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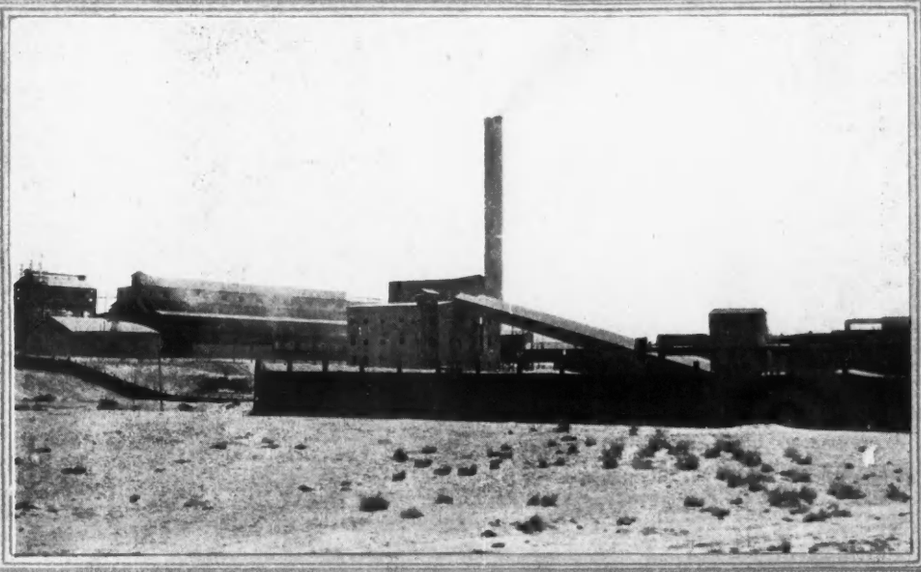


Calumet and Arizona Smelter at Douglas, Arizona

October 16, 1920

Carnotite Mining in Southwestern Colorado

By Blair Burwell

The Shattuck Arizona Mill for Concentrating Silver-Lead Carbonate Ores

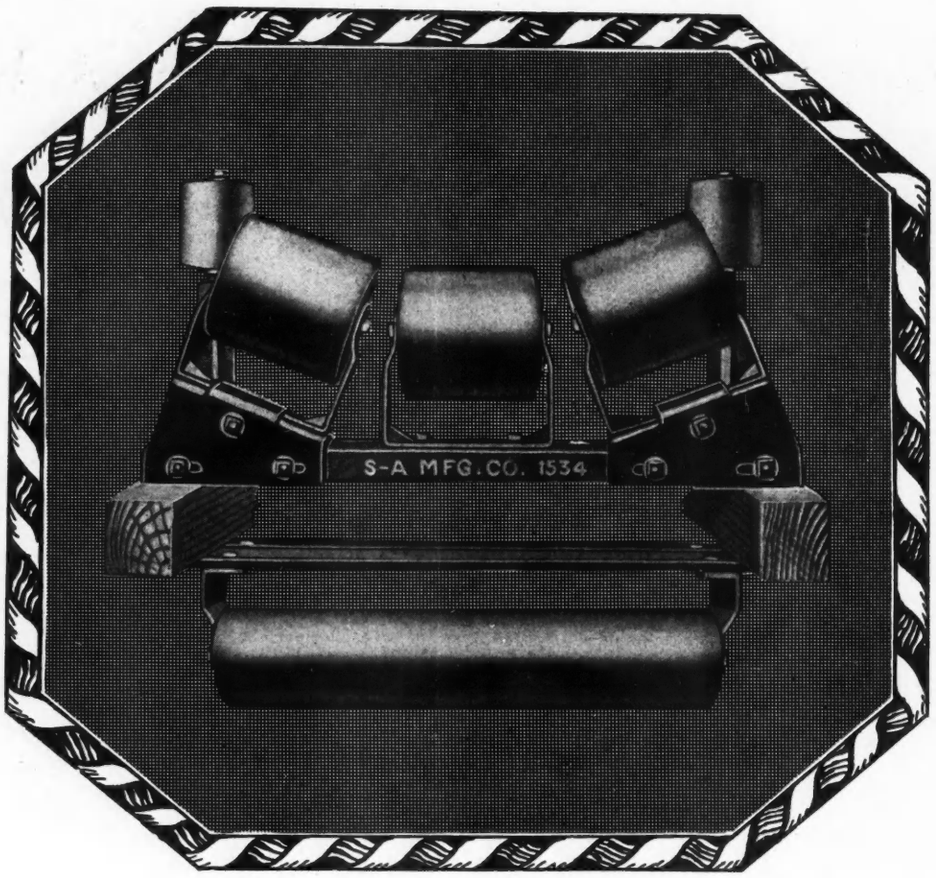
By Glenn L. Allen

Revival of the Colquechaca Silver-Tin District in Bolivia

By Joseph T. Singewald, Jr.

The Declining Quicksilver Production

By Murray Innes



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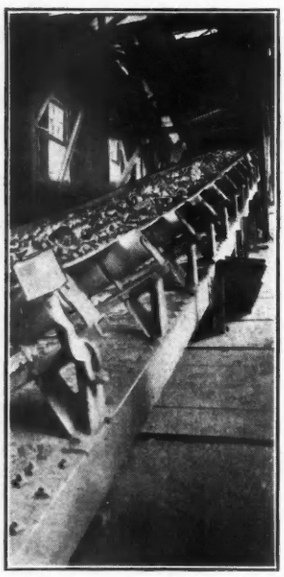

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Volume 110 New York, October 16, 1920 *Number* 16

The Bureau of Mines Directorship

THE novel idea of having someone who is familiar with mining from actual experience, contact, and practice as head of the Bureau of Mines, when in the future the time comes for a new selection to be made, has been taken up with great favor by the mining industry. The Bureau needs such a man, for only such a one can understand and classify in the proper order of priority the different demands which the industry will make upon the Bureau which represents it. It needs such a man, with the business experience of having handled mining enterprises with a view toward economy and efficiency, to expend the large sums which are annually allotted to the Bureau, and secure the maximum results per dollar of the public's money expended.

It matters little who the practical engineer is who will be called upon or who will consent to take charge of the Bureau's affairs and devote his thoughts to perfecting plans for organization. We have already mentioned Pope Yeatman, whose record of experience and ability leaves little to be desired. Other excellent suggestions have included Arthur Thacher, Robert M. Raymond, and Allen H. Rogers. All these gentlemen are familiar with organization, efficient administration, and the whole range of mining problems; all are expert captains of men, with histories which guarantee success to anything they undertake.

The Function of Government

THERE is a rumor in Washington, which has been reported in our columns by our Washington correspondent, to the effect that a party from the Interior Department is in Alaska investigating smelter charges and that the plan to install in that region a Government mill or smelter is receiving consideration.

We may question whether such an investigation is within the function of the Bureau of Mines or the Geological Survey. At first glance it would seem to fall under the redoubtable Federal Trade Commission, if anywhere. If the Interior Department has the right to investigate supposed industrial monopolies and prescribe a remedy therefor, the idea is novel. If not, is it proper to spend Government money even in the investigation? Granted the propriety, however, of the investigation, is it permissible to consider the solution of a Government-owned smelter or mill?

In a spineless commonwealth, as we conceive of it, the people lean on the government; in an ideal democracy, the government would lean on the people. In our Government today we see both tendencies. A large class of people are yearning to become Government paupers, demanding from the Government that they be babied from birth till old age. "The world owes us a living," was the old remark of the loafer. "The Government owes us a living," is the present-day theory. But for every bone that is thrown to a man by the Government on such a system, a substantial bit of his freedom and liberty is taken away. Suppose the Government is to smelt the miner's ore, or mill his ore. If this is to be done in Alaska, by all means let it be done in Colorado, Arizona, and Montana. Any Government official who imagines that the Government can do it for a substantially less cost than the present average charges is unfamiliar both with custom smelting and milling and with Government administration. It would be done, then, below cost, in order to help out the miner; and the deficit, as in the case of the Government administration of railroads, would be saddled on the taxpayer.

