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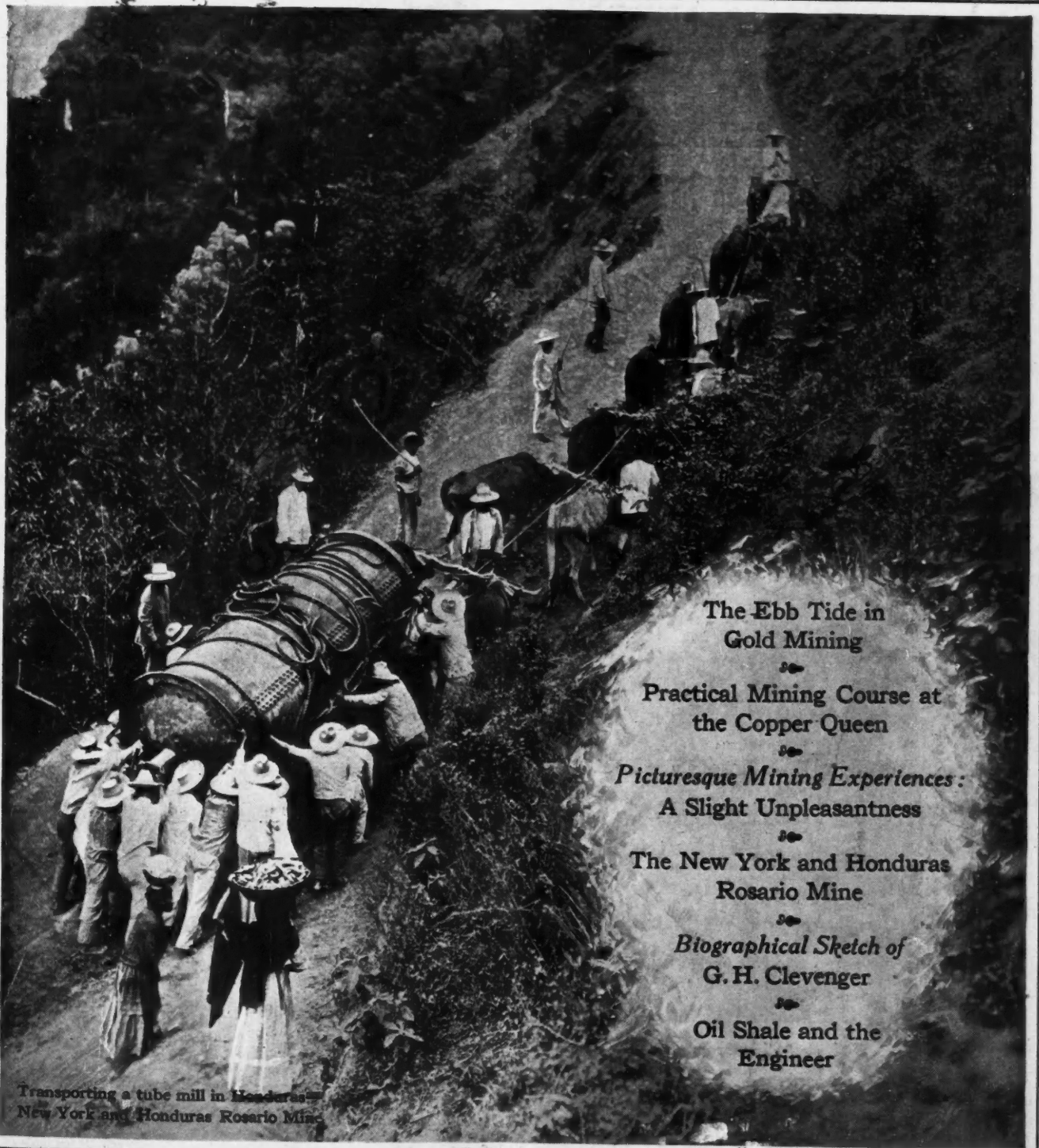
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ENGINEERING AND MINING JOURNAL

December 18, 1920

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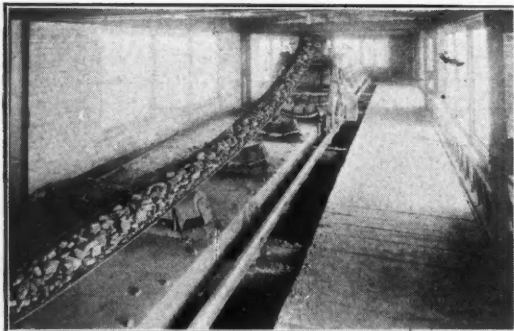
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The Close of the War Minerals Relief Commission

SECRETARY PAYNE of the Interior Department advises that up to Nov. 27 the War Minerals Relief Commission had made recommendations in 1,124 cases out of 1,203 legally before it, and in all has made awards of something over two million dollars on claims asking nearly sixteen million. The remaining eighty-three claims cover an asked-for amount of less than one million. The total amount appropriated by Congress as a figure which must not be exceeded, it will be remembered, was eight and a half million, so that at least five million dollars will remain unexpended when the commission is through with its work, which it expects to be within sixty to ninety days. It is to be hoped that the Secretary will at once return to the Treasury the five million credit remaining for him to draw on, and will a few months later add the odd change remaining, which will be probably in the neighborhood of half a million dollars. This will complete the record of prompt and decisive meeting of problems which has characterized this war minerals matter from the start.

Congress put the adjudication of these claims up to the Secretary of the Interior, without appeal, because it was of the opinion that if referred to the Court of Claims they would drag interminably. Beyond question, the Secretary and his appointees have justified the shrewd judgment of Congress. It is a highly creditable achievement to have disposed of over 1,100 claims in a little over a year, with adequate engineering, auditing, legal, and equitable investigation of each. The examining staff has consisted of experienced mining engineers and the auditing staff of especially selected and experienced mine accountants; and of the commission, two are mining engineers who make their living out of their profession, and the third is an old and tried favorite son of a mining state.

None of the commissioners had any hand in the Government's mineral policy during the war. A more ideal tribunal could not be imagined, and certainly not one to which the mining industry could look with more confidence. No doubt the claimants, with the characteristic sportsmanship of the profession, will thank the Secretary's organization for prompt and just awards, and forget the claims which the commission has found invalid. And we hope that the matter may be closed with a vote of appreciation to the Government for its equitably-meant handling of the war and post-war problems regarding minerals, and that claimants, individually or collectively, will not seek to prolong the matter indefinitely, by securing the permission of Congress to drag out a miserable existence in the Court of Claims.

The Court of Claims is, from the standpoint of fitness and intelligence for these special cases, an inferior tribunal, as it has not the special knowledge concerning

the questions involved possessed by the organization which has handled them, and which will never again be available, since it is now breaking up. Furthermore, we are claiming nowadays that the engineer can solve general questions more promptly and equitably than the lawyer, who has long held the reins over us in public life. The record of the handling of the war minerals problem justifies the claim; therefore, let us not turn the remains which the engineers have rejected over to the lawyers, to whom procrastination is a source of income.

The Price of Copper in Canada

RECENTLY we were drawn into a discussion as to whether or not the Canadian government paid a bounty on copper refined within the dominion. Several mining men here in New York were very sure that this was being done, and we were informed that it amounted to 1½c. per lb. and had been in effect for about one year. However, inquiry from the Minister of Mines at Ottawa brought the reply that no such bounty under that or any other name is paid by the dominion government, or, as far as his information went, by any of the provincial governments. This, of course, proved that any federal bounty was a myth, but looking into the subject further, we found that a Canadian smelter or refiner who settles on a basis of the New York price does enjoy a premium, and we believe the true state of affairs should be known.

Each week the *Canadian Mining Journal* publishes the price of electrolytic copper in Montreal. On Dec. 1 this price was 18.75c. and the New York quotation on the same day was 13.25c. Why this great difference? It is accounted for in this way: Canada imposes an import duty of 1½c. per lb. on copper in blocks, ingots or pigs, and 10 per cent on semi-manufactured forms. As the country consumes, or did in 1918, three or four times as much refined copper as it produces, this 1½c. must be added to the New York price. Then there is the matter of exchange. On Dec. 1 New York funds in Montreal were quoted at approximately 13½ per cent premium. This would be equivalent to 1.8c. on a pound of 13½c. copper. Freight would be approximately ½c. Also, we are reliably informed, though we have not confirmed it, there is an excise tax of 1 per cent on imported copper. This would amount to only about 0.1c. per lb. Summing these up, we have 3.9c. as a differential for copper in Montreal compared with New York, or, with the New York price 13.25c., we would expect the Canadian price to be 17.15c. This is not quite 18.75c., but we hear that Montreal dealers actually sell for less than the figure published by the *Canadian Mining Journal*, which is only supposed to represent less-than-carload lots. It would probably be safe to assume that with the current rates of exchange, Canadian producers would be able to sell their copper for about 4.5c. above the New York price. Freight, of course, say from the Trail

refinery to Toronto or Montreal would be an item of some importance, so that Western refiners would not net as large a premium as this over the New York price.

Curbing Cagliostro

THE way of the bogus stock promoter is hard, but, nevertheless, the field of this modern Cagliostro remains to a considerable degree fertile. His latest invasion is—by virtue of the fact that the unsuspecting public is still very much in the dark concerning it—the promotion of oil-shale stock. What argument could be more persuasive to the gullible prospect, than the mere statement that, though our petroleum resources are dwindling, untold quantities of shale oil await only the investments of those shrewd enough to get in “on the ground floor”? We are invited to take heart, to cease listening to the idle chatter of the pessimist, for, lo and behold, the opportunity of the ages has come, and oil shale—millions of tons of it—is to take the place of our “wasting resources.” The prospective investor is shown magnificent mountain views, disclosing a veritable treasure-trove in the form of oil-bearing rock; also photographs of well-ordered plants in full operation, and, hypnotized by the dazzling prospect of out-rivaling a Standard Oil magnate, the stupefied victim subscribes. He is not advised, of course, that a direct air route between the Colorado mountains and the oil-shale refineries of Scotland has not yet been established.

After having pointed out the devious workings of the nefarious promoter for a number of years, we are inclined to take exception to the statement made by David Eliot Day, in his article “Oil Shale and the Engineer,” on page 1182, that, “The time for promotion schemes has passed.” True, as he says, it is “becoming more difficult”; but it is our general observation that the narrower the eye of the needle the thinner and smoother becomes the promoter. And it is unreasonable to suppose that those of the light-fingered gentry are going to lose the opportunity to make the most of this latest experimentation.

No doubt there will be ample opportunities in the oil-shale industry for legitimate stock issues, but at the present time there is little to attract the moderate and conservative investor, and the experimental and development work will necessarily have to be backed by large financial interests. Such concerns make haste slowly, and usually build on a firm foundation.

Philanthropically speaking, however, we wish that Mr. Day's paper might be accorded wide dissemination in the non-technical press, for he has outlined in excellent fashion the several problems that must be met before the commercial production of oil from shales in this country may be practicably realized. A careful reading is sufficient to convince the most skeptical as to the fallacy of the arguments produced by the spellbinders.

The Unreliability of Iron as a Trade Barometer

THE rapid and striking decline in the price of most commodities was initiated so swiftly that most people, unprepared for the sudden change, were dumfounded. Their unpreparedness might very possibly have been induced by an incorrect reasoning as to the state and effect of underlying economic conditions in this period of readjustment. In other words, their barometer didn't function properly and failed to indicate the advent

of an impending storm. It could easily have been the fault of the barometer, as, judging from the indicators that are ordinarily used in forecasting the ups and downs in the general price trend of commodities, it is exceedingly easy to be led astray.

For example, pig iron has been hailed as the exponent of barometrical perfection. Yet glance at the present price of the several grades of pig iron. It has budged but slightly from its high of last September, and compared with copper, lead, zinc, wheat, cotton, leather, and a multitude of other materials, the decline is relatively small. It may be gainsaid that the present period is so abnormal that it is logical to find an exception to what is merely a generality. Perhaps there is something in such reasoning, but from our own observation, consisting, for one thing, of a comparison between the price of pig iron and copper for a span of years, copper has been much more sensitive than pig iron in reflecting impending market changes—and sensitiveness is the paramount essential of a good barometer.

On page 1197 will be found curves comparing the price of basic pig iron with that of New York electrolytic copper, from which the fluctuations in each are clearly apparent.

During the last ten years, pig iron has lagged from one to thirteen months in failing to reflect the market trend in the metals, as compared with copper. In the last twelve critical months, copper has come down in an almost unbroken descent. Pig iron delayed its decline until September of this year; and if pre-war conditions are any criterion of the limit of the drop in metals—it is difficult to determine what is a criterion these days—pig iron is due for a mighty fall.

No doubt it is hazardous to rely upon one single indication in predicting a general trend. Statistical organizations and banks which make a practice of forecasting a trade cycle study railroad earnings, bank clearings and bank conditions, crops, the prosperity of the iron and steel industry, and other economic factors which are considered fundamental. They feature a service founded upon a compilation of such information and call it a business barometer. The average man, however, is more interested in singling out one commodity which is most likely sensitively to reflect a price trend. The pig-iron “barometer” is either exceedingly sluggish or requires calibration—at any rate, our faith in its reliability has been sadly shaken and the reputation of copper considerably enhanced.

Many commodities are endowed with a barometrical halo. Silver is a common example, and it has borne this dignity unusually well. Singularly enough, the price of silver has fluctuated very sensitively with the price of other metals. We have confidence in silver. Its gradual price descent from its phenomenal high of last February not only began earlier than the decline in most other commodities, but has kept abreast of the trend. After the price descent crossed the dollar line, artificial conditions affected its capacity as a barometer.

There are other choices. We recently read in a Bureau of Mines bulletin that “In recent years in the United States, especially in the East, the demand for sulphuric acid for chemical and metallurgical industries has been an accurate and sensitive barometer of general business conditions. The demand for acid responds much more quickly to a general slump or boom in the industrial world than does the demand for iron and steel.” Which would indicate that there are other pet barometers—and a lack of faith in pig iron. Which one do you use?

WHAT OTHERS THINK

The Reconciliation of Science and Law

YOUR editorial comment in a recent issue is an excellent illustration of the state of unpreparedness with which some of our editorial critics enter upon the discussion of apex litigation. Many of your readers are sufficiently familiar with the subject to perceive at once the unstable basis for your criticisms and to lay aside your strictures with a smile. But others not so well advised are liable to gain a false impression and to find real wisdom in your sophistries. For their benefit it seems advisable for me to reply.

Having in mind only the textbook definitions and imbued solely with scientific conceptions, you fail to realize that the Federal mining laws and the construction placed upon them by the courts have in many instances compelled the geologist to modify his preconceived and perhaps more scientific definitions.

Let us first glance at the statute itself and then read what the courts have said. The act of May 10, 1872, provides that "all mineral deposits in land belonging to the United States, both surveyed and unsurveyed, are hereby declared to be free and open to exploration and purchase by citizens of the United States." Section 2 provides for the location of mining claims "upon veins or lodes of quartz or other rock in place, bearing gold, silver, cinnabar, lead, tin, copper, or other valuable deposits."

Section 3 provides "that the locators of all mining locations . . . on any mineral, vein, lode or ledge situated on the public domain . . . shall have the exclusive right of possession and enjoyment of all the surface included within the lines of their location, and of all veins, lodes or ledges throughout their entire depth, the top or apex of which lies inside of such surface lines extended downward vertically, although such veins, lodes or ledges may so far depart from a perpendicular in their course downward as to extend outside the vertical side lines of said surface locations." And that is the whole substance of the vexatious extralateral right law. But the courts have been called upon to interpret this law between conflicting claimants. They have given us definitions and rules for our guidance.

More than forty years ago we were told by Justice Field of the United States Supreme Court that "these acts were not drawn by geologists or for geologists; they were not framed in the interest of science and consequently with scientific accuracy in the use of terms. They were framed for the protection of miners in the claims which they had located and developed, and should receive such a construction as will carry out this purpose. The use of the terms 'vein' and 'lode' in connection with each other in the act of 1866, and their use in connection with the term 'ledge' in the act of 1872, would seem to indicate that it was the object of the legislator to avoid any limitations in the application of the acts which a scientific definition of any one of these terms might impose." This language has been frequently quoted with approval by other courts.

The statute refers to "any mineral, vein, lode or ledge" and grants the extralateral right to all such. The

dictionaries define these terms in somewhat various ways, among which we find "ledge" defined by the Standard Dictionary as "a metal-bearing rock stratum; a quartz vein."

Von Cotta says, "Veins are aggregations of mineral matter in fissures of rocks. Lodes are therefore aggregations of mineral matter containing ore in fissures."

Dr. R. W. Raymond, many years ago, in one of the first great apex cases, testified that "The miners made the definition first. As used by the miners, before being defined by any authority, the term 'lode' simply meant that formation by which the miner could be led or guided. It is an alteration of the verb 'lead,' and whatever the miner could follow, expecting to find ore, was his lode. Some formation within which he could find ore, and out of which he could not expect to find ore, was his lode." (Eureka case, 4th Sawyer, 302, 311.) He also refers to the fact that cinnabar is one of the minerals locatable under the statute, and this mineral occurs not in fissure veins but "as impregnations and masses of ore distributed through zones of rock."

Dr. T. Sterry Hunt, an eminent geologist and in 1877 president of the American Institute of Mining Engineers, testified in this same case as follows:

That this whole mass of rock is impregnated with ore; that although the great mass of ore stretches for a long distance above horizontally and along an incline down the foot wall, as I have traced it, from this deposit you can also trace the ore into a succession of great cavities or bonanzas lying irregularly across the limestone and into smaller caverns or chasms of the same sort; and that the whole mass of the limestone is irregularly impregnated with the ore. I use the word "impregnation" in the sense that it has penetrated here and there; little patches and stains, ore-vugs and caverns and spaces of all sizes and all shapes, irregularly disseminated through the mass. I conclude, therefore, that this great mass of ore is, in the proper sense of the word, a great "lode," or a great "vein," in the sense in which the word is used by miners; and that practically the only way of utilizing this deposit is to treat the whole of it as one great ore-bearing lode or mass of rock.

Dr. C. Le Neve Foster in speaking of the Great Flat Lode in Cornwall says that it is in the main a band of altered rock and that perhaps half the tin ore of the country is obtained from tabular masses of stanniferous altered granite and concludes that "the term lode or mineral vein should include not only the contents of fissures but also such tabular masses of metalliferous rock."

Our great textbook writer on mining law, the late lamented Curtis H. Lindley, says that the terms lode and vein are legal equivalents, and quotes with approval Ross E. Brown's language as follows:

Originally the word "vein" was narrow in its significance, defining a single clearly marked seam or fissure-filling in the country rock. The word "lode" was a broader term, applied not only to ore-bearing veins in a narrow sense but to various more complicated forms of ore deposits as well.

Under the influence of the mining acts of Congress it has gradually become more and more customary to use the two terms synonymously and to give to the word "vein" the broad definition that would formerly have been regarded

as more properly applicable to the word "lode." Still, the custom is not rigid, and the miner, as a rule, continues to make certain distinctions in the use of the terms. For example, when his deposit contains separate parallel seams, or sheets, of ore, and he regards the whole as a unit, he may call it either a lode or a vein, but the separate sheets he designates as distinct veins within the limits of his lode. He calls the entire mass vein-matter, and his conception is that the word "vein" refers either to the entire mass or to narrow streaks within the mass, while the word "lode" always refers to the entire mass.

In a very general way a lode may be described as a mass of mineralized rock in place, the word "mineral" referring only to commercially valuable constituents. The form is usually more or less tabular or sheet-like, but occasionally too irregular to fit such description.

Now let us see how the courts have treated this subject: In the first place we note that they have been forced to admit that "what constitutes a lode, or vein, of mineral matter has been no easy thing to define." (116 U. S. 529.) One of the earliest court definitions was given in the Eureka case, decided in 1877 (4 Sawyer, 302, 311; 8 Federal cases 4548):

We are of the opinion that the term (lode) as used in the acts of Congress is applicable to any zone or belt of mineralized rock lying within boundaries clearly separating it from the neighboring rock. It includes . . . all deposits of mineral matter found through a mineralized zone, or belt, coming from the same source, impressed with the same forms, and appearing to have been created by the same processes.

And as Judge Johnson points out in his opinion in the Highland Boy case:

There was a wedge-shaped zone of limestone dipping into the mountain for a distance slightly exceeding a mile lying between quartzite and shale beds which at the east end of the zone approach so closely as to be separated by a bare seam less than an inch in width. From that point they diverged until on the surface in the Eureka mine they were about 500 ft. apart, and on the surface in the Richmond mine about 800 ft. In this limestone zone at different places throughout its length and in various forms, mineral was found, sometimes in a series or succession of orebodies more or less closely connected, sometimes in apparently isolated chambers, and at other times in what would seem to be scattered grains. This limestone zone was broken up, crushed, disintegrated and fissured in all directions so as to destroy, except in places of a few feet each, so far as exploration showed, all traces of stratification.

From a consideration of all the court decisions Lindley finds that "a lode or vein is a body of mineral, or mineral-bearing rock, within defined boundaries in the general mass of the mountain. . . . With ore in mass and position in the body of the mountain no other fact is required to prove the existence of a lode or the dimensions of the ore. As far as it prevails the ore is a lode; and it is not at all necessary to decide any question of fissures, contacts, selvages, slickensides, or other marks of distinction in order to establish its character. . . . It has sometimes been contended that the lode must have a certain position in the earth; that is to say, it must be more or less vertical before this rule which is given in the act of Congress can be applied; but we have heretofore held, and we are still of the opinion, that it applies to all lodes which have an inclination below the plane of the horizon, whatever it may be." (Federal Cases, No. 8158.)

Judge Hawley in the Ninth Circuit Federal Court, after reviewing most of the decisions on the subject, spoke as follows:

This statute was intended to be liberal and broad enough

to apply to any kind of a lode or vein of quartz or other rock bearing mineral, in whatever kind, character or formation the mineral might be found. (58 Fed. 106, 120.)

And in a later case, speaking for the Circuit Court of Appeals:

When a locator of a mining claim finds rock in place containing mineral in sufficient quantity to justify him in expending his time and money in prospecting and developing the claim he has made a discovery within the meaning of the statute, whether the rock or earth is rich or poor, whether it assays high or low. (77 Fed. 249, 255.)

In *Steven vs. Williams* is found the following by Judge Hallett:

As to the word "vein," or "lode," it seems to me that these words may embrace any description of deposit which is so situated in the general mass of the country, whether it is described in any one way or another; that is to say, whether in the language of the geologist we say it is a bed, or a segregated vein, or gash vein, or true fissure vein, or merely a deposit. . . . Whenever a miner finds a valuable mineral deposit in the body of the earth (in place) he calls that a lode, whatever its form may be, and however it may be situated, and whatever its extent in the body of the earth.

The same judge, in another case, held that an impregnation to the extent to which it may be traced as a body of ore is as fully within the broad terms of the act of Congress as any other form of deposit. (29 Fed. 347, 353.)

The Supreme Court of Colorado speaks as follows:

Many definitions of veins have been given, varying according to the facts under consideration. The term is not susceptible of an arbitrary definition applicable to every case. It must be controlled in a measure at least by the conditions of locality and deposit. The distinguishing feature between a vein and the formation inclosing it may be visible. It must have boundaries, but it is not necessary that they be seen. Their existence may be determined by assay and analysis. The controlling characteristic of a vein is a continuous body of mineral-bearing rock in place in the general mass of the surrounding formation. (47 Colo. 473.)

The Land Department of the United States says:

By the term "vein" or "lode" . . . it is not to be understood as having had in mind merely a typical fissure or contact vein, but rather any fairly well defined zone of mineral-bearing rock in place. (40 Land Dept. Rep. 271.)

In the case of *Lawson against the United States Mining Co.* the United States Supreme Court sustained the finding of the Circuit Court of Appeals couched in the following language, to wit:

A careful examination and consideration of the evidence clearly convinces us that the stratum of limestone constitutes a single broad vein or lode of mineral-bearing rock extending from the quartzite on one side to the quartzite on the other,

and goes on to say:

This stratum of limestone underlies the four claims of the plaintiff, and one of the contentions of the defendant is that there are several independent veins, one of which has its apex within the surface lines of the Kempton and another its apex in the Ashland, that these independent veins continue down through the stratum of limestone beneath the surface of plaintiff's claims, and that it was only from these independent veins that defendants were mining and removing ore. Of course this difference between the conclusions of the court and the contentions of the defendants affects materially the scope of the inquiry. If the limestone is not, strictly speaking, a vein, but a mere stratum of rock through which run several independent veins, then the inquiry must extend to the location of the apex of each sep-

arate vein; whereas if the stratum of limestone is itself a single broad vein, then the inquiry is narrowed to the location of its apex.

And further, with reference to veins so wide as to cover more than one claim at the surface, the same Supreme Court has held (*loc. cit.* p. 76; 11 Pac. 515):

Under the law of 1866 the surface ground was merely for the convenient working of the lode. The discoverer and first locator took the lode in its entirety. The law contemplated its segregation in its length, but not in its width. It refers to lodges between the end lines, not to a part of a lode. No expression can be found in it indicating an intention to limit the rights of a locator to a portion of the lode in its width. The discovery of any part of the apex of a vein is regarded by it as the discovery of the entire apex. And we think that the law of 1872, when all of its provisions are considered together, and in connection with the former law on the subject, as it should be, evinces the same intent. Under this law the discoverer of any part of the apex gets the right to its entire width, despite the fact that a portion of the width may be outside of the surface lines of his claim extended vertically downward. While he has no right to the extralateral surface, he has a right to the extralateral lode beneath the surface.

It may be remarked in passing that the mining claims referred to in the opinion just quoted are in Bingham. The Old Jordan claim, located under the law of 1866, is several thousand feet in length. The Jordan limestone, here held to be a lode, extended still further on the surface for some thousands of feet, containing fissures and scattered orebodies, and has been judicially held to be a lode on still other and more remote claims, such as the Red Rover.

In the case of Keeley against the Ophir Hill Consolidated Mining Co. the district judge of the Federal court also upheld the limestones as lodges against the contentions of surface owners on the dip of the limestone, although fissures containing ore extended from the surface downward into and through the limestone.

In the case of Star Mining Co. vs. Federal Mining Co., involving ore deposits in quartzite in the Cœur d'Alene district, the Court of Appeals for the Ninth Circuit cited with approval the findings of a former decision regarding the Bunker Hill lode (131 Fed. 579):

That within the Bunker Hill claim there is a vein or lode of rock in place, carrying silver and lead, commonly known in the district as the "Bunker Hill Lode," the apex of which is indicated by the outcrop of the foot wall, which traverses the claim in a general northwesterly course from where it cuts the south boundary; that the foot wall is the well-defined and persistent feature of this vein, and enters the Bunker Hill claim at a point on its south line about 300 ft. from the southeast corner, and, extending along its course at the surface northwesterly, passes out of the north line of the claim about 726 ft. from the northeast corner of the claim; that the Bunker Hill lode has no physical hanging wall, no marked line complement to the foot wall, in defining the limit of the fissure; that for its underlying boundary it has a well-defined, continuous bed of barren quartzite, but for its overlying boundary it has only an irregular and vague outline of the limit of mineralization, from which fact, and the peculiar geological formation of the lode, it is very difficult to define this limit with any degree of certainty, for which reason much confusion and some contradiction appears in the testimony upon this point; that the lode or ledge extending from the foot wall into the hanging wall country gradually fades in value until a point is reached 350 or 400 ft. out, where the rock is practically barren.

In the Star case last mentioned the court established by its finding and decision as a lode (under the meaning of the mining laws) a body or mass of quartzite

from 100 to 300 ft. wide with a length of more than one mile and containing, according to the testimony, probably over 95 per cent of pure quartzite. From this lode has been taken ore valued at more than thirty million dollars. It is not an ordinary vein; it has no walls; it is not between boundaries of different kinds of rock; it is not continuous quartz; it is simply mineralized country rock. And yet it is a lode located and patented as such under our mining statutes, and no sophistries or pleantries of theoretical geologists and editorial writers can make it anything else.

From the foregoing it is abundantly evident that, when mineralized, zones and strata of limestone and quartzite become lodges. The "other rock" referred to in my testimony which you have ridiculed so humorously is the monzonite or "porphyry" of Bingham. The Old Jordan lode lies south and the Highland Boy lode north of the great Utah Copper deposit. Fortunately, the holdings of the Utah Copper Co. have been so shaped and consolidated that its character as a lode has never been questioned. But does anyone, even a textbook geologist, in his most exalted mood and hyper-scientific abstractions, ever for a moment venture to question the propriety and common sense of the law under which it was located and patented in many claims and fractions as a mineral deposit, lode or ledge? And how about the other so-called "porphyry coppers"? Even the Calumet and Hecla conglomerate and the cupriferous amygdaloid flows of the Lake Superior region as well as the banket of the Rand would be lodges subject to the provisions of our mining law if situated within the territory to which that law applies. The Treadwell and adjacent gold mines are further examples of lodges of mineralized rock of large dimensions and low mineral content. In all of these the country rock constitutes by far the larger portion of the lode.

And now let us consider for a moment how much valuable mineral there is in these country-rock lodges:

According to the classic monograph on the Eureka district by Curtis, the Eureka-Richmond lode contained about 1 per cent of valuable and minable ground. The testimony in the various Bunker Hill and Star cases was to the effect that the ore minerals in the Bunker Hill and Morning-Star lodges constituted from 1 to 5 per cent of their volume. In the Highland Boy cases the figures were around 2 per cent. In the Utah Copper lode there may be from 2 to 5 per cent of sulphide minerals, but the average copper content is less than 1½ per cent. The Alaska Gastineau and the Alaska Juneau lodges average less than \$1.50 per ton in gold, and contain, therefore, a small fraction of 1 per cent of valuable mineral. Under these conditions it would not seem to be a difficult task to "prove that the country rock is the vein."

And finally, it may not be amiss to request our critics to read more carefully the courts' opinions before writing their editorials. You state that "the quartzites which lie between the limestone" (heaven help us! How can quartzites get between a limestone) "in Bingham Canyon also are ore-bearing, as was shown by abundant testimony at the trial." The finding of the court is that "the ores and mineral in controversy in this action are found beneath the surface of the mining claims of the plaintiff in the Highland Boy limestone and only to a limited extent in the quartzite above or below it."

You proceed on the assumption that the court found that the Highland Boy limestone is not a lode, and upon

this supposition you ridicule me for claiming it to be one. The language of the court is as follows:

Up to the dip of the Highland Boy limestone, about one-fourth of a mile from the Leadville orebody, there has been developed and mined an immense deposit of ore. This deposit was made up of a great number of closely associated and related orebodies almost entirely in the limestone and extending in length for a distance of approximately 3,000 ft. in a northeasterly direction, roughly paralleling the Leadville orebody, and from 200 to as much as 1,000 ft. in width. . . . This great deposit. . . is admitted by the plaintiff to be a broad lode.

And further:

I conclude, therefore, that the Eureka case is authority for finding that the upper orebody found in the Highland Boy limestone, developed on its plunge and rake in the limestone, is a lode or vein within the meaning of the statute.

And again:

The orebodies which were the subject of litigation in the Lawson case were found in a body of limestone called the Jordan limestone, separated only a few thousand feet from the Highland Boy limestone, and (as) the Jordan limestone and the Highland Boy limestone are undoubtedly a part of the same sedimentary bed, uplifted at the same time and possibly mineralized from the same mass or similar masses of porphyry lying below.

Do these quotations from the court's opinion uphold your assumption?

Lead us not astray, Mr. Editor. Do not try to hold me responsible for definitions and conceptions which were fixed more than forty years ago. Do not accuse me of a "desire to twist the apex law" to my "own protection or profit." It was framed expressly for the protection and profit of the mining community, and if it be twisted it became so long before I laid my hand upon it. Come down out of the rarefied atmosphere of higher criticism. Get your feet on the firm basis of facts and established principles. You and I are too young to frame definitions and shape the structure of a growth of half a century. Your testimony comes too late. You should have been on the witness stand in 1877 with Rossiter Raymond, Clarence King, Sterry Hunt, and Dr. Newberry. "Geology applied to mining" is more effective if it be seasoned with less humor and better understanding of the mining statutes as already for many years interpreted and established.

Yours very truly,

HORACE V. WINCHELL.

Los Angeles, Nov. 27, 1920.

Cheapening the Mining Engineer

As a graduate and a trustee of the Massachusetts Institute of Technology I read with a good deal of concern the editorial in your issue of Oct. 30 entitled "Cheapening the Mining Engineer." I made immediate inquiries, and found that mining engineering had been used as a generic term to cover a number of things that are no more mining engineering than house wiring is electrical engineering. The University of Kentucky, for example, has a school for coal miners in which certain disabled men are getting training of great value to them, but with no thought, of course, of entering the profession of mining engineering. Again, our receiving school at Tulane University takes in disabled soldiers of all sorts of previous preparation and gives them "try-out" courses along a number of lines, including, I presume, certain elementary work in connection with such

mining as is commonly performed in that part of the country.

On the other hand, many of the disabled soldiers for whose training we are responsible are men of high grade intellectually, whose college courses were interrupted by their enlistment in the war and who are now finishing those courses at the expense of the Federal Government. Those men will be competent not only in the ordinary sense of being well educated but in the higher sense of being engineers who have had the added privilege of military discipline and of strenuous war service.

I will ask that, in future statements as to the engineering students in training, closer distinction be made between real mining engineers and those men who are getting training in some particular phase of the mining industry.

You may be interested in seeing the list of schools and colleges in which disabled soldiers under Federal care are pursuing studies in the general field of mining.

Washington, D. C.

JAMES P. MUNROE,

Vice-Chairman, Federal Board for Vocational Training

The list kindly sent to us by Mr. Munroe, issued in September last, follows:

SCHOOLS WHERE STUDENTS MAY STUDY MINING ENGINEERING IN THE UNITED STATES

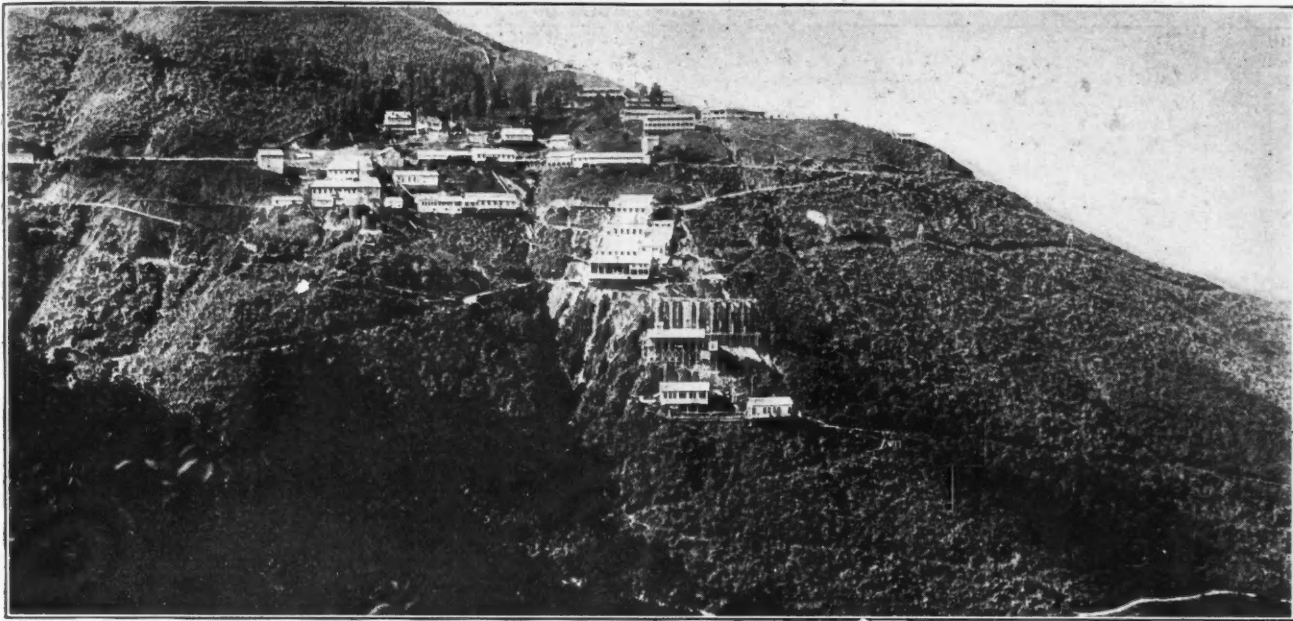
District

1. Harvard University, Cambridge, Mass.; Huntington School, Boston, Mass.
2. Columbia University, New York City, N. Y.
3. Carnegie Institute of Technology, Pittsburgh, Pa.; I. C. S. Scranton, Scranton, Pa.; Lafayette College, Easton, Pa.; Lehigh University, South Bethlehem, Pa.; Mining and Mech. Institute, Freeland, Pa.; Penn. State College, State College, Pa.; University of Pittsburgh, Pittsburgh, Pa.
4. West Virginia University, Morgantown, W. Va.
5. Georgia School of Technology, Atlanta, Ga.
6. Tulane Rec. School, New Orleans, La.
7. Case School of Applied Science, Cleveland, Ohio; University of Kentucky, Lexington, Ky.
8. Michigan School of Mines, Houghton, Mich.; University of Wisconsin, Madison, Wis.
9. Rolla School of Mines Inst., Rolla, Mo.; University of Kansas, Lawrence, Kan.; Kansas State Normal School, Pittsburg, Kans.
10. Montana School of Mines, Bozeman, Mont.; Montana School of Mines, Butte, Mont.; South Dakota State School of Mines, Rapid City, S. D.; University of Minneapolis, Minneapolis, Minn.
11. Colorado School of Mines, Golden, Col.; New Mexico School of Mines, Socorro, N. M.; University of Utah, Salt Lake City, Utah.
12. Stanford University, Palo Alto, Cal.; University of Arizona, Tucson, Ariz.; University of California, Berkeley, Cal.; University of Nevada, Reno, Nev.; University of Southern California, Los Angeles, Cal.
13. Oregon Agricultural College, Corvallis, Ore.; University of Washington, Seattle, Wash.
14. El Paso School of Mines, El Paso, Tex.; Receiving Station, Wilburton, Okla.; Texas A. and M. College, Bryan, College Station, Tex.

Where All Good Mules Go

In a Western mining paper of recent date we note the following ad:

FOR SALE—Good tunnel broke mule in excellent condition: now in Golden pasture.



MINE, MILL, AND SURFACE PLANT OF ROSARIO MINE

The Rosario Mines, in Honduras

BY AN AMERICAN ENGINEER

Written for *Engineering and Mining Journal*

THE ROSARIO group of mines, operated by the New York & Honduras Rosario Mining Co., is in the Department of Tegucigalpa, Honduras, not far from Tegucigalpa, the capital. The port of entry is Amapala, on the Pacific side of Honduras. Tegucigalpa is ninety miles from Amapala and is reached by auto road. The mines are twenty miles from Tegucigalpa at San Juancito, and are reached from Tegucigalpa by pack trails and a rough mountain road. The altitude is 5,000 ft. The topography is accentuated and the hills are covered with tropical vegetation. Water is abundant, the rainy season starting about August and lasting until January. There is a heavy precipitation, and floods are not uncommon. A precipitation of five inches in six hours has been recorded. Living conditions are good, and the company has constructed substantial quarters, a clubhouse, hospital, ice plant, and other conveniences. A large library is maintained for the benefit of the employees. There are about fifty white employees on the staff, and the working force is composed of natives. Approximately 1,500 men are employed in and about the mines. Initial operations began in 1882.

EXTENT OF DEVELOPMENT

Operations are distributed over a considerable territory, as twenty veins have been worked at different times. During 1919, according to the last report of the company, development consisted of 10,904 ft. of drifts, 3,145.5 ft. of raises and 1,851 ft. of crosscuts, or a total of 15,900.5 ft. The ore broken in the veins was 92,167 tons, ore from development 12,117 tons, and stope-fill material 29,718 tons, making a total production for that year of 134,002 tons. The development ratio is 8.4 tons milled per foot of development. There was treated in the mill 133,900 tons, producing 1,584,579 oz. silver and 10,200 oz. gold, the ratio of silver to gold

being 155 to one. Production was made from seventeen veins. The range of production was a maximum of 25,911 tons from the San Miguel vein (South) and a minimum of 213 tons from the Porvenir vein. Development was distributed over twenty-one veins and ranged from a minimum of 71 ft. to a maximum, in the San Miguel (South), of 5,362 ft. during the year in question.

ORES MAINLY SILVER

The ores at the Rosario group are principally silver, the most important silver mineral being stephanite. Some native silver occurs. The wall rocks are slate, andesite, and altered granite. The mines are worked through adits. There are over sixty miles of mine track, 20 and 24-in. gage, and forty miles of pipe underground, ranging from 10 to 2 in. in size, and used for compressed-air distribution. The workings are scattered. Shrinkage stoping is largely used. Where wall rocks are bad, overhand stoping on waste fills is practiced. Little timber is needed. Stoppers and hammer-type drills are used. A few jackhammers are employed in sinking winzes. The native miners compare favorably with those of America. Labor conditions are good and strikes are unknown.

The ore is transported by electric locomotives of the trolley type. On the two haulage levels there are two six-ton, two five-ton and two seven-ton electric locomotives. In the last ten years the Rosario electric haulage has handled approximately 1,000,000 tons over a distance of about one and one-half miles.

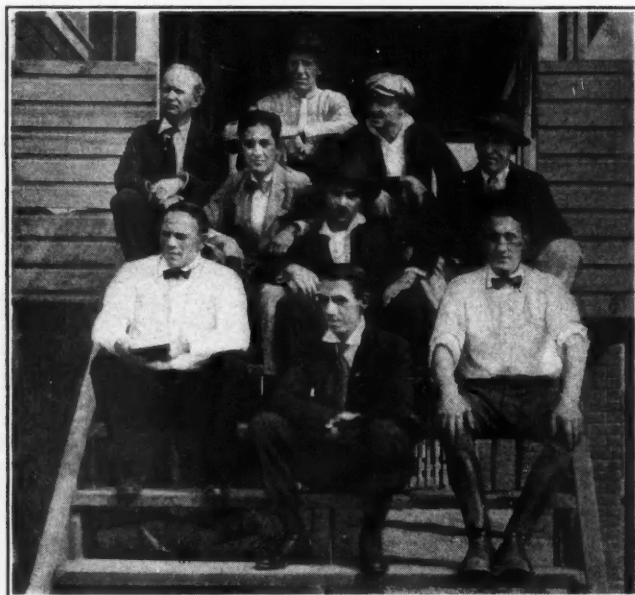
The mill is of the all-sliming cyanide type. Primary crushing is by twenty 1,850-lb. stamps to 1-in. screen size. Supplementary crushing is by one ball mill and three tube mills. Four Dorr classifiers are in use in closed circuit with the ball and tube mills. From the classifiers the pulp goes to Dorr thickeners, and the thickened pulp is treated in eight Pachuca tanks, each



CLUBHOUSE, ROSARIO MINE

of 100 tons' (dry) capacity. Merrill zinc-dust precipitation and presses are used. The Crowe process was installed in 1919. In the silver refinery two oil-fired tilting furnaces are in use. Good results are obtained from tube-mill pebbles manufactured at the mine by selecting and cobbing "nigger heads" from the ore. The capacity of the mill is 400 tons per day, and since its installation in 1912 a total of 845,758 tons has been treated.

Mining cost was \$5.07 and milling cost \$2.65 per ton during 1919. Silver recovery averaged 85.6 per cent; gold recovery, 94 per cent. The mill supplies used were, on the basis of pounds per ton milled: Sodium cyanide, 2.389 lb.; aluminum dust, 0.237 lb.; soda ash, 1.725 lb.; lead acetate, 0.011 lb.; lime (46.2 per cent available), 16.124 lb.; tube-mill pebbles (local), 18.273 lb. The use



SUPERINTENDENT PIERCE AND MEMBERS OF STAFF

of aluminum dust was discontinued. Steel balls are manufactured at the mine from worn-out battery shoes and dies. Another economy practiced is the redressing of the stamp dies in a special machine. This results in from three to six weeks' longer wear.

The power required in mining and milling operations is given in the table.

Two hydro-electric power plants, one at San Juancito, two miles from the mine, and one at Guadalupe, five miles from the mine, supply both mine and mill. The

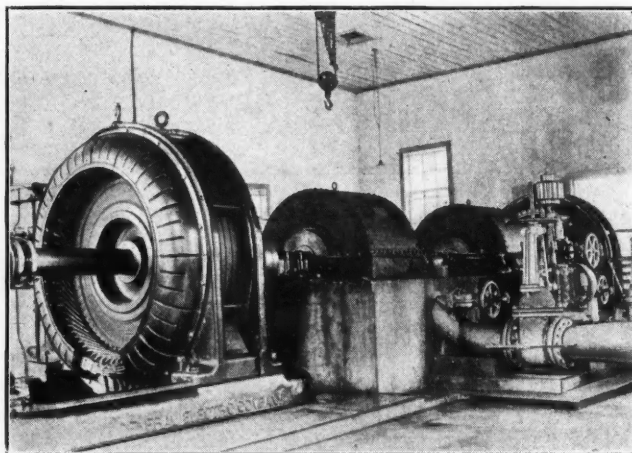
total power developed is approximately 1,200. Two air compressors, two-stage Ingersoll-Rand direct-driven by

ROSARIO MINES TOTAL POWER CONSUMPTION AND POWER REQUIRED PER TON OF ORE IN 1919

	Kw.-Hr.	Kw.-Hr. per Ton
Mill.....	3,621,716	27.048
Mine.....	2,167,459	16.187
Electric haulage.....	267,527	1.997
Surface department.....	88,450	0.661
Surface department lights.....	37,075	0.276
Mill lights.....	31,382	0.234
Mine lights.....	18,829	0.141
Machine shop.....	25,105	0.187
Laboratory.....	18,827	0.141
Total.....	6,276,370	46.872

Cost per kw.-hr., \$0.0028.

induction motors, supply compressed air for mining operations. A well-equipped machine shop, together with electric welding outfit, is an important adjunct to

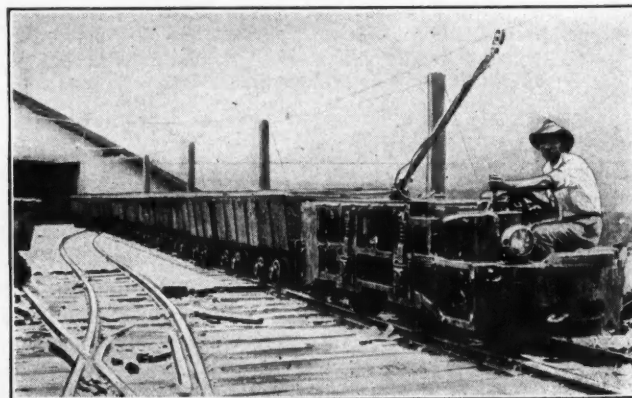


POWER PLANT, ROSARIO MINES.

the mine plant. Two Leyner drill sharpeners and accessory equipment are used for tool sharpening. Native blacksmiths are employed. An assay office and laboratory is also part of the equipment.

Supplies are purchased in New York. Explosives are shipped from San Francisco. A six-months' stock is carried. Transportation is effected with difficulty. It is said that it required three months' time to deliver the compressor equipment to the mine, and that sixty bulls were killed in doing the job. Two months' time was needed to haul in the tube mills.

A. R. Gorden is general manager, L. F. Pierce mine superintendent, F. C. Devereux mill superintendent, H. Douglas master mechanic, and C. Walbrecht chief electrician.



ELECTRIC HAULAGE—DUMPING INTO MILL BINS

The Ebb Tide in Gold Mining

High Lights on the Economic Position of Gold and Conditions in the Gold-Mining States, by W. J. Loring, H. N. Lawrie, Fletcher Hamilton, George E. Collins, Milnor Roberts, B. C. Yates, Henry M. Parks and W. B. Phelps. Addresses* Made at Denver Meeting of the American Mining Congress, November 15-20, 1920

IN A LETTER addressed to Representative Louis T. McFadden under date of Nov. 26, 1920, W. J. Loring, president of the American Mining Congress, made the following comments with reference to the seriousness of delaying relief to the gold-mining industry:

The pity will be that if these mines are allowed to remain idle for a lengthy period of time, no matter whether the water is kept from them or not, there will be a collapse of the underground workings in many of them that will render their condition beyond repair, and should the water be allowed to rise in these mines, 80 per cent of them will be practically a total loss.

It must be understood that a mine deteriorates not only underground, but its equipment lying idle deteriorates with much more rapidity than when in operation. The reason for this is that the slightly acid water attacks the iron machinery, and when lying idle and dry, rust continues rapidly; while the woodwork, both underground and on the surface, when in operation is protected from rot through being kept damp; but timber work after being soaked with water and then allowed to dry rots rapidly.

With the passage of the McFadden Bill, the mines referred to, together with a host of others in the same condition, may be saved from ruin. When the McFadden Bill is passed, they will resume operations and produce hundreds of thousands of ounces of gold that will otherwise be a total loss.

It should be remembered that the mines in existence at the present time should be kept alive by all means within the power of this nation, because it is not easy to find a mine with payable ore in sufficient quantities to be classed as a payable concern; and it would appear to be a pity to allow the known gold producers of this country to cease to exist with millions of ounces of gold contained in their ore reserves, that cannot be extracted at a profit under present conditions but can be made to meet expenses under the relief that will be afforded them by the McFadden Bill.

If the known mines are allowed to permanently close down and become abandoned, it will be necessary to search for new mines, because the old mines have entirely perished. It will be greater economy to maintain the existence of the old mines that are known to contain large tonnages of payable ore under normal conditions than to attempt to find new mines.

Subsidy Paid by Gold Producers

BY H. N. LAWRIE

HAD the price of gold ascended to the average wholesale price of all other commodities during the five-year period (1915-1919) the gold producers would have received for the amount of gold they actually produced \$218,280,000 more than the amount which they did receive of \$404,509,000. Of the \$218,280,000, the amount which would have been paid by the industrial consumers of gold would have been \$133,686,000 for the gold actually consumed, while the Government would have paid \$84,594,000 upon the monetary gold surplus. Inasmuch as the price of gold has been fixed, these respective amounts may be con-

*In part abstracted and in part condensed from original manuscripts.

strued as subsidies paid by the gold producers to the industrial consumers of gold and also to the Government, which received the monetary surplus. Since there was no monetary surplus in 1919, the industrial consumers of gold benefited by the entire subsidy of \$65,500,000. It is reasonable to assume that if the premium had been in effect during the entire period (1915-19), which would have insured a normal (1914) purchasing power of the ounce, the gold production of 1915, \$100,000,000, would have been maintained throughout the period, in which event the gold producers would have received \$500,000,000, the monetary price, plus \$250,000,000, the premium, a total of \$750,000,000, or \$345,491,000 more than has been actually received.

IMPORTANT GOLD FACTS

Total U. S. gold stock May 1, 1919	\$3,092,430,916
Total U. S. gold stock May 1, 1920	2,646,615,750
Decline in U. S. gold stock May 1, 1919, to May 1, 1920, 14.4%	445,815,166
Exports of gold from the U. S., calendar year 1919	368,144,500
U. S. gold imports, calendar year 1919	76,534,000
Loss of gold by excess exportation, calendar year 1919	291,610,500
Exports of gold from the United States, Jan. 1 to Sept. 30, 1920	259,331,925
U. S. gold imports, Jan. 1 to Sept. 30, 1920	198,888,957
Loss of gold by excess exportation, Jan. 1 to Sept. 30, 1920	60,442,968
Total Federal Reserve net deposits Oct. 15, 1920	1,694,130,000
Federal Reserve notes in circulation Oct. 15, 1920	3,353,271,000
Total reserves Federal Reserve Banks Oct. 15, 1920	2,154,911,000
Ratio of reserves to F. R. net deposit and note liabilities Oct. 15, 1920, 42.7 per cent, 4.3 per cent above the legal requirements	
Gold cover of the Federal Reserve dollar note in circulation Oct. 15, 1920	46.6c.
World's gold production 1915, \$469,000,000; 1920 (estimated)	\$325,000,000
World's gold production decline 1915-1920	\$144,000,000 or 30.5 per cent
U. S. gold production 1915	\$101,000,000; 1920 (estimated)
U. S. gold production decline 1915-1920	\$51,000,000 or 50.5 per cent
Gold sold by U. S. Mint for consumption in manufactures and the arts, 1919	\$76,837,600
Usual estimated gold coin destruction	3,500,000
Total gold sold and coin destroyed for use in manufactures and the arts, 1919	80,337,600
1919 production fails to equal gold consumed in manufactures and the arts by	21,848,000
Old gold reined by New York Assay Office and returned to manufacturers, 1919	20,359,613
Gold sold by U. S. Assay Office, New York, for consumption in the manufactures and the arts Jan. 1 to March 31, 1920	20,037,317

	1918	Per Cent	1919	Per Cent	1918-19 Cent
U. S. siliceous ore gold on put	\$42,284,130	63.7	\$38,209,508	64.8	Decline 9.6
Placer gold output	15,673,424	23.6	14,918,468	25.3	Decline 4.7
Base ore by product output	8,454,282	12.7	5,847,359	9.9	Decline 30.8
U. S. gold production, 1920 (estimated)			\$40,000,000		to 50,000,000
Estimated failure of gold production to meet 1920 requirements of manufactures and the arts			\$30,000,000		to 40,000,000
Estimated income from excise of 50c. per pennyweight based on 1919 domestic consumption of gold in manufactures and the arts (excludes imported jewelry, an additional source of revenue)					43,000,000
Estimated premium cost based on 1919 gold production					29,000,000
Balance in favor of U. S. Treasury					14,000,000

In imposing the excise of 50c. a pennyweight; which is equivalent to \$10 an ounce, for the gold contained in manufactured articles, the McFadden Bill enables the industrial consumer to pay more nearly the anticipated cost of production during the forthcoming five-year period, an amount which when paid to the producer of new gold will re-establish the purchase power of the ounce of its status of 1914, and will therefore insure the normal production of gold in the United States.

The gold production of the United States for 1920 will be between \$40,000,000 and \$50,000,000, less than 50 per cent of the 1915 production; and unless some

remedy, as is provided for in the McFadden Bill, is expedited, the production for the ensuing years will rapidly approach the vanishing point, as the gold mines of the country continue to shut down. By reason of the monetary necessity for maintaining the normal gold production of the United States, especially during this period of credit and currency contraction, of protecting the monetary gold reserve from further industrial depletion and of safeguarding the gold standard itself, Congress should provide a remedy without delay in the interest of national security.

Gold-Mining Industry in California

BY FLETCHER HAMILTON

DURING the last six weeks I made an automobile trip through various counties in California, traveling about 4,000 miles. In that time I did not cover one-half of the state, but only reached the points where I thought some good could be done, and some education started along the lines which would bring the business people, the bankers as well as the miners of California, to the point where they would realize that the gold situation not only of California but of the United States was at a critical point. We know the conditions confronting the gold-mining industry, the high cost under which mines are operating. The industry is confronted by a condition unlike that of any other industry, and that is a fixed price for its product.

In making my trip, I wanted to familiarize myself with the conditions, and I can say to you, coming from a gold-producing state—the primary gold state of the nation—that it is a shame to see the mining camps and the mines themselves forced to close down because of the unnatural conditions which prevail at this time. In Trinity County there were three stamps operating, where in the past there had been a hundred stamps in operation. In Amador County, where there were from 500 to 600 stamps in operation, today the number is equivalent to sixty stamps. In Calaveras County, in 1914, there were 494 active stamps, and today fifty. In Tuolumne County, where there were 300 active stamps, today there is not a stamp in operation in the county. In Kern County, the Yellow Aster, which had 100 stamps, is not operating. So it goes throughout the state, and it does not mean only that stamps are not dropping, but it means that the population of the mining counties of California is dropping off. For example, in Calaveras County the decrease shown by the census of 1920 is 40 per cent. I take it that this condition pertains as well to the other gold-producing states.

The relief that we are working for is provided by the McFadden Bill. It seems to me that every business organization in this country should take action on a measure which so vitally affects the business of the country. There has been some opposition to the McFadden Bill by the jewelers, who based their opposition on the grounds that paying the gold producer a premium of \$10 per ounce would be granting a subsidy to that industry at the expense of the jewelry trade. The gold consumer is being subsidized by the United States because of the very fact that he is supplied with his raw product at a fixed price. There is no economic formula which will vitalize an industry in a period of rising costs if it must sell its product at a fixed price.

There has also been opposition by bankers stating that there is too much gold in the country. In the same breath they say that the gold problem is an international question, but they do not say in the same breath that there is too much gold in the world. It is merely that there is too much in the United States. So the problem is the distribution of the gold, and not the fact that no new gold is necessary.

We have had opposition from people who say that the principle of the McFadden Bill is wrong. I state to you that the government of France has had for many years a sumptuary tax upon the use of gold as a commodity, or the use of gold in the arts and trades. In June of this year the French passed an additional sumptuary tax, or an excise tax upon the use of gold as a commodity. You did not find at the time that there was any change in the monetary value or the exchange rate on the franc, and it was proved that such a tax did not affect in any way the monetary value of the gold.

In answer to the statement that other governments are not giving relief to the gold miner, I quote the following from a report by Sir Evelyn A. Wallace, president of the Transvaal Chamber of Mines:

Since the 24th day of July, 1919, we have been able, under the new agreement with the Bank of England, to market our gold not indeed to the best advantage, since the government of India is reserving the best for its own operations, but to considerably increase advantage. The result of this has been that during the last five months of 1919 we obtained about three million pounds more than we should have obtained had we been restricted to the standard price. Beginning at approximately 16 per cent, the premium has varied up to 44 per cent, the average up to the latest date of which we have advice being 26½ per cent, and the last cable states that the premium is approximately 33½ per cent.

I should like to see the American Mining Congress make a stronger effort to bring about relief to the industry. I believe that the gold-mining industry, as well as the nation itself, should give to H. N. Lawrie, who has sacrificed his personal affairs to study this question, the support which would carry this legislation through to a successful conclusion. It is right and it is just, and I believe it is necessary for the maintenance of our financial position.

The Gold Producer in Colorado

BY GEORGE E. COLLINS

IN THE five years from 1915 to 1919, the production from the gold mines of Colorado steadily declined, from \$22,500,000 to \$9,750,000 in round numbers. In 1920 the production, assuming that November and December will continue at the same rate as the rest of the year, will be less than \$7,250,000. The first year's drop was 15 per cent, the second nearly 17, the third 20, the fourth over 23, and this year nearly 26 per cent. The decrease has been steady and continuous. If present conditions continue, the production in 1921 will decline to \$5,000,000.

What does this involve? In the first place it involves the depopulation of thriving communities; homes broken up, the savings of a lifetime sacrificed; families parted. Typical gold-mining towns such as Cripple Creek and Central City are almost deserted. Houses are being torn down, and the lumber shipped away. Mining railroads, such as the Cripple Creek Short Line,

the Boulder & Northwestern, and the Gilpin Tramway, have gone out of business, and in some cases have already been scrapped. Mines are being abandoned, and their workings are caving or filling with water. Most of the men who used to work in the mines have left and gone into other employment.

Why has Colorado, as a gold-producing state, suffered so much more than California? The reason is, I think, largely because California produces gold principally in the form of bullion, whereas our production consisted to a greater extent of gold contained in ores and concentrates which were shipped to the custom smelters and treatment plants. The figures supplied to me by individual producers show that the falling off in the case of the mines and districts which produce gold as bullion was not as serious as in those which shipped to smelters. This is confirmed by the fact that from 1915 to 1919 the gold from Colorado mines deposited in the Denver Mint fell from \$14,304,980 to \$7,648,044, or 46½ per cent, whereas the gold from Colorado purchased by the smelting plants dropped from approximately \$6,846,320 to \$2,175,745, or over 68 per cent.

When a mine reduces its own gold the treatment costs are under its control. To some degree employees, and especially the skilled and permanent employees, of treatment plants, are influenced in their demands, and in the character of the work which they produce in return for a given wage, by what they know to be the surplus available from which to pay them. Such men, usually more intelligent than the mine employees, and often possessing comfortable homes, are disinclined to destroy the enterprise by which they live. Actual figures show that in two of the largest and most representative treatment plants in the state, both producing gold almost entirely as bullion by the cyanide process, in districts widely separated and physically very different, the treatment costs from 1915 to 1919 increased respectively 8 per cent and 60 per cent. In the same mines, during the same period, the mining costs increased respectively 98.8 per cent and 160 per cent. According to my experience this tendency is universal. Costs of mining have advanced more than costs of treatment at the mine.

In the case of mines which ship ores and concentrates to the smelters, this is not true. I cannot give you the figures from all mines, but I feel confident that the costs of smelting have advanced at a greater ratio than the costs of milling or cyaniding; and I am still more sure that the smelting charges, including deductions, show a still greater increase. In the case of one mine, which was once among the principal gold producers of the state, and where the nature of the ore renders it entirely dependent on the smelters, the freight increase has been 57 per cent, and the smelting costs have doubled. Freight and smelting are a first charge on the value of the ore shipped. The miner does not share the proceeds of the ore with the railroads and the smelting plant. He receives the balance after their charges have been deducted. They have not the same incentive to temper the wind to the shorn lamb which may be supposed to influence the men employed in a mine treatment plant. To the worker in the smelter, his employer is a great and wealthy international corporation; he does not realize that his compensation really comes from mines which are struggling to make both ends meet, usually without success. The increased cost can be, and is, passed on to the miner.

Nor is this the entire story. If you increase the

limit at which ore becomes workable from \$5 to \$10, you are certain to reduce the quantity of available ore by more than one-half. Without going further into detail, I may say that the minimum value of workable smelting ore, excepting certain districts, is now from \$20 to \$30. The minimum value of workable concentrating ore has similarly increased in about the same proportion. The result is that most of what was ore in Colorado in 1915 has ceased to be ore in 1920, and will continue worthless until all costs have come back to the 1915 level.

Meantime, the ores which were of higher grade, or cheaper to handle, have been mined out in the struggle for bare existence, and in almost every instance development work has been curtailed or suspended. It is clear that, while the proposed bonus of \$10 per ounce on gold will prevent a further decline in the gold output, no increase in production will be possible unless, in addition to the bonus, a considerable reduction in working costs is effected.

Many mines have managed to stave off the evil day by the use of various expedients.

The acute danger of the situation is that mines are getting down to where they can no longer resort to such temporary expedients. A large proportion of the gold mines in the state which are still in operation are reduced to a situation where they must spend more on development and maintenance, must have new stocks of supplies, must purchase new plants of machinery, etc., or go out of business altogether.

Gold-Mining Conditions in Alaska

BY MILNOR ROBERTS

ALASKA is principally a mining country. The development of its settlements and routes of transportation took place under the pressure of mining needs. The upbuilding of nearly all its cities, except the fishery centers, accompanied the opening of its mines. Although some of the coast towns existed as fishing and trading ports prior to the finding of gold in the Klondike on Aug. 17, 1896, their real growth took place after that date, along with the opening of the territory as a whole. Juneau, the capital of the territory since 1906, attained early importance through the Treadwell mines, which were in regular operation in the early 80's. Seward, another part, was founded and developed as the coast terminus of a railway (now owned and being completed by the Government) to be built to reach near-by mining districts and the gold fields of the interior. Cordova also is a railway terminus and ore-shipping point. All the cities, towns, and camps of interior Alaska without exception grew up either as mining centers or as stopping places on routes to the mines. It seems clear that no cause has yet arisen in Alaska that would have served to develop the country in any degree as mining has done.

The current life and activities of the territory, as distinguished from the causes of its settlement, are likewise mainly dependent on mining. The exceptions to this statement are easily noted and can be segregated for the purpose of considering the condition of the mining industry. The only prominent exception consists of the fishery interests, and these are confined to the coast. The fur trade involves a comparatively small number of persons, and the same may be said of farming. Indeed, the farming industry depends

upon either the mines for disposal of its products, or upon other lines of industry which in turn serve mining. The basic industry of the territory as a whole is mining. The one metal that far outranks all others, except copper, which is mined along the coast and on the Copper River, is gold. Therefore, it may be said that whatever influences affect gold mining have a bearing also on most other industries in Alaska.

Gold mining has suffered a great decline in the North during the last few years, a period in which it has been dwindling elsewhere in the United States. In 1905, the gold production for Alaska reached a value of \$15,630,000, and in the following year rose to its record figure of \$22,036,794. These two totals served as limiting figures for the output during the next ten years. At the close of that period, in 1916, the production was \$17,241,713. Since this latter figure corresponds closely to the average for the twelve-year period of which it marks the end, evidently no falling off in production had taken place up to 1916, but thereafter the gold output decreased rapidly. In 1919 it was about \$9,000,000, while for the present year (1920) the estimated total is far less.

The first probable cause for existing conditions is the war. At the outbreak of the war in 1914, many British miners in Alaska, together with those from the adjacent Yukon Territory of Canada, hastened to their country's aid. As the need for men became more imperative, they were followed by others. America's entry into the war caused most of our young men to enlist, but even then there remained a good proportion of the older and more experienced miners. When the demand for men to carry on war industries in the States became pressing, another outpouring took place. On hearing from "the outside" of the ever-increasing wages in the copper mines and the fabulous earnings (so-called) being made in shipbuilding and other industries in the Pacific Northwest, the miners, being accustomed to adapt themselves to various kinds of work, were quick to take advantage of the opportunities open to them. Thus the war drew upon the man power of Alaska both directly and indirectly.

The statement is occasionally made that the mines of Alaska have run out and that the decreased production of gold is due to this cause alone. Such a theory would postulate the simultaneous failures of practically all mines distributed over an area one-fifth the size of the United States proper. To believe that under the varying conditions that exist in Alaska's gold-producing districts Nature's numerous stores of gold all came to an end at once, requires a great stretch of the imagination. The flooding of three of the four Treadwell mines in 1917 is also pointed out as a prominent factor in the lessening of production. Yet in place of the Treadwell there are two other low-grade properties in the Juneau gold belt, the Alaska Gastineau and the Alaska Juneau, which have been yielding gold steadily, although not profitably, and the Chichagoff, a remarkable mine of high-grade ore situated near Sitka.

Elimination of the factors that have had only a minor part in diminishing the output of gold from Alaska brings us to the most direct cause, namely, high wages and the high cost of materials and supplies used in mining. The increased wages in the States reached during the war not only drew men away from the North, as already stated, but since then have held them here, the high scale having in general remained in effect on the Pacific Coast. Why should men pay the high

rates of fare to distant points in the North, only to receive less wages there than they can obtain here? In order to attract miners to Alaska, rates of pay higher than those prevailing in the coast states must be offered them. In the Puget Sound region today common labor receives \$5 to \$6 per day, the higher rate being paid for heavy work comparable to mining. Carpenters, machinists and blacksmiths are paid \$7 and up. At the same time the Alaska Gastineau near Juneau is offering millmen, laborers and oilers \$3.50, cranemen, carpenters and blacksmiths \$4 to \$5.50, mine laborers \$3 to \$3.75, and machinemen \$4, although contract miners are enabled to earn \$5 to \$10 per day. This is the highest wage scale this gold mine can pay and still make both ends meet, regardless of a profit. Meanwhile the copper mines to the westward can offer shovelers \$5.25 to \$5.75, miners \$5.75 to \$6.25, or, including contractors, an average of \$6.75, and millmen \$5.60 to \$7.10. Inasmuch as the cost of boarding men has fully doubled, and the wages are exactly double, it will be seen that the whole item of labor has doubled.

Materials and supplies have increased in cost even more than wages. Ordinary lists showing former and present prices of numerous commodities are not wholly applicable when considering the particular needs of the Alaska miner, who cannot afford to ship goods of doubtful quality to his distant camp. On this point there should be no confusion. Prices in the coast states for the good grades of materials needed for the mining trade in the North are far above those prevailing before the war—approximately double, in round numbers. To mention a few items, dynamite has advanced 70 per cent; caps and fuse 100 per cent; drill steel 110 per cent; tool steel 125 per cent over pre-war prices. California crude oil has greatly advanced and gasoline has doubled in price.

While the large operations in Alaska are carried on with the aid of engineers and office forces, many small mines are worked by the individual owners with small crews. Such operators do not need a complicated system of accounting to show them whether they are making money or losing it. A pocket notebook and a pencil have often sufficed for working out an estimate of cost for the proposed season's work and for summing up the results, while many a million in fat pokes has come out of the North unchaperoned by even that much bookkeeping. Yet the owners knew how they stood on the season's operations and the miners had their pay from bedrock. Today the consensus of opinion is that gold mining, except in rich ground, does not pay. In a recent letter the Alaska Bureau of Publicity at Juneau states that in pre-war days the average cost of mine operation was \$6 per man-day, including wages, materials, supplies and overhead expenses, while the average today is \$11.

Ordinarily, in the fall our Alaskan friends call at the Mines Building, University of Washington, to compare notes on the past season's doings and to discuss plans for the coming year. Some of them attend the winter session given for mining men at the College of Mines and make use of the laboratories for experimenting on their ores. Many such men are letting their gold claims lie idle while they turn their attention to other metals. The high cost of operation has not only lessened the actual mining, but has also discouraged prospecting for new ground and the development of finds already made. A grubstake nowadays represents a small fortune. Under present conditions prospecting is not justified.

South Dakota Gold Mining

BY B. C. YATES

PERHAPS the best way to show what failure to obtain an increased price for newly produced gold means to South Dakota is to present the actual condition of the gold industry of the state, with the more apparent causes which have brought about this condition. Briefly stated, the gold industry of the Black Hills of South Dakota is in a state of disintegration, not because the mines are becoming exhausted, but because the gold taken from the mines does not have sufficient value to pay the cost of production.

The Black Hills do not comprise a very large area, about 100 square miles, and the gold-producing section is only a small part of the whole. In this limited area, four years ago, there were from ten to twelve regular producers, and there were other mines being developed, some of which were producing a considerable amount. Only two, the Trojan and the Homestake, have survived the war period. These properties have been operated during this period to keep their mines and treatment plants in working condition and their organization intact, with the hope that, in the near future, conditions will be such that some profit may be had from their operations. Prospecting is at a standstill, and only two or three mines in the development stage show any signs of activity.

The population of the two largest mining towns of the Hills, Lead and Deadwood, has decreased from 12,045 in 1910 to 7,416 in 1920, and Lawrence County, which is the principal mining section, has now 6,665 fewer people than ten years ago. Practically all of this decrease has occurred during the last three years. In every mining community of the Hills are to be found idle mills, empty houses, and deserted prospectors' cabins.

The joint reports of the U. S. Geological Survey and the Bureau of the Mint give the average yearly production of gold in the Black Hills, from 1912 to 1917 inclusive, as having a value of \$7,436,000, in 1918 \$6,699,400, in 1919 \$5,289,700; and from the report of the State Mine Inspector for the first six months of 1920, it is estimated that the total for this year will not be much over \$4,000,000. This is a reduction of approximately 45 per cent in three years. The annual reports of the State Mine Inspector give the average number of men employed in the gold mines of the district from 1912 to 1917 inclusive, as 3,063, for 1918 and 1919 as 1,933, and for the first six months of 1920 as 1,681, with very little if any increase to date. These figures do not indicate a very healthy condition of the gold-mining industry in this district. They do tell us, in language which cannot be misunderstood, that something must be done to improve the situation.

The prices of supplies and labor which have prevailed during the last few years, and which still prevail, make the cost of production almost prohibitive at the fixed price for which the gold miner is forced to sell his product. Wages have increased from 40 to 50 per cent, cyanide 52 per cent, dynamite 92 per cent, drill steel 138 per cent, and all other supplies used in mining operations show similar increases. No figures are available which will accurately give the increased cost of producing an ounce of gold in the Black Hills mines. The producing mines of the Hills are fortunate enough to have had a large amount of ore broken down and

remaining in the mine, as well as ore which could be mined at a low cost, which has thus far tided them over the high-price period. It is needless to say that these favorable conditions will not last. Calculations based on normal operations show an increase of approximately 30 per cent in the cost of producing an ounce of gold, without taking into account interest on investment or depreciation of mine and plant due to deferred development and repairs. It is difficult to estimate how much should be added to operating costs to cover the last two items, but they will certainly be reflected in future balance sheets. Should cost of labor and supplies be reduced to pre-war normal in the near future, it will still be necessary to pay more for our gold, because of the depreciated physical condition of our mines, and this is true whether they have been kept running or were closed down.

You no doubt will consider this an extremely pessimistic report. It is, gentlemen. The gold industry is face to face with a grave crisis—a crisis brought about by a world war and the short-sighted policy, adopted by the Government, of bleeding without feeding an industry essential to the life of any civilized nation.

When our Government decided to take an active part in the great European conflict, the producers of metal, gold included, were urged to speed up production. Gold producers, trying to respond to this patriotic call, found themselves confronted with indifferent governmental executives, loss of labor, high prices of supplies, an ever-increasing difficulty in getting supplies at any price, and a fixed price for their product, based on pre-war conditions. For the gold mines to keep up production during this period of rising cost it was necessary to reduce expenses, and this could be done only by cutting off development, prospecting and plant repair, as the price of labor and supplies was continually rising. Increased costs for the future is only a natural consequence. As a concrete example, the Homestake mine, under normal conditions, excavates yearly 17,500 ft. of tunnels for the purpose of developing known ore-bodies and prospecting virgin ground. During 1918 and 1919 this was reduced to 8,600 ft. From this it may be readily seen that the company will have to spend many thousands of dollars, in the very near future, to bring the mine up to its normal working condition. What is true at the Homestake is undoubtedly true at other producing gold mines, and the situation is far worse in those mines that were forced to close down.

Gold-Mining Conditions in Oregon

BY HENRY M. PARKS

FOR A FEW years prior to 1916, Oregon produced annually about \$2,000,000 in gold. This annual production has continually decreased since 1916, and with increasing rapidity. The greatest decrease has taken place during the year 1920. This is due to the fact that some of our most important quartz properties, which have been holding on for the last year or two, hoping against hope, have at last exceeded the elastic limit of their holding-on power. Three of these important producers have recently closed down and pulled their pumps. As a result Oregon's 1921 gold production will probably be not more than one-fourth of the output in 1916.

The conditions which have brought this blight upon

the gold-mining industry of Oregon and of the United States are due naturally to the unavoidable expedient of enormous inflation or expansion of the currency of the country. Necessarily it required more and more of this diluted currency to satisfy. All the real money of the country (gold) vanished from circulation almost over night. The only gold in sight during the last four years has been that produced under great difficulties by the gold miner, and he had no alternative but to take diluted currency in exchange for his gold. Is there any wonder that the gold production of the country is rapidly diminishing?

The surprising thing to my mind is, not that these conditions, with their natural results, obtain, but that so little national concern is in evidence because of the existence of such unfortunate conditions. I am surprised that \$50,000,000 can be lopped off from our country's annual gold production without commanding more interest and concern on the part of our statesmen and financiers.

A very logical plan is proposed in the McFadden Bill, which is intended only as a temporary relief measure to tide over this crisis and to save, if possible, the life of a fundamental industry. It seems incredible that there should be any opposition to the reasonable plan of throwing out a life line to the gold-mining industry. The opposition to the measure that has arisen in certain of the industrial arts and trades seems short-sighted. By such opposition there is grave danger of "killing the goose that lays the golden egg."

The commission of the Oregon Bureau of Mines and Geology, at its regular meeting in Portland on Oct. 22, 1920, discussed the McFadden Bill at considerable length. The measure was introduced in the House of Representatives on March 22, 1920, by Congressman Louis T. McFadden and is designed to stimulate the production of gold in the United States for use directly as money or indirectly as a base for the issuance of currency. The interesting fact was brought out in a prolonged discussion of the bill that during the year 1919 gold to the amount of \$20,000,000 in excess of the entire gold production of the country for that year was purchased from the United States Mint for uses other than coinage.

The conclusion of the commission by unanimous vote was as follows: (1) That the bill is carefully drawn and can be successfully administered without difficulty. (2) That if enacted it will greatly stimulate the production of new gold, the annual output of which is now less than one-half that of 1915. (3) That the excise tax on manufactured gold will produce revenue sufficient to meet the requirements of the act. (4) That the benefit accruing to the gold producers is justly due them and is in no sense a bonus. (5) That the act, when in operation, will not in the slightest degree alter or affect the monetary system, except that the increased production of gold will, by adding to the supply of gold currency, permit a reduction of paper currency already issued in excessive amounts, thus tending away from unsound money in the direction of sound money. (6) That after a careful study of the bill and the need therefor the commission unqualifiedly indorses the same and is confident that no one, after seriously reading the provisions of the measure, will do otherwise than indorse it; and that such opposition as has arisen is due to failure to read and study the bill and not the result of mature judgment as to the effects of the proposed act. (7) That other agencies interested

in sound currency and the maintenance of the gold production be advised of our action and urged to work to the end that the bill may become a law.

Gold Mining in Arizona

BY W. B. PHELPS

GOLD MINING in Arizona is almost entirely confined to the Oatman district. The gold produced in other parts of the state is won as a byproduct from copper ores. Gold mining in Arizona is languishing under the heavy burden of conditions over which it has no control, and which have grown worse instead of better, year after year. The producing mines are becoming depleted, and there is no incentive to find new gold mines. The prospector has forsaken the hills. The discovery of ore that could be mined at a fair profit a few years ago does not interest him today; nor can capital be interested to pursue the development of ore-bodies where there is no hope of any return on the investment. Unless some measures of relief are afforded the gold-mining industry, it is my belief that it will be only a question of time until gold mining will be a thing of the past.

Those who use gold for industrial purposes even object to paying the cost of production. They buy their gold today for the same price as they did five years ago, \$20.67 an ounce. Five years ago, before the dollar had diminished in purchasing power, gold could be produced at a profit, and normal gold production was maintained, but now the purchasing power of the gold ounce is less than half what it was then.

Gold mining is not an ordinary business. In fact, it is unlike any other business. As an example, the Tom Reed company has been in operation for over twelve years and represents an investment of over \$3,000,000. It will not cost us much to close down—but what will it cost to stay closed down, and what will it cost to reopen? A shutdown for any length of time would mean destruction and ruin to the mine and its investment. It is not so much the visible as it is the invisible loss. Our mill and surface equipment can be repaired or replaced, but there are miles of underground work which would be flooded, caved in, and destroyed. Work that was done and carefully protected at enormous expense would be ruined. Would that mine ever be reopened and would its possible ore output warrant the tremendous cost, even if it was?

The case of the Oatman district, which I represent, is typical. Powder for which we paid \$13.25 now costs us \$24; fuse once \$38.40 costs today \$81; caps were \$11.50 and are now \$21; steel rails were \$65 and now cost \$115; timber that we paid \$24 for is now \$71; oil and coal have more than doubled in price. Boarding-house supplies are about 90 per cent higher, and the cost of labor has increased \$2 per shift per man. The gold-mining industry alone has been called upon to bear this increased cost of production without any increase in the price of the metal produced.

It has been stated that we are now in a downward market and that prices are dropping. That may be the case in other parts of the country, but, gentlemen, I can assure you that we have not been confronted with any such "serious" predicament in Oatman. If certain small items have been reduced in price, the reduction means nothing in comparison with the recent increase in electric power and freight rates.

Practical Mining Course at Copper Queen

An Opportunity Afforded to Ambitious Workers To Increase Their Knowledge and Obtain Advancement by Systematic Study Under the Leadership of Men in Direct Charge of Operations—Weekly Classes Covering a Wide Range of Practical Subjects

BY GEORGE J. YOUNG

Written for *Engineering and Mining Journal*

APART from the direct problems which present themselves to the management of a large mining property, there are others of a less direct nature, but important, in that their successful solution establishes a foundation upon which the industry makes substantial advance. A management broad in spirit will not fail to see the importance of these indirect factors. It is, of course, a debatable point as to how far a management can go, and there are practical reasons why a small mine cannot undertake what might be easily done by a large mine. Nevertheless, both the small mine and the large one can contribute their quota in advancing the practical knowledge of the individual miner.

Skilled miners, well versed in their craft, accustomed to handling mechanical equipment, and willing to cooperate with the superintendent and foremen, are, needless to say, an asset to the industry. With a given number of such workers, greater tonnage, fewer acci-

probable that there is not a sufficient number of skilled workers to satisfy the needs of all of the metal mines in this respect. There thus remains, as an alternative, the task of raising the average grade of miner, shift boss, and foreman by systematic instruction.

Probably every mine does a certain amount of unsystematic instruction and training. The well-managed mine, where the overseeing is well done, contributes in no unimportant way its share in developing skilled miners. The large labor turnover operates to reduce in the aggregate the regular training which a miner would get were he to remain a longer time in a good mine. The cumulative experience that is gathered by the itinerant miner has a certain value, it is true, but not nearly as much as would be the case were he to grow up with a mine. There is no general organization that is actively directing its attention to the task of developing skilled miners. Evolution acts to some extent, but for the most part the mine superintendent takes what he can get and does with it the best he can.

RAISING THE GRADE

Raising the grade of the average miner is a real problem confronting the mining industry. Efforts made along these lines are worth the study of mine managers. The most important example that has come to my attention recently is the practical mining course offered to its employees by the Copper Queen Branch of the Phelps Dodge Corporation at Bisbee, Ariz. By creating an atmosphere stimulating the individual to make an effort to better his knowledge and position, and by making the actual leaders of the men in their everyday tasks the leaders in the educational work, a unique and highly commendable organization has been built up.

An Educational Department, under S. C. Dickinson as director, conducts the practical mining course. The attendance for the first two years is given in Table I. As might be expected, the foremen and shift bosses were more assiduous in their attendance than miners and muckers. To a school superintendent the total attendance might be looked upon as relatively small when compared to the total number of underground employees, averaging approximately 1,000. Due regard must be given to the inertia shown by the average miner as well as to the fact that attendance is voluntary. The proportion of really ambitious men who are prepared to make some sacrifice to advance themselves is not large.

ADVANTAGE OF MAN-TO-MAN CONTACT

The effect of the work, however, is not measured by attendance alone. The man-to-man instruction that receives its primary stimulus from those who attend the practical courses cannot be evaluated, but it is, in my opinion, an important element in raising labor standards and making the work as a whole effective with respect to a goodly proportion of all the workers. A small proportion of men actively working to advance themselves



BISBEE FROM SACRAMENTO HILL

dents, better timbering, cleaner mining, and lower unit costs can be obtained than with mixed crews. It is from this group that foremen, shift bosses, and bosses are drawn. These sergeants and corporals of industry are fully as important as skilled miners and of great practical importance under existing conditions.

PERCENTAGE OF WELL-TRAINED WORKERS SMALL

A cross-section taken of the rank and file of the operating crew of a mine will show, in most instances, only a relatively small proportion of well-trained workers and a large proportion of less-skillful and poorly informed workers. The direct result is that the number of workers may be largely in excess of that required, were they all to reach a proper standard. In a small mine, it is possible to make a drastic selection and to obtain a majority of skilled workers. In a larger mine, the process of selection is not so easy. It is highly

will leave a much larger number who come in contact with them.

Apart from these general considerations, there is much that is worth while examining in the practical course. Arthur Notman, superintendent of the Mine Department of the Copper Queen company, states the objectives in the following:

"The object of the company in establishing the Educational Department and providing this course is twofold: first, to determine who are the ambitious men among you; second, to provide ways and means for developing such men as are ambitious to such a point that they will be competent to fill positions of greater responsibility. Those of you who have succeeded in the past and those who will succeed in the future are the men who have the determination to take advantage of every opportunity. This is such an opportunity."

TABLE I. ATTENDANCE AT PRACTICAL MINING COURSE

	1919-20	1918-19
Per cent of foremen attending one or more lectures.....	100.00	...
Per cent of night foremen.....	100.00	...
Per cent of shift bosses.....	94.4	...
Per cent of miners.....	44.7	...
Per cent of muckers.....	39.2	...
Per cent of others, underground.....	4.0	...
Per cent of attendance total underground (using average attendance).....	13.3	...
Per cent attendance total underground (using total attendance at class).....	30.6	...
Average attendance for the year.....	136	166
Number attending this year who did not attend last year.....	352	...
Number attending 22 or more lectures (half).....	94	118
Number attending one lecture (total attendance).....	659	821
Number attending each and every lecture.....	2	6
Average number of employees underground.....	1,021	1,003

Mr. Notman, speaking directly to ambitious men in his organization, says:

"Your chance to fit yourself for the place ahead, to place yourself on the salary list instead of the day wage list, to gain the necessary knowledge to improve your opportunities, is right here in this mining course. It is a part of the Copper Queen Branch just the same as the Mines, Safety Department, the Employees' Conference Committee, etc., are parts of the same branch. It is not connected with any other educational institution or association in the district. The course is designed solely to give men the opportunity to better themselves.

"Men who have attended thirty-five or more different lectures will be examined and rated by an Examining Board, and those passing, whenever possible, will be given preference in future appointments. Merely passing the course, however, does not signify that a man has all the necessary qualifications to be the broad and sympathetic type of boss that the company desires; the ability to handle men figures largely in the preferred list. Completing the course successfully does not necessarily mean immediate promotion, but rather promotion as vacancies occur."

The specific rules governing the course are as follows:

RULES GOVERNING THE COPPER QUEEN MINING COURSE

1. To be eligible to take the examination the applicant must have attended thirty-five different lectures. Credit for absences is to be allowed if accompanied by a doctor's certificate.
2. The Examining Board shall consist of the superintendent of the Mine Department, the assistant superintendent of the Mine Department, two mine superintendents, the master mechanic and three miners appointed by the Employees' Conference Committee.
3. "Skilled Miner" certificates are to be issued to men who satisfactorily pass the examination, provided that they have had at least two years' underground experience as a miner.
4. "Knowledge of Practical Mining Operations" certificates are to be issued to those who pass the examination

satisfactorily but have not had the necessary experience. Such certificates are to be exchanged for a "Skilled Miner" certificate when the holder has had the necessary experience. Optional.

5. All oral questions are to be answered correctly either by the applicant or the board at the time of the examination.

6. Correct answers to the written questions are to be furnished by the department upon request.

7. Foremen are to be allowed to appoint emergency shift bosses who do not hold certificates, the understanding being that they will not be appointed regular shift bosses until they pass the examination.

8. Credits in the examination are to be as follows:

Oral examination.....	20
Written examination.....	20
Experience.....	25
Ability to handle men.....	25
Attendance.....	10
Total.....	100

Seventy per cent of the total required to pass.

9. Full credit is given in "experience" to a man who has had five years' experience as a miner.

10. The foreman and shift boss of each applicant for examination shall submit to the examining board a written report on his ability to handle men, such report to be used by the examining board in determining points to be credited under "Ability to Handle Men."

11. Experience is to be graded as shown in the following table:

1. In no case shall a man receive more than 25 points.
2. Outside experience to be accompanied by documentary evidence in proof of service.

Years.....	Occupation	Years				
		District	1	2	3	4	5
Timberman.....	1	4	9	14	20	27
	2	4.5	10	15	21	28
	3	5	11	16	22	29
Repairman.....	1	3.5	8	13	19	26
	2	4	9	14	20	27
	3	4.5	10	15	21	28
Shaftman.....	1	3	7	12	18	25
	2	3.5	8	13	19	26
	3	4	9	14	20	27
Stopeminer.....	1	3	7	12	18	25
	2	3.5	8	13	19	26
	3	4	9	14	20	27
Stopeman.....	1	3	7	12	18	25
	2	3.5	8	13	19	26
	3	4	9	14	20	27
Driftminer.....	1	3	7	12	18	25
	2	3.5	8	13	19	26
	3	4	9	14	20	27
Raiseminer.....	1	2	4.5	8.5	13.5	20
	2	2.5	5	9	14	21
	3	3	5.5	9.5	14.5	22
Timber rustler.....	1	1.5	3.5	6.5	10.5	15
	2	2	4	7	11	16
	3	2.5	4.5	7.5	11.5	17
Mucker.....	1	1	2.5	5	9	14
	2	1.5	3	5.5	9.5	15
	3	2	3.5	6	10	16
Group "A".....	1	7	16	27		
	2	8	17	28		
	3	9	18	29		
Foreman.....	1	5	14	25		
	2	6	15	26		
	3	7	16	27		
Shift boss.....	1	5	14	25		
	2	6	15	26		
	3	7	16	27		

(Subject to Revision)

Group "A"
Skipmen
Pipemen
Nippers
Trackmen
Powdermen
Cagers
Timber swamper

Group "B"
Motormen
Swampers
Loaders
Carmen
Drivers

12. After each examination the three miners on the Examining Board to be replaced by three others who hold certificates.

13. Compensation for miners on the Examining Board shall be the existing scale of wages.

14. Each candidate shall answer a set of questions as to training and experience, answers to be presented to the examiner when the candidate presents himself for written examination.

15. The examination proper shall consist of oral and written questions, conducted in the English language, and shall be of such a nature as to determine the competency and qualifications of the applicant.

16. The oral examination shall be had separately, and candidates will be called alphabetically in so far as this can be done. There shall be from twelve to twenty questions.

17. All candidates, being assembled for the written examination, shall be assigned to separate desks, provided with writing material and a list of printed questions required to be answered. Also a printed card, numbered, on which to write his name and address. This card will be inclosed in a sealed envelope and passed to the person keeping the records of the examination, together with the answers to the printed questions. The candidate's examination paper will be marked by the number which appears on the card.

18. Questions for examination shall be uniform and shall be selected by the Examining Board.

19. All applicants who shall receive a grade of 70 per cent and shall be otherwise competent and adjudged competent shall be granted a certificate signed by the Examining Board and the manager of the Copper Queen Branch.

20. The board shall have the right at any time to add to or modify these rules in any way.

A man can start to take the course at any time. Meetings are held in Bisbee every Wednesday, an afternoon session at 1 o'clock and an evening session at 7 o'clock. The instruction consists of a series of articles or lectures prepared for the most part by members of the engineering staff, superintendents, foremen, and other employees. The lectures are given by the individual preparing them, and thus there is the important principle of contact between the leader and his men in the highly desirable relationship of instructor and student. The advantage is a double one, for the leader must definitely organize his subject and must look at it from the point of view of his men. He is thus under the necessity of reviewing and visualizing his own work.

The subjects presented the second year, together with the lectures, were as follows:

1. Mucking and Mine Tools, by J. T. Marshall, foreman, Lowell.
2. Breaking Ground, by F. D. Lane, efficiency engineer.
3. Shaft Sinking, by T. N. Jewell, foreman, Calumet and Cochise.
4. Breaking Ground in Drifts, by James McGarry, foreman, Dallas.
5. Timbering and Repair Work in Drifts, by Jack Radcliffe, foreman, Sacramento.
6. Raises, Breaking and Timbering, by J. S. Stewart, foreman, Holbrook.
7. Track and Road Maintenance, by Lou Moon, night foreman, Holbrook.
8. The Selection of a Mining Method, by Gerald Sherman, consulting engineer.
9. Horizontal and Inclined Top Slicing, by J. W. Scott, foreman, Czar.
10. Square-Setting, by J. W. Toland, underground superintendent.
11. Horizontal and Inclined Cut and Fill, by J. F. Sinclair, underground superintendent.
12. Caving Methods, by Gerald Sherman, consulting engineer.
13. Steam Shoveling, Open-Cut Mining, by George Mieyr, superintendent, Sacramento Hill, and A. Livingston, statistician.
14. Accident Prevention and Safety, by W. W. Gidley, safety inspector.
15. Explosives, by F. D. Lane, efficiency engineer.
16. Sampling, by Leon Fuchere, chief sampler.
17. The Importance of Metallurgical Considerations in Mining, by William B. Boggs, chief metallurgist, Copper Queen smelter.
18. Ventilation of Metal Mines, by C. A. Mitke, mining engineer.

19. Fire Prevention in Metal Mines, by C. A. Mitke, mining engineer.

20. Mathematics, by C. S. Heislar, construction engineer.

21. Drifting Machines, by Fred Doscher, drill-repair man.

22. Stoppers and Pluggers, by Fred Doscher, drill-repair man.

23. Standards, by Al Cromer, foreman, Gardner.

24. Electricity, by Charles Bear, chief electrician.

25. Air Compression and Transmission, by Frank Duval, assistant master mechanic.

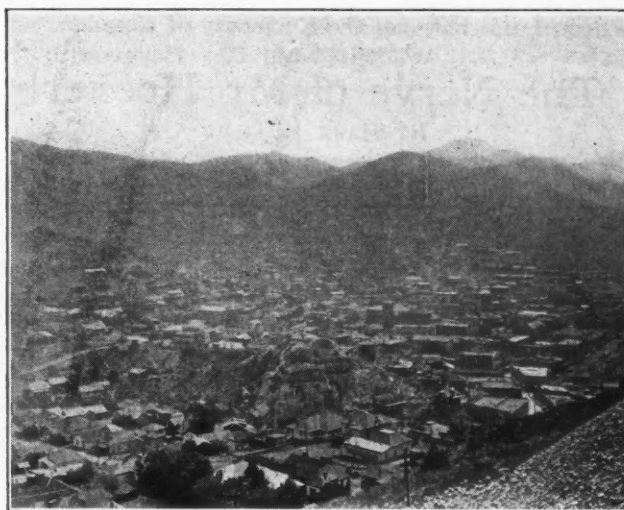
26. Hoisting and Haulage, by O. N. Alvin, master mechanic.

27. Pipes, Pipe Fittings, and Hose, by J. S. Maffeo, mechanical engineer.

28. Discipline, by G. H. Dowell, manager, Copper Queen Branch.

29. Drainage, by O. N. Alvin, master mechanic.

30. Map Making, Reading, and Interpretations, by H. Ziesemer, chief engineer.



BISBEE FROM THE TRAIL TO HIGGINS MINE

31. General Geology, by J. B. Tenney, consulting mining geologist.

32. Geology of the Warren District, by J. B. Tenney.

33. Chemistry and Ores of Copper, by C. H. Compton, chief chemist.

34. Mine Time-keeping and the Segregation of Mine Labor, by E. A. Crocker, cost department.

35. The Purchasing, Distribution, and Handling of Supplies, by F. S. Davenport, superintendent, supply department.

36. Methods of Compensation, by E. B. Rider, chief efficiency engineer.

37. Organization, by H. C. Henrie, chief clerk.

38. Efficiency Engineering, by Arthur Notman, superintendent, mine department.

39. Economics of the Mining Industry, by Gerald Sherman, consulting engineer.

40. The Employment of Men, by C. W. Moon, employment manager.

41. The Duties of a Shift Boss, by R. R. Boyd, assistant superintendent, mine department.

42. Company Policies, by G. H. Dowell, manager, Copper Queen Branch.

The lectures are printed in the form of pamphlets and are placed in the hands of the men. I have examined practically all of these pamphlets, and have found the subject matter interesting and practical. There has been conscientious care in their preparation, and as a whole they reflect great credit upon both the individuals preparing them and the management broad enough to initiate this work.

It is worthy of note that a similar school was started by the Cleveland-Cliffs Iron Co. in 1915. Its purposes

are much the same as the Copper Queen school, and, like it, it began in a small way. C. S. Stevenson described this school in a paper presented at the twentieth annual meeting of the Lake Superior Mining Institute in September, 1915. In the State of Nevada, a miners' instruction class was formed a number of years ago at Virginia City, and has continued up to the present. It was organized by certain mine superintendents and school men. With the assistance of the University of Nevada, it obtained a fair start. Since then other schools have been organized at Tonopah and Ely. Each of the schools is under the direction of a technically trained man, and though the attendance has been relatively small, good work has been done. The Nevada work is of special interest, in that it represents the welding together of the state educational system and local initiative. Unlike both of the examples quoted before, it is directly in charge of the University of Nevada.

The Nerve of Mr. Hoover!

BY MARK R. LAMB

Written for *Engineering and Mining Journal*

LATELY Mr. Hoover has been discussing WORLD problems. These problems require executives. Mr. Hoover thinks that the engineer, speaking generally, would be best equipped for the task. He gives his reasons. Poor engineer!

"Hoover held that engineers were best qualified to undertake the great task he outlined, inasmuch as they had no special economic interests for themselves in a constructive solution of the problems, their only interest being in creating a working force for public service."

In other words, the engineer is not financially interested, and is therefore more or less in the position to be impartial and fair—like a preacher.

It is only natural that Mr. Hoover was mistaken, and at least let us be charitable and accuse him of nothing worse. Anyone knows that Mr. "X," with the big oil company, has shares and is a millionaire. That he is still a practicing engineer does not mean that he has "no economic interest" in the British control of all the oil in Mesopotamia. Mr. "Y," the famous copper man, after many years' faithful labor in building up a famous company with mines all over the world, is surely heavily interested in shares in mines in Chile, Russia, and Africa. Mr. "Z," the flotation expert, with many victories to his credit, is certainly a heavy holder of stock in his company, and interested financially in the free development of mines in all protected territories.

A list like this would include most of the membership of the Institute, and on behalf of the Institute I protest against the base insinuation that engineers have no "economic interest" in anything in the world. It sounds too much like "living with his wife's folks" (see "Lamb's Formula") and is sure to hurt the engineer's feelings.

Mr. Hoover should also remember that he and I are not the only ones who have escaped the drudgery of engineering by broadening activities into commerce and finance and becoming comparatively wealthy. Hardly an engineer in these days but knows intimately the intricacies of "common and preferred," the many types of bonds; how to borrow at the bank, and all about notes and acceptances, bills of exchange, and trust receipts; whereas, only a few years ago, an engineer was more or less proud of his ignorance of such things, and talked in a self-satisfied way of being "purely (and poorly) technical."

Not a few engineers lately have deliberately worked with bankers and financiers for a time with no other purpose than to broaden their experience and value and to improve their financial standing. Most of these have substantial "economic interests" in all parts of the world, and Mr. Hoover is unfair in putting them on the economic rating of an elevator starter.

If Mr. Hoover sends me on such an economic errand to Europe, I want it distinctly understood that I am just as much entitled to an "economic interest" in Rumanian oil fields as any other engineer-financier like Mr. McAdoo, Morgan, Sørensen, Van Law, Butters, Bosqui, Jackling, Hoover, and thousands of others.

Of course, if Mr. Hoover had in mind those merely civil engineers, I have nothing to say. They are a sad lot. Always talking about the railroad *they* built in Brazil or China, totally forgetting the financier in New York who *really* built the railroad. They are poor fish! If they built the railroad or the bridge or the port works or the office building, why does someone else own it? And why, immediately after completing the job, is it so vitally important for a C.E. to get another?

The electrical engineers are worse. They don't know a banker's acceptance from a wedding invitation: They labor over (someone's else) drawing board, improving (someone's else) machinery, building (for someone else) beautiful, efficient power plants.

Whoever heard of a C.E. or an E.E. doing anything big *for himself*? Whoever heard of one who had even an "economic interest" in the house he lives in, much less in world matters?

Now, as to things political, Hoover must grant that mining engineers are enthusiastic students of political economy and are constantly being elected as congressmen, senators, governors and mayors and are frequently given cabinet portfolios. Some of them actually vote occasionally. Who can say that a wealthy mining engineer with shares in mines, steamship lines, banks and commercial organizations has no "economic interest" in the economic development of Europe, the benighted?

Please make Mr. Hoover retract.

Silica Brick Production Decreased In 1919

The quantity of silica (refractory) brick produced in the United States in 1919, according to an estimate made by the U. S. Geological Survey, was the equivalent of 216,363,000 9-in. brick, and was valued at \$11,798,000, a decrease of 120,199,000 brick and of \$8,190,000 from 1918. The average price per thousand decreased from \$59.39 in 1918 to \$54.53, in 1919. The output in 1919, though much smaller than that in 1918, was much larger than that made in any year prior to 1916.

Mexican Onyx

When waters charged with carbonate of calcium derived from limestone are allowed to evaporate they deposit masses of the carbonate, some of which are of great beauty. This process can be observed at many warm and "petrifying" springs and also in limestone caverns where stalactites and stalagmites are being formed, according to the U. S. Geological Survey. Mexican "onyx" is formed in this way. Its variations in color and texture, which make it attractive and valuable as an ornament, are commonly produced by oxide of iron, or even by mud and clay.

Picturesque Mining Experiences—VI

A Slight Unpleasantness

By W. H. SHOCKLEY

Written for *Engineering and Mining Journal*

ON JULY 26, 1899, my pack train started from Yao-tzu-po at 4 a.m. Riding with my interpreter, Wang, my official companion (wei yuan) Yeh, and a few servants, we soon left the pack train behind. At the walled village of Ku Cheng we found the central square jammed by a holiday crowd watching a temporary stage whereon brilliantly clad performers were enacting a battle between imperial and rebellious forces. The Emperor's troops, led by his slender daughter, were winning, but suddenly her shrill cries rose to a shriek of agony, and she fell on the stage in convulsions. Her suffering was pitiful to see, but my Chinese friends seemed to find the scene amusing, and smilingly explained that the lady general was in the throes of approaching maternity. As a result of her incapacity, the rebels won the battle.

Seeing that the attention of the crowd was directed as much to us as to the play, we rode on to Ho-chin-hsien, the residence of a district magistrate, an official who personally attends to those duties that are divided among our county officers. The people call him "the father-mother official." We arrived at Ho-chin at 2 p.m., and expected the mules within a couple of hours, but late in the afternoon a muleteer brought word that four of our servants had been beaten and the mules impounded by the villagers. This was startling news, for all our goods, except the thin clothes we wore, were

Accompanying the pack train in the morning came our servants—dirty, haggard, and blood-stained. I had prepared hot water for them, and was much surprised when they unanimously declined a bath. They wanted to look as miserable as possible until after the visit of the coroner (wu tsoa), an official whose business it is to examine into assaults and murders. He proved to be a keen little man of sixty-odd. He looked over the servants, who were stretched out on improvised couches, and almost too weak to talk. The cook's case was the worst; he gave no sign of life when questioned. But when the coroner told the bystanders that the four



TEMPLES ON THE YELLOW RIVER AT YU MEN K'OU

The Yellow River leaves the mountains at Yu men K'ou and is the boundary between Shansi on the right and Shensi on the left. This break in the mountains was, so the priest told me, made by the Great Yu, when he was controlling the floods of China, about B. C. 2278. The Shansi temple was lately (1895?) redecorated, and one of the principal pictures represents nine states paying their respects to Yu. Among the crowd are representatives of various nations—a big, hirsute, fur-clad Russian, a Frenchman leading a bear by a string, a Salvation army lass in short skirts, a middle-aged Englishwoman with projecting front teeth, a man bearing a banner on which is written B. Furth, Vienna. These foreigners are probably taken from some comic paper or advertisement; I think, Austrian. Mixed up with these nations are various monsters: the man with the head in the middle of his abdomen; the man with a hole through his body; the egg with six legs and four wings; a bird with a Frenchman's head, hair nicely parted. The whole excellently well done.

bloody wounds on the cook's head were knife-cuts, the cook spoke up quite vigorously: "No, they were made by a stone." At this answer the coroner smiled in a relieved manner, for he had found out that the cook was shamming. After the coroner left the servants consented to wash themselves, and in a few minutes made a marvelous recovery. Meanwhile, I had gone over the baggage and found everything intact. Our 3,000 ounces of silver, which must have been a temptation, was untouched.

From our servants we learned that they had stopped in the village after tiffin and watched the play. While there, one of the villagers stepped on the foot of my number one boy, and to his remonstrance replied: "If your foot had been where you ought to be, and that's at home, there would have been no trouble." On this a row started, and my men were driven away. Going back to their inn, they seized staves and, returning, drove everyone out of the square. On this the villagers shut the gates, rang the alarm bell, came in force, captured



THE AUTHOR IN CHINA, ACCOMPANIED BY INTERPRETER AND GUIDE

with the pack train. We told Yeh that he must at once ask the officials to help us, but he said that he could not call on the magistrate because he had no cards and no proper clothes. His objections being speedily overruled, he visited the magistrate and came back in half an hour, telling us that ten cavalymen had been sent to the village. Late that night we received word that the pack train would arrive in the morning. Worrying about the safety of our servants and our goods, and suffering from the heat, I passed a wretched night trying to sleep on some boards in the upper story of a temple.

the servants, beat them, tied their hands behind them around the columns of the temple and their cues tight above their heads. In this position they remained for several hours, insulted, jeered at, and tortured by swarms of flies.

With the pack train had come as prisoners several elders and the head man of the village. After abjectly apologizing they were led away. I appealed to the magistrate to let them off lightly because of their honesty, but I heard that they were given 650 blows—a very severe punishment.

Mining Activities in the Potosi District, In Bolivia

Several Important Tin Operations Being Carried On Which Are Revivals of Ancient Mines—Both Old and Modern Methods Used

THE Potosi district of Bolivia, according to Trade Commissioner Schurz, is essentially a mining region. The mining industry centers about the famous Cerro de Potosi, although there are less important mines at other points outside the immediate radius of the city of Potosi. Silver and tin are the principal products of the Potosi mines, though copper, lead, antimony, and other minerals are also produced. Exports from the district during 1918 amounted to the following totals:

Mineral:	Kilos
Tin:	
Barilla (concentrate).....	4,639,530
Bars.....	582,050
Wolfram.....	1,990
Silver.....	22,840
Copper.....	31,000
Bismuth.....	18,360

The Cerro de Potosi is a cone shaped mountain about 2,000 ft. high, situated on the outskirts of the city of that name. The Spaniards began to work its rich deposits of silver ore in about 1545, and during the colonial régime the enormous quantities of silver taken out of the Cerro, variously estimated at from \$1,000,000,000 to \$2,000,000,000, formed the principal basis of the mineral industry of the old viceroyalty of Peru. However, the Spaniards not only ignored the tin and other metals existing in the Cerro, but the inadequate methods used in mining and smelting prevented them from securing the full benefit of their labors, so that the dumps left from their workings still contain a very appreciable quantity of metal. During the past few decades there has been a marked revival of mining in the Cerro, the present operators being comparative newcomers.

IMPORTANT MINING INTERESTS IN THE REGION

The most important interests in the Cerro are those belonging to Luis Soux, of French birth, who operates several mines in the Cerro and owns a smelter, the only one in Bolivia, which was built about twenty-five years ago, and in which he makes bars containing about 95 per cent tin. He also sends out large quantities of tin concentrate (barilla) and silver ore. About 1,000 people are employed in all his workings. The second most important interest in the district belongs to the Bebin brothers, also of French origin. These men have recently installed a new concentration plant, where the tin ores from their mines in the Cerro are prepared for shipment in the form of concentrate. The equipment of this plant, which is the most modern of its kind in

Bolivia, is of American manufacture. About five tons of barilla which runs from 55 to 60 per cent tin are turned out a day. Probably 400 employees are on the payrolls of the Bebins. Third in importance are the interests of the Anglo-Bolivian Mining Syndicate, Ltd., which is controlled by the Aramayo Francke Mines, Ltd., with important tin, silver, and bismuth mines in southern Bolivia near Atocha. This company works, among other mines, the old "Real Socavon," which dates from early colonial times. Of secondary importance are the mining interests of Benavides, Cabrimonte, and Medinaceli.

ANTIQUATED METHODS EMPLOYED

Numerous small operators work one or two galleries with the aid of a few Indians and sell their ore to the larger miners or to the regular buyers of ores. In 1919 there were 742 bocaminas, or mine entrances, in the Cerro. The mountain is, in fact, honeycombed with galleries, which are connected throughout its interior. Conflicting claims have given rise to a great mass of litigation, not only because of disputes over original ground claims, but also because of the survival of a peculiar old Spanish law, now only applicable to the Cerro, whereby any miner must cease working on encountering the gallery of another miner, or must divert his own gallery in another direction in the hope of striking another vein of ore. Mining methods are still generally antiquated, being for the most part in the pick-and-shovel stage, with little use of power drills or mechanical equipment of any kind. The laborers are Indians or "cholos," few of whom can be called expert miners. The ore is carried down the mountain to the concentrating plants on the backs of burrows, though an "andarivel," or cable way, is used also in one instance.

Among mines outside the radius of the city of Potosi are those of Porco, which are situated along the railway between Potosi and Rio Mulato. It is believed that these deposits of tin are now nearing exhaustion. Another mining company controlled by British interests, which was formed for the purpose of working the alluvial tin deposits in the bed of a river for a few miles from the city of Potosi, installed two powerful dredges, one at Aroifilla and the other at Chaca. The material taken out of the river bed contained about 20 per cent tin. The Aroifilla dredge produced for a time upward of 110 tons of barilla per month, running from 60 to 63 per cent tin, and the Chaca dredge produced 30 to 38 tons of barilla per month. However, the burning of both of these dredges, which represented an investment of about £100,000, paralyzed the work of this company.

Importance of Burmese Gems

Burma is said to be the world's chief source of supply of rubies and of one kind of jade. The quantity of jade exported during the year 1918-19 was 2,763 hundredweight, as against 3,108 hundredweight in 1917-18. Most of this trade is with Hongkong. In addition to this export by sea, 571 hundredweight went across the frontier to China during 1918-19, as against 500 hundredweight during the preceding year. No record is kept of the exports of rubies, sapphires, and spinels, as most of these articles go out as personal effects. The value of the trade, however, must be several hundred thousand dollars a year.

Metallurgists of Note

Galen H. Clevenger

GALEN H. CLEVINGER'S career as a metallurgist is the result of hard luck. Otherwise he would have been a miner. Thus, by this same hard luck the mining fraternity lost an excellent human prospect. When Mr. Clevenger was sixteen years old an old miner in the Black Hills of Dakota considered him such a good man that he contracted with him to drive a tunnel on a prospect, for which work he was to receive a one-half interest in the expected mine. Clevenger drove the tunnel single-handed. Ore, however, was absent, so that although he received the physical one-half interest as promised, his mental interest in mining quickly declined to a much smaller fraction than this, and caused him to take up metallurgy, which offered a greater opportunity for experimentation and research. At this time he was a student in the South Dakota School of Mines. This was the natural school for him to attend, for he had lived in that state since 1882, when, at the age of three, he helped his parents move from their old home in New York State. From the age of fifteen, he was obliged to

earn his own living. While a student at the mining school Clevenger began experiments upon the cyanidation of an accumulation of chlorination tailings. For the purpose he built a 200-lb. demonstration plant out of what were known in those days as whiskey barrels, these being plentiful at that time and place. The operation of this small plant convinced him that the tailings could be treated profitably; he not only assayed his feed and tailings but actually recovered the gold and silver in the form of bullion. However, to others there were all sorts of reasons why chlorination tailings could not be cyanided, the chief being the familiar one that if it were economically possible it would have been done before, it being assumed that young Clevenger did not know more than all the prominent metallurgists that had preceded him. Finally a woman loaned him a few hundred dollars, and this, together with credit extended by a foundry whose owner was not particular as to whom he extended credit, enabled him to proceed with the construction of a thirty-ton plant. This was

a success from the start, and Clevenger was able to pay all his obligations by running the plant well into a Dakota winter, which was not particularly pleasant for an outdoor plant. Following this practical demonstration by a youngster, many thousands of tons of

chlorination tailings were treated profitably by Western mining companies. After being graduated from the South Dakota School of Mines, Mr. Clevenger accepted the position of assayer and chemist to the Dakota Mining & Milling Co., of Deadwood, which had the first wet-crushing cyanide plant of any importance in the United States. Later he traveled through the West, from Mexico to Alaska, and prospected unsuccessfully for a season in the district around Skagway. On the way back he decided that the best way to advance in the art of metallurgy was to take a post-graduate course at Columbia University. His chief trouble that fall, he says, was to find a bank which would take care of his money for him, a \$200 balance being about the minimum accepted by New York banks, and to persuade some of the professors that he had been properly prepared to

take their courses. After securing his Columbia degree, Mr. Clevenger returned to the scene of his endeavors and was engaged as research metallurgist with the National Smelting Co., when he rediscovered the Pearce process of recovering gold from matte, which was a secret known only to the Argo smelter at Denver. Since then, Mr. Clevenger has had wide practical experience, and for a time taught at Stanford University. With Charles Butters he did a great deal in developing the silver metallurgy of the Cobalt district by devising a process for the local treatment of the ores. With the co-operation of H. W. Gepp he solved some of the problems connected with the recovery of zinc from Broken Hill concentrates by the electrolytic process, discovering the deleterious effect of traces of cobalt in this connection.

Mr. Clevenger is now consulting metallurgist both to the U. S. Smelting, Refining & Mining Co. and to the U. S. Bureau of Mines, as well as holding responsible positions in the National Research Council and the A. I. M. E. His home is in Boston.



GALEN H. CLEVINGER

HANDY KNOWLEDGE

How To Cut Belts Square

By F. D. RICH

Cutting the ends of a belt as a preliminary to fastening them seems such a simple operation that often the belt man does not give it the consideration necessary to insure the best results, and much of the difficulty with otherwise good belts is due to their not being cut and joined accurately. It is as easy to make a belt joint which will run the same as an endless belt as it is to make a poor one by careless rule-of-the-thumb methods.

When a belt runs "wobbly," or races back and forth across the pulleys, it is not giving its best service, nor can it have its longest life. A belt that is repeatedly jumping off the pulleys is costing about twice as much as it should, because its life is being shortened and power is lost. Provided that its ends are cut square, and it is joined with care, a belt can be made to run as straight as an arrow if the pulleys are lined up true.

If a square is not used, one or both of the ends will be cut unevenly or irregularly, which prevents smooth running. Even the use of a straightedge does not assure the perfect results obtained by using a square, for the slip of a fraction of an inch will bring the belt ends together at an angle, as shown in Fig. 1. This results in the belt "shimmying" on the pulleys, which impairs its service, for, as it moves from side to side, the line of direct pull, "A-B," moves from one side of the belt to the other, imposing shifting and irregular strains, which no belt can be expected to stand indefinitely.

For belts up to 15 or 18 in. wide the ordinary square is used. It is pressed firmly against the edge of the belt and the knife held vertically when cutting. See Fig. 2. A sharp knife is essential. The point of the knife should be wet. When a number of belts have to be cut, a good arrangement is to drive two nails in a large block of wood, and against these set the edge of the belt and the edge of the square, as shown in Fig. 3. This prevents either the belt or the square slipping. A slip of leather or a piece of old belt is often tacked on the end of the block to protect the point of the knife as it comes through the belt.

Wide belts are more difficult to square accurately, and the difficulty is often increased by slight variations in width, which throws the square out. To avoid this and assure perfect results, the following method has proved to be the best: At any point near where the belt is to be cut, measure across and find the center as at "A-A," Fig. 4. At any distance back of this, two or three feet, find the center again as at "B-B." Between these two center points draw a clean, sharp line. This marks the center axis of the belt. As shown in Fig. 5, the square is placed against the center line, and the end of the belt trimmed off. Two small nails driven in on the center line will prevent the square from slipping.

In cutting the other end of the belt, the center line

is found in a similar manner as that just described. At any point on this line other than where the belt clamp will come, a point "C" is taken—Fig. 5. By using the square, a line "D-C-E" is drawn at right angles to the axis, and all the way across from edge to edge. It is sometimes easier to draw this line by marking the points "D" and "E" and then placing a straightedge through the points "D-C-E" to draw the line. See Fig. 6. The straightedge should be straight. The line "D-C-E" is

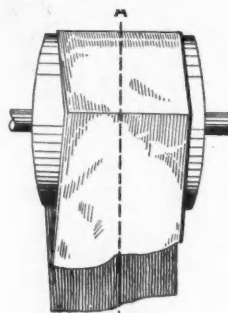


FIG. 1

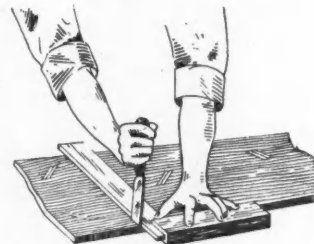


FIG. 2

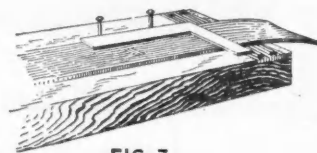


FIG. 3

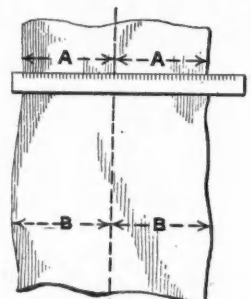


FIG. 4

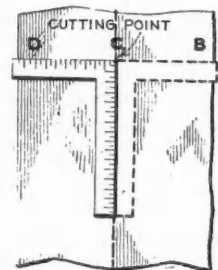


FIG. 5

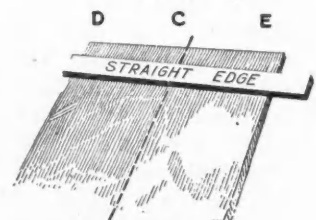


FIG. 6

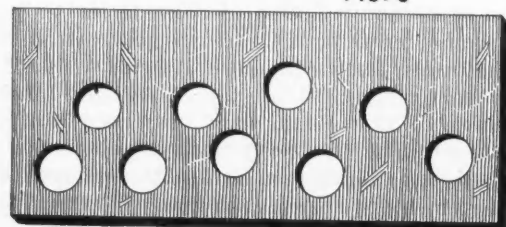


FIG. 7
DETAILS OF BELT CUTTING

used as a "base line" to measure from after the belt is in the clamps.

Where the ends are to be cut is determined after clamps have been put on and the belt brought into position. By measuring from the line "D-E" an equal distance on each side of the belt, a new cutting line can be established. Calipers are convenient for making this

measurement over the belt clamp. As a matter of convenience, one end of the belt is always cut square and ready for making the joint before putting the belt into the clamp.

It is no uncommon thing to see, in journeys through plants, laced belts in which from 40 to frequently more than 70 per cent of the cross-section of the belt is removed in punched holes. See Fig. 7. Many types of metal fasteners are in common use, which from an engineering standpoint are but slightly if any more satisfactory than lacing methods, for several reasons: First, because many of them sever the lengthwise, power-carrying fibers. Second, because others place all the strain in a straight line comparatively close to the end of the belt. Third, because some make a joint which is so stiff and hard that they pound on the pulleys and cause the belt to break back of the joint. Fourth, because many put metal in contact with the pulleys, which causes noise and wears and weakens the metal, so that such joints must be constantly watched, both to prevent danger to workmen and to detect failure of the joint.

The ideal belt joint is one which would run the same as an endless belt, without the drawbacks or difficulty in making and later shortening to take up stretch. Belting manufacturers themselves estimate that only a very small percentage of belts need to be made actually endless. Their estimates range from one-half of 1 to 2 per cent as the proportion of belts which it is necessary to make endless. The qualifications of a belt joint, by which any engineer can check up the comparative efficiency of his own methods, are as follows: The joint must maintain the maximum strength of the belt and it must avoid destruction or weakening of the lengthwise, power-carrying belt fibers. The joint should prevent breaking the belt back of the joint. It must not hammer on the pulleys, and it must not be subject to wear or to weakening through shock. The joint should insure continuous, uninterrupted operation without supervision; should hug the pulleys tightly, and insure full transmission of power. It should run silently, the same as endless. Joints should be so made that they can be easily taken apart for removing or shortening the belt; they should be safe against accidents or breakdowns, must be easily and quickly made without special equipment, and should last for the life of the belt.

Repair of Leaching Vats

BY C. FLURY

The bottom of a 5½ x 22 ft. circular cyanide leaching vat constructed of iron was pierced with numerous holes. Some parts were so badly worn that a needle could have been pushed through without effort. Previously, the leakage was stopped by means of plugs made from coal-tar-soaked cotton waste. This method, however, proved to be inefficient. A two-inch cement bottom was laid on the inside of the vat; but pressure variations during charging and discharging broke the cement layer in a short time. This result led those responsible for operations to devise a more flexible bottom, which was built in the following way: Over the whole defective iron bottom was laid an asphalt layer, one-quarter inch thick. This was covered with a layer of canvas (old filter leaves removed from a Butter's vacuum filter). Care was taken that the canvas was placed while the asphalt was

still hot. The canvas was then covered with an asphalt layer one-quarter inch in thickness. After twenty-four hours the tank was put under water pressure for seventy-two hours. The water was then discharged and the tank filled again. It was left for seventy-two hours. During the experiment the vat was closely observed, but not the smallest leak could be found. The repair cost amounted to approximately \$92, whereas a new tank was quoted at \$750. To put in a new bottom was impossible, as the bottom ends of the mantel pieces would not stand new riveting.

Protection of Eyes in Using Arc-Welding Apparatus*

BY DR. C. R. KINDALL

Recently thirty men were viewing the demonstration of a new portable electric arc-welding outfit. A few hours later seventeen of the thirty men reported to the doctor for treatment. They were suffering from traumatic conjunctivitis. In two cases the pain was severe. Only two men of the thirty were not affected in some way from this exposure. These two men wore thick-lensed orange-colored glasses. Several of the men wore orange-colored glasses with thin lenses, but the latter were not heavy enough to afford protection against an exposure as long as that which took place. The distance of the eye from the arc also influences the possibility of injury. Conjunctivitis is an inflammation of the conjunctiva. The conjunctiva is the mucous membrane covering the inside of the eyelids and part of the eyeball. Traumatic conjunctivitis is caused by foreign bodies in the eye, exposure of the eyes to high winds, dust, smoke, intense light from electric arc lamps, and from electric welding apparatus. In the instance mentioned, the inflammation was due to the ultra-violet rays. The ultra-violet rays lie beyond the violet rays in the spectrum and are visible to the eye. In some cases the effect is so severe that, in addition to conjunctivitis, an inflammation of the skin is produced.

The symptoms of conjunctivitis caused by intense light or by the ultra-violet rays are abnormal intolerance to light, excessive secretion of tears, intense smarting of the lid, contraction of the pupil, sometimes swelling of the lid, and small ulcers developing on the eyeball or cornea. Unless properly treated by a physician immediately, chronic inflammation of the conjunctiva, cornea, iris, or retina, and possibly blindness, may result.

Under proper treatment most cases get well in a few days. All treatment should be under the direction of a physician. That usually advised is to place ice packs on the patient's eyes three or four times daily. The pack should be left on from fifteen minutes to an hour. The eyes should be irrigated with normal salt solution (a teaspoonful to a quart of sterile water) or a saturated solution of boric acid several times daily. If there is a discharge of pus, a few drops of a 25 per cent solution of argyrol or a 5 per cent solution of protargol should be placed in the eyes three to six times daily. The patient should be confined to a darkened room until his condition improves, in order to avoid complications. These treatments will reduce the swelling, give the patient comfort, and prevent the development of chronic conjunctivitis.

*From *Reports of Investigations*, U. S. Bureau of Mines, October, 1920.

BY THE WAY

A Fruitless Reformation

"Tha trouble these 'ere pro'ibitin' h'enforcement h'officers do be 'avin in makin' h'all o' we min' their laws," said Cap'n Dick, "remin's me o' tha night that Dicky Truscott an' Jan Richards tried for to cure Tom Trezise o' tha drinkin' 'abit. Tom did dearly love a drop o' beer or a noggin o' whiskey. Scoores 'pon scoores o' times I've 'eard 'im say, 'I've 'ad lots o' beer in my time an' I've never yet 'ad no *poor* beer.' Tha night o' w'ich I do be speakin' h'all three boys wuz drinkin' daown to 'Arry James 'Drain Tunnel' saloon. Wuzn't long afor' Tom, 'oo couldn't 'old much drink, any'ow, wuz maudlin' drunk, so h'out 'e gaws to tha back room an' fell asleep in a cheer. Dicky an' Jan then an' there decided that they should try for to cure Tom o' tha drinkin' 'abit. So they took Tom, poor h'ol chap, an' lifted un h'into a cart an' 'auled 'im h'out to tha graveyard. There they puts un daown by a new-dug grave—an' Tom a-sleepin' all the w'ile. Then they 'id theyselves be'ind a bush an' waited. 'Baout a' 'our Tom wakes h'up an' looks aroun'—wil' h'eyed like. 'Is 'and slips h'over tha hedge o' tha grave, an' 'e sez, 'W'ot bloody shaf' is this?' Then 'e sees tha 'eadstone an' 'e h'asks, 'W'ere am I to?' So Dicky h'up an' speaks, 'Thee's in 'ell, m'son, an' close to one o' its pits.' "Ow long 'as I been 'ere?' sez Tom. 'Thee's been 'ere a week,' h'answered Dicky. "Ow long you been ere', h'asks Tom. 'I been 'ere two weeks,' sez Dicky. 'Well,' sez Tom, 'thee's naw tha bloody place better'n I do. 'Ere's a shillin' for to gos' h'out an' get a quart o' beer for we.' An', m'son, never h'again did they try for to cure Tom o' tha drinkin' 'abit."

The Latest in Ideas

We take the following from the *New York World*:

Laborer Gets \$150,000

Anaconda, Mont., Nov. 28.—From a laborer's task at the Washoe smelter to the possession of \$150,000 was the realization here recently of Claude Sheumaker, who received a telegram from an eastern broker advising him that he had realized this fortune on the sale of oil stock. Sheumaker immediately drew his earnings, purchased a railroad ticket and started east. Sheumaker conceived the idea of buying oil stock while in the army. While serving overseas with the Twenty-third Division he was wounded. His original investment was \$300 of back army pay. He intends purchasing a ranch in Oregon, he said.

As an Idea Conceiver we cannot rate Claude better than one-half of 1 per cent, but for plain bull-headed luck we should grant him at least a plus.

Volcanism in Pennsylvania

"The Fayette mine of the Lowber Gas & Coal Co., three miles from Fayette City, Pa.," said the *New York Times* recently, "is on fire and burning fiercely. Investigation so far made lends color to the belief that the fire was caused by volcanic eruptions of mild intensity, which, according to engineers, have been responsible for the breaking out of flames in two other mines in this region in the last four weeks."

Murderer's Bar

Murderer's Bar in the Middle Fork of American River is described in Hittel's "History of California" as it was in July, 1851, at which time it was perhaps at its best for activity and yield. According to Hittel, an

eye-witness said: "A turn in the road presented a scene of mining life as perfect in all its details as it was novel in its features. Immediately beneath us the swift river glided tranquilly, though foaming still from the great battle which a few yards higher up it had fought with a mass of black obstructing rocks. On the banks was a village of canvas that the winter rains had bleached to perfection and round it the miners were at work at every point. Many were waist-deep in the water, toiling in bands to construct a race and dam to turn the river's course; others were intrenched in holes like grave diggers, working down to the bed-rock. Some were on the brink of the stream washing out 'prospects' from tin pans or wooden 'bates'; and others worked in company with the long tom by means of water sluices artfully conveyed from the river. Many were 'coyote-ing' in subterranean holes, from which from time to time their heads popped out, like those of squirrels, to take a look at the world; and a few with drills, dissatisfied with nature's work, were preparing to remove large rocks with gunpowder. All was life, merriment, vigor, and determination, as this part of the earth was being turned inside out to see what it was made of."

A Scientific Geologist

The common or garden geologist has produced some thrilling literature; but now comes the upper crust, the "scientific geologist"; and his work is certainly far finer and more full of pep. We publish a sample of it, taken from a prospectus designed to sell stock in the Frio County, Tex., oil fields. We may pause to warn the intending investor (who, according to the prospectus, will be everyone who is "not a piker") that Frio means cold, and, in the slang of our youth, it may be a very cold day for him if he yields to the seduction.

Geological Survey

Gentlemen:

The State of Texas contains a volume of unwritten history, wrapped in the confines of geologic ages. With this there is an unwritten law, for the genius of man to unfold, and understand.

Well equipped, he can open this book of nature, and read, even to its lowest foundation, seeking the blessings therein concealed, which are so necessary to the comfort and pleasure of the human family.

In our present age oil is the most anxiously sought for, among the world's greatest commodities. You are greatly favored in the selection of the property, west of the town of Moore, on the I. & G. N. R.R., about forty miles southwest of San Antonio. This tract of land—3,327 acres, on the Brown holdings—is indeed a veritable treasure house of oil, of the best grade known to commerce.

It is located on one of the largest rivers of the Carboniferous Age; one of the western rivers of the great Mississippi Valley. These rivers of the Carboniferous Age are the oil depositories of the world.

The deposit under your lease is a very large pool on an anti-clinal dome. This dome was formed by an internal uplift, which constructed a true oil-structure.

There are many interesting features connected with this valuable property, which I can assure you is one of the very best in the district.

134-acre Miller lease, northwest of the Kimball well, is situated on the same great oil-channel.

In about the 300-ft. level you will strike sufficient gas to run all of your machinery, and about the 600-ft. level you will strike lubricating oil in paying quantities. In about the 2,000-ft. level you will strike gusher oil.

Sincerely yours,

J. V. KIMBALL, M. E. and
Scientific Geologist.

Oct. 13, 1920.
San Antonio, Tex.

CONSULTATION

Spanish Pyrites

"I am seeking some information regarding the consumption of Spanish pyrites in this country. In how large a quantity is this material ordinarily imported? I would also like to know if the domestic pyrites deposits can compete successfully with the Spanish product. The statement has been made that the Spanish pyrites deposits supply about two-thirds of the world's production, so that their importance is apparent to anyone; but I would like to know the especial importance of Spanish pyrites in supplying United States demands. Any further information you may supply, such as market prices and grades, will be greatly appreciated."

The extensive pyrites deposits of Spain and Portugal are the most important source of pyrites in the world, and account for over two-thirds of the world's production. Although practically a unit, Spain supplies 90 per cent of the output of the district and Portugal the remainder. About two-thirds of the output contains copper in recoverable quantities. The higher-grade copper ore (containing over 5 per cent copper) is smelted locally. A lower grade of copper ore containing 1½ to 5 per cent copper is shipped to European countries for the recovery of its copper, sulphur, and iron content. Ores containing about 1½ per cent copper are customarily treated locally for their copper content, and the residue, or "washed ore," containing pyrites, is exported to the United States. The lowest grade of ore, as judged by copper content, is shipped solely for its sulphur content.

The treatment of the 1½ per cent copper ore is a leaching process utilizing water and atmospheric oxidation that extends over a period of three years.

According to A. E. Wells, two of the companies selling Spanish pyrites in this country dispose of part of their copper-bearing unwashed ores under a contract by which the sulphur content alone is paid for, the pyrites cinder reverting to the dealer. These companies have plants for treating the cinder for the recovery of copper by a chlorination and lixiviation process, after which the residue is sintered and shipped to the iron furnace.

The sulphur content of the Spanish pyrites imported to the United States varies between 45 and 50 per cent, the lump varieties usually running higher than the fines. A little arsenic may be contained in the ore. Most of the imported ore enters the country by way of New York, Philadelphia, and Baltimore, although the southern ports of Charleston, S. C., Savannah, Ga., New Orleans, La., Norfolk, Va., Jacksonville, Fla., and Wilmington, N. C., are also important domestic points of entry.

The Spanish ore comes in two principal grades, recognized by the trade as furnace size and fines size. Most of the ore of furnace size finds its way to the South, where furnaces for treating this sort of material almost exclusively are situated. The fines are consumed by the acid plants in the north. The price of the two grades ordinarily shows a differential of about 2c. per unit in favor of the furnace grade. This is due, as may be surmised, to the objectionable character of the extremely fine ore which the "fines" grade may contain.

The fine dust tends to clog the flues and towers and interfere with the process to a harmful degree.

Incidentally, one of the objections to the use of domestic pyrites is the fact that the ore when mined frequently produces more fines than lumps. An average proportion as stated by Wells is about two-thirds fines to one-third lump. As the greater portion of the Southern acid plants are equipped to handle furnace ore, this interposes some difficulty in manipulation. Sulphuric-acid manufacturing equipment in the north consists principally of fines burners. Concentration is frequently necessary, to make the ore sufficiently high grade to treat. The average eastern domestic pyrites, lump, fines, and concentrates, runs about 40 per cent sulphur, which is lower than the imported Spanish grades, and is usually very low in phosphorus and arsenic. A small percentage of copper is frequently present. Domestic fines and concentrates have the advantage of usually being easier to roast than the Spanish fines.

As given in the market report, Spanish fines are quoted at 12c. per unit, c.i.f. Atlantic ports; domestic fines, 12@14c., f.o.b. Georgia mines. The prices of domestic and foreign material do not vary widely. Other quotations are referred to in the market report. As the Spanish product is a convenient ballast, it has an important transportation advantage.

Ever since 1891 the total yearly imports of pyrites from all countries has been greater than the domestic production. During the greater part of this period imports have been more than twice the domestic output, indicating clearly the important part played by importers in the pyrites industry. It has only been in the last few years, in 1918 and 1919, that imports have taken a decided downward slump, so that domestic production and imports nearly balance. The decrease in imports was largely due to the difficulty of obtaining ships for the transportation of the pyrites from Spain. Unless a tariff or governmental restriction is imposed upon the importation of Spanish pyrites, imports will likely increase; but the ready availability of crude sulphur for acid manufacture tends to compete and restrict the rate of former importation.

A comparison of domestic production and total imports of pyrites from figures given by the U. S. Geological Survey follows:

	U. S.		(a) Total	
	Production (Long Tons)	Value	Imports (Long Tons)	Value
1910	241,612	\$977,978	803,551	\$2,748,647
1911	301,458	1,164,871	1,006,310	3,788,803
1912	350,928	1,334,259	970,785	3,841,683
1913	341,338	1,286,084	850,592	3,611,137
1914	336,662	1,283,346	1,026,617	4,797,326
1915	394,124	1,674,933	964,634	4,817,977
1916	439,132	2,038,002	1,244,662	6,728,318
1917	482,662	2,593,035	967,340	5,981,457
1918	464,494	2,644,515	496,792	2,741,676
1919	380,000	2,500,000	388,973	2,176,565

(a) Containing more than 25 per cent sulphur.

The largest domestic pyrites production occurred in 1917. Since then, output has dropped to a little above the pre-war rate.

THE PETROLEUM INDUSTRY

Oil Shale and the Engineer

The Mining, Retorting, Refining, and Marketing of Shale and Its Products Can Best Be Developed by Those Familiar With Similar Operations in Established Fields—Problems To Be Solved Before the Industry Can Be Made Commercially Successful

BY DAVID ELIOT DAY

Written for *Engineering and Mining Journal*

THE subject of oil shale and shale oil has received considerable publicity in the last two years; perhaps too much for its own good. It is a new and exceedingly interesting topic, about which little is definitely known, and it has inspired numerous contributions to both the technical and the popular press.

One of the effects of this publicity has been to stimulate the sale of stock in numerous oil-shale companies. That any of this stock will ever achieve a value in excess of that of the property which it represents is exceedingly doubtful. In all probability the work of commercially developing oil shale will be done by companies already established and successful, notably oil or mining corporations, and these companies will have no stock for sale. This may seem undesirable, but it is certainly logical.

To be successful in a new enterprise of this sort, the operating company must be financially sound. It must have sufficient capital to carry on a long, expensive campaign of research, experiment, and construction. It must have an experienced staff of high-grade engineers. The established mining or petroleum corporation possesses these qualifications. Furthermore, each of these institutions has had long and valuable experience in some of the operations which will be included in the oil-shale industry. Thus the mining company, although unfamiliar with the detailed technology of petroleum, is experienced in developing and mining ore, and in roasting ore after mining, a process which, as closely as any other, approaches the operation necessary for the retorting of oil shale. The oil company, on the other hand, although not as familiar with the preceding operations, has had long experience in refining, transporting, and marketing petroleum products.

ESSENTIAL PREREQUISITES TO SUCCESSFUL EXPLOITATION

It is not my intention to attempt to dissuade the earnest, capable operator from entering this field, but he must fully appreciate the problems which will be encountered. He must realize the futility of attempting to operate without sufficient capital, without the entire confidence and understanding of his stockholders, and without the benefit of capable technical advice. He should be determined to secure all possible data before he begins operations.

Such data may be grouped under three main heads: (1) Information concerning the property, (2) facts

concerning the process to be adopted, and (3) data concerning the oil produced.

The exploration of an oil-shale property, to be of permanent value, should produce certain concrete facts. The most important of these are:

- a. The tonnage of commercial shale on the property.
- b. The amount of recoverable oil that this tonnage represents.
- c. The number of units of shale which must be mined and treated to produce one unit of oil.
- d. The attitude and thickness of the commercial beds, together with other data governing mining conditions.
- e. The relation of the property to selection of a plant site, to economical mining, to dumping facilities, transportation, water conditions, and other operating and marketing conditions.

ADVANTAGES OF CORE DRILLING

These facts may be readily obtained by an experienced mining engineer with the aid of a systematic method of sampling. Except in the preliminary examination of a property, before acquisition, in which careful hand sampling may be justified, the only trustworthy method of completely sampling a property is that of core drilling, the advantages of which are many. It is the only method by which acceptable samples may be recovered from beds which do not outcrop on the property. The core forms an accurate record of the beds encountered and furnishes a complete continuous sample which may be rapidly and accurately subdivided into samples of retorting size. The samples obtained are at depth, where the actual mining will be done; not at the surface, where samples may or may not represent what will be encountered below.

COST OF PROSPECT INVESTIGATIONS

Many data concerning water conditions, hardness of formations, and mining methods employable are obtained at no extra cost. Although core drilling is considerably more expensive than haphazard hand sampling, the tonnage proved by this method, together with the results obtained, will more than offset the initial cost. In Colorado and Utah, the rich shale layers lie nearly flat, and as the oil content of any one bed does not vary greatly in a horizontal distance of less than half a mile, a series of three drill holes should prove 160 acres each, or about 500 acres in all. Assuming that in going to an average depth of 500 ft. these holes encounter a total thickness of 100 ft. of commercial

shale, roughly 126 million tons will be proved by this method. At a cost of \$5 per foot for drilling, or \$7,500 for the three holes, this development work will cost about 0.005 of a cent per ton. By analyzing samples representing every five feet of the core, and arranging the results obtained on a chart, it is possible to express graphically the number of commercial shale beds, the thickness of these beds, their attitude with regard to overburden and other mining conditions, the total tonnage of rich shale, and the total recoverable oil which may be expected from this tonnage. With these data in his possession, if they be favorable, the conservative operator is justified in proceeding with his development work, building roads, preparing his plant site, and making ready for the installation of his process.

EXPLORATORY OBSERVATIONS OF VALUE TO SUBSEQUENT OPERATIONS

If the analysis of the drill cores has been performed in a careful and intelligent manner, a considerable quantity of data will have been obtained concerning the reactions of this particular type of shale under retorting. For example, much should be known about the temperature most suited to economical retorting, the rate at which the retorting should progress, the advantages of employing steam or vacuum during the process, and other similar matters. This evidence will be of great service in choosing the type of retort which can be best adapted to the treatment of the particular shale under consideration.

To date, considerable time and money have been spent in the United States in experimenting with processes for oil-shale distillation, but no process has been put into true commercial operation, nor do many of those which have been so far devised show much promise of ever becoming commercially important. The reasons for this lack of success are various. In the first place, the majority of these processes lack sound technical fundamentals. Not only have they been designed without the services of competent engineers, but the experiments made with them have been so sporadic and so poorly correlated that the results have yielded little of either positive or negative value. In the second place, the inventors responsible for these processes have striven rather for a good patent than for a sound process. The attempt usually has been to produce something radically new, rather than to adapt or improve some furnace already proven and operating in an analogous field.

NEGLECTED SOURCES OF INFORMATION

The cement industry, the byproduct coke-oven industry, and the practical methods of gas production have been neglected by the inventor of shale processes. None of the apparatus used in the above industries could be applied without change to retorting oil shales, but a vast amount of pertinent information is obtainable from them. Furthermore, there are a number of companies in this country which have successfully built and operated drying and roasting furnaces for many years. Seemingly the engineering departments of these companies would be the best source of information for the shale operator, but comparatively few such firms have been approached. Finally, most of the effort spent in experimenting with shale processes has been directed along non-essential lines. The vital need is to produce a retort of large capacity, low operating cost, and sound, permanent construction, not the possibility of produc-

ing 1 per cent more oil per ton, nor oil worth a fraction of a cent more per barrel. Oil-shale retorting presents a problem which is no more difficult than many already solved in metallurgy. It will only be solved by the methods applied in metallurgy: intelligent research, mechanically sound design, and careful, correlated experimentation.

SHALE-OIL PRODUCTS DIFFER FROM THOSE OF PETROLEUM

A vast amount of hocus-pocus has been written by so-called experts on shale oil. Some claim that the products from shale oil far exceed those produced from ordinary petroleum. Others state that shale oil cannot be refined without tremendous refining losses, and for that reason is relatively worthless. As a matter of fact, the products from shale oil are different from, but not greatly superior or inferior to, those from ordinary petroleum. Paraffin from shale oil is undoubtedly of a better grade than the petroleum variety. Shale-oil lubricants, although satisfactory for many purposes, cannot fill the place of certain high-grade petroleum products, notably steam cylinder oil. The quality of gasoline is a matter of refining and blending. Shale gasoline may be better or worse than the petroleum product, according to the method of distillation and treatment.

The high percentage of unsaturated hydrocarbons in gasoline has been the subject of much unfavorable discussion. These products are removed by ordinary acid and soda treatment and cause a large refining loss. In all probability, by the time that shale gasoline is on the market in large quantities, the shortage of gasoline of any sort, and its high price, will have largely removed the trade prejudice against an unsaturated product. Gasoline from "cracking" plants is high in unsaturated, but there is no slackening in the development of "cracking" plants for that reason. Furthermore, methods of treatment which will produce a marketable product without exorbitant loss are being perfected, and will undoubtedly be applied to shale gasoline in some stage of its production.

Refining problems deserve as thorough technical and economic treatment as do any others connected with oil shale. The form in which the product should be marketed to produce the highest net return, refining methods and economies, production and treatment of particularly valuable fractions—all of these matters will play a prominent part in determining the success of the enterprise, and should be given full and technical consideration.

Those closely in touch with the economies of petroleum have no doubts as to the ultimate development of oil-shale resources. Many conservative men believe that, as the process of putting the oil-shale industry on a commercial basis will involve a long period of research, experiment, and construction, the time has already arrived to begin acquiring essential data. The future therefore promises a great advance in the technology of the subject. The time for promotion schemes has passed. So many investors have already lost money in such schemes that shady promotion is becoming more and more difficult. In the expansion of industry which will accompany a return to normal financial conditions, oil-shale development should prosper. No field offers greater opportunities to the engineer, and the engineer is indeed essential to the successful development of this field.

NEWS FROM THE OIL FIELDS

Merger of Producers and Refiners Planned in Wyoming

From Our Special Correspondent

A merger of all the companies operating in the Warm Springs district, Wyoming, into a \$10,000,000 corporation is planned. The merging companies would include the Singers Securities Co., Alliance Oil Co., Woods Petroleum Co., Wyoming Premier Co., and others, together with the new refining plant of the Alliance Oil Co. at Thermopolis, of 3,500 bbl. daily capacity. It is stated that there are fifty-three producing wells in the district, most of them producing from the shallow sand. Many of the wells are now being drilled to the deeper and more productive sand.

The Mountain Producers' Co. declared its initial dividend of 2 per cent payable Jan. 3 to stockholders of record on Dec. 15.

Deepest Texas Well Proves Dry

From Our Special Correspondent

The deepest drill hole in Texas was abandoned recently at 5,908 ft. The hole was dry, or a "duster," in oil-field parlance. It is on the Roy Henderson ranch, Crockett County, and was drilled by J. A. Pope for the Ryan Petroleum Corporation. The hole was started 22 in. in diameter and finished 5 $\frac{1}{8}$ in. in diameter. From 3,590 ft. down the well was uncased.

Production in north Texas continues to decline. Stephens County is now making only 115,000 bbl. per day. Few new wells have been completed recently. The best are the No. 4 Ackers, of the Cosbrook Petroleum Co., northwest of the town of Breckenridge, making an initial production of 800 bbl.; and the No. 2 S. M. Moore well, of the Gulf Production Co., north of Necessity, making 2,000 bbl. after having been heavily shot. These wells are in proved territory, and add no new acreage to their respective fields. In Wichita County the Burkburnett and Iowa Park districts continue to decline in production also, and Electra, with several good producing wells completed recently, is probably holding its own. In the Kemp-Munger-Allen section of this county the test on the Munger No. 6 well, of the Kemp-Munger-Allen Oil Co., at 1,800 ft., is being watched with interest. It is making a small amount of oil by pumping.

An epidemic of fires has visited the north Texas fields recently. In and around Wichita Falls fires have caused a property loss of \$125,000. At Breckenridge a fire was started in the heart of the business district by one of the wells, and a loss estimated at \$200,000 resulted.

Johnson County, Ky., Promises Good Production

From Our Special Correspondent

In the Gullett Branch neighborhood in Johnson County, Ky., the Big Paint Creek Oil Co. has three good wells, the Eastern Imperial Oil Co. one, and there is an encouraging showing of oil on the properties drilled by the Kentucky Counties Oil Co. and the Pitts-Yeo Oil Co. The Kentucky Counties Oil Co. struck oil in the Big Injun sand, which flowed over the top. Later some salt water developed, but the well looks to be a substantial producer. The Wheeler-Watkins well on the O. T. Rule lease was struck in the shallow sand and is making 50 bbl. at a depth of 250 ft.

The Big Boone Oil Co. reports a gusher at 410 ft. on the Tarrants lease, Davenport pool, Warren County. This well came in flowing and is said to have produced over 400 bbl. the first twenty-four hours.

No. 3 well on the Mose Wall lease, Simpson County, which was drilled in recently, is one of the largest producers yet struck in either Logan or Simpson counties and is being estimated at 500 bbl. per day.

The Cumberland Pipe Line Co.'s runs for the week ended Nov. 27 totaled 69,769 bbl., which is an increase of 13,000 bbl. over the previous week. This company serves only the eastern part of the state.

Californians To Prospect Stanislaus County

Among land owners east of Modesto, Cal., who have signed leases to the Montgomery-Jennings-Keller oil syndicate of Los Angeles, co-operating with the latter to prospect the Stanislaus County field for oil, are: Douglass F. Mullin, T. H. Kewin, Mrs. Abe Johanson, H. W. Voight and W. H. Van Near. The plan is to lease 12,000 acres before beginning active operations and over half the amount required has already been subscribed. It is expected that \$100,000 will be spent in development work. The bulk of the leases lie in and about Waterford, Heckman, La Grange and Denair.

First Well in South Dakota Brought In

From Our Special Correspondent

Edgemont—The first oil well in South Dakota was brought in last week, two miles southwest from Edgemont, when French and Rossiter, drilling on the Slocum lease, struck oil at a depth of 700 ft. in the Lakota sand. This new well is fifteen miles east from the Mule Creek field of Wyoming and is in South Dakota.

Another Well in Chinampa Field Shows Salt

From Our Special Correspondent

The Thompson well No. 3, on Lot 114, Chinampa, which came in on Nov. 21, went to salt water on the following Tuesday. In drilling this well the drillers decided that they would just pierce the "pay strata" and thus delay the appearance of the salt. On piercing the line the well flowed under heads at intervals of one-half hour. It was while they were trying to get the well to flow steady that it blew itself in, due to the high pressure. The salt water appeared at once.

The Nicklos well No. 1, on the same lot, was brought in on Nov. 29. The oil was encountered in this well at a depth of 1,953 ft., but the flow was only about 10,000 bbl. It was decided to drill deeper to increase the production. An oil saver was put on the well and five more feet were drilled, when the production was increased to about 30,000 bbl. per day. The oil has been contracted for by the Metropolitan Co. On the same day the Aguila Co. brought in its well No. 15, in the Naranjos field. This well affects the International Co.'s well at Lot 252, Amatlan. The oil was shot fifty feet over the top of the derrick, owing to the high pressure and large percentage of gas. The estimated flow of the well is about 50,000 bbl. daily.

The Zacamixtle country is building up rapidly, and each day sees a new derrick or two springing up. The wildcats spread over a wide breadth, and are fairly well spaced, and as they will all be deep enough to define the pool by the end of the year, great concentration can be expected by March of next year, and the pool will probably have a short life.

The first expedition of oil prospectors to the Mackenzie River district left Edmonton, Alberta, Can., on Nov. 25. The party comprised Dan Darough, A. H. Schwier, Tony Nels and J. A. M. Rankin, all experienced northerners. They were given a clearance by the mounted police. It will take them about forty-five days to make the trip to Fort Norman, a distance by the winter trail of nearly 1,200 miles.

A great rush has set in for oil leases in the country on the Pouce Coupe River near its confluence with the Peace River, Alta., where the first in the field was a geologist representing the interests of the Imperial Oil Co., who secured leases covering approximately 10,000 acres. Several thousand acres were filed at the land office at Grand Prairie by other claimants during two days. It is reported that drilling operations will start soon.

ECHOES FROM THE FRATERNITY

A. I. M. E. Organizes the Mining Engineers of the Lake Superior District

Bradley Stoughton, secretary of the American Institute of Mining and Metallurgical Engineers, recently returned from his campaign among the mining men of the copper and iron districts of the Lake Superior region. Mr. Stoughton's efforts to consolidate the engineering men of those districts were quite successful.

At Duluth, Minn., he was the guest of honor at a subscription dinner held by the local members of the A. I. M. E. At the dinner there was discussion of the scheme to form a whole unit of the Institute for the Minnesota ranges, to be composed of four sub-units, viz., the Mesabi Range, the Vermillion Range, the Cuyuna Range, and the Duluth district. Each of these four sub-units later met separately and elected two representatives, who held a joint organization meeting on Dec. 4. At this joint meeting bylaws were adopted for the northern Minnesota section, and a list of nominations for officers was prepared. The annual meeting of the section will be held in February and officers elected. A separate section for Minneapolis-St. Paul is now forming, the committee on organization being W. R. Appleby, chairman, C. E. Juhlin, and Lloyd D. Cooper.

In the Upper Peninsula of Michigan Mr. Stoughton met the Institute members at Ironwood, Iron River, Iron Mountain, Ishpeming, and Houghton, and after full discussions at each point it was decided that each locality should appoint representatives, who should meet and organize into one or two local sections for the Peninsula. Sub-units will be formed at the different points, just as has been arranged for the northern Minnesota district.

Mr. Stoughton spent Nov. 28, 29, and 30, in Houghton, Mich., where he addressed a meeting of mining engineers at the Houghton Club. At this meeting the advisability of forming a Houghton or Copper Country chapter was discussed and an informal organization was established at Houghton under Professor Sperr.

During his stay Mr. Stoughton addressed the students at the Michigan College of Mines, emphasizing the many advantages offered to the student and alumnus by membership in a national organization of mining engineers such as the A. I. M. E. He also expressed the opinion that a large proportion of the mining engineers of the future would have to find employment in foreign countries, such as South America, Siberia, and Africa, inasmuch as it is quite certain that the larger mining enterprises of the future would be situated not in the United States but in these countries.

Freight Rates Affect Utah's Industries

Walter Fitch Declares Mines Could Not Survive Proposed Increases

The question of transportation, especially as regards the effect of increased freight rates on Utah industries, was discussed at the regular weekly luncheon of the Salt Lake Commercial Club on Nov. 25. Mention was made also of certain improvements, such as the increase in the number of cars available, obtained through the efforts of the Salt Lake City traffic bureau. These betterments were outlined by H. W. Prickett, of the bureau, who pointed out that it had been possible, through efforts at Washington, to secure a division of the territory just east of the Rocky Mountains, so that the increase in rates east of that line was 35 per cent and that west—which includes Salt Lake City—25 per cent.

Walter Fitch, of the Chief Consolidated, Eureka, was the first speaker representing the mining industry. Mr. Fitch said that though all were of the opinion that the advance of 25 per cent in freight rates is reasonable, there were some spots that could not stand it, and that the mining industry was one of them. He held that the Public Utilities Commission of Utah had performed a wonderful service to the state when it declined to allow the railroads to advance their rates. Mr. Fitch spoke, among other things, of William G. McAdoo having made a gift of \$1,000,000,000 to the railroad men, for which benevolence all must pay. C. F. Solomon, traffic manager of the J. G. McDonald Chocolate Co., also spoke. H. N. Byrne presided. An unusually large number of engineers and mining men were present.

Engineers' Club of Northern Minnesota Holds Annual Meeting

The public library at Hibbing, Minn., was the scene of the annual meeting of the Engineers' Club of Northern Minnesota on Nov. 26. The slate of officers for the coming year was presented by the nominations committee, as usual, but excited some discussion. The members in attendance finally rejected the committee's designations and the following new slate was prepared: For president, W. R. Van Slyke, Eveleth, or P. F. Chamberlain, Virginia; for vice-president, H. J. McInnis, Virginia, or Bert St. Vincent, Hibbing; for secretary-treasurer, Robert H. Ely, Eveleth, or M. W. Coleman, Virginia; for directors, Ed Loye or Walter Pohl, Hibbing; Howard McAdams, Eveleth, W. B. Bushnell or A. H. Krogdall, Virginia; H. H. Angst or A. Tancig, Chisholm. The balloting will be by mail.

New York Section, A. I. M. E., Devotes Evening to Gold and Silver

The New York section of the American Institute of Mining and Metallurgical Engineers held its regular meeting at the Machinery Club on the evening of Dec. 8. E. P. Mathewson presided. The speaker of the evening, George E. Roberts, vice-president of the National City Bank, made an interesting address on the bankers' view of the McFadden Bill. Mr. Roberts qualified for the subject by stating that he had received his mining education at Nome, where he had invested in a company started by Charles D. Lane. The company, known as the Wild Goose Mining & Trading Co., took out \$1,000,000. Subsequently, although \$8,000,000 was taken out, the accumulated debts overbalanced this sum, and Mr. Roberts sold his interest at a loss.

Mr. Roberts next discussed the American Bankers' Association report on the McFadden Bill. He stated that he was not entirely in sympathy with the bankers' view and considered it based on theoretical arguments which ignored a very serious and oppressive condition. In his opinion, the gold standard was essential, but could not be maintained without a gold-mining industry. As to the McFadden Bill, Mr. Roberts did not like it, but he did not see anything fundamentally wrong about it. He was not, however, prepared to say that he favored the bill.

C. W. Handy, secretary of Handy & Harmon, was next introduced, and presented an analysis of the silver market in particular, showing the cumulative causes which produced peak prices in 1920 as well as the conditions which operated to bring silver down to present prices.

George F. Kunz presented the jewelers' argument against the McFadden Bill. Briefly, his points were that the jewelry business is already heavily taxed, that it has troubles of its own, that rich people were buying platinum jewelry, and consequently the tax would be paid by poor people. "Things are coming down," he said, and if the gold miners would only have patience there would be no occasion for the excise tax.

C. W. Wheelock gave an historical summary of the gold and silver market. Mr. Chang, of the China Commercial Co., spoke about precious-metal hoarding in China. H. Emerson made some interesting comments on how silver first depreciated in price relative to gold. E. P. Mathewson adjourned the meeting after calling the attention of the members to the program of the next meeting, at which Robert Linton would present moving pictures of the operations of the North Butte Mining Co.

MEN YOU SHOULD KNOW ABOUT

O. R. Whitaker has returned to Denver from a trip to Mexico.

W. S. Bayley has completed a study of North Carolina iron ores.

Philip N. Moore, of the War Minerals Relief Board, was in New York City Dec. 8.

Pentecost Mitchell, vice-president of the Oliver Iron Mining Co., will spend the winter in California.

W. A. Harrod, mining engineer, of Golden, Col., examined mining property in southern Arizona recently.

C. W. Botsford, mining geologist, of Phoenix, Ariz., is in Magdalena, N. M., examining S. S. Lang's holdings there.

M. E. Merrill, mining engineer, is chief engineer for the Cia. Minera "La Constanca," Sierra Mojada, Coahuila, Mexico.

W. P. Chinn, general manager, and W. A. Rose, chief mining engineer, of Pickands-Mather & Co., are in Cleveland, Ohio.

P. K. Lucke, mining engineer, of Mexico City, who left for Europe on Oct. 19, writes that he has returned to Mexico City.

J. Morrow Campbell, mining geologist, left England for Burma late in November. He is on the staff of Steel Bros., Rangoon.

Raymond B. Ladoo, of the Bureau of Mines, and Benjamin LeR. Miller, of Lehigh University, Bethlehem, Pa., were in New York City on Dec. 10.

President Frank P. Knight and Vice-President J. Judson Dean of Iron Cap Copper Co., are in Globe, Ariz., to inspect late progress on the company's property.

Charles F. Williams, mining engineer, of Socorro, N. M., is at Batopilas, Chihuahua, Mexico, making a survey and report on the properties of the Batopilas Mining Co.

J. M. Callow, of Salt Lake City, Utah, president of General Engineering Co., consulting engineers, has returned to Salt Lake City after a month's visit at the New York City office of the company.

W. W. Shelby, mining engineer, recently at Charcas, S. L. P., Mexico, has been appointed assistant superintendent of the Cia. Minera "La Constanca," at Sierra Mojada, Coahuila, Mexico.

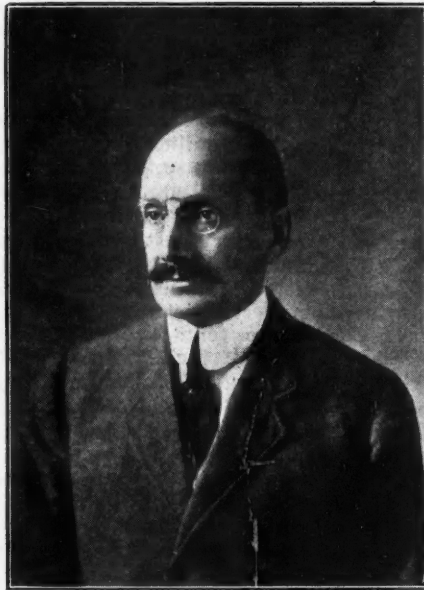
W. C. Teagle, president of the Standard Oil Co. of New Jersey, and a number of the officials of that company were in Houston, Tex., recently. They were making a tour of inspection of the oil fields.

W. J. Olcott, president, John H. McLean, general manager, and John Uno Sebenius, chief mining engineer, of the Oliver Iron Mining Co., inspected the

company's properties on the Mesabi Range recently.

Mining Men Recently in New York City included H. C. E. Spence, of Mount Royal, N. M.; J. P. McCulloch, of Newville, Pa.; E. A. Holbrook, of U. S. Bureau of Mines, and Stanly A. Easton and R. S. Handy, both of Kellogg, Idaho.

Max Söhnlein, mining and metallurgical engineer, of Santiago de Chile, Chile, is spending a month visiting the Western States. He expects to return to South America from New York City about the end of December.



HERBERT M. WILSON

A party of Phelps Dodge officials, including Walter Douglas, president, Arthur James, vice-president, and P. G. Beckett, general manager, is visiting the corporation's mining and reduction plants in Mexico, New Mexico and Arizona.

T. H. Jenks, mining engineer, who has been in Colorado on professional work all summer, is in Denver, Col., completing work in Gilpin County. Before returning to Los Angeles, Cal., he will examine properties in New Mexico and Arizona.

Justice F. Grugan, mining engineer, who has been with the Suffern company, New York City, is on his way to the Transvaal to reorganize the affairs of an outcrop mine on the Rand, owned by the Langlaagte Proprietary company (the late Jacques Lebaudy).

F. A. Malins, formerly superintendent of El Cedro mill, Cia. Minera "Las Dos Estrellas," El Oro, Mexico, has been appointed consulting metallurgist to the company. W. B. Rhodes succeeds him as superintendent of El Cedro mill. T. Skewes Saunders is general manager of the company.

T. F. Cole, of New York; Thomas Hoatson, of Calumet, Mich.; Walter Congdon, of Duluth, Minn.; George A. Newett, of Ishpeming, Mich.; William B. Mershon, of Saginaw, Mich.; and John C. Oliver, of Pittsburgh, Pa., di-

rectors of the Calumet & Arizona Mining and the New Cornelia Copper companies, are visiting the holdings of the two companies in Arizona and New Mexico. They are accompanied by John C. Greenway, general manager, and Ira B. Joralemon, assistant general manager.

OBITUARY

Capt. Richard Webb, who represented the fee interests of M. H. Alworth on the Mesabi Range, died recently at his home in Hibbing, Minn. He opened the Cary mine, on the Gogebic Range, and was one of the pioneer mining men of the Lake Superior district. The remains were taken to Ironwood, Mich., for burial.

Christopher P. Russell, mining engineer, of Salt Lake City, a graduate of the University of Utah, was struck and fatally injured by a street car in that city on Nov. 24. He died without regaining consciousness on Nov. 25. Mr. Russell served abroad with the 115th Engineers and later with the army of occupation. He was a native of Salt Lake City and was only thirty-seven years old.

Herbert M. Wilson, the first president, later secretary, and one of the earliest proponents of the American Mine-Safety Association, died at Hartford, Conn., on Nov. 25, after a brief attack of pneumonia. Mr. Wilson was selected by Director C. D. Walcott as the chief assistant to J. A. Holmes when in 1907 the latter was appointed the first chief of the newly created technologic branch of the Geological Survey, which has since grown to the Bureau of Mines. Mr. Wilson will be remembered as the first engineer in charge of the Pittsburgh station of the Bureau; but yet more gratefully, and by a wider circle, for his great services and active interest in the mine-accident investigations whose headquarters were placed at Pittsburgh in 1910 by authority of Congress.

Mr. Wilson was born of English parents in Glasgow, Scotland, on Aug. 23, 1860, but came to the United States when a few months old and grew up in Plainfield, N. J., living there until he was graduated from the Columbia School of Mines in 1881. For two years he was in railway engineering in Mexico, but from 1882 to 1909 he served on the corps of the Geological Survey as topographer, irrigation engineer, geographer, and chief engineer of the technologic branch. From 1910 to 1914 he was engineer in charge of the Pittsburgh station, Bureau of Mines, resigning Government work to become director of the department of inspection and safety of the Associated Insurance Companies, Hartford, Conn. He subsequently became general manager of the companies.

THE MINING NEWS

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

LEADING EVENTS

Minerals Separation Fails on Appeal in Miami Case

Court Affirms Ruling Dismissing Applications for Supplemental Bills—
No Injunction Issued

The decision of the Circuit Court of Appeals, in its opinion which was rendered in Philadelphia on Dec. 9, affirms the rulings of dismissal of certain applications for supplemental bills, which were made by Minerals Separation, Ltd. for the purpose of finding the Miami Copper Co. in contempt of court for the use of its present flotation processes, and also sought to enjoin that company from the continued use of its processes.

The opinion of the Circuit Court of Appeals goes to considerable length in order "to quiet the controversy" as to several of its phases, and in its determination as to whether the trial judge had "rendered his judgment upon a wholly wrong comprehension of the facts or the law of the case," and whether, accordingly, he had abused his discretion in this respect. The only respect in which an appellate court will disturb such an order states that "to this end we have read and carefully studied the entire record." More than once the opinion states that the Judge writing the Circuit Court of Appeals' opinion would himself have ruled exactly as Judge Morris had done in the case of the orders which had been brought up upon appeal, the opinion of the Circuit Court of Appeals concluding as follows:

"Stress has been laid on a reference made by the learned trial judge to embarrassment because of his lack of familiarity with the facts of the case due to his coming into the case after it had gone to an accounting. To allay any unrest that might arise from this situation and to avoid the appearance of affirming the court's decree upon the negative quality of a finding that we discern no error in its order, we go farther and say, that, having made the law of the case we are presumed to know what it is, and that, applying the law to the facts, which, on the defendant's motion to dismiss are regarded most favorable to the plaintiffs, we would have made the same disposition of the case had we been sitting in the District Court when the application for a supplementary injunction was made." (See *Engineering and Mining Journal*, Aug. 14, 1920, p. 328, where the full text of Judge Morris' opinion, handed down on July 29, is given.)

WEEKLY RESUMÉ

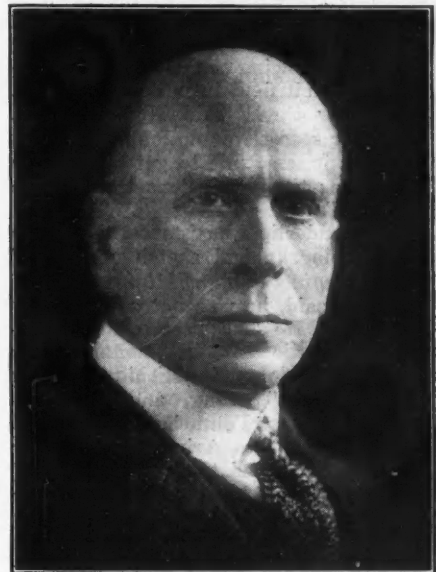
The time in which the 1920 assessment work on mining claims may be performed will be extended to July 1, 1920, it is reported, if the House accepts the bill passed by the Senate, as is anticipated. A permanent interdepartmental committee to study Alaskan problems has been appointed by the President with G. A. Parks as chairman. Tariff hearings on metal imports are to be held next month before the House Ways and Means Committee. Marion E. Rhodes, of Missouri, is the new chairman of the House Committee on Mines and Mining. J. H. Means is talked of for the position of chief engineer of the War Minerals Commission.

Both the Montana Legislature and that of Arizona, it is said, will be asked at the coming sessions to take steps in the direction of licensing engineers. Minerals Separation has failed on its appeal in the Miami case, the higher court affirming the ruling dismissing the application made for supplemental bills and refusing to enjoin the copper company. At Butte, Anaconda has closed the Leonard mine, which act will bring its copper production to 40 per cent of normal. In the Coeur d'Alenes Marsh Mines Consolidated has decided to continue its action against Hecla in spite of the latter's agreement with the Federal company. In the Black Hills, labor is reported to be more plentiful. The decrees quashing indictments in the Bisbee deportation cases have been sustained by the U. S. Supreme Court.

Washington B. Vanderlip Arrives in New York

Sketches His Career for "Engineering and Mining Journal"—Claims To Have Important Concessions

Washington Baker Vanderlip, whose reported success in obtaining important concessions in northeastern Siberia from the Soviet government for



WASHINGTON B. VANDERLIP

American interests has caused so much discussion on both sides of the water, returned to this country on the S. S. "Aquitania," arriving in New York on Dec. 11. According to Mr. Vanderlip, his concessions embrace coal and oil lands and fishing rights. In speaking to the representative of *Engineering and Mining Journal* of his efforts to interest capital in the development of this Siberian oil field, he said that in 1903 he was introduced to John D. Archbold by his cousin Frank A. Vanderlip and endeavored to get him to finance an expedition for oil. Mr. Archbold, however, finally concluded that "there was too much oil in the world," and informed Mr. Vanderlip that they had no market then for their gasoline. This was at a time when the automobile was comparatively new.

About ten years ago, continued Mr. Vanderlip, he succeeded in interesting Ralph Arnold in the same matter, and Mr. Arnold had endeavored to finance the proposal in London and New York,

Possibility of Wage Decrease Considered at Cobalt

The drop in the price of silver, combined with the difficulties caused by power shortage, has created a situation at Cobalt, Ont., which renders it impossible for some of the smaller producers to continue operations profitably unless mining costs can be reduced. This can be done only by a reduction in the rate of wages, which are now on the basis fixed when silver was bringing \$1.30 per oz. In view of the general decrease of wages in other lines of industry, including lumbering, which has been the strongest competitor of the mining operators in the labor market, the question is receiving much attention. It is thought that when the men realize that a reduced rate of pay is the only alternative to a closing down of many mines for the winter they will accept a lower wage scale.

but failed. Later, said Mr. Vanderlip, Seeley W. Mudd and Philip Wiseman had tried to do the same thing during the war, but, Russia being in the throes of revolution, they could not make any progress. Mr. Vanderlip then suggested to Franklin D. Roosevelt, Assistant Secretary of the Navy, that if he would land him and members of the U. S. Geological Survey on the Siberian coast, he (Vanderlip) would show them the oil field, and made the proposition that the U. S. Government should obtain possession in order to forestall Japan. Mr. Roosevelt replied courteously that he was interested, but said that this was a mercantile proposition which the U. S. Government could not consider. Mr. Vanderlip then made the same proposal to the British Admiralty through the British Consul at San Diego, and received the usual polite acknowledgment of his letter—but no more. A few months ago Mr. Doheny brought the news to Los Angeles that he had been sought by an ex-officer of the British Navy to assist in financing the development of a wonderful oil field in northern Siberia. "We knew then," said Mr. Vanderlip, "that our secret was no longer a secret and that it was time to get busy. The result was the concessions that I have obtained."

Mr. Vanderlip was requested to give a brief biographical sketch of himself for the *Engineering and Mining Journal*. First, he said, he was not a university graduate. He had received his academic education at the Orchard Lake Military Academy, in Michigan, under Major-General Strong, and was preparing for West Point, but changed his mind and went to Arizona, where for a time he followed the cattle business. At the age of nineteen, he said, he found the Bright Angel Trail to the bottom of the Grand Canyon while prospecting for minerals, which happened to be his very first experience along mining lines. He then purchased a three-year course in mining engineering at the International Correspondence School at Scranton, Pa. This he followed with a year of study under Professor Falkenau, of San Francisco, who instructed him in mining geology, chemistry and allied subjects.

Following this, he worked as miner and assayer in various camps in California. Later, he met Leigh Hunt and went to Korea. From there he was given charge of exploration work in northeastern Siberia for a Russian-English company. His experiences at this time, said Mr. Vanderlip, are set forth in his book entitled "In Search of a Siberian Klondyke," which was published by the Century Company in 1903, but is now out of print. In 1900 he went to the Philippines as a partner of Mr. Hunt. Here he explored the islands, at times with the assistance of American troops, in the course of which work he discovered the placer deposits on the Paracale River, which were afterward worked for several years by several dredges and yielded many millions. From the Philippines, continued Mr.

Vanderlip, he was engaged by Sir Ralph Moore through Arthur Pierce, a mining engineer of London, to explore Nigeria. He found nothing, but had the misfortune, he said, to pass on the opposite side of the range to that on which the famous Nigerian tin deposits were later found. Sir Ralph Moore, it seems, had obtained a piece of gold quartz the size of his thumb which had come down the Niger River with a load of oil nuts, and it was for the purpose of finding where this piece of quartz came from that he was selected to explore the interior, said Mr. Vanderlip. The latter traced the piece of quartz from tribe to tribe, at times passing through stretches where he was the first white man the natives had ever seen, until he located the ledges, but found them too low in grade to be commercially valuable. For this work Mr. Vanderlip said King Leopold offered him the then unheard of salary, all things considered, of \$25,000 a year, together with full charge of the exploration of the Tanganyika Concessions. This, said Mr. Vanderlip, was prior to the amalgamation of the Thomas Ryan and Beatty interests with those of Leopold. On being examined, however, by a commission of the King, to determine his fitness for the work, the physicians stated that he was worn out physically and that if he returned to Africa he would die. Mr. Vanderlip said he then returned to America and went to Honduras for the New York & Honduras Rosario Mining Co. He contracted a tropical complaint at San Juancito, and was forced to return to this country, being carried to the coast on a litter.

On returning to New York Mr. Vanderlip met D. M. Riordan, then in charge of the mining department of the General Electric Co., who had known him since boyhood, and who engaged him as his assistant in the work of examining mining properties for the company. He was with the company for three years, and during this period was instructed to find deposits of rutile in this country. Knowing nothing about this mineral, he said, except that it was a mineral, he went to Washington, where Frank Hess and others of the U. S. Geological Survey informed him that no known veins of rutile existed on the American continent, but that small pieces of the mineral had been found from Georgia to Nova Scotia. He went South, and, beginning at the Tiffany mine, instituted a systematic search for rutile. By a process of elimination and with the aid of Mr. Hess and Dr. Watson he settled on Nelson County, Va., as the most likely place for operation. He prospected Nelson County thoroughly, panning every stream, and finally found the only two veins of rutile known to exist in the United States.

When the General Electric Co. ceased its mining operations Mr. Vanderlip was engaged by F. Augustus Heinze to examine mining and oil properties in Alaska. After leaving Alaska he went to Oakland, Cal., from which place he made various trips from time to time

through the West on examination work. He then went to Los Angeles, he stated, on account of his wife's health, and has remained there ever since, making reports from time to time through the West and in Mexico.

Mr. Vanderlip stated that he was at one time a member of the A. I. M. E. and was made a fellow of the Royal Geographical Society for his work in Siberia and elsewhere.

His recent trip to Siberia, from which he has just returned, was started on July 10 this year, and it is just about thirty days since he left that country to return to the United States. Long interviews with Mr. Vanderlip in regard to his concessions were published in all the New York Sunday papers of Dec. 12. In these Mr. Vanderlip said he had been more or less correctly quoted and could add nothing to what he had already said.

The list of the capitalists associated with him is given in one of these interviews as follows: Harry Chandler, proprietor of the *Los Angeles Times*; O. F. Brandt, vice-president Title Trust Co.; W. G. Stewart, president Union Oil Co., Los Angeles; E. L. Whittier, oil operator; J. F. Sartori, president Security and Savings Bank Co.; T. E. Gibbon, retired, capitalist and attorney; H. Jevne, president Jevne company, wholesale grocers; T. W. Braun, president Braun company, wholesale druggists; Mr. Helman, vice-president Helman Banks; Lee Phillips, vice-president Pacific Mutual Life Insurance Co.; and E. Fishburn, president Merchants' National Bank.

Bisbee Cases Dismissed Supreme Court Sustains Federal Court Decrees

The Supreme Court on Dec. 13 sustained Federal Court decrees quashing indictments brought against twenty-five defendants who were charged with participating in the deportation of 221 alleged undesirables from Bisbee, Ariz., into New Mexico in July, 1917. Chief Justice White rendered the opinion of the court. The lower court in dismissing the indictments held in effect that the proceedings interfered with the state police powers, and that although the indictments sufficiently charged conspiracy to deport forcibly and against their will citizens of Arizona the Federal statute did not apply.

Price of Mine Explosives Cut in Cœur d'Alenes

Effective Nov. 29, the Dupont Powder Co., which has practically a monopoly of the powder business in the Cœur d'Alene district, made a cut of 50c per 100 lb. in the price of 40 per cent gelatin and 17 per cent stumping powder, or \$10 per ton. This makes the local price of 40 per cent powder \$25.15 per 100 lb. in ton lots, and \$25.65 per 100 lb. in less than ton lots. The cut does not apply to 60 per cent gelatin, the local price of which remains \$28.65 per 100 lb. in ton lots, and \$29.15 per 100 lb. in less than ton lots.

Mexico Would Avert Shut Down of Mines

Presidential Decree Reducing Freight Rates and Taxes and Removing Import Restrictions Expected

"With approximately one-third of the republic's 3,500 silver and copper mines closed down because of the low market price of those metals," says an Associated Press dispatch from Mexico City dated Dec. 12, "the Government this week will take emergency measures to prevent complete paralysis of the industry with the consequent throwing out of work of more than 500,000 laborers, according to a Treasury Department statement.

"The action is expected to take the form of a Presidential decree reducing freight rates and Federal taxes and annulling laws restricting the importation of materials such as steel, powder, acids and tools.

"During the past week, President Obregon has conferred with the Governors of Guanajuato, Zacatecas and Durango and has met delegations from the States of Hidalgo, Chihuahua and Coahuila, all of whom described the situation as grave, with the possibility that mine owners would be forced to close down all their properties.

Governor Madrazo of the State of Guanajuato declared here today that silver and copper mines in his state pay 700,000 pesos in taxes annually, and expend more than 4,000,000 pesos annually, and if forced to suspend operations the heads of 5,000 families would be without work.

"Representatives of large mining interests have asserted that the present market price of silver of 58 cents per troy ounce renders operation of the mines impossible except at a loss of approximately 22 cents on each ounce, although Federal aid in the form of reduction of freight rates and taxes would make possible at least partial operation until the market ascends.

"A delegation of miners from Pachuca, the most important mining city in Mexico, arrived in Mexico City last night bearing a manifesto which will be presented to President Obregon today, asking the Government to take over all the mines and operate them.

"Reflecting on the delicate situation is the refusal of Mexico City bankers yesterday to accept silver deposits of more than 20 pesos. The Government is known to be coining only small amounts of silver."

Indians' Revenue from Zinc Land Greater in 1920

Greatly increased revenue from lead and zinc mining in the Joplin-Miami district for Indian owners of land is indicated in the annual report of the board of Indian commissioners. Only forty-one Indians have received the great bulk of this revenue, the figures for which are given as follows: 1917, \$84,772.03; 1918, \$384,679.41; 1919, \$496,523.75; and 1920 (5 months only), \$379,473.53.

Marsh Mines To Continue Apex Litigation Against Hecla

Refuses \$100,000 Offered by Federal Company for Surrender of Lease—Stockholders Assessed

The directors of Marsh Mines Consolidated, operating in the Cœur d'Alene district, Idaho, have formally announced through a letter to stockholders that preparation is being made to continue the litigation against the Hecla Mining Co. to establish the claim of the Marsh to the "east orebody" of the Hecla. Marsh has a lease on the Russell and Mono Fraction Claims secured from the Federal Mining & Smelting Co., and which contain the alleged apex of the "east vein." The Federal company instituted suit against Hecla, but before the case came to trial a settlement was made out of court through which Hecla purchased the Russell and Mono claims and secured release from all claim for trespass, details of which were published in *Engineering and Mining Journal* in the issue of Nov. 27.

The settlement was made subject to the Marsh lease, which runs until July, 1926, the Federal agreeing to endeavor to make a settlement with the Marsh. In pursuance of this agreement the Federal company offered Marsh \$100,000 for the surrender of its lease. This offer was promptly declined, following which the directors say action was immediately taken to continue the litigation to a conclusion. The directors say that it will be necessary to continue the Russell winze, now down 375 ft., to a connection with the Hecla workings, an estimated distance of 680 ft. This, with the extension of the Russell tunnel, from which the winze is sunk, 700 ft. to the east end line, is stated to be the only development work of importance that will have to be done before proceeding to trial. The directors have levied an assessment of 1c. per share, which they estimate will bring \$20,000 into the treasury, and this, with \$4,500 on hand, is expected to be sufficient to meet all preliminary requirements of the litigation. In this connection the directors say that "plans are now being considered which may result in securing such substantial financial assistance as to make it possible to take the major part of the burden off the stockholders."

Watchman Charged With Burning Oklahoma Concentrator

G. W. Hill was arrested on Dec. 4 in the Joplin-Miami district on a charge of arson and two other men were held on a charge of conspiracy by Deputy Fire Marshal Bert Foster, of Oklahoma City. The charges grew out of the burning of the Georgia Mining Co.'s concentrator on Nov. 15. It burned early in the morning after having been on fire twice the day before. Hill was the night watchman at the property. Preliminary hearing has been set for Dec. 21 at Miami, Okla.

Greene-Cananea produced 3,350,000 lb. copper in November.

Bill for Licensing Engineers in Arizona To Come Before Next Legislature

Before the approaching session of the Arizona Legislature is to be placed a bill, prepared by a committee of members of the southwestern district of the American Association of Engineers, calling for examination and investigation of all applicants who may apply for permission to practice in the state as mining or technical engineers or geologists, assayers, surveyors or architects. Creation of a board of engineering examiners, appointed by the Governor, to serve without pay, is suggested. This board's work is to be supported by an initial registration fee of \$25 and by renewal fees of \$5 annually. Fines are to be provided for failure to observe the provisions of the act.

Propose Licensing of Engineers in Montana

Mining engineers of Montana are taking steps to preserve mining engineer positions for mining engineers. The State Legislature, which convenes in January, will be asked to impose a license, it is said, upon such positions in order to lift them out of the category of the ordinary job, according to sentiment heard in Butte mine engineering circles.

Recent Production Reports

Calumet & Arizona produced 3,486,000 lb. copper in November, of which 3,236,000 was available for the company.

United Verde Extension produced 2,642,812 lb. copper in November against 3,864,756 in October.

North Butte produced 1,342,029 lb. copper in November compared with 1,390,829 in October. The November silver output was 52,211 oz. and that of gold 76 oz.

Shipments of specified Alaskan products to the United States in November as reported by the Department of Commerce were as follows: Copper ore, matte, etc., 16,720 gross tons (copper contents 12,802,696 lb.); tin ore and concentrates, 26,052 lb.; platinum, 28 oz.; palladium, 103 oz.; gold ore and base bullion, \$250,230; gold bullion, 42,737 oz.; silver ore and base bullion, \$137,425.

New Cornelia produced 2,670,000 lb. of copper (cathodes) in November.

Inspiration produced 5,350,000 lb. copper in November.

United Verde Extension produced 2,642,812 lb. copper in November.

Utah Copper's output for November was 9,120,000 lb., as against 8,000,000 in October.

Chino Copper produced in November 4,000,000 lb. as compared with 3,933,435 in October.

Ray Consolidated's November output was 3,975,000 lb., compared with 3,990,800 in October.

Nevada Consolidated produced 3,950,000 lb. copper in November, compared with 3,850,000 in October.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Six Months Grace Probable for 1920 Assessment Work

Senate Committee Against Further Suspension But Favors Extension of Time

The opening of Congress saw the introduction of bills by a large number of Representatives and by several Senators, looking to the suspension of assessment work for the year 1920.

There is considerable opposition to these resolutions, on the ground that many have gone ahead and have done their 1920 assessment work and that the requirement of this assessment work would make for more activities in mining regions.

On the other hand, the main argument is that the Government should relieve the mining industry of this burden at a time when the industry is especially unable to bear it.

The time in which the 1920 assessment work on mining claims may be performed will be extended to July 1, 1921, if the House of Representatives accepts a bill so providing that has been passed by the Senate. It is expected that the House will accept the bill promptly. Failure to do so would result in no legislation and would require all assessment work to be completed by the end of this month. The text of the bill as passed by the Senate is as follows:

"That the period within which work may be performed or improvements made for the year 1920 upon mining claims as required under Section 2,324 of the Revised Statutes of the United States is hereby extended to and including the 1st day of July, 1921, so that work done or improvements made upon any mining claim in the United States or Alaska on or before July 1, 1921, shall have the same effect as if the same had been performed within the calendar year of 1920. Provided that this act shall not in any way change or modify the requirements of existing laws as to the work to be done or improvements made upon mining claims for the year 1921."

The Committee on Mines and Mining of the House reported favorably a bill which would relieve claim owners of the necessity of doing this assessment work for 1920, but the Senate Committee does not favor the suspension of the work for another year and decided on the extension of the time in which the work may be done, as stated above.

An amendment to the assessment work statute has been introduced by Senator Smoot, of Utah, which would change the assessment work year to the fiscal, rather than the calendar, year. This would include Alaska.

Only 97 War Mineral Claims Remain

Awards totaling \$75,631.56 were recommended during the week ended Dec. 4, by the War Minerals Relief Commission. The awards were as follows (the name of the claimant, the mineral, the amount recommended and its percentage relationship to the amount claimed are shown): Kershaw Mining Co., pyrites, \$57,011.07, 50 per cent; Sig. Salomon, chrome, \$206.28, 15 per cent; F. J. Abbott, tungsten, \$2,615.17, 20 per cent; Farmer & Walsh, chrome, \$2,770.82, 53 per cent; L. M. Mining Association, pyrites, \$9,606.98, 40 per cent; Colorado Manganese Mining Co., manganese, \$2,989.95, 80 per cent.

In addition, revised action was taken in three claims. In the case of Charles M. Tucker the full amount of his claim, \$770, was allowed. In the claim of F. R. & E. E. Smith an award of \$1,944 was recommended. The claim previously had been disallowed. In the claim of Ott and Thompson an additional \$400.48 was allowed. Previously the award had been for \$280.

Only ninety-seven claims remain to be acted upon.

Tariff Hearings Scheduled for Next Month

Tariff revision on metal imports will be the subject of hearings before the Committee on Ways and Means of the House of Representatives on Jan. 12, 13 and 14. The hearings on chemicals will be had on Jan. 6, 7 and 8, and on earths on Jan. 10 and 11. The free list is to be taken up at hearings on Feb. 11, 12 and 14.

It is not the intention to attempt the general revision of the tariff at this session of Congress. Advantage is to be taken of this time, however, to complete the hearings, so that a bill can be framed and introduced at the extra session, which is expected to be called before April 1.

Heads of Experiment Stations To Meet at Berkeley

Superintendents of the five western experiment stations of the U. S. Bureau of Mines have been instructed by Dorsey A. Lyon, the supervisor of stations, to report at Berkeley, Cal., Jan. 24, for a two-day conference on matters pertaining to future work and its co-ordination. The conference will also be attended by the deans of the five schools which are co-operating in the conduct of the experiment stations of the Bureau.

George A. Parks Heads Permanent Alaska Committee

Chairman Is Representative of Interior Department—Body To Enter Upon Its Work Immediately

As a further step toward providing more intelligent government for Alaska, and in an effort to stimulate further its industries, the President has given special authority to make permanent the interdepartmental committee which will deal with Alaskan problems. The committee is to be headed by George A. Parks, a mining engineer who has resided for thirteen years in Alaska, and who has made a special study throughout that time of the questions which will confront the interdepartmental committee. The President, in his letter to the Secretary of the Interior, said:

"In view of the work of the different departments in dealing with Alaskan affairs and the wisdom of co-ordination, I approve the formation of an interdepartmental committee to consist of a representative of the War, the Post Office, the Navy, the Interior, Agriculture, and Commerce departments; the Shipping Board; and the Federal Power Commission; the Governor of Alaska to be ex-officio a member.

"Each of the departments, the Shipping Board, and the Power Commission, is to appoint one member. The function of the committee is to co-ordinate and bring together facts and suggestions touching matters affecting Alaska, and to make recommendations for definite action to the department charged with the particular function, to the end that duplication may be prevented and efficiency secured.

"While the work of the committee is advisory, it is believed that by bringing together all available information and providing for an exchange of views by representatives of the different departments, much of the difficulties now experienced in dealing with Alaskan affairs will be obviated, and speedy and intelligent co-operative action secured.

"It is important that the committee have permanency. It will be well, therefore, that the representative of the Interior Department be the chairman, and that office space for the committee be there provided."

The personnel of the committee, in addition to Chairman Parks, is as follows: War Department, Maj. Clarence O. Sherrill, Corps of Engineers; Post Office Department, James B. Corridon, superintendent of railway adjustments; Navy Department, Capt. W. C. Cole, U. S. N.; Department of Agriculture, E. A. Sherman, associate forester; Department of Commerce, Dr. Hugh M.

Smith, Commissioner of Fisheries; Shipping Board, H. Y. Saint, staff assistant, office of director of operations; Federal Power Commission, O. C. Merrill, executive secretary, Federal Power Commission; Governor of Alaska, Thomas Riggs, Jr., member ex officio.

The committee will take up its work immediately, and among other things

will give consideration to the recommendations made by the Alaska Advisory Committee in its report of June 11, 1920, to Secretary Payne. This committee consisted of representatives of the Department of Agriculture, Post Office Department, U. S. Shipping Board, and the Interior Department. Its report dealt with many matters af-

fecting the growth and development of industries in Alaska, including mining, fisheries, farming, stock raising, timber, reindeer, transportation, road building, water power, etc. The organization of the present interdepartmental committee is in accordance with one of the recommendations of this Advisory Committee.

NEWS BY MINING DISTRICTS

CANADA

Ontario

Dome Mill Capacity Reduced to 600 Tons—Power Shortage and Drop in Silver Cause Further Curtailment

Porcupine—The Hollinger has declared a dividend of 1 per cent, payable Dec. 31, to shareholders of record Dec. 15. This makes a total of \$2,214,000 for the year and \$13,360,000 to date. Large supplies of coal are being rushed to the property to permit of the auxiliary steam plant being used to offset the shortage in hydro-electric power. The year's production is expected to reach a total of \$6,000,000.

On account of breakdowns to both the underground and mill crushers, the Dome mill capacity has been reduced to about 600 tons per day. It is understood, however, that the grade is very satisfactory, and the production for the year should be approximately \$2,000,000. The power shortage is still acute, and may cause further curtailment in milling, but should not interfere with underground operations.

Cobalt—A considerable decline in the price of silver has caused further curtailment of operations in the Cobalt district.

The Mining Corporation has stopped treating tailings in the Buffalo mill, and operations in other departments will be still further curtailed. It is understood that the Dominion Reduction will close its mill altogether. The operation of the high-grade plant for the treatment of flotation concentrates will be continued until toward the end of January, by which time all the concentrates on hand at the end of the clean-up and those concentrates from outside customers will be put through.

The Kerr Lake, which sends all its ore to the Dominion Reduction Co. plant, will also close. Kerr Lake is going ahead with its Utah property, and is now treating 100 tons of silver-lead ore a day. According to an official statement made last April, 87,000 tons were blocked out, averaging 18 oz. in silver and 80c. gold per ton. By the time the purchase price is completed, the property will represent an investment of about \$500,000.

La Rose has stopped work at its Violet property, and the underground

operations at the Bailey mine have been suspended.

The Ontario Department of Mines has just issued a report showing the output of the mines and smelters for the first nine months of 1920. The report shows a total production of \$35,920,418, which is an increase of \$6,000,000, as compared with the corresponding period of 1919. Practically all of the different metals covered by the report showed substantial increases, but the shortage of power and the low price for silver, as well as the curtailment of operations in the nickel field, will show a loss for the final three months as compared with the last three months of 1919. The report states, however, that on account of the drop in the price of commodities and the surplus of labor which now exists, this should prove specially advantageous to the gold-mining industry.

British Columbia

Trail—Shipments received at the Consolidated M. & S. Co.'s smelter during the week ended Nov. 30 totaled 12,502 tons. Shippers were as follows:

Mine	Location	Net Tons
Bluebell	Riondel	203
Canada Copper	Allenby	80
Horn Silver	Chopaka	53
Josie	Rossland	281
Knob Hill	Republic	56
North Star	Kimberley	173
Silver Cup	Gerrard	14
Velvet	Velvet	28
Company Mines		11,614

CALIFORNIA

Allison Ranch Starting New Exploratory Crosscut—Strike at Finnegan Mine Reported

Grass Valley—A new crosscut has been started in the Allison Ranch mines. This starts from the 600 level and will extend southwest into the Croesus and Keystone claims, where a system of ledges and pay-shoots is believed to exist. The crosscut from the 1,200 level into Hartery ground has so far failed to develop pay-streaks, although a strong ledge has been discovered. A 400-ft. raise has been driven, and drifting both ways on the ledge is now in progress.

The tunnel of the Placer Gold-Lead mine, near North Bloomfield, is now approximately 470 ft., and it is ex-

pected that the gravel channel rim will be cut within 150 to 200 ft. more. Two shifts are employed, and 30 ft. advance is being made per week.

J. Wesley Gebb, state mine inspector, has been devoting considerable attention to the new and reopened drift gravel mines of the Grass Valley district. In some of these properties bad ground has been encountered and the greatest care is necessary to avert accidents.

Angels Camp—There is a gravel mining boom developing and considering the number of undeveloped channels and gravel mines it has a chance of rivaling that of quartz. Since the reopening of the Victor, the Slab Ranch and the Sanguinetti gravel mines and the prospecting in the Rough Diamond gravel mine, much interest is being taken in working the old channels.

The discovery of a rich body of ore in the Finnegan mine at Carson Hill, south of Angels Camp, is considered encouraging. Several of the officials came from San Francisco in response to a telegram notifying them of the strike.

Knights Ferry—The Yankee Hill gold dredge, which started Nov. 19, is now running at capacity. At present it is situated about the middle of the Dan Mann and Sol Morris mining claims along the river. It will work two miles up stream from the starting point and two miles down stream, in accordance with present plans. Fifteen men are employed.

NEVADA

Reduced Railroad Rates Benefit Ely and Pioche

Ely—On Dec. 3 a new rate of \$3 per ton became effective on all ore of a value not exceeding \$15 per ton and consigned to Utah Smelting plants, adjacent to Salt Lake City from East Ely. This rate is a reduction of approximately \$1.25 per ton on the tariff recently instituted. The new rate will encourage a number of the low grade shippers. According to S. B. Elbert, who is in charge of the mining operations at Ward, 50 tons of ore will be shipped daily to the Utah smelters. The Jennie A mine in the Hamilton section near Ely is shipping ore which is being hauled to Kimberley at a total cost of \$19 per ton.

The Nevada Consolidated operating at about one-half normal capacity during the quarter ending Sept. 30, 1920, milled 671,063 dry tons as against 691,095 dry tons concentrated in the preceding quarter. The average copper assay of the ore milled was 1.5 per cent as compared with an average of 1.47 per cent during the preceding quarter. Cost of production was 16.04c. per lb. of copper.

Pioche—Ore shipments for the week ended Dec. 2 showed a large increase over the recent average, being 3,495 tons. Shippers were as follows: Prince Con., 1,865 tons; Virginia Louise, 950; Combined Metals, 305; Bristol Silver mines, 240; Black Metals, 50; Hamburg mines, 45, and Fairview Lease, 40.

Divide—The management of the Tonopah Divide has reported that its southeast drift on the 800 level is in \$35 ore for the last 80 ft. and that the face is in ore of the same grade with only one wall exposed. The ore is harder and more siliceous than on the upper levels and shows sulphides.

NEW MEXICO

Great Eagle Fluorspar Co. Incorporated

Lordsburg—The total shipments of crude ore from this district for November amounted to 91 carloads, 4,445 tons, of an approximate value of \$66,675.

The Great Eagle Fluorspar Co. has been incorporated with a capital of \$100,000 by Merton W. Wentworth and Cyrus G. Goodrich, of Battle Creek, Mich., and Alford Roos and R. S. Spann, of Lordsburg, N. M. A large warehouse with ore platform, bins and track scale will be built at once.

Steins Pass—McGee Bros. have been carrying on development work quietly for the last three years upon their zinc property three miles south of town. They now have enough ore blocked out to justify a 100-ton mill, which will be built at an early date. A steam power plant of 300 hp. will also be put in. Water will be developed in the Animas Valley and pumped to the mill, a distance of 2½ miles, with a head of 400 ft. The orebodies opened up are large, and about 20,000 tons of lead-silver-zinc ore is in sight. The main shaft is down 300 feet and core drilling has been done to a depth of 600 ft., showing heavy lead sulphides.

COLORADO

Portland No. 2 Shaft Now Deepest in District

Cripple Creek—Shaft No. 2 of the Portland Gold Mining Co. has reached a depth of 2,450 ft., and is now the deepest shaft in the district. The collar of the shaft is at an altitude of 10,244 ft., and the new shaft station is being cut at an elevation of 7,794 ft. As soon as this is completed, development will be started on this level to determine the downward continuation of the big oreshoot opened on the 21st and 23d levels. The hoist from the

Granite mine, which was recently purchased by the Portland company, will be installed at Shaft No. 2. A new screening plant is being installed to reduce the amount of hand labor on the surface.

MONTANA

Anaconda Closes Leonard Mine—Barnes-King Operating Shannon Only

Butte—The closing of the Leonard mine of the Anaconda Copper Mining Co. last week, rendering 400 men idle serves further to emphasize the depression into which the copper market has fallen. With the Leonard down, Anaconda's production is reduced to about 40 per cent of normal. Officials of the Anaconda declined to discuss the probability of a further reduction in output or whether or not wages would be cut, but from the pessimism prevailing in producing circles the belief obtains there will be a wage reduction from \$5.75 to \$4.75. Development work in such properties as are being operated is being conducted practically on a normal basis. Fireproofing has been halted until market conditions improve and no more money is being expended other than that which is necessary.

With the surplus of labor rapidly increasing in the Butte district, applications for silver leases are increasing, the price of the metal under the Pittman Act offering to the miner about the only hope at the moment. Efficiency of the miners still at work is showing a marked increase and for the first time in years there is a total absence of any radical talk, with no mention whatever of the I. W. W. being heard.

The directors of the Barnes-King have decided to make no effort to reopen the Piegan-Gloster property until improvement in the gold situation is in evidence. But one mine is now being operated by the company, the Shannon in the Marysville district. The North Moccasin is being worked by lessees.

WASHINGTON

Mineral Creek Copper Co. Shuts Down—American Refractories Co. Increasing Magnesite Shipments

Seattle—Unless the present sagging copper market takes a turn for the better several copper properties now operating in Washington will be forced to shut down, it is stated. It costs the small producers of Washington an average of about 15c. a pound to produce copper and several of them are now losing money. It is expected that the Sunset Copper Co. operating near Index will suspend operations in a short time. Their mine and mill are in excellent physical shape.

Cle Elum—The Mineral Creek Copper Co., operating a property at the head of Little Lake Kachess, has closed down for the winter season but expects to resume operations early in the summer if market conditions are

then favorable. During the past summer they erected a small mill with a Forrester rod mill, Wilfley tables and Ziegler flotation cells. The property is developed with 2,000 ft. of tunnels and a large mineralized zone of chalcopyrite replacing granite along shatter planes has been developed.

Valley—The American Refractories Co. of Pittsburgh, which are operating the Double Eagle magnesite deposit, are increasing their shipments of calcined magnesite. The 14-mile truck road between the quarries and Valley is being repaired and the number of auto trucks increased to a three-shift basis.

SOUTH DAKOTA

Labor Becoming More Plentiful in Black Hills District—Golden Crest Property Sold

Deadwood—James Hardin, of Deadwood, and associates in New York City have purchased the Golden Crest property in the Two Bit district, and work has already started to place the mine in shape for operation. The property is equipped with a complete treatment plant as well as all machinery for mine development. This will be added to and overhauled and it is expected that active work will be started early next year. The new management states that all work will be pushed, that arrangements for placing the treatment plant in commission will also be completed early and that production of bullion will be made in 1921. The property has been idle for a number of years, but during the years of operation a good grade of milling ore was developed and a large amount of underground work completed. This mine work together with the equipment has cost to date over \$300,000. James Hardin, of Deadwood, will have charge of the work and it is expected that an active producer will be added to the list of Black Hills mines.

Deadwood—New pumps and equipment have arrived at the property of the Cutting company, and are being installed to handle the large amount of water that necessitated the suspension of work in October. The company is making the necessary installations and active work will again be started soon after the first of the year.

Lead—The Monroe mill of the Homestake company at Terraville has been placed in commission and a total of 920 stamps are now dropping. There remain 100 stamps that are as yet idle, but these will be used early in 1921. Labor is becoming more plentiful and it is expected that a normal production will be reached early in the next year. Good progress is being made with improvements, and the Ellison hoist, which is being changed from steam to electric power, will be ready for use during the coming summer. The cages in this shaft will be replaced by skips. Most of the equipment required for the change has been received.

JOPLIN-MIAMI DISTRICT

Oklahoma-Kansas-Missouri

McCullough and Associates Sue for Loss Through Trespass on Fish Land Lease

Miami, Okla.—Suit was filed here Dec. 8 by W. P. McCullough, B. E. Beth, and Thomas F. Phillips for recovery of damages in the amount of \$155,000, which they claim from Wesley M. Smith, the Quebec Mining Co., C. H. Plumb, E. R. McClelland, J. S. Mabon, the Tri-state Mining Co., and others. The plaintiffs allege that the McCullough lease to certain portions of the Fish estate in the Picher mining field is the legal lease and that the lease of Wesley M. Smith is not legal, and on this ground they ask the return to them of \$125,000 paid in royalties by the Quebec Mining Co., and \$30,000 paid as a bonus. They also ask \$100,000 damages for loss through similar trespass on other sections of the Fish land lease, which they assert rightfully belongs to McCullough. The suit is ancillary to another tried in the Federal Court for the eastern district of Oklahoma in which McCullough's claims were upheld.

Joplin—It is rumored here that the Metals Extraction Corporation of America, which has been operating a zinc-oxide plant, employing a new process at Galena, Kan., is about to be absorbed by large eastern interests.

MINNESOTA

Mesabi Range

McKinney's Stevenson Mine Down—Rogers Brown Ore Co. To Have Fire-Proof Shaft

Virginia—The new shaft being sunk by Coates & Tweed Co. at the Julia mine is rapidly nearing completion. The company expects to be able to stock ore from it this winter.

Hibbing—Seven state owned properties report for the week ended Nov. 27 a total shipment of 72,485 tons.

The Stevenson mine of the McKinney Steel Co. has closed down and indications are that it may not operate next shipping season. The company has offered to send its several hundred employees to its coal mines in Kentucky.

The Rogers Brown Ore Co. has decided to put in steel sets instead of wood or concrete for its new shaft timbers. The shaft will be approximately 335 ft. deep and the only wood used will be the skip guides, which will make the shaft practically fire-proof. There will be five compartments with inside dimensions of 17 ft. 2 in. by 10 ft. The compartments will be as follows: Cage, 5 ft. 8 in. by 10 ft.; two skip compartments each 5 ft. by 6 ft.; and a ladder and pipe compartment 5 ft. by 3 ft. 7 in. respectively. The wall and end plates will be of 18-inch I-beams and the dividers will be 9-in. I-beams. The studdles will be 3½ by 3½ by ¾-in. angle irons. There will be three sets of bearers besides the surface ones, spaced approximately 85 ft. apart and

made of 12-in. I-beams 20 ft. long. The surface bearers will be of 18-in. I-beams 27 ft. long. The shaft lining will consist of reinforced concrete slabs for which the American Bridge Co. has designed special forms to conform with their design.

Vermillion Range

Ely—The Chandler Mining Co., operating the North Chandler and South Chandler mines, shipped a total of 133,000 tons of ore this season. The South Chandler reports 58,000 tons and the North Chandler 75,000 tons. It is reported that the mines will curtail their operations this winter and only work at one-half normal.

ALABAMA

Republic Company's Spalding Mines Shut Down—Production of Pig Held Back

Birmingham—Brown ore development in the next twelve months in Alabama promises to be on a big scale. Investigations are being made by representatives of financial interests of the Middle West and elsewhere that hold out great promise. Brown ore fields in the vicinity of Russellville, around Goethite and on the Alabama-Tennessee state line are receiving attention. The Republic Iron & Steel Co. is preparing to build a washery in its brown ore field around Goethite, Bibb County.

The Republic company has shut down its Spalding red ore mines, and will make no effort for further output there until the pig iron market is better and a large accumulation of ore has been consumed. The Republic company has only one out of three of the blast furnaces in this district in operation and the needs of ore are being supplied from the Raimund red ore mines and the brown ore mines. Dave McDaniels, who has been superintendent at the Spalding mines, has been transferred to the Raimund mines and W. H. Jobe, superintendent there, who came to Alabama from the Wisconsin-Michigan fields a few years ago, will take a position with another company.

The site has been purchased and the Federal Government will shortly begin construction of a coal-storage plant at Mobile, to handle coal being shipped from the Birmingham district down the Warrior River for export and to coal ships touching at the port of Mobile. The plant will have a compartment that will permit the handling of ore, regular shipments of manganese ores from Brazil and other countries for use in the Birmingham district being promised. The river transportation facilities of the Government are now handling a shipment of 6,500 tons of manganese ore from Brazil and one furnace of the Tennessee Coal, Iron & RR. Co. is on ferromanganese iron altogether. It is expected that the storage plant will be completed by May 1 next and then the imported ore can be brought with greater frequency and, awaiting barges to handle it up the Warrior River, can be stored at Mobile.

Chronology of Mining
November, 1920

Nov. 1.—Interstate Commerce Commission opened hearings in Salt Lake City, Utah, concerning increases in intrastate freight rates on coal and ore.—Copper Queen at Bisbee, Ariz., laid off 350 steam-shovel men on Sacramento Hill.—Temiskaming Mine Managers' Association restored flat-rate wage scale.—United Verde Copper Co. reduced its force by 30 per cent.

Nov. 2.—Walker Copper Co., Quincy, Cal., laid off most of its miners.

Nov. 3.—Officials of British coal miners declare off the the general British coal strike.

Nov. 4.—New Idria Quicksilver mine, Cal., closed its larger plant.—Judge S. L. Pattee, Bisbee, Ariz., dismissed the 206 deportation cases pending due for trial Nov. 8.

Nov. 6.—Fire found burning in magazine on 300-ft. level of Fairview Fluorspar & Lead Co.'s mine.

Nov. 8.—Tom Read Gold vs. United Eastern apex suit came to trial before Mohave County, Ariz., superior court.

Nov. 10.—U. S. Court of Claims dismissed claim by American Smelting & Refining Co. against United States for additional payment of \$512,515 on 33,069 tons copper taken at 23½c. per lb. during war.—Quincy Mining Co., Hancock, Mich., started up new 6,000-hp. Nordberg hoist.

Nov. 11.—American Engineering Standards Committee met in New York City.

Nov. 12.—Apex suit between Federal Mining & Smelting Co. and the Hecla Mining Co. officially announced to have been settled.

Nov. 13.—A circuit of mines in Grass Valley, Cal., district was served by airplane carrying supplies.

Nov. 15.—American Mining Congress' 23d annual session opened at Denver, Col., closing on Nov. 19.

Nov. 16.—Calumet & Hecla reduced all wages and salaries 15 per cent, closed down Osceola branch, and reduced forces at other mines; 1,500 men affected.

Nov. 17.—Nenzel Crown Point Mining Co.'s holdings sold at public auction.

Nov. 18.—American Metal Co.'s coal mines in Monclova district, Coahuila, Mexico, seized by striking Mexican coal miners; Americans warned out of the district.

Nov. 19.—American Engineering Council of Federated American Engineering Societies organized at Washington, D. C.; Herbert Hoover elected president of F. A. E. S.

Nov. 26.—Suit against J. F. Robinson and Commerce Mining & Royalty Co. for \$200,000 damages and recession of land abruptly thrown out of court by Judge E. F. Laster, Miami, Okla.

Nov. 30.—Last ore carrier cleared from the Missabe docks at Duluth and Superior.

THE MARKET REPORT

Daily Prices of Metals

Dec.	Copper, N. Y. net refinery*		Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.	
9	13.50@13.75	32.50	35.75@36.00	4.90@5.00	4.75@5.00	6.10@6.25	
10	13.50@13.75	31.50	34.50@35.00	4.85@5.00	4.75@5.00	6.10@6.20	
11	13.50@13.75	31.50	34.25@34.50	4.80	4.75@5.00	6.00@6.10	
13	13.50@13.75	31.00	33.00@33.50	4.60@4.75	4.75	5.90	
14	13.25@13.50	30.50	33.00@33.50	4.50@4.75	4.75	5.85	
15	13.25	31.50	34.00@34.50	4.50	4.60@4.75	5.70	

*These prices correspond to the following quotations for copper, "delivered": 13.75 @14, 13.75@14, 13.75@14, 13.75@14, 13.50@13.75, and 13.50.

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

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

Quotations for zinc are for ordinary Prime Western brands. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Dec.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3 M	Spot	3 M	Spot	3 M
	Spot	3 M							
9	79 $\frac{3}{4}$	79 $\frac{3}{4}$	90	228	232	26	26 $\frac{3}{4}$	31 $\frac{1}{2}$	33 $\frac{3}{4}$
10	77 $\frac{3}{4}$	77 $\frac{3}{4}$	89 $\frac{1}{2}$	223	226	25 $\frac{1}{4}$	26 $\frac{3}{4}$	30 $\frac{1}{4}$	31 $\frac{3}{4}$
11	...	...	...	...	...	...	...	...	...
13	76 $\frac{3}{4}$	76 $\frac{3}{4}$	87 $\frac{1}{2}$	215	218	24 $\frac{3}{4}$	25	28 $\frac{3}{4}$	30
14	75 $\frac{3}{4}$	75 $\frac{3}{4}$	87 $\frac{1}{2}$	212 $\frac{1}{2}$	216	23	24 $\frac{1}{4}$	28	29 $\frac{3}{4}$
15	75 $\frac{1}{2}$	75 $\frac{1}{2}$	87	217 $\frac{1}{2}$	228	22 $\frac{1}{2}$	23 $\frac{3}{4}$	25 $\frac{1}{2}$	27 $\frac{1}{2}$

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

Silver and Sterling Exchange

Dec.	Sterling Exchange	Silver			Dec.	Sterling Exchange	Silver		
		New York, Domestic Origin	New York, Foreign Origin	London			New York, Domestic Origin	New York, Foreign Origin	London
9	344	99 $\frac{1}{2}$	60 $\frac{3}{4}$	39 $\frac{1}{2}$	13	344 $\frac{1}{2}$	99 $\frac{1}{2}$	62 $\frac{3}{4}$	40 $\frac{1}{2}$
10	344	99 $\frac{1}{2}$	59 $\frac{1}{2}$	38 $\frac{3}{4}$	14	344	99 $\frac{1}{2}$	62 $\frac{1}{2}$	40 $\frac{3}{4}$
11	344	99 $\frac{1}{2}$	61 $\frac{3}{4}$	40 $\frac{1}{2}$	15	346 $\frac{1}{2}$	99 $\frac{1}{2}$	66	42 $\frac{3}{4}$

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

Metal Markets

New York, Dec. 15, 1920

Several times this year firmness in the local metal market has been killed by declines in London, which have not only a sentimental effect here but also have threatened the importation of European metal into this country. That has been the case the last week. As we mentioned on Dec. 8, the feeling here was much better and prices were tending to advance slightly. Beginning with Thursday, Dec. 9, however, the declines in the London market have been regular and violent, with no promise of their being at an end, deflation in general there not having progressed as far as in this country. Local interests have been quick to accord with the movement, and sharp price cutting has

been in evidence. Some producers refuse to do any business whatever at the current figures. The price of metals in London will, without doubt, dominate the local markets for the next few weeks.

Copper

Some of the larger producers continue to hold for 14c. delivered, and on Thursday and Friday did a satisfactory business at that figure. On Tuesday, however, the price declined, and this week, with copper being freely offered at 13 $\frac{1}{2}$ c. delivered, it is probable that holders at the 14c. price are doing little or no business. Sales have been scattering and not of large individual volume. Consumers in general are willing to buy only small lots. If a large order should come into the market, there is

no doubt that some very attractive prices, considerably under the current low levels, would be quoted.

Although metal for December or January can be obtained at the prices we quote, a premium of about $\frac{1}{8}$ c. for each succeeding month is being asked. Almost no metal is being booked for these forward deliveries.

Reports from the League of Nations conference at Geneva indicate that some plan for financing the sale of copper until it can be fabricated may be decided on. Just what effect this will have on the market remains to be seen. If a workable plan can be agreed upon a great deal of good may come from this movement.

Lead

Lead prices held up manfully to the 5c. level on Thursday and Friday, and quite a few small orders were taken at that price, though on somewhat larger business the price was shaded 10 or 15 points. Many of the sales were made to jobbers. On Monday, however, the London influence could no longer be withstood, and the 5c. price became purely a nominal one. Today metal for any delivery and in any quantity could be obtained at 4.50c., New York. Even at this price it will be profitable to fill orders with lead imported from Germany or Spain. There has been no rush on the part of consumers, and it seems that they do not care for the metal at any price.

In St. Louis, the lead business is exceedingly dull. There are practically only two sellers, and they are not now reported as offering anything at as low figures as now prevail in New York. With the New York price being influenced by the cost of importation, the tendency will again be for the Western price to be higher than at the seaboard.

Zinc

The pronounced upward movement recorded last week was of short duration. With the violent declines abroad, the price has again dropped below 6c. and is still heading downward. Today zinc can be bought in Europe and delivered here at a profit at any price over 5c., so the possibility of improved prices, even with a further curtailment of domestic production, is not alluring. Zinc can now probably be obtained at the same price in New York as we quote for St. Louis, and possibly less. With business at practically a standstill, prices are largely nominal. On orders of any size there is little doubt that today's figure of 5.70c. could be shaded, particularly for New York delivery.

Tin

As would be expected, with the unsettlement abroad, this metal has been weak and irregular. Straits has sold as low as 31c. for spot metal, that be-

ing the settlement price of a 25-ton lot sold at auction on the New York Metal Exchange yesterday. This auction, however, was a fluke, as such sales are likely to be these days, with no demand. One sale of electrolytic tin of fairly satisfactory size was made on Thursday at approximately the price for spot Straits.

Straits tin for future delivery: Dec. 9th, 36.75@37c.; 10th, 36@36.25c.; 11th, 35@35.50c.; 13th, 34.25@35c.; 14th, 35@35.50c.; 15th, 35.50@36.50c. Demand fairly good.

Arrivals of tin in long tons: Dec. 11th, London, 80; 13th, Straits, 375.

Silver

Since our last week's report there has been some improvement in the market price of silver. This advance was a natural reaction from the sharp declines which have occurred over a considerable period. It is only reasonable to expect that at some point there would be a reaction, and as the impression prevailed that any further material decline would result in the closing up of foreign mines, operators have taken advantage of the situation to cover short sales, and there has been buying for speculative account and China operations. The market is very sensitive, and it is difficult to predict the immediate future.

Mexican Dollars—Dec. 9th, 46½; 10th, 45½; 11th, 46½; 13th, 47½; 14th, 47½; 15th, 50½.

Gold

Gold in London: Dec. 9th, 119s.; 10th, 118s. 2d.; 13th, 118s. 9d.; 14th, 118s. 7d.; 15th, 117s. 10d. Five million dollars in Australian gold is being taken by a local bank. The Australian government allows only current mine output to be exported.

Foreign Exchange

With foreign business exceedingly dull and with scarcely any speculation in foreign exchange, the market has been dull and narrow. On Tuesday, Dec. 14, francs were 5.85c.; lire, 3.44c.; and marks, 1.34c. New York funds in Montreal advanced to a premium of 16½ per cent.

Other Metals

Aluminum—For 50-ton lots: ingot, 99 per cent and purer, 33c.; 98@99 per cent, 32c. Outside sales reported at as low as 22c.

Antimony—Chinese and Japanese brands, 5½@5¾c.; market very quiet; W.C.C. brand, 6¼@6¾c. per lb. Cookson's "C" grade, 11@12½c. Chinese needle antimony, lump, nominal at 4½c. per lb. Standard powdered needle antimony (200 mesh), 7¼c. per lb.

White antimony oxide, Chinese, guaranteed 99 per cent Sb₂O₃, wholesale lots, 7c.

Bismuth—\$2.40 per lb., 500-lb. lots, and \$2.42 per lb., 100-lb. lots.

Cadmium—Nominal, \$1.40 per lb. Cobalt—Metal, \$6 per lb.; black oxide, \$4.10 per lb.; sulphate, \$1.60.

Iridium—Nominal, \$350@400 per oz.

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

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

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

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

Osmium—Open market, \$70@80 per troy oz.

Palladium—\$85 per oz.

Platinum—Firm at \$85 per oz. Nominal.

Quicksilver—Nominally \$50 per 75-lb. flask, with second-hands selling as low as \$47 per 75-lb. flask. San Francisco wires \$50@55. Market dull.

Rhodium—\$200@225 per troy oz.

Ruthenium—\$175@200 per troy oz.

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

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

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

Metallic Ores

Chrome Ore—Guaranteed 50 per cent Cr₂O₃ foreign ore with a maximum of 6 per cent silica, 55@60c. per unit, New York. California concentrates, 50 per cent Cr₂O₃ and upward, 60@65c.

Manganese Ore—45@50c. per unit, seaport; chemical ore (MnO₂) \$60@65 per gross ton, lump; \$75@80 per net ton, powdered.

Molybdenum Ore—85 per cent MoS₂, 55@60c. per lb. of contained sulphide, New York.

Tantalum Ore—Guaranteed minimum 60 per cent tantalic acid, 45c. per lb. in ton lots.

Titanium Ores—Ilmenite, 52 per cent TiO₂, 1¼@2c. per lb. for ore. Rutile, 95 per cent TiO₂, 15c. per lb. for ore, with concessions on large lots or running contracts.

Tungsten Ore—Scheelite, 60 per cent WO₃ and over, per unit of WO₃, \$4@4.50, f.o.b. mines; wolframite, 60 per cent WO₃ and over, per unit of WO₃, \$4@4.25, in New York.

Uranium Ore (Carnotite)—Ore containing 1½ per cent U₃O₈ and 5 per cent V₂O₅ sells for \$1.50 per lb. of U₃O₈ and 75c. per lb. of V₂O₅; ore containing 2 per cent U₃O₈ and 5 per cent V₂O₅ sells for \$2.25 and 75c. per lb., respectively; higher U₃O₈ and V₂O₅ content commands proportionately higher prices.

Vanadium Ore—\$1.50 per lb. of V₂O₅ (guaranteed minimum of 18 per cent V₂O₅), New York.

Zircon—Washed, iron free, 5c. per lb.

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

Zinc and Lead Ore Markets

Joplin, Mo., Dec. 11—Zinc blende, per ton, high, \$36.75; basis 6 per cent zinc, premium, \$33.50; Prime Western, \$32.50; fines and slimes, \$30 @ \$27.50; calamine, basis 40 per cent zinc, \$30.

Furnished by Foote Mineral Co., Philadelphia, Pa.

Average settling prices: Blende, \$34.99; calamine, \$30; all zinc ores, \$34.90.

Lead, high, \$67.85; basis 80 per cent lead, \$65 @ \$47.50; average settling price, all grades of lead, \$60 per ton.

Shipments for the week: Blende, 6,515; calamine, 135, lead, 1,432 tons. Value, all ores the week, \$318,050.

Fifty mills, or 45 per cent of the total number in operation in mid-summer, are now idle, representing about 35 per cent suspension of output. An additional 10 per cent restriction is occasioned by curtailment in working forces at mines in operation. This cuts off around 3,750 tons per week from the midsummer producing capacity, and will reduce December production about 18,750 tons, 48,750 tons by the fifth of March.

Platteville, Wis., Dec. 11—No market here again this week. Mines continue to close. Shipments for the week: blende, 604; calamine, 17 tons. Shipments for the year: blende, 59,885; calamine, 2,551; lead, 452; sulphur ore, 1,242 tons. Shipped during week to separating plants, 1,538 tons blende.

Non-Metallic Minerals

Asbestos—Crude, No. 1, \$2,000@3,500; No. 2, \$1,400@2,000; spinning fibres, \$400@1,000; magnesia and compressed sheet fibres, \$325@500; shingle stock, \$110@150; paper stock, \$60@75; cement stock, \$17.50@30; floats, \$8.50@15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax.

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

Chalk—English, extra light, 5@5½c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

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

Feldspar—Crude, \$8@14 per gross ton, f.o.b. Maryland and North Carolina points; \$7.50@10, f.o.b. Maine; ground, \$27@30, car lots, f.o.b. Baltimore; ground, \$17@21, f.o.b. North Carolina points; \$17@21 per ton, No. 1 ground, f.o.b. New York State; \$21@23 per ton, ground, f.o.b. Maine. Crude spar very scarce.

Fluorspar—Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, \$25 per ton, f.o.b. Illinois mines, and \$25.50, f.o.b. Kentucky; ground, suitable for acid, chem-

ical or enameling purposes, \$60; lump, \$17.50, f.o.b. Tonuco, N. M. In Canada 85 per cent calcium fluoride sells for \$20 per ton, f.o.b. Madoc; output limited. Canadian price generally \$18 (Canadian currency) per ton, f.o.b. mines; market inactive.

Fuller's Earth—\$16 per ton, carload lots, f.o.b. New York.

Graphite—The 90 per cent crucible grade is held in Alabama for 9c. per lb. and 85 per cent grade, 7@9c. Lubricating grade commanding the best price is a fine flake, passing a 100@120 mesh, and running higher than 96 per cent carbon. Linotype machines use a flake passing 90 mesh and standing on a 120 screen, with 90 per cent carbon, retailing at 75c. to \$1 per lb. and selling to jobbers at 11@40c.

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

Kaolin—See China Clay.

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

Magnesite, Calcined—High-grade caustic calcined, lump form, \$35@40 per ton, carload lots, f.o.b. California points. In Chicago district, \$57.70; Atlantic seaboard, \$61@63.

Dead-Burned—\$38 per net ton, Chewelah, Wash.; \$58@64, Chester, Pa. Austrian grade, \$55@60 per ton, f.o.b. Baltimore. (Magnesite brick—See Refractories.)

Mica—India block mica slightly stained, per lb.: No. 6, 50c.; No. 5, \$1.20@1.40; No. 4, \$2@3; No. 3, \$4.25@5; No. 2, \$5.50@7; No. 1, \$8. Clear block; No. 6, 55c.; No. 5, \$1.75; No. 4, \$3.25; No. 3, \$5; No. 2, \$6.50; No. 1, \$8; A1, \$10; extra large, \$25; all f.o.b. New York; ground, \$150 per ton, Philadelphia. Domestic, uncut, f.o.b. Franklin, N. C., as follows: Scrap, \$45@50 per ton; punch, 10c. per lb.; circle, 15@25c.; 1½ x 2 in., 75c.; 2 x 2 in., \$1.15; 2 x 3 in., \$1.65; 3 x 3 in., \$2.10; 3 x 4 in., \$2.50; 3 x 5 in., \$2.75; 3 x 6 in., \$3.75; ground 165 mesh, \$150@170 per ton; ground roofing mica, \$60; mica washers, 75c.@2 per lb.; 1½-in. disks, No. 1, \$1.40 per lb.; No. 2, \$1.25. The foregoing domestic prices obtain also in the Chicago district.

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

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, \$13; 75 per cent, \$11.50; 75@74 per cent, \$11; 70 per cent, \$8.35; 68 per cent, \$7.85; 68@66 per cent, \$7.60. Finely ground Tennessee rock sells for \$8.50 per net ton for 13 per cent phosphorus content, agricultural application; for acid-making, 14 per cent, \$9; both prices being f.o.b. Centerville, Tenn.

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

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

Quartz—(Acid tower) fist to head, \$10; 1½ to 2 in., \$14; rice, \$17; all net ton, f.o.b. Baltimore; lump, carload lots, \$5@7.50 net ton, f.o.b. North Carolina mines.

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

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

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

Mineral Products

Arsenic—White arsenic, 12@12½c. per lb.; sulphide, powdered, 15@15½c. per lb. in carload lots.

Sodium Nitrate—\$3 per cwt., ex vessel, Atlantic ports. Market quiet.

Sodium Sulphate—For 95 per cent material, \$22 per ton, f.o.b. mines, Idaho and Arizona, spot and six months' contract.

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

Ferro Alloys

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

Ferrocerium—Per lb., \$12@15.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 16@17c. per lb. of chromium contained; 4 to 6 per cent carbon, 17@18c., f.o.b. works.

Ferromanganese—Domestic 76 to 80 per cent, \$150, freight allowed; \$145, f.o.b. seaboard bases; English, \$135@140, c.i.f. Atlantic seaports. Spiegel-eisen, 18@20 per cent, \$60@65, f.o.b. furnace.

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

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, \$60@65; 50 per cent, \$78@80; 75 per cent, \$160.

Ferrotungsten—Domestic, 70 to 80 per cent W, 65@75c. per lb. of contained tungsten, f.o.b. works. Foreign, 65c.

Furnished by Foote Mineral Co., Philadelphia, Pa.

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

Ferrovanadium—Basis 30 to 40 per cent, \$6.50@7.50 per lb. of V contained, according to silicon content, f.o.b. works.

Metal Products

Copper Sheets—Current New York price, 23½c. per lb.; wire, 18c. Even lower quotations are heard.

Lead Sheets—Full lead sheets, 9½c.; cut lead sheets, 9½c. in quantity, mill lots.

Nickel Silver—Unchanged at 34½c. per lb. for 18 per cent nickel.

Yellow Metal—Dimension sheets, 21½c.; sheathing, 21½c.; rods, 5 to 3 in., 18½c.

Zinc Sheets—\$11.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 10½c. per lb.

Refractories

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

Chrome Cement—40@45 per cent Cr₂O₃, \$55@60 per net ton, and \$65 in sacks, carload lots, f.o.b. eastern shipping points.

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

Magnesite Brick—9-in. straights, \$110 per net ton; 9-in. arches, wedges and keys, \$120; soaps and splits, \$130.

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

Iron Trade Review

Pittsburgh, Dec. 14, 1920.

The rate of steel-ingot production in November may be estimated at 36,000,000 tons a year, against a 42,000,000-ton rate during the preceding ten months. The Steel Corporation's output is even greater now than formerly, but the independents seem to be well below 50 per cent, the divergence being due to the difference in price policy. The independents are now down to the Steel Corporation prices, except on pipe, but did not get down soon enough to accumulate orders, and there is now no buying.

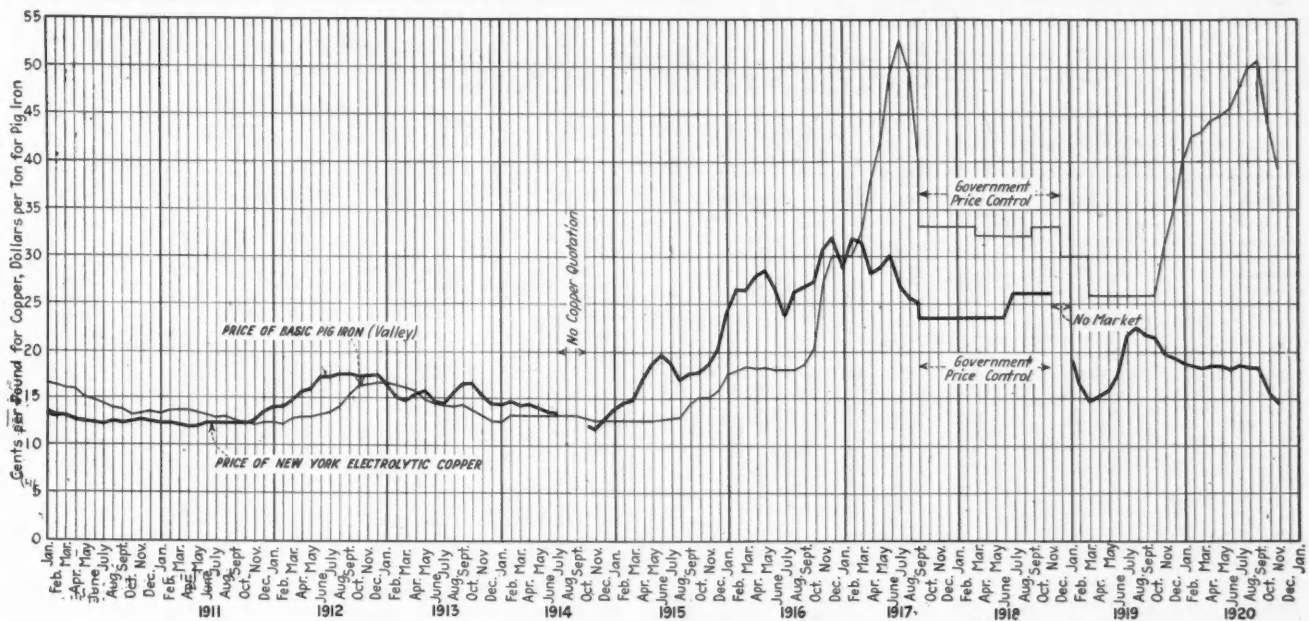
Pig Iron—Foundry iron is quotable at \$35, Valley, or \$2 decline, bessemer and basic remaining at \$35 and \$33 respectively. There is no demand, and additional furnaces are going out of blast.

Semi-finished Steel—A large independent having outstanding contracts to furnish sheet bars at \$65, but lacking specifications, has revised the contracts to the Steel Corporation price of \$47, which is now the market. Billets have not developed a market.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 5½c. per lb., in 250-lb. bbls. Barrel charge is 35c. additional.

Connellsville—Furnace, \$10@12; foundry, \$8@10.



FLUCTUATIONS IN MONTHLY AVERAGE PRICE OF ELECTROLYTIC COPPER AND BASIC PIG IRON, 1910-1920

A Comparison Between Copper and Pig-Iron Prices

An Analysis of Price Curves Shows That Pig Iron Is Strikingly Less Sensitive Than Copper in Acknowledging a Major or Minor Market Trend

THE curves illustrated above show the fluctuations in the monthly average price of electrolytic copper at New York and the price of basic pig iron at Valley furnaces. Basic pig iron has been selected from the various pig-iron grades because it represents by far the greatest production of all classes of pig iron traded. The vertical scales of the curves have been so chosen that in pre-war years the curves of metal prices are placed closely together, admitting of easier comparison. It should be noted that a fluctuation of 1c. in the price of copper is relatively equivalent to a fluctuation of 100c. in the price of pig iron.

An inspection of the curve will show that there are both major and minor movements in the prices of each of these commodities. The major movement is shown by a definite upward or downward trend over a period usually several years long, whereas a minor movement records merely a temporary setback or recession in the general trend of a major movement.

For the period covered by the graph there are three well-defined "major" peaks in the copper and pig-iron curves. The first occurred in the summer of 1912 for copper, and the winter of 1912 for pig iron; the second just prior to the assumption of governmental price control—in the winter of 1916-1917 for copper, and in the summer of 1917 for pig iron; the third, which is commonly called the peak of post-war inflation, occurred in the summer of 1919 for copper, and the fall of 1920 for pig iron. In each case there was a decided lag on the part of pig iron to reach its peak price as compared with copper, the time of lag varying from four to thirteen months.

A glance at the behavior of these metals during major declines in the market will show a similar lag for pig iron. The first major decline for the period under discussion occurred during 1910 and the early part of 1911. Copper reached bottom in April and May of 1911; pig iron continued its decline until November of the same year. The next major drop began in the fall of 1912 and the winter of 1913, extending well into 1914, and being the immediate effect of the depression that resulted from the declaration

of hostilities in Europe. Copper ended its decline in November, 1914, and started on an upward climb that was to take over two years; pig iron reached its major low point at practically the same time as copper in this major downward movement.

The third major decline in the ten-year period covered by the graph took place a few months before the institution of governmental price control of both metals, and, although the fluctuations in prices were arbitrarily controlled by governmental authority for an extended period thereafter, the price declined upon the removal of price restriction, both copper and pig iron reaching a major low point in March of 1919. The pig-iron price fixed by the Industrial Commission of the Department of Commerce ruled the pig-iron market for several months immediately after the low of March, 1919, but copper quickly rose in price under the stimulus of post-war speculation and inflation.

The next major decline, or what will undoubtedly become such, began in August of 1919 for copper, and September of this year for pig iron—an interval of thirteen months. Copper, as can readily be seen from the curve, has reached a pre-war price level; pig iron has still to take a great fall before it reaches the pre-war plane.

In the minor movements of these two metals the same tardiness of pig iron to respond to market conditions is apparent. The curves speak for themselves, and detailed enumeration of instances where this condition has prevailed is needless.

The conclusion is warranted that for the past critical and important ten years pig iron has strikingly failed to "sense" the metal market as compared with copper, and that it has been and is consistently tardy in its acknowledgment of a change in the market. This property of pig iron may be ascribed to various causes, not the least of which is the greater concentration of the iron and steel industry in the hands of one large and overshadowing producer, whereas the copper-producing interests are more evenly distributed, with greater competition than in the iron and steel trade.

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:

	Large Mill Lots		St. Louis	Chicago	San Francisco	New York	
	Pittsburgh	St. Louis				Current	O. e. Yr. Ago
Blue Annealed							
No. 10.....	\$3.55-4.50	6.22½	7.13	8.65	\$5.20-6.15	4.57	
No. 12.....	3.60-4.55	6.27½	7.18	8.70	5.25-6.20	4.62	
No. 14.....	3.65-4.60	6.32½	7.23	8.75	5.30-6.25	4.67	
No. 16.....	3.75-4.70	6.42½	7.28	8.85	5.40-6.35	4.77	
Black:							
*Nos. 18 and 20.	4.20-5.35	8.00	7.90	10.60	6.50-8.00	5.30	
*Nos. 22 and 24.	4.25-5.40	8.05	7.95	10.65	6.55-8.05	5.35	
*No. 26.....	4.30-5.45	8.10	8.00	10.70	6.60-8.10	5.40	
*No. 28.....	4.35-5.50	8.20	8.10	10.80	6.70-8.20	5.50	
Galvanized:							
No. 10.....	4.70-6.00	8.70	8.60	.....	8.00-8.25	5.75	
No. 12.....	4.80-6.10	8.80	8.70	11.35	8.10-8.25	5.85	
No. 14.....	4.80-6.10	8.80	8.70	11.35	8.10-8.35	5.85	
Nos. 18 and 20..	5.10-6.40	9.10	9.00	11.65	8.35-8.65	6.15	
Nos. 22 and 24..	5.25-6.55	9.25	9.15	11.80	8.50-8.80	6.30	
*No. 26.....	5.40-6.70	9.40	9.30	11.95	8.65-8.95	6.45	
*No. 28.....	5.70-7.00	9.70	9.60	12.25	8.95-9.25	6.75	

* For painted corrugated sheets, add 30c. per 1,000 lb. for 5 to 28 gage; 25c. for 19 to 24 gages; for galvanized corrugated sheets, add 15c., all gages.

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, ½ in. and larger.....	\$4.00-4.25	\$3.35	\$3.40@4.00	\$5.47½	\$7.75
Track bolts.....	6.00-6.50	4.35	4.60@ 5.00	.....	8.75
Standard section angle bars 3.00-4.00	3.00	2.75@ 3.40	.....	.....	5.45

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

	Mill Pittsburgh		New York		St. Louis	Chicago
	Current	One Year Ago	Current	One Year Ago		
Beams, 3 to 15 in.....	\$2.45@3.00	\$3.80	\$3.47	\$3.67½	\$3.97	
Channels, 3 to 15 in.....	2.45@ 3.00	3.80	3.47	3.67½	3.97	
Angles, 3 to 6 in., ½ in. thick	2.45@ 3.00	3.80	3.47	3.67½	3.97	
Tees, 3 in. and larger.....	2.45@ 3.75	3.85	3.52	3.72½	4.02	
Plates.....	2.65@ 4.00	4.00	3.67	3.87½	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
\$4.00@4.50	\$4.00@5.00	\$2.55

RIVETS—The following quotations are per 100 lb:

	Mill Pittsburgh		New York		St. Louis	San Francisco
	Current	One Year Ago	Current	One Year Ago		
in. and larger.....	\$4.50	\$5.73	\$4.72	\$5.00	\$5.82½	\$7.05
½ in. and larger.....	\$4.60	\$7.10	\$4.82	\$5.10	\$5.92½	\$7.15
¾ in. and 1 in.....	4.75	7.25	4.97	5.25	83	7.40
1 in. and 1 ½ in.....	5.00	7.00	5.32	5.60	6.92½	7.60

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.....	30%
Special steel round strand rope.....	30%
Cast steel round strand rope.....	22½%
Iron strand and iron tiller.....	5%
Galvanized iron rigging and guy rope.....	+12%
Chicago, +10% on galvanized, 22½-24% off on bright.	
Western and California Territory	
Montana, Idaho and Arizona	
15, plow steel, 22½% galv. iron rigging and guy rope.	

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

	Mill Pittsburgh	Denver	Chicago	St. Louis	Birmingham
Straight.....	\$5.75	\$8.15	\$7.00	\$7.00	\$7.00
Assorted.....	5.85	8.40	7.15	7.15	7.25

BAR IRON AND STEEL—Per 100 lb. to large buyers at mill, Pittsburgh:

Iron bars.....	\$3.63	Steel bars.....	\$2.35
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DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham	Denver
Solid.....	12@14c.	13c.	20c.	14½c.
Hollow.....	17@20c.	.....	.....	21c.

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the Pittsburgh basing card:

Inches	Steel Black		Galv.	Iron Black		Galv.
	Current	One Year Ago		Current	One Year Ago	
½ to 3.....	54 to 57½	41½ to 44	.....	15 to 5½	11 to 11½	8 to 10½
2.....	47 to 50½	34½ to 38	.....	19 to 9½	11 to 11½	9½ to 12½
2½ to 6.....	50 to 53½	37½ to 41	.....	24 to 34½	.....	.....

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

	New York	Black Cleveland	Chicago
½ to 3 in. butt welded.....	38%	39%	54@40%
¾ to 6 in. lap welded.....	33%	41%	50@40%

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.....	+1.25	1.50	List	\$2.25	+1.15	\$1.00
Hot pressed hexagon.....	+ 1.25	1.50	List	2.25	+ 1.15	0.85
Cold punched square.....	+ 1.25	1.50	List	2.25	+ 1.15	1.00
Cold punched hexagon.....	+ 1.25	1.50	List	2.25	+ 1.15	1.00

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ in. by 4 in. and smaller.....	+10%	30%	20%
Larger and longer up to 1 in. by 30 in.....	Net list	30%	10%

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

New York.....	List	Cleveland.....	\$2.50	Chicago.....	\$1.90
New York.....	\$7.00	Cleveland.....	\$4.50	Chicago.....	\$5.50

CONSTRUCTION MATERIALS

PREPARED ROOFING—Standard grade rubbered surface, complete with nails and cement, costs per square as follows at manufacturing points:

	New York			Philadelphia		
	1-Ply c.l.	2-Ply l.c.l.	3-Ply c.l.	1-Ply c.l.	2-Ply l.c.l.	3-Ply c.l.
No. 1 grade.....	\$2.05	\$2.40	\$2.80	\$1.95	\$2.30	\$2.75
No. 2 grade.....	1.85	2.15	2.50	1.75	2.05	2.40

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs \$3.50 per roll in carload lots and \$3.75 for smaller quantities.

Shingles, red and green slate finish, cost \$8.00 per square in carloads; \$8.25 in smaller quantities, in Philadelphia.

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

Tar felt (14 lb. persquare of 100 sq.ft.), per roll.....	\$3.05
Tar pitch (in 400-lb. bbl.), per 100 lb.....	\$0.3314
Asphalt pitch (in barrels), per ton.....	56.50
Asphalt felt (light), per ton.....	122.00
Asphalt felt (heavy), per ton.....	122.00

HOLLOW TILE—

	4 x 12 x 12	8 x 12 x 12	12 x 12 x 12
Minneapolis.....	\$0.121	\$0.2117	\$0.3314
Seattle.....	.13	.175	.30
Los Angeles.....	.10	.175	.....
Cincinnati.....	.125	.2	.....

LUMBER—Price per M in carload lots:

Table with columns for city (Boston, Kansas City, Seattle, etc.), wood type (Pine, Fir, Hemlock, Spruce), and price per M. Includes sub-sections for 8x8-In. x 20-Ft. and Under, 12x12-In., and 1-In. Rough, 10-In. x 16-Ft. and under.

*Montreal—Up to 22 ft.; over which, \$3.00 per M. increase up to 30 ft.

NAILS—The following quotations are per keg from warehouse:

Table with columns for material (Wire, Cut), mill (Pittsburgh, Denver, Chicago, San Francisco), and price per keg.

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

Table with columns for city (New York, Jersey City, Chicago, etc.), current price, one month ago price, and one year ago price.

NOTE—Charge for bags is generally 25c. each, \$1 per bbl. NOTE—There has been a sharp decrease in the Middle West, which we will show next month.

LIME—Warehouse prices:

Table with columns for city (New York, Kansas City, Chicago, etc.), hydrated per ton (Finished, Common), lump per 200-lb. barrel (Finished, Common), and price.

NOTE—Refund of 10c. per barrel, with 25c. per ton off on hydrated. *300-lb. barrels. †180-lb. barrels.

LINSEED OIL—These prices are per gallon:

Table with columns for raw per barrel (5 bbl. lots), 5-gal. cans, 1-gal. cans, and price, with sub-sections for New York and Chicago.

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

Table with columns for weight (100-lb. kegs, 25- and 50-lb. kegs, etc.), red lead (Dry, In Oil), white lead (Dry and Dry and, In Oil), and price.

MINING AND MILLING SUPPLIES

Table for HOSE—Underwriters' 2 1/2 in., Common, 2 1/2 in., with columns for FIRE and AIR, and 50-Ft. Lengths.

Table for AIR—First Grade, Second Grade, Third Grade, with columns for 3-in. per ft. and price.

Table for STEAM—DISCOUNTS FROM LIST—First grade, Second grade, Third grade, with columns for percentage discount.

Table for LEATHER BELTING—Light Grade, Medium Grade, Heavy Grade, with columns for percentage discount.

RAWHIDE LACING—For cut, best grade, 35%, 2d grade, 40%. For laces in sides, 63c. per sq.ft.; 2d, 62c. 1 or semi-tanned; cut: 25%; sides, 65c. per sq.ft.

MANILA ROPE—For rope smaller than 1/2-in. the price is 1/2 to \$0.02 extra while for quantities amounting to less than 600 ft. there is an extra charge of \$0.01.

Table for MANILA ROPE—New York, Cincinnati, Chicago, Minneapolis, San Francisco, Kansas City, Seattle, St. Louis, Denver, Los Angeles, with columns for price per pound.

PACKING—Prices per pound:

Table for PACKING—Rubber and duck for low-pressure steam, Asbestos for high-pressure steam, Duck and rubber for piston packing, etc.

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

Table for RAILWAY TIES—Chicago—Plain, Chicago—Creosoted, San Francisco—Douglas fir, green, San Francisco—Douglas fir, creosoted.

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

Table for RAILWAY TIES—Untreated A Grade White Oak, Untreated A Grade Red Oak, with columns for No. 1, 2, 3, 4 and price.

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

Table for FLOTATION OILS—Pure steam-distilled pine oil, sp.gr. 0.93-0.94, Pure destructively distilled pine oil, etc.

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

Table for COTTON WASTE—White, Colored mixed, with columns for New York, Cleveland, Chicago and price.

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

Table for WIPING CLOTEC—Cleveland, Chicago, with columns for 13 1/2 x 13 1/2 and 13 1/2 x 13 and price.

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

Table for EXPLOSIVES—New York, Kansas City, Seattle, Chicago, Minneapolis, St. Louis, Denver, Los Angeles, Atlanta, Cincinnati, Montreal, with columns for Low Freezing, Gelatin, Black Powder and price.

CHEMICALS

SODIUM CYANIDE—New York price is 22@30c. per lb.; Chicago, 30c.; St. Louis, 34c.; Birmingham, 45c.; Denver, 3c.

SODIUM SULPHIDE—New York price per pound is 6 1/2c. @ 7c. for concentrated. Chicago, 5c. for concentrated, 3 1/2c. for crystals. Denver price is 6c. for crystals.

ZINC DUST—For 350 mesh the New York price is 12@13c. per lb.; Chicago, 12 1/2c.

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

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

Table for MINERS' LAMP CARBIDE—Union 100-Lb. Drums, Cameo 100-Lb. Drums, Union Single 25-Lb. Drums, with columns for price.