.25	1.00	1.90	.90	1.30
Cold punched hexagon	+3.00	2.25	1.00	1.90	.90	1.30

Semi-finished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	40%	50-16%
Chicago	50%	50%
Cleveland	55%	60-10-10%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
1/2 by 4 in. and smaller	20%	40-5%	35-5%
Larger and longer up to 1 in. by 30 in.	10%	30%	25-5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

	New York	Cleveland	Chicago
For wrought-iron washers:			
New York	List	\$3.75	\$3.00
For cast-iron washers the base price per 100 lb. is as follows:			
New York	\$5.00	\$4.50	\$4.25

CONSTRUCTION MATERIALS

ROOFING MATERIALS—Prices per ton f.o.b. New York and Chicago:

	Carload Lots		Less Than Carload Lots	
	N. Y.	Chicago	N. Y.	Chicago
Tar felt (14 lb. per square of 100 sq.ft.)	\$99.00	\$97.00	\$101.00	\$99.00
Tar pitch (in 400-lb. bbl.)	25.00	22.00	26.00	23.00
Asphalt pitch (in barrels)	40.00	40.00	43.50	43.50
Asphalt felt	98.00	98.00	100.00	100.00

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York, St. Louis, Chicago and San Francisco:

No.	1-Ply		2-Ply		3-Ply	
	e.l.	l.e.l.	e.l.	l.e.l.	e.l.	l.e.l.
No. 1 grade	\$2.00	\$2.25	\$2.50	\$2.75	\$3.00	\$3.25
No. 2 grade	1.70	1.95	2.15	2.40	2.50	2.75

Asbestos asphalt-saturated felt (14 lb. per square) costs \$170 per ton.
Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs \$3.00 per roll in carload lots and \$3.25 for smaller quantities.
Shingles, red and green slate finish, cost \$7.25 per square in carloads, \$7.50 in smaller quantities, in Philadelphia.

HOLLOW TILE—

	4 x 12 x 12	8 x 12 x 12	12 x 12 x 12
St. Paul.....	\$0.087	\$0.158	\$0.248
Seattle.....	.09	.175	.30
Los Angeles.....	.082	.154	.236
New Orleans.....	.198	.264	.38
Cincinnati.....	All prices withdrawn		
Birmingham.....	.072	.135	.....
St. Louis.....	.08	.15	.....

LUMBER—Price per M in carload lots:

	8 x 8-In. x 20-Ft. and Under				12 x 12-In. 20-Ft. and Under	
	P.	Fir	Hemlock	Spruce	P.	Fir
Boston.....	\$86.50	\$65.00	\$65.00	\$65.00	\$110.00	\$100.00
Kansas City.....	53.00	52.25	52.25	52.25	64.00	52.25
Seattle.....	.....	34.00	.....	.....	65.00	35.00
New Orleans.....	55.00	.....	.....	.....	65.00	.....
St. Paul.....	62.00	61.00	61.00	47.50	43.00	58.00
Atlanta.....	62.50	64.50	66.00	76.00	79.50	82.00
Baltimore.....	75.00	.....	.....	.....	87.50	.....
Cincinnati.....	55.00	55.00	55.00	.....	62.50	60.00
Montreal.....	89.00	80.00	65.00	60.00	73.00†	73.00
Los Angeles*.....	.....	59.50	58.00	.....	.....	51.00

	1-In. Rough, 10-In. x 16-Ft. and Under			2 In. T. and Gr. 10 In. x 16 Ft.	
	P.	Fir	Hemlock	P.	Fir
Boston.....	\$75.00	\$65.00	\$65.00	\$85.00	\$65.00
Kansas City.....	115.25	89.75	89.75	117.25	92.75
Seattle.....	.....	37.50	.....	.....	38.50
New Orleans.....	60.00	.....	.....	65.00	.....
St. Paul.....	54.00	54.00	53.00	64.50	58.50
Atlanta.....	85.00	90.00	.....	77.50	87.50
Baltimore (box).....	65-67.50	.....	.....	60-65.00	.....
Cincinnati.....	60.00	58.00	60.00	55.00	55.00
Montreal.....	65.00	65.00	65.00	66.00	66.00
Los Angeles*.....	.....	57.00	56.00	.....	.....

* Base price, 2 x 4, is \$53, Los Angeles.
† Montreal—Up to 32-ft., over which, \$3 per M. increase up to 36-ft.

NAILS—The following quotations are per keg from warehouse:

	Mill	St.			San
	Pittsburgh	Louis	Dallas	Chicago	Francisco
Wire.....	\$4.50	\$4.50	\$6.90	\$4.15	\$5.50
Cut.....	4.925	5.40	7.40	7.00	6.90

PORTLAND CEMENT—These prices are for barrels in carload lots, without bags.

	Current	One Month Ago	One Year Ago
New York (delivered).....	\$2.80	\$2.80	\$2.45
Jersey City (delivered).....	2.47	2.47	2.62
Boston.....	2.42	2.42	2.57
Chicago.....	2.00	2.00	2.05
Pittsburgh.....	2.05	2.05	2.15
Cleveland.....	2.32	2.32	2.32

NOTE—Charge for bags is generally 15c. each, 60c. per bbl.

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 200-lb. Barrel	
	Finished	Common	Finished	Common
New York.....	\$18.50	\$17.50	\$3.00*at plant	\$2.80*
Kansas City.....	26.00	25.00	2.50	2.40
Chicago.....	20.50	14.50	2.25	1.50
St. Louis.....	22.00	18.00	.....	2.00
Boston.....	24.00	21.00	4.30*	4.05*
Dallas.....	.....	25.00	.....	2.50†
San Francisco.....	20.00	16.00	.....	2.30†
St. Paul.....	24.00	19.00	1.60	1.50
New Orleans.....	.....	22.00	.....	2.40
Atlanta.....	22.50	.....	.....	.....

NOTE—Refund of \$0.10 per barrel.
* 300-lb. barrels. † 180-lb. barrels.

LINSEED OIL—These prices are per gallon:

	New York		Chicago	
	Current	Year Ago	Current	Year Ago
Raw per barrel (5 bbl. lots).....	\$1.87	\$1.55	\$2.05	\$1.66
5-gal. cans.....	1.87*	1.70	2.30	1.86

* To this oil price must be added the cost of the cans (returnable), which is \$2.25 for a case of six.

WHITE AND RED LEADS—500-lb. lots sell as follows in cents per pound:

	Red				White	
	Current		One Year Ago		Current	1 Yr. Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100-lb. keg.....	15.50	17.00	13.00	14.50	15.50	13.00
25- and 50-lb. kegs.....	15.75	17.25	13.25	14.75	15.75	13.25
12½-lb. keg.....	16.00	17.50	13.50	15.00	16.00	13.50
5-lb. cans.....	18.50	20.00	15.00	16.50	18.50	15.00
1-lb. cans.....	20.50	22.00	16.00	17.50	20.50	16.00

MINING AND MILLING SUPPLIES

	FIRE			50-Ft. Lengths
	AIR			
Underwriters' 2½ in.....			\$0.78 per ft.
Common, 2½-in.....			35%

	First Grade			Second Grade			Third Grade		
		
½-in. per ft.....	\$0.55			\$0.35			\$0.25		

STEAM—DISCOUNTS FROM LIST

First grade.....	25%	Second grade.....	35%	Third grade.....	40%
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LEATHER BELTING—Present discounts from list in the following cities are as follows:

	Medium Grade		Heavy Grade	

New York.....	20%	.....	10-5%	.....
St. Louis.....	40%	.....	35%	.....
Chicago.....	45%	.....	40%	.....
Birmingham.....	35%	.....	30%	.....
Cincinnati.....	30-5-2½%	.....	40-2½%	.....

RAWHIDE LACING—For cut, best grade, 25%, 2nd grade, 30%. For laces in sides, best, 81%.

MANILA ROPE—For rope smaller than ½-in. the price is ½ to \$0.02 extra while for quantities amounting to less than 600 ft. there is an extra charge of \$0.01. The number of feet per pound for the various sizes is as follows: ½-in., 8 ft.; ¾-in., 6; 1-in., 4½; 1½-in., 2 ft. 10 in.; 2-in., 2 ft. 4 in. Following is price per pound for ½ in. and larger, in 1200-ft. coils:

Boston.....	\$0.33	Kansas City.....	265
New York.....	.29	New Orleans.....	285
Cincinnati.....	.275	Seattle.....	25
Chicago.....	.275	St. Louis.....	265
St. Paul.....	.275	Atlanta.....	295
San Francisco.....	.27	.....	.....

PACKING—Prices per pound:

Rubber and duck for low-pressure steam.....	\$1.00
Asbestos for high-pressure steam.....	1.70
Duck and rubber for piston packing.....	1.00
Flax, regular.....	1.20
Flax, waterproofed.....	1.70
Compressed asbestos sheet.....	1.50
Wire insertion asbestos sheet.....	.90
Rubber sheet.....	.50
Rubber sheet, wire insertion.....	.70
Rubber sheet, duck insertion.....	.50
Rubber sheet, cloth insertion.....	.30
Asbestos packing, twisted or braided and graphited, for valve stems and stuffing boxes.....	1.30
Asbestos wick, ½- and 1-lb. balls.....	.85

RAILWAY TIE—For fair size orders, the following prices per tie hold:

Material	7 In. x 9 In. by 8 Ft. 6 In.		6 In. x 8 In. by 8 Ft.	

Chicago—Plain.....	\$1.75	.....	\$1.60	.....
Chicago, creosoted.....	1.95	.....	1.80	.....
San Francisco—Douglas fir, green.....	1.74	.....	1.24	.....
San Francisco—Douglas fir, creosoted.....	3.36	.....	2.38	.....

Prices per tie at Missouri mills; St. Louis prices about 25c. higher:

Untreated A Grade White Oak 6x8x8		Untreated A Grade Red Oak 6x8x8	
No. 1.....	\$0.70	No. 1.....	\$0.55
No. 2.....	.80	No. 2.....	.65
No. 3.....	.90	No. 3.....	.75
No. 4.....	.98	No. 5.....	.87
7x9x8 white oak.....	1.05	.....	.....
7x9x8 red oak, No. 4.....	.80	.....	.....

FLOTATION OILS—Prices of oils for flotation, in cents per gal. in bbls.:

	New York		Chicago	
	In Bbl.	Carloads	In Bbl.	Carloads
Pure steam-distilled pine oil, sp.gr. 0.93-0.94.....	\$1.65	\$1.60	\$1.60	\$1.53
Pure destructively distilled pine oil.....	.....	1.55	1.50	1.50
Pine tar oil, sp.gr. 1.025-1.035.....	.48	1.40	.....	1.38
Crude turpentine, sp.gr. 0.900-0.970.....	1.75	2.60	2.52	2.52
Hardwood creosote, sp.gr. 0.96-0.99*.....	.35	.09	.....	.08

*F. o. b. Cadillac, Mich.

COTTON WASTE—The following prices are in cents per pound:

	New York		Chicago	
	Current	One Year Ago	Cleveland	Chicago
White.....	13.00	13.00	16.00	11.00-14.00
Colored mixed.....	9.00-12.00	9.00-12.00	12.00	9.50-12.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

Cleveland.....	13½x13½	13½x13½
Chicago.....	\$52.00	\$58.00
.....	41.00	43.50

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder:

	Low Freezing		Gelatin		Black Powder
	20%	40%	60%	80%	
New York.....	.....	\$0.3425	\$0.3425	.....	\$2.30
Boston.....	\$0.225-24	.245-48	.25-31	.....	2.40
Kansas City.....	.235	.26	.385	.....	2.35
New Orleans.....	.2375*	.2275	.255	.....	2.90
Seattle.....	.18	.2175	.2475	.....	2.45
Chicago.....	.2175	.2525	.2975	.....	2.45
St. Paul.....	.185	.2275	.2525	.....	2.25
St. Louis.....	.2175	.26	.285	.....	1.90
Denver.....	.205	.2475	.2725	.....	2.50
Dallas.....	.265	.275	.3025	.....	2.60
Los Angeles.....	.25	.30	.35	.....	3.00
Atlanta.....	.22	.245	.265	.....	2.55
Baltimore.....	.225	.2675	.3075	.....	2.40
Cincinnati.....	.2275	.2525	.2725	.....	2.30
Montreal.....	.28	.31	.34	.....	3.90

* For 50%.

CHEMICALS

SODIUM CYANIDE—New York price is 24@25c. per lb.; Chicago, 31½c.; St. Louis, 31c.; Birmingham, 45c.

SODIUM SULPHIDE—New York price per pound is 5c.@6c. for concentrated, Chicago, 6c. for concentrated, 3c. for crystals. Birmingham price is 35c. for crystals. Concentrated comes in 500-lb. drums; crystals in 440-lb. bbl.

ZINC DUST—For 350 mesh the New York price is 12c. per lb.; Chicago, 13c.; St. Louis, 12c.; Birmingham, 35c.

ALUMINUM DUST—Chicago price is \$1.10 per lb.; Birmingham, \$1.52.

MINERS' LAMP CARBIDE—Prices net f.o.b. cars at warehouse points:

	Union		Cameo		Union		Union	
	100-Lb. Drums	Per Ton	100-Lb. Drums	Per Ton	Single 25-Lb. Drums	Single 25-Lb. Drums	25-Lb. Lots	25-Lb. Lots
East of the Mississippi, North of Chattanooga.....	\$106.00	.....	\$101.00	.....	\$1.52	.....	\$1.49	.....
Southeastern portion U. S. A.....	115.50	.....	110.50	.....	1.63	.....	1.60	.....
Texas (except E. Paso).....	124.00	.....	119.00	.....	1.74	.....	1.71	.....
El Paso, Texas.....	126.00	.....	121.00	.....	1.77	.....	1.73	.....
Denver, Colo.....	124.00	.....	119.00	.....	1.74	.....	1.71	.....
West Coast.....	129.00	.....	124.00	.....	1.81	.....	1.77	.....

INDUSTRIAL NEWS

The Chicago Pneumatic Tool Co. transferred its general office from Chicago to New York City on March 31. The new quarters of the company are in a ten-story structure erected for its exclusive use at 6 East 44th St. At the same time the Chicago district sales branch, formerly in the Fisher Building, was moved to 300 North Michigan Boulevard. The Chicago service branch, formerly at 521 South Dearborn St., has been consolidated with the sales branch at the new address, where both are under the direction of J. S. Canby, district manager.

Goldfield Development Co., Goldfield, Nev., has fitted up part of its milling outfit as a complete metallurgical testing laboratory and is executing commissions for large- and small-scale tests as well as undertaking the solution of any part or the whole of a metallurgical problem. F. Dean Bradley is consulting metallurgist to the metallurgical department and E. S. Pettis is metallurgical chemist.

Uehling Instrument Co., 71 Broadway, New York City, combustion engineers, as well as manufacturers of CO₂ recording equipment and other fuel economy apparatus, announce that Charles C. Phelps recently became associated with that company. Mr. Phelps is devoting most of his attention to research work in connection with the efficient combustion of fuel oil in boiler furnaces. It is estimated that nearly \$100,000,000 is wasted unnecessarily every year through improper methods of burning fuel oil, which fact shows the importance of this field of investigation. Mr. Phelps was graduated from Stevens Institute of Technology with the degree of mechanical engineer, and has since spent several years studying power-plant problems. For five years of this period he was connected with the Ingersoll-Rand Co., manufacturers of power plant equipment and pneumatic machinery. Mr. Phelps is an associate member of the American Society of Mechanical Engineers.

Traylor Engineering & Manufacturing Co. records the work of that organization during the Great War, in an elaborate cloth-bound volume entitled "For the Glory of America," just published. This company, founded in 1902 for general consulting engineering work, erected its first plant, a small shop, at East Orange, N. J., successively larger shops at Newark and Belleville, N. J., and in 1916 established at Allentown, Pa., the beginning of its present enormous plant and activities. "For the Glory of America" describes the period between 1914 and 1918 on the "home front," when the manufacture of Traylor mining and smelting

equipment was largely suspended in favor of Government war work. The building of 1,400 hp. marine engines, 18-lb. high-explosive shells, 500 h.p. marine boilers, and portable "Bulldog" gyrotory outfits for army road building formed part of the Traylor war activity. This plant used 37,600,000 lb. of steel in the manufacture of shells alone. The Traylor Engineering & Manufacturing Co., and the Cement Gun Co., Inc., an important Traylor industry, are again giving exclusive attention to their "before-the-war" activities.

The Pioneer Rubber Mills, of San Francisco, has sent its vice-president, D. D. Tripp, on an extended tour through that territory. Mr. Tripp will visit Japan, China, French Indo-China, India, the Straits Settlement, Java,

Novel Electric Pocket Lamp Has No Battery To Fail

The pocket electric lamp shown in figures 1 and 2 draws its power from a small electric generator built in as part of the lamp. The whole is known as the "Magnet Lamp," and is put on the market by the Combined Engineering and Supply Co., 30 Church St., New York City. The generator, a back view of which is shown in Fig. 1, is a small revolving-field type alternator. A concentrated winding *W* is placed on a 6-pole laminated-iron frame and constitutes the stator or armature. Three permanent bar magnets *M* are mounted on a shaft so as to form a six-pole revolving field. By pulling on the ring *R* the field *M* is made to revolve past the stator coils and generate a voltage across the lamp

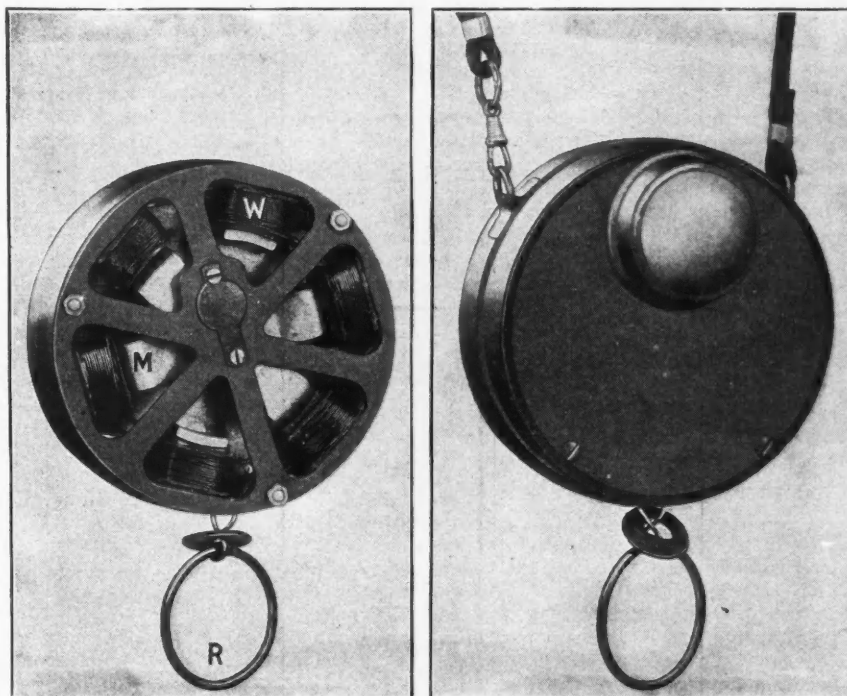


FIG. 1. LAMP GENERATOR WITH COVER REMOVED. FIG. 2. MAGNET-TYPE LAMP AND GENERATOR ASSEMBLED

Manila, and Australia. He is really going in the role of a trained observer, as he will be accompanied by the regular line salesman.

This "scouting trip" into foreign parts is directly in line with the remarkable progress made by the Pioneer Rubber Mills. Under the present management it has widened its field of operations until it embraces practically every foreign country with the exception of Europe. There have been such insistent demands for Pioneer Products that material additions to the company's plant at Pittsburg, Cal., have become imperative. The present capacity of the plant is being practically doubled. Until about a year ago, the Pioneer Rubber Mills was operated under the name of the Bowers Rubber Works. The change in name is significant today; there has been, however, no change in personnel or management.

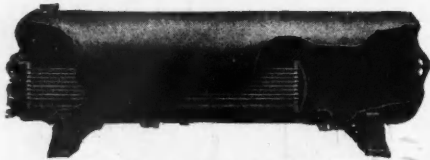
Attached to the ring *R* is about 18 in. of small chain which is wound upon a wheel by a flat spiral spring. Attached to the chain wheel is a gear wheel of 112 teeth meshing into a pinion on the generator shaft having 14 teeth. The pinion is free on the rotor shaft and is connected to the field poles by a pawl, so that the rotor always turns in one direction. The lamp is intended to be carried by a cord around the operator's neck, and is easily operated by one hand pulling out the chain and allowing the spring to wind it up again ready for another pull. In operation one sharp pull on the chain about every 3 sec. is sufficient.

This lamp seems specially suited to the needs of mine surveyors, rodmen and note takers, as the hand carrying pencil or pen can give the tug at *R*, and the glow lasts long enough to record a reading.

Russell Storage Heater

The Griscom-Russell Co. of 90 West St., New York City, has recently placed on the market the Russell Storage Heater, intended to furnish hot water in hotels, apartment houses, factories, and other types of buildings. Exhaust steam is supplied to the heating element where it condenses and heats the water in the tank.

Storage-type heaters insure a reservoir of hot water at all times. In their general form they have been on the market for years, but the Russell Storage Heater departs from the general practice as regards construction of the heating surface. It has been standard practice to use U-tubes for the heating element of a storage heater. Careful study and experiment have shown that practically all of the work of heating is done in the upper or outgoing portion of the U-tube, and that the lower row or return portion of the U-tube simply acts as a drain pipe, returning the condensed steam to the steam head. Therefore in a U-tube heater, practically one-half of the tubing is useless as a heating medium. Furthermore, a certain volume of steam, when condensed, will occupy only about 1-1,600th of the volume of steam. Therefore, the large area of drain tubes in a U type of heater is absolutely unnecessary and a waste of material.



RUSSELL STORAGE HEATER

The Russell Storage Heater is designed with a number of straight tubes in the steam element. These tubes are of sufficient length to insure that the required heating will be taken care of and all of the steam will be condensed when it reaches the rear end of these heating tubes. It is, therefore, necessary to provide only a sufficient area of drain-tube section to carry the condensation back to the steam head.

The heating surface consists of seamless drawn brass tubes, expanded into a fixed tube plate at one end and a floating tube plate at the other end, permitting expansion and contraction of tubes without straining the tube joints. This straight-tube construction, as contrasted with U-tubes, eliminates the necessity for removal and scrapping of a large portion of the tube surface when replacing an inner tube, as is the case in U-tube construction. These straight tubes are all of the same length, and this reduces the spares necessary to be carried in stock, and, in fact, permits the purchase of stock tubing to replace worn-out tubes.

The shell is regularly furnished of welded construction, but can be supplied with riveted construction if preferred. A manhole is provided, if desired, for easy access to shell for inspection and cleaning.

Forbes Pipe-Threading Machine Wins Certificate of Merit

The Curtis & Curtis Co., of Bridgeport, Conn., manufacturer of the Forbes' pipe-threading and cutting machine, is one of the few concerns in Bridgeport to receive a "Certificate of Merit" from the War Department for patriotic service during the war. This citation is expressly for "making prompt deliveries and otherwise co-operating with the Construction Division of the Army." During the war Forbes' pipe-threading and cutting machines were supplied for pipe fitting work in the cantonments, battleships, and navy yards. Because of their high speed and splendid efficiency in this work, the Forbes machines were in such demand that the factory was operating to its fullest capacity on war orders alone.

General Electric Business at Its Highest in 1919

The General Electric Co., reports a gross business of \$235,980,930 for 1919, which is an increase of \$14,559,338 over the preceding year and the greatest volume ever recorded by the company. After charges and Federal taxes, \$25,379,505, or \$21.05 per share, was available for dividends. In the preceding year the balance for dividends was \$17,104,981, or \$14.76 a share on the stock outstanding at that time. The total surplus for 1919 was \$64,311,780. The surplus after dividends in 1918 was only \$3,351,961. The amount set aside to cover Federal taxes in the current report is \$11,000,000, whereas there was an appropriation of \$13,500,000 for the same purpose in 1918.

New Name in Oxy-Acetylene Field

The Oxweld Acetylene Co., of Newark, N. J., and Chicago, has recently extended its manufacture of oxy-acetylene apparatus and equipment to include "Eveready" welding and cutting outfits. "Eveready" is a new name in the oxy-acetylene field, but the apparatus is not new, except in certain refinements of design, having been used extensively in the metal-working trades for several years under the name of "Prest-O-Lite" apparatus. The apparatus is designed to use exclusively with compressed acetylene in cylinders, thus providing the welder and cutter a compact and complete portable outfit. "Eveready" outfits and supplies are moderately priced and are sold through distributors direct to the retail trade.

The Wellman-Seaver Morgan Co., announces that its manufacturing sales department, which handles the sales of rubber equipment and machinery, moved on March 31 from the company's Akron office to its general offices at 7000 Central Avenue, Cleveland, Ohio. This department is in charge of L. N. Ridenour.

NEW PATENTS

U. S. Patent specifications may be obtained from the Patent Office, Washington, D. C., at 10c each.

Cement—Process for the Manufacture of Cements and Similar Products (by means of an electric furnace). Maurice Lucien Boillot and Jean Daudignac, Moutiers, France. (1,332,422; Mar. 2, 1920.)

Drill—Pneumatic Rock-Drilling Machine. Gustaf Andersson. (1,326,825; Dec. 30, 1919.)

Furnace—Blast-Furnace. Julian Kennedy, Pittsburgh, Pa. (1,332,846; Mar. 2, 1920.)

Furnace—Open-Hearth Furnace. Frank Carter and David McLain. (1,331,804; Feb. 24, 1920.)

Furnace—Open-Hearth Furnace. John Oliver Griggs, Youngstown, Ohio. (1,331,989; Feb. 24, 1920.)

Furnace—Open-Side Water-Jacket for Smelting-Furnaces. Alexander B. Carstens, assignor to The American Metal Co., New York, N. Y. (1,331,803; Feb. 24, 1920.)

Hoists—Mechanism for Disengaging and Engaging the Main Governors in Steam Hoisting - Engines. Eugène Schneider, assignor to Schneider & Cie. (1,327,633; Jan. 13, 1920.)

Lamp—Miner's Lamp. Louis Chomier, St. Etienne, France. (1,331,320; Feb. 17, 1920.)

Metallurgical Furnace—Sectional Lining for Rotary Furnaces. Walter S. Rockwell, assignor to W. S. Rockwell Company, New York, N. Y. (1,330,219; Feb. 10, 1920.)

Mine-Car-Check Lock. Ned Williams. (1,330,669; Feb. 10, 1920.)

Ore-Concentrator. Lino Sauz Polo. (1,332,751; Mar. 2, 1920.)

Ore Housing—Storage - Building. George Fletcher Hurt, assignor to Pratt Engineering & Machine Company, Atlanta, Ga. (1,330,709; Feb. 10, 1920.)

Ore Loader—Conveyor. Joseph A. MacLennan, assignor to Link-Belt Co., Chicago, Ill. (1,331,020; Feb. 17, 1920.)

Pulverizer—Rotary Impact-Pulverizer. Clifford J. Tomlinson, assignor to Allis-Chalmers Manufacturing Co., Milwaukee, Wis. (1,331,968; 1,331,969; Feb. 24, 1920.)

Recovery—Art of Precipitating Suspended Material from Gases. Edson Ray Wolcott, assignor to International Precipitation Co., Los Angeles, Cal. (1,331,225; Feb. 17, 1920.)

Refractories—Process for Producing Refractory Compounds. Wilfred M. Handy. (1,330,263; Feb. 10, 1920.)

Retorts—Method of Making Retorts or Similar Devices. John J. Simmonds, Iola, Kan., assignor to The Simmonds Engineering Co., Iola, Kans. (1,331,285; 1,331,286; Feb. 17, 1920.)