But the Government, if it smelts the miner's ore, must grind the farmer's wheat and refrigerate his beef, must operate all public utilities to rescue the citizen from the "grinding corporations," must by all means dig and transport his coal for him. In short, it must take charge of and direct all big business. This is what is commonly called socialism. We are not here arguing for or against this system, except to point out again that, apart from the question of practicability of business being conducted honestly and efficiently by an ever-increasing swarm of bureaucrats, every coddling function of the Government carries with it a corresponding loss of individual liberty.

As for us, we believe in the maximum of individual liberty consonant with the general welfare. Therefore, we should like to scrutinize carefully each project which makes toward socialism and attacks individualism. If, however, the opposite theory is to hold, we should like to get on the band wagon while the going is still good. We should like to see a bill for the pensioning of editors of mining journals, and will agitate also for a 2-cent subway fare in New York, a Government housage program whereby each citizen can get eight rooms and bath at a nominal rental, and Government remission of all taxes to fathers of families of more than two children.

The Provincialism of Engineers

IT IS A CURIOUS fact that mining engineers to a great extent carry out in practice a theory which is diametrically opposed to certain fundamentals which they absorbed in their early technical training. The study of elementary geology revealed the fact that there are certain fixed laws with regard to the formation of rock strata. We learned, among other things, that there are movements of the earth's crust which cause various phenomena; the actions of ascending and descending solutions produce metals and ores, and certain effects are produced by contact. Contact, as we understand it, and as later studies and investigations showed, was highly important. What is true in a geological sense also has its application in a general way, namely that the law of "contacts" is a most important factor in the existence of the mining engineer—but how many consider it so, or, at any rate, put it into practice?

The engineer, by reason of the fact that much of his work deals with certain concrete facts and with fixed natural laws, is provincial. He takes things as he finds them, applies his acquired knowledge to further his ends, and seeks to obtain a result which is satisfactory to himself and his employers. He takes a pride in his work, and to him one of the greatest pleasures obtained from any accomplishment is the satisfaction of originality. All of which is laudable, justifiable, and eminently proper in one sense, but not at all times advisable.

The story is told—it is ancient history to some perhaps, but we only read of it recently ourselves—of a smelterman who did not know that copper matte could be safely turned into granulated material if a spray of water were properly directed upon it as it flowed from the furnace. He thought that it would cause an explosion, just as it does when the matte is allowed to flow into water. At a neighboring plant, less than twenty miles away, matte had been successfully granulated for some years in the manner described. In the former case, coarse crushing was used, followed by treatment in a ball mill, and a result obtained which was satisfactory to the operator, but at a comparatively high cost. The idea was, to a considerable extent, original, but in comparison with the simpler method which was pursued at the neighboring plant it was an unjustifiable waste.

There exists today a greater realization among engineers of the value of "contacts" and the need of getting the "other fellow's" viewpoint and way of doing things; but there is still room for improvement. Perhaps the best evidence that mining men appreciate the need for this co-operation is shown by the fact that there is a greater tendency toward publicity of mining, milling, and metallurgical methods. More encouragement is offered to engineers to visit other plants, to attend technical meetings wherever operative details are discussed, and to present their views to the technical press. But, as we have before stated, the engineer is by nature inclined to provincialism, and it needs not only the urging of his "boss" but of his fellow engineer as well to pry him from his shell.

On Taking Losses

THERE is no doubt that the consumer will come into his own; a recession in prices has occurred, and in some commodities so rapidly that the rubber balloon called inflation has almost collapsed, as if by a puncture. From a producer's market, conversion has taken place to a buyer's market, and the smooth and exhilarating passage from the valley to the mountain peak of high prices has given way to a rather bumpy and uncomfortable journey to lower levels. The journey up was easy and entailed no worry—the journey down is a different story, and already many business houses have found themselves in a bankrupt condition due to the abrupt turn of affairs.

To ascertain just how metal prices are being affected by deflation, the following table has been prepared, listing a few representative basic agricultural and mineral commodities which reflect the general commodity price level. The table is primarily intended to show how certain of the metallic commodities, such as copper and zinc, are bearing and have borne the brunt of the economic movement downward.

The outstanding feature of the table is the small margin of present copper and zinc prices over 1914 prices. Lead is notably higher, and pig iron is far above its 1914 level. This great trade barometer has shown little inclination to drop, but that other extraordinary price barometer, silver, pointed the way last spring for the general downward movement. The fluctuations in the price of silver have been unusually accurate gages of the general commodity trends, but the peculiar situation in the white metal at the present, whereby the entire United States production is removed from the market, precludes using it as a reliable index.

COMPARATIVE TABLE OF COMMODITY PRICES

	Average 1914	Sept., 1920	Inflation Per Cent
Cotton—Middling, spot, New Orleans, per lb.	$0.11¼	$0.28½	+ 148
Hides—Calfskins, No. 1 Chicago, per lb.	0.21	0.28	+ 33⅓
Wheat—No. 1 Northern Spring, Chicago, per bu.	0.97	2.46	+ 154
Wool—Ohio fine delaine, per lb.	0.61	1.50	+ 146
Rubber—Plantation, per lb.	0.58	0.25	— 57
Hogs—Good merchantable, Chicago, per 100 lb.	8.50	16.20	+ 90½
Petroleum—Kansas-Oklahoma, per bbl.	1.03	3.50	+ 240
Coal—Anthracite stove, f.o.b. mines, per ton.	3.80	8.00	+ 137
Pig Iron—Basic, Pittsburgh, per ton.	12.87	50.46	+ 292
Copper—N.Y. (1910-1914 Av., 0.141 per lb.)	0.136	0.181	+ 33
Lead—N.Y. (1910-1914 Av., 0.0429 per lb)	0.038	0.082	+ 110
Zinc—St. L. (1910-1914 Av., 0.0567 per lb.)	0.055	0.077	+ 40

Rubber is the only commodity listed which has been deflated below its 1914 level. Although practically all items have exhibited in the last few months a tendency to the normal level, their prices are still markedly high. From hogs to cotton the story is the same—prices have dropped, but are still in the clouds.

For the copper and zinc industry, deflation has meant much financial hardship. Many producers of these metals are taking losses and have been doing so for some time, and there are certain ones whose activities were encouraged by the high price of the metals during the war that are in too weak a position to continue operations. Even the larger corporations are living on the surpluses they were able to accumulate during the war and are undergoing a test of their financial strength. They are progressively becoming leaner—should the process continue ribs will begin to show—and all are receiving a severe lesson in how to take losses. However, as the vice-president of one of our large banks recently pointed out to an editorial conference, the ability to take losses is foreign to the constitution of many organizations, despite the fact that it is part of every-day commercial life to take losses as well as gains.

The business man well schooled in the matter of taking losses and able to judge the market is in an infinitely better position to emerge from this period of deflation with a whole skin than a person so constituted as to be unable to weather a loss. When sugar took its recent tumble we noticed many retailers holding at 20c. when the market was 18c. and less. How much better it would have been to sell at 18c. with a relatively small loss than to have held the product in the face of daily decline, only to unload subsequently with a much greater loss at 16 and 15c.

The same proposition holds true for other business lines, and the shrewdest business acumen will be necessary to weather this period of contraction of prices.

The Artificial Preservation Of Mine Timber

A RECENT inquiry by us in several places indicated that little attention has been paid to the preservation of mine timbers by chemical treatment before placing in the mines. There is field for investigation of this problem, especially in districts where timber is costly. We do not emphasize the additional argument covering the preservation of our forests, for the demands of the

mining industry on the timber supply are relatively not large.

The mine manager, in considering this problem, finds that in many instances the function of mine timber is to withstand an increasing strain, which in the end proves irresistible and crushes the timber long before material decay sets in. Artificial treatment against rot would not increase efficiency in such cases. In the square-set-and-fill type of mining the functions of the timbers are to support the crushing strain of the walls during that period before the fill is complete, and thereafter it is of no importance whether the timber rots or not. In many other stoping operations only a relatively temporary support is economically desirable. Stulls or other forms of timbering are needed only until the ore is extracted, and rot does not progress during that period. Indeed, in many instances it may be said that where timbers last long enough under crushing strain to rot, no timbering is required. Falsely judged timbering is familiar to all of us, as evidenced where the props or stulls have finally rotted away while the walls or roof stands immovable.

Exceptions to this, where the long life of a timber is desirable, are in gangways or travel channels of all kinds, whether shafts, adit tunnels, drifts, permanent crosscuts, manways, or chutes. These may require timbering, often including lagging, when the strain is slight. In such cases the life of the timber under slight strain may be prolonged by guarding against rot.

The careful student of economy will doubtless again discriminate as to the exact conditions. Water acts as a preservative of timber in mines, whereas moist air passing over the wood brings on the growth of fungi which produce the so-called dry rot. It is, finally, in the last condition that the problem of timber preservation may be studied. Probably the timbering of shafts will be the most common example. In instances of this sort the preservative may be creosote or other chemical means, the timber being treated before being placed. A spray of magnesium chloride has been tried and found to be efficacious after the timber is set if it is available for the spray from all sides. Under similar conditions, the thin layer of cement spread by the "Cement Gun" may also be efficient in sealing the wood from the air, which is the rotting agent.

Will the Zinc Industry Respond?

THE American Zinc Institute has taken a practical and commendable step. In the October issue of the *American Zinc Institute Bulletin* appears an article entitled the "Future of the United States Zinc Industry" (reprinted in our issue of Oct. 2), which is a frank discussion of the precarious position of the domestic zinc producers, the underlying causes, the exceptional opportunities facing the industry, and the remedy for existing conditions. The necessity of readjusting the zinc business to meet the changed world economic condition, and the urgent need of meeting lower foreign smelting costs and more efficient working, if the United States is to enter the export market, is properly emphasized, and the suggestion is made—the crux of the article—that "the Institute stands ready to co-operate, through its Developments of Industry Committee, with the zinc manufacturers of the United States in studying, analyzing, charting, diagraming, and putting each and every operation in their plants to a test in the light of world practice, with a view of reducing their zinc costs below those of other nations." Splendid! But does the industry realize fully that this plan, if followed, means abandoning the secretive and narrow-minded policy of some of the zinc producers—a policy well known to the trade—and which at times has led to attempts on the part of competitors to resort to unscrupulous means in obtaining each other's trade secrets?

It appears that the seed sown by the speech of Charles M. Schwab at the annual 1920 banquet of the A. Z. I., in which this exponent of team work expressed surprise at the attitude of the zinc producers in failing to compare production costs, to their mutual benefit, has taken firm root. Will it grow? Will each member of the institute, by doing his share, help nourish it? For their own good they will do so. Few people besides themselves will benefit by a new tendency on the part of the producers. Should the idea perish, and the wheels of the industry slip back into the old rut, one of the greatest opportunities faced by the United States zinc industry will be lost—foreign trade will be relegated to foreign producers, who will supply that trade, hands down, by lower production costs, if for no other reason.

One of the important and as yet intangible fruits of the war that has come to this country of ours, is the prospect of a highly enlarged foreign trade—an expansion undreamed of a few years ago, but which an increased merchant marine, the havoc and destruction of the war, and enlarged domestic production facilities have brought within our reach. The nation does not know what to make of this international aspect of its markets, and many difficulties must be overcome before a place in export favor and trade can be won. The problem peculiar to the zinc industry can be duplicated in many other lines—not only metallic.

If the zinc producers avail themselves heartily of the timely effort of their representative organization to make co-operation replace isolated endeavor, the announcement of the American Zinc Institute noted will herald a new era, for then no longer will there be, as in pre-war days, a balance of domestic production and consumption, because a new factor, that of foreign trade, will have been introduced. But to compete in the world's zinc markets means a concerted co-operative spirit, which can readily be achieved only by the action proposed. "If they (the producers) will not do so," so the statement goes, "they will simply continue to supply for a time what will eventually prove to have been an incidental European market."

Will the zinc industry change its behavior?

Engineering and Mining Journal Quotations in South America

MR. V. L. HAVENS, editor of *Ingenieria Internacional*, who has just been on an extensive tour of South America, relates that while he was in Buenos Aires a judge requested him to procure a file of *Engineering and Mining Journal* to assist him in making a decision. A dealer in Buenos Aires had purchased tungsten ore from Bolivia, which was shipped from time to time, and there was a legal dispute as to the price. The judge ruled that settlement was to be made according to the *Engineering and Mining Journal* quotations at the time of each shipment. We have, before this, chronicled rulings in the United States courts where our quotations were accepted as standard and a basis for legal decisions, and it is gratifying to note that South American courts have followed the precedent.

WHAT OTHERS THINK

Engineers on the Witness Stand

If a young man may comment critically on the professional and public actions of his elders, I should like to register an impression that I have received from reading the testimony of several prominent engineers when testifying before important governmental bodies. During the spring of 1918, W. R. Ingalls, editor at that time of the *Engineering and Mining Journal*, was requested to come to Washington and express his opinion about the War-Minerals bill before the Committee of Mines of the House of Representatives. The conservative Mr. Ingalls was strongly opposed to any interference by the Government with the sacred law of supply and demand, and spoke at every opportunity against the bill. But the point that I wish to emphasize was the uncoöperative and sarcastic attitude which he assumed toward the poor Congressmen, who scarcely knew enough about mining to ask intelligent questions. The following is a sample of Mr. Ingalls' replies[1]:

Mr. Hamlin was trying to understand the position which arsenic plays as a byproduct of the copper industry. He compared it with the production of oleomargarine in its relation with the cattle business. Mr. Ingalls said: "I wish you would cite some analogy which is more in my line." Mr. Hamlin asked: "It (oleomargarine) is a byproduct of the steer, is it not? Is that not a fact?" Mr. Ingalls: "I do not know about that." Again, the chairman remarked: "The emergency is here. What are we going to do about it?" Mr. Ingalls replied: "What is anybody going to do?"

My impression from reading the testimony was that Mr. Ingalls made things difficult for the committee. Many of his replies were curt, and he apparently showed little tact or willingness to help matters. Now, much has been said recently about the need for engineers mingling in more friendly fashion with people in general, and establishing a respect for their profession among public men. Such an attitude as Mr. Ingalls' seemingly would antagonize more than it would conciliate, and would even arouse resentment about engineers in the minds of Congressmen who were present.

During the past several weeks the editor of the *Mining and Scientific Press*, T. A. Rickard, was called before the Federal Trade Commission in San Francisco to testify about the Minerals Separation companies and the flotation patents. His attitude, as is evident from reading the testimony,[2] was flippant at times, as when he suggested that a man could be born in a stable and yet not be a horse, or as when he remarked that it would be well for the questioning lawyer if he had had as much literary experience as had Mr. Rickard.

The attitude of both Mr. Ingalls and Mr. Rickard contrasts with that of another prominent engineer, the late Hennen Jennings, who testified in 1918 before the Committee on Ways and Means of the House of Representatives in regard to the menace to gold mining. At that time Jennings held a position with the Bureau of Mines, but the service was largely from patriotic motives, as was shown recently by the large fortune left on his death. In reading his testimony[3] one cannot but be impressed by his extraordinary patience in striving to have the Congressmen understand what they were talking about. Mr. Rainey, for instance, appeared to think that the German control of iridium would affect the use of gold as a standard of exchange, because iridium is more precious than gold. Jennings explained tactfully why this was not so, although such a foolish question is difficult to answer tactfully. Another questioner, Mr. Sloan, said of platinum: "It don't burnish like gold, it is not as desirable for the vision as gold, and it yields to certain acids (anything that has lead in it), so that it may be lost in a very short time?" Now, what engineer could reply seriously to that? Yet Jennings said: "It is really more valuable in the arts now for electrical purposes, and chemical purposes, and in laboratories—and it is very useful."

The question is, is it not better for engineers, when called to testify before governmental bodies, to take a tactful and coöperative course than to be sarcastic or flippant?

P. B. MCDONALD.

New York University.

[1] *Mining and Scientific Press*, July 6, 1918.
[2] *Mining and Scientific Press*, Aug. 21, 1920.

Engineering in the Tropics

Under "News From Washington" in your issue of Oct. 2 was published a half column of complaint from someone of the "greatest of hardships" in tropical areas, and for that reason "it is becoming difficult to persuade the more experienced [Government?] engineers to undertake such expeditions." This seems to me to be hardly an authoritative statement, and as an impression might be made on some younger engineer contemplating such a trip which would cause him to miss a very interesting and valuable experience, I protest against such rot, for I have had many years of experience and enjoyment of examinations in the tropics.

The animals and insect pests may be avoided, and with them most of the exposure to disease. Any man who does not sleep under a net where there are mosquitoes is exposing himself to malaria, and the net should be the close woven net of the tropics, not the one for use against our larger mosquitos. Proper boots and clothing guard against many other pests and, in bad cases, putting the legs of cots and chairs in cans full of water or kerosene keeps away prowling insects. To drink unboiled and unfiltered water or to eat fresh salads and vegetables in cholera time without thoroughly washing them first is to invite disaster.

Work in the tropics is somewhat of a special character and should not be undertaken by engineers without experience—"tenderfeet," in other words—except under some experienced man, but there is no reason whatever that any engineer in good health, with some regard to sanitation and the well-being of his body, cannot undertake such a trip without misgivings. I speak from an experience embracing paddling through rainy seasons in the Philippines, Venezuela and Nicaragua, and various wanderings all over South America and the rest of the globe.

A. J. EVELAND.

Boston, Mass.

[3] *Mining and Scientific Press*, July 27, 1918.

PACKING WATER BY BURRO TRAIN TO CARNOTITE MINE. LOWER SAN MIGUEL RIVER DISTRICT

Carnotite Mining in Southwestern Colorado

Estimated Ore Resources Larger Than at One Time Anticipated—Extensive Use of Diamond Drill for Discovery and Outlining Ore Deposits—High Mining Costs and Difficult Transportation—Experimentation With Milling Methods

BY BLAIR BURWELL

Written for *Engineering and Mining Journal*

PRODUCING radium, vanadium, and uranium during the year 1919 valued in excess of five and one-half millions, and with a total production, including the year 1919, of approximately 29,000 tons of carnotite ore averaging 1.90 per cent U_3O_8 and 5.80 per cent V_2O_5, the carnotite field of southwestern Colorado is at present producing the bulk of the world's radium ore. With little of the publicity that usually attends the initial success of a Western mining camp, the region promises, in the course of a few years, to exceed the gold production of the State of Colorado in the value of its output[1].

Carnotite has been found over a wide area in western Colorado, eastern Utah, and even in northern New Mexico; but at present the bulk of the mining is carried on in the semi-arid basin country in Colorado, along the course of the Dolores River in the west ends of Dolores, San Miguel and Montrose counties, and in the southwest corner of Mesa County. This belt of country is roughly divided into districts whose degree of development is dependent upon transportation facilities, operations at present being centered in the Paradox Valley, Long Park, and Lower San Miguel River districts tributary to Plaverville, Col. To the south the Bull Cañon and McIntyre regions and to the north the Mesa Creek, Grubstake, and Gateway districts constitute a vast mineralized area that awaits transportation facilities.

The eight producing camps in the region are operated by the Standard Chemical Co., the Radium Co. of Colorado, and the Radium Luminous Materials Corporation. The Standard Chemical Co. is by far the largest operator, mining approximately 75 per cent of the region's output. The Radium Co. of Colorado produces 10 per cent and the Radium Luminous Materials Corporation 8 per cent of the total production.

Horizontal and slightly dipping Mesozoic sediments overlie the region. The present drainage has exposed the cliff forming Cutler and Dolores red beds (Permo-Triassic) in the cañons that deeply dissect the region. Above the red beds occurs the prominent La Plata sandstone (Jurassic), with a distinctive white top. Above the La Plata sandstone occurs the carnotite-bearing McElmo series (Jurassic) of sandstones and clays, in which erosion has created a series of rims and flats, capped by the bold cliffs of the so-called "Dakota series of conglomerates" and sandstone. The McElmo formation varies considerably in thickness, but averages about 700 ft.

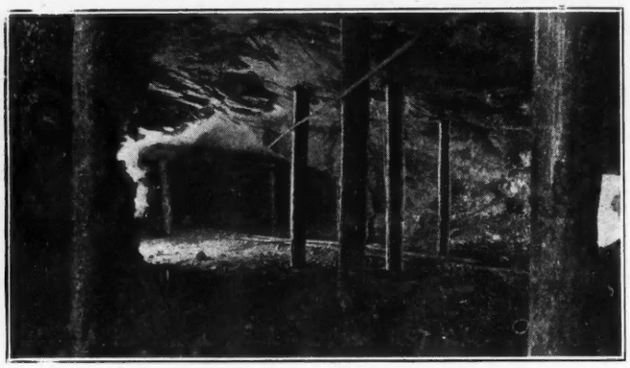
GEOLOGICAL CHARACTERISTICS

The ore deposits are exceedingly irregular as to size, shape, distribution, and grade of ore. It is believed that the thick series of clays and impure sandstones at the top of the McElmo formation, containing uranium and vanadium minerals widely disseminated, were the source, as traces of these elements are found throughout this member and not in any overlying formation. A downward migration of uranium and vanadium took place in ground waters containing sulphates, with a formation of crystalline gypsum and the precipitation of vanadium and uranium under the influence of carbonaceous matter. In many cases the vanadium was precipitated first, and the uranium subsequently partially replaced the vanadium, thus forming carnotite. In some parts of the district the ready solubility of uranium and vanadium, when exposed by erosion to

[1]In Bulletin 103, U. S. Bureau of Mines, may be found a detailed résumé of mining and other conditions in this area.

ground waters containing carbon dioxide, has resulted in four successive migrations and the formation of four ore levels in favorable precipitating horizons. However, the bulk of the deposits are found in a fairly definite sandstone and clay member of the McElmo formation, about 200 ft. from its base. This member is predominantly æolian in origin and probably represents a sand-dune region where local patches of vegetation and occasional overwhelmed trees, now replaced by ore, followed the pitches and undulations of the dune surface.

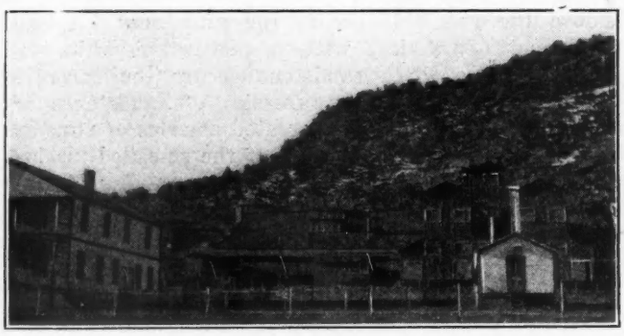
CARNOTITE OREBODY, DOLORES CAMP, STANDARD CHEMICAL CO.



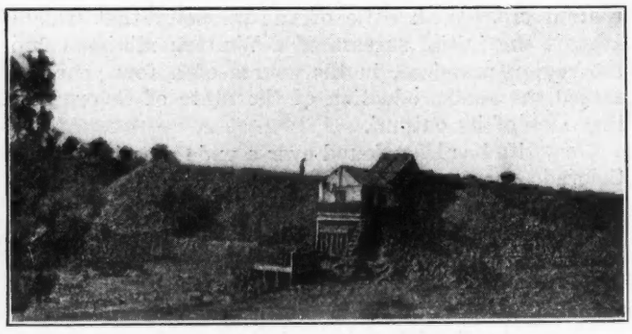
CARNOTITE. STOPE IN YELLOW JACKET MINE AT CLUB CAMP, STANDARD CHEMICAL CO.

The orebodies are found throughout this member without any special relation to present cañons, faults or minor dislocations, their distribution being governed by the presence of carbonaceous matter and the lenticular nature of closely associated clay formations.

Two ores are recognized: One, which is the most widely distributed, a black oxide ore of vanadium, carrying a small amount of uranium; and carnotite, which contains a variable proportion of uranium to vanadium, ranging from 1 to 1 for an ore containing 8 to 18 per cent U_3O_8 to 1 to 3 for an average ore containing 1½ per cent U_3O_8. Carnotite frequently carries large



MILL OF THE STANDARD CHEMICAL CO. ON THE LOWER SAN MIGUEL RIVER



ORE-SORTING CHUTE, CLUB CAMP, STANDARD CHEMICAL CO.

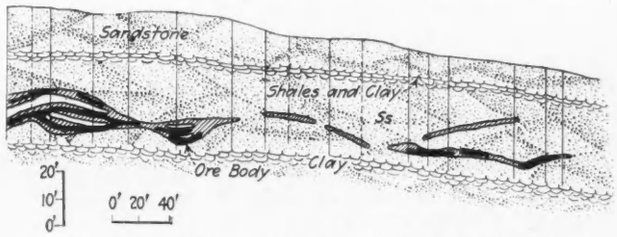
amounts of calcium vanadate as well as other variable constituents. This is especially true of deposits found under heavy cover, where in some cases carnotite forms the outer shell of masses of calcium vanadate. In this connection it is interesting to note that calcium vanadate is usually formed from interaction of vanadium solutions and gypsum, and often occurs as a pseudomorph after the latter mineral.

In size the orebodies vary from pockets containing a few hundred pounds to deposits yielding as much as 1,800 tons in exceptional instances. As there are often no indications leading to an orebody, prospecting by jackhammers or by diamond drills is resorted to in advance of mining operations. When the overburden is less than twenty-five feet, the jackhammer is the cheapest method of prospecting, and for this purpose portable gasoline-driven compressors are used. However, as most of the mining operations are being carried on under increasing cover, the diamond drill, with its superior core information, is taking the place of the jackhammer. The practice in prospecting with a diamond drill is to run a line of holes thirty to sixty feet deep and from fifteen to fifty feet apart across the area to be prospected. Upon striking ore or mineralization, drilling is concentrated until the body is roughly defined.

At the Club Camp of the Standard Chemical Co., situated on the west rim of the San Miguel Cañon, four miles above its junction with the Dolores, 45 per cent of the region's total production is being mined from ore located by diamond drills. Three drills are in operation continuously during the drilling season, and 1,000 holes have been completed in an area of approximately 200 acres. The ore is mined from four inclines and four adits, and a total of 10,000 ft. of drifts and crosscuts have been driven.

The irregular nature of the orebodies makes it difficult to follow a definite plan of mining, but the usual procedure is to drive haulage drifts below the lowest ore horizon shown by the drills. Raises are then made into the ore, and the waste and ore from stoping are wheeled or shoveled into chutes, from which the cars on the haulage level are loaded. In stoping, what might be termed a room-and-pillar method is followed, the poorer portions of the deposit being left as supports. The waste is stripped from below, and the ore care-

fully shot down on canvas or on a swept floor. In the usual mining operations, from five to ten tons of waste are moved for each ton of ore mined. The roof is usually good, and as a rule little timbering is required, which is fortunate, as the local piñon and cedar are of poor quality. For purposes of mining, the ore is divided into three grades: Low grade, covering up to 0.7 per cent U_3O_8 and usually 2.5 per cent V_2O_5, which is left in the mine or dumped separately for possible future



TYPICAL CROSS-SECTION OF CARNOTITE OREBODY

use; milling ore, assaying from 0.7 to 2 per cent U_3O_8; and high grade, which is carefully mined from the richer portions of the deposit and carries up to 35 per cent U_3O_8.

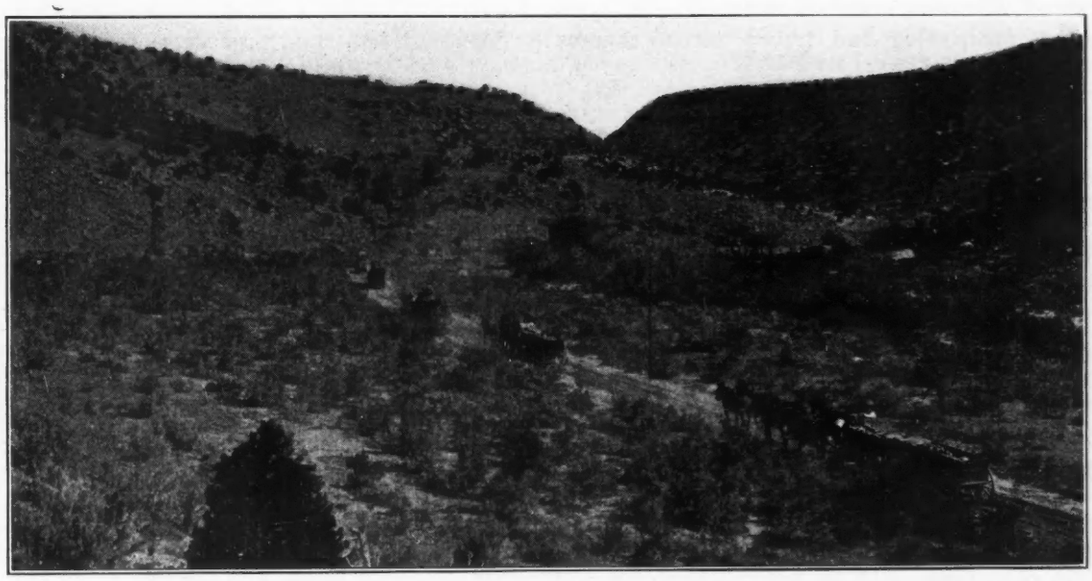
Hand sorting on the dumps from specially designed sorting chutes is taking the place of the early methods of spreading the ore on a flat rock and picking out the waste. The ore from the mine is dumped into chutes, which discharge upon a breaking platform, where the waste is rejected. The ore then drops into chutes beneath the platform, from which it is sacked and loaded upon wagons for haulage to the company's mill on the San Miguel River, a mile and a half distant and eight hundred feet lower than the mines.

The equipment of the camp consists of a 50-hp. Ingersoll-Rand two-stage compressor, driven by an electric motor with a Foos gas engine in reserve, and a 25-hp. compressor, also motor driven. Power is supplied from the company's hydro-electric plant on the San Miguel River, in which supplementary units consisting of two 200-hp. Fairbanks & Morse "Y" engines have recently been added. A motor-driven triplex pump and pipe line to the camp from the river are installed.

Typical of the smaller camps is the Dolores, also operated by the Standard Chemical Co., and situated on the east rim at the junction of the Dolores and San Miguel rivers. The camp is reached by a trail that climbs five hundred feet above the road, over which water, supplies, and ore are packed by burro trains. Prospecting by drills has not been as intensive as at the Club Camp, but a number of orebodies have been located, and a steady production of about three tons of carnotite ore per day is maintained. Six adits have been driven from the rim, and orebodies located under seventy feet of cover. A Sullivan Compressor with a 25-hp. Foos gas engine has been installed.

From the San Miguel River southward the formations rise with a two-and-a-half-degree slope to the north rim of the Paradox Valley. Here is found a park-like area known as Long Park, in which are the camps of the Radium Co. of Colorado and the Radium Luminous Materials Corporation. Two roads give access, one from the San Miguel River and the other from the Paradox Valley. Long Park has to its credit a total shipping production of about 4,200 tons of carnotite ore averaging 2 per cent U_3O_8, and at present is producing at the rate of about five tons per day when all the camps are in operation. Mining is carried on in open cuts, tunnels and inclines, and jackhammers and diamond drills have been used in prospecting. A number of camps—Saucer Basin, Jack Rabbit, Julian, Outlaw, and the Hieroglyphic—have been established on the sloping country between Long Park and the San Miguel River, but the general scarcity of water in the region has hindered prospecting by drills, and, as a consequence, the majority of the camps lie idle after having exhausted the exposed orebodies.

On the south side of the Paradox Valley a number of claims are located on a faulted segment of the carnotite strata. The most important camps are the Jo Dandy and Monogram, which are owned and operated by the Standard Chemical Co. At the Monogram Camp, reached by trail from the Paradox Valley, mining operations are carried on by hand, due to the difficulties of packing machinery. However, a road to the camp from the Paradox Valley is now under construction.



THE MOTOR TRUCK HAS NOT ENTIRELY REPLACED THE FREIGHTERS' "SIX." HAULING ORE OUT OF THE PARADOX VALLEY

Three adits are worked and several extensive orebodies have been found.

The Jo Dandy claim, early mined by the General Vanadium Co. and declared exhausted, is now a steady producer. Due to broken ground and lack of water, diamond-drill prospecting has not been attempted, but three development adits with connecting crosscuts have opened up a number of orebodies, which are being worked in some cases under 140 ft. of cover. From the operations here, evidence is strong that the carnotite orebodies will be found under the heavier cover of the overlying formations as well as under the shallow overburden of the flats and benches on which operations in the district have so far been confined.

Utilization of low-grade ores is one of the problems in the district. Considerable experimentation is being done with various methods of concentration. The Standard Chemical Co. operates a 50-ton mill on the lower San Miguel River, and at present is the only company concentrating its ores. A simple method of crushing the ore and recovering the mineral in the slimes by a classifier is used. The carnotite and vanadium is friable, slimes readily, and the sand is rejected as tailings. Extensive tests are being made by this company to improve the mechanical details of its process.

Cost

Cost, of course, varies widely with the camp and its condition. The average mining cost per ton is as follows:

Labor—Mining and mucking	$24.35	
Sorting and sacking	2.60	
		$26.95
Powder, fuse and caps		2.25
Other supplies		6.66
Laboratory expense, boarding house loss and general overhead		19.24
Depreciation and replacement on mining equipment		5.22

To which prospecting and transportation charges should be added as follows:

Diamond-drilling prospecting	5.78
Wagoning to Placerville	30.00
Total	$96.10

Where packing is necessary, the cost per ton varies from $3 to $5. Freighting is usually done at the rate of 50c. per ton-mile.

Diamond-drill costs, with the light type of rig used, vary from 80c. to $2 per ft., an average cost being as follows:

Wages	$0.56
Gas and oil	0.05
Repairs	0.10
Depreciation, machine and diamonds	0.07
Overhead and interest	0.16
Total	$0.94

To this must be added the cost of supplying water, which varies from 7c. to 50c. per ft.

The labor supply is scanty and of poor quality, due to the distance of the region from the railroad and the attractions of a town. Miners and muckers are paid $4.50, ore sorters $5.50, and drill runners $7 per shift, with board at $1 per day.

Market

Practically all the operators treat their ore in plants in Denver, or in the East, under secret processes, and market their products as ferrovanadium, ferrouranium, and radium. Owing to the costs involved, little mining is done by the small prospector.

A uranium assay is one on which very few laboratories can check, and the difficulty of reconciling the assays of the miner's inaccurate sample against the pessimistic assay of the buyer causes constant trouble. Ore has changed hands on a basis of $2.75 per lb. of U_3O_8 contained, with a minimum of 2 per cent ore, and some deals are made with a flat rate of 75c. per lb. for vanadium oxide and a sliding scale for the uranium oxide, based on grade.

Excessive transportation costs over roads that are impassable three months of the year comprise one of the limiting factors in the development of the region. Plans are being made to build a road from Naturita to Placerville, the principal shipping point, a distance of forty miles, by the co-operative efforts of the mining interests with state and county aid. This proposed road will follow the course and grade of the San Miguel River, and will greatly stimulate the opening up of the district.

Taking the average tonnage per acre on ground systematically prospected by diamond drills as a basis, and multiplying this into the number of acres in located claims, exclusive of territory mined out, which show equal surface promise of production, and for safety dividing this by five, gives an estimate of 100,000 tons of carnotite ore containing 1.5 per cent U_3O_8 and 4.5 per cent V_2O_5, which may possibly be termed as the ore resource of the region. The located claims cover only a small fraction of the mineral-bearing territory, and include none of the vast areas where the carnotite sandstone is covered by heavy overburden. Consequently, it is evident that the carnotite region of southwestern Colorado possesses great potentialities for future production.

Chromium Ore in Russia

The most important producers of chromium ore are South Africa (Rhodesia), New Caledonia, Asiatic Turkey, and Russia. Generally speaking, chromium is rarely found in commercial quantities; therefore it has a good market, especially at the present time, when the production of various kinds of steel is increasing. Most of the consuming centers are a great distance from the centers of production. The United States is the most important consuming country, using over 50 per cent of the world's production.

The most important beds of chromium ore in Russia, according to *Commerce Reports*, are found in the Urals (from south to the extreme north), mainly on its eastern slope. All these beds have been only superficially explored; therefore, their supplies cannot be estimated. But the great number of these deposits and their nearness to metallurgical centers give them much importance. It can be expected that a considerable amount of chromium ore will be exported when conditions are again normal and proper methods of exploitation are adopted. Prior to the war the mining of this ore was considered of minor importance in the Urals, but the increasing demand for it may aid in the development of its mines. Chromium ore has been obtained from twenty to thirty small mines, but mostly by primitive methods. In addition to the Urals, chromium ore is also found on the northeastern banks of Lake Goktcha, Government of Erivan, Transcaucasia, where the supply is considered rather large, and also along the Gazimur River, near the Kultuminsk silver-lead mines, Transbaikal region. These beds are all undeveloped.

The Shattuck-Arizona Mill for Concentrating Silver Lead-Carbonate Ores

How a Low-Grade, Truly Oxidized Ore Is Concentrated at a Profit—Exceedingly Fine Crushing Necessary—Table Treatment and Sulphidizing Followed by Flotation Gives Satisfactory Lead Recovery

BY GLENN L. ALLEN
Mill Superintendent, Shattuck Arizona Copper Co.

Written for the *Engineering and Mining Journal*

THE Shattuck-Arizona Copper Co., of Bisbee, Ariz., has probably the most unique and successful plant in operation today for the concentration of silver lead-carbonate ores. The plant and process represent a new departure in the art of dressing low-grade oxidized ores of lead and constitute a real advance in a new and rapidly developing form of metallurgy. This mill is designed for treating a class and grade of ore heretofore considered impossible of profitable treatment.

GLENN L. ALLEN

The most abundant economic mineral in the Shattuck ore is cerussite, or the carbonate of lead. The ore contains in addition silver chloride or cerargyrite, and gold. Sulphate of lead is present but in very small quantities. The major gangue constituents are silica, specular iron, and limonite. Lime, alumina and manganese together represent less than 1 per cent by weight of the ore. The sulphur content is about 0.1 per cent, so the ore is truly oxidized. A typical analysis of the mill feed is Au, 0.06 oz.; Ag, 5 oz.; Pb, 5.3 per cent; Fe, 13 per cent; "insoluble," 71 per cent.

The mill has a nominal capacity of 400 tons in 24 hours and employs both gravity concentration and flotation, as shown on the flow sheet. Flotation of the carbonate mineral depends upon a sulphidizing process wherein the silver chloride and lead carbonate are lightly coated with a film of sulphide and thus made amenable to oil flotation such as is commonly practiced with the natural sulphide minerals. The reagents and chemistry of sulphidizing have been described in detail elsewhere.[1]

GYRATORIES AND ROLLS USED FOR CRUSHING

Ore from the mine, 800 ft. deep, is delivered to the mill in 50-ton side-dump cars and dumped directly into the coarse-ore bins (1) having 1,000 tons' capacity. Eight Jeffrey stationary steel apron feeders (2) deliver the run-of-mine ore into one movable hopper car which feeds a 20-in. conveyor belt (3). This belt delivers to a 20-in. inclined conveyor belt (4) provided with a magnetic head pulley. The grizzly (5) on which this belt discharges is spaced 1.5-in. between bars and delivers the oversize to a No. 5 Telsmith gyratory crusher (6) set at 1.5-in. opening. The undersize of the grizzly joins the gyratory product at the boot of a Jeffrey continuous bucket-and-chain elevator (7) which discharges over a Hummer electrically vibrated screen (8). This screen is equipped with a heavy wire cloth having a rectangular opening $\frac{5}{8}$ in. wide. The oversize, after passing through the 42 x 16-in. Traylor rolls (9), is returned to the boot of the elevator (7). The undersize of the screen is sent to the fine-ore bins by a Jeffrey 16-in. conveyor belt (10) inclined at 21½ deg. Another conveyor belt (11) drives a self-reversing automatic tripper (11) which beds the crushed ore in either of two 400-ton bins (12). These bins feed the ore by means of six Challenge feeders to 16-in. belts (13 and 14). The next belt (15) passes over automatic weighing scales (16) and delivers the crushed ore into the mill. About 20 per cent of the crusher product will remain on a 3-mesh screen, 75 per cent is coarser than 48 mesh, and 14 per cent will pass a 200-mesh sieve.

About half of the ore is too coarse to concentrate, so it is sent to a Whip-Tap vibrating screen (17) screening dry through a 4-mm. opening. Water is added to the undersize to carry it to primary Butchart tables (18), two operating. These tables produce a finished concentrate. Their tailings are deslimed and dewatered in a 12-in. drag classifier (19) operating at 75 ft. per min., and ground in a 4 x 10-ft. Allis-Chalmers ball tube mill (20) in closed circuit with the drag classifier.

The oversize of the screen (17) is a coarse, hard, siliceous material and is laundered nearly dry directly

[1] "Flotation of Oxidized Ores of Lead," Glenn L. Allen, *Chem. and Met. Eng.*, Vol. 20, No. 4, Feb. 15, 1919; and "Innovations in the Metallurgy of Lead," Lyon and Ralston, Bull. 157, U. S. Bureau of Mines.

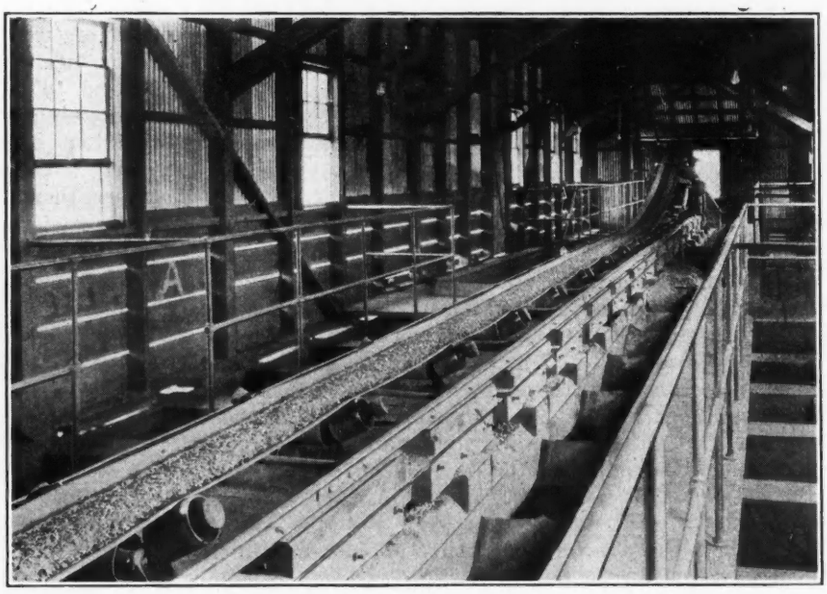
THE SHATTUCK ARIZONA MILL, BISBEE, ARIZ.

to the scoops of two 6 x 4½-ft. Marcy mills (21) in closed circuit with 5-ft. Dorr duplex classifiers (22). The overflow of these classifiers joins the overflow of the drag classifier (19) and is laundered to 6-ft. Allen sand cones (23) for sand and slime separation.

Sizing the mill feed through a 4-mm. screen has distinct advantages. It gives the primary tables an enriched feed of finer material, on which they do good work; it eliminates much wear of linoleum and riffles on the tables; and it provides a minus 4-mm. feed for the 4-ft. tube mill. For the 6-ft. Marcy ball mills the screen oversize provides a dry feed of minus ⅝-in. and plus 4-mm. material and allows a high percentage of solids in the mills. Sizing the mill head thus virtually gives a modified two-stage grinding wherein the larger sizes are ground in large diameter mills with larger steel balls and heavy ball charges. The smaller sizes are ground in a smaller diameter mill using small cast balls and cheaper cast liners. This permits of finer grinding, easier and closer control of the size of the material in the overflow of the classifiers, and a higher percentage of solids in the mills. Economy in balls and liners is probably secured and power per ton milled is materially less.

The ball charges in the Marcy mills are replenished with 85 per cent 4-in. and 15 per cent 3-in. forged steel balls. When the occasion offers, the balls smaller than two inches are sorted from Marcy mill charges and fed into the 4-ft. tube mill. This mill is regularly charged with 2-in. and 1.5-in. cast balls, although a small percentage of 3-in. balls appears to give the mill more grinding capacity. The tube mill makes 31 r.p.m. and the ball mills make 25 and 23.5 r.p.m. All are belt driven from a line shaft which is driven by a 220-hp. synchronous motor.

Referring again to the flow sheet, the products of the mills are finely ground and ready for desliming. The tube mill furnishes a product 68 per cent of which is plus 200 mesh and the ball mills grind to 55 per cent through 200 mesh. Both products are combined and deslimed in two 6-ft. Allen cone classifiers (23). The



DISTRIBUTING ORE IN FINE-ORE BINS

overflow of the cones is about 90 per cent through 200 mesh and is laundered to a 34 x 12-ft. Dorr thickener (24) to thicken it for flotation. The underflow of the cones contains about 15 per cent through 200 mesh. This 200-mesh material contains a large percentage of lead carbonate which, though very finely ground, is still granular and is recovered in the subsequent tabling operation.

The two secondary Butchart tables (25) treating the underflow of the Allen cones are similar to the primary tables except that they use shallower riffles and higher speed. The same highly developed system of riffling found most effective with lead carbonate ores is used on both primary and secondary tables. These secondary machines produce a finished concentrate about 30 per cent of which is minus 200 mesh. The tailings are again classified in an Allen cone (23-*A*), and re-treated on Butchart tables mostly for gold and silver because virtually all the lead has been removed in the previous tabling operation. The last two tables (26) produce finished tailings and a middling product that is returned to the tube-mill circuit for regrinding.

Pulp Treated With Sodium Sulphide Previous to Flotation

Virtually all of the slime portion of the minus 200-mesh material, whether primary or resulting from the action of the mills, collects in the thickener (24). The underflow of this thickener is sulphidized with a weak solution of commercial sodium sulphide, then pumped to an agitator (27), where primary oiling takes place. From the agitator the pulp, which is now well sulphidized and oiled, is distrubuted to six K. & K. and two Rork flotation cells (28) arranged in four series of two 10-ft. cells each. The froth concentrate from the first cell in each series is run to the concentrates dewatering plant and the low-grade concentrate from the second cell in each series is returned to the agitator (27). The tailings from the second machine go to waste. The low-grade concentrate from the secondary cells was formerly re-treated in a separate cleaner machine, but this practice was abandoned in favor of returning to the head of the system.

The sodium sulphide used for sulphidizing is the ordinary commercial 60 per cent Na_2S fused in iron drums for convenience in shipping. For convenience the sulphide is dissolved and held in steel storage tanks. The dilute solution is drawn from the tanks and added to the flotation circuit at the rate of about 3 lb. per ton of ore treated by flotation.

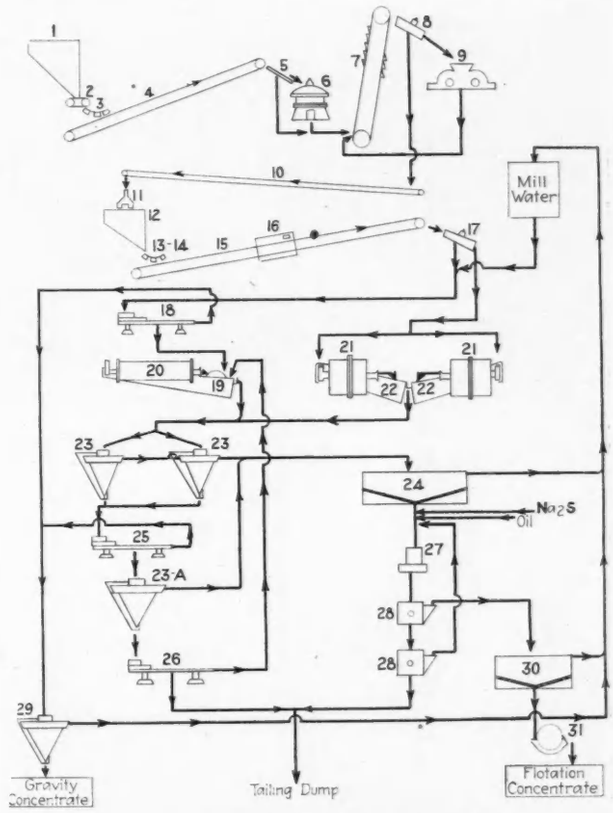
The primary flotation oil consists of a mixture of coal-tar creosote and hardwood creosote. The secondary oil usually consists of a mixture of oil tar, coal creosote, wood creosote and sometimes a little pine or eucalyptus oil.

The usual percentage of solids in the flotation pulp at the head of the primary machines is 30 and at the foot of the secondary machine about 28. Fine grinding seems essential to good flotation work. The usual grinding is all through 100 mesh, 2 per cent on 150 and 90 per cent through 200 mesh.

Flotation Machines Are Particularly Sensitive

The flotation operator controls the work of the flotation machines by varying the amount and kind of oil used, pulp density, pulp-level adjustments, and by varying the amount of sulphide solution used. The work of the machines is very sensitive to changes in the amount of sulphide, so that every precaution is taken to have the flow of the sulphidizing solution under ready and positive control by the operator. Although flotation requires close attention of expert operators, the results obtained are good and remarkably consistent; especially so when it is remembered that the ore treated is entirely oxidized and contains no natural sulphides of the minerals recovered.

All gravity concentrates are combined and laundered to Allen cone classifiers (29) for dewatering. These machines are automatic and entirely satisfactory. The spigot discharge of the cones, containing 21 per cent moisture, is caught in concrete bins having a sand-



THE MILL FLOW SHEET

filter bottom which further reduces the moisture to about 10 per cent. The clear water overflow of the cones is combined with the overflow of the flotation concentrate Dorr thickener and returned to the mill for reuse. The concentrate is shoveled from the bins onto shuttle-type conveyors which load the cars for shipment to the smelter.

Ratio of Concentration Almost 6 to 1

The flotation concentrate is thickened in a 20 x 12-ft. Dorr thickener (30). A 3-in. diaphragm pump ele-

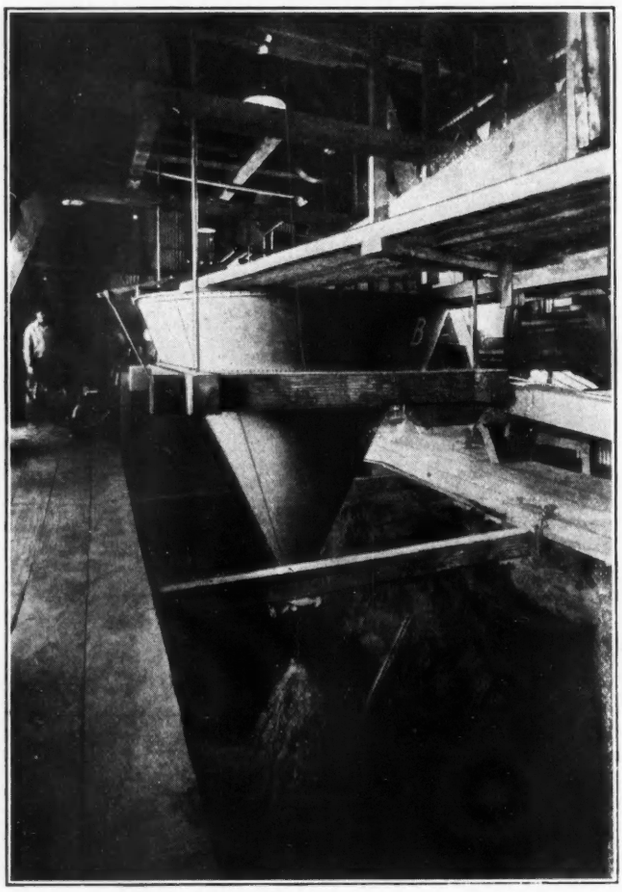
AVERAGE ANALYSES

	Au, Oz.	Ag, Oz.	Pb, per Cent	Fe, per Cent	"Insoluble," per Cent
Mill feed	0.059	7.22	6.27	13.73	65.99
Concentrate	0.227	28.53	32.92	20.6	22.3
Mill tailings	0.022	2.52	0.43	.....	.....
Recovery, per cent	69.4	71.3	94.4	.....	.....

vates the thick pulp underflow of the thickener to the hopper of an 8-ft. diam. x 6-ft. face Oliver filter (31) which discharges its cake into a concrete bin ready for loading.

The metallurgical efficiency of the process is well shown by the average analytical results of a recent period. During this time the ratio of concentration was 5.56 to 1 and the grade of ore was good. The recoveries were calculated from the average assays as noted.

The mill was designed for 400 tons' capacity, but has handled up to 500 tons with but little loss in efficiency. The buildings are all frame structures with corrugated galvanized iron sides and asbestos roofing. The floors and all foundations are of concrete. The mill was built during the World War at war prices at a cost of $275,000. All of the metallurgical work incident to the Shattuck milling enterprise, including the development of the sulphidizing flotation process, was done by Glenn L. Allen, who also designed the mill and supervised its construction.



DEWATERING GRAVITY CONCENTRATES
SHATTUCK ARIZONA MILL

Each shift in the mill consists of two millmen and two helpers, the ball-mill operator having charge of the shift. In addition to the operators the mill organization consists of a superintendent, foreman, clerk, samplers, millwright and mechanics. The crushing, loading of concentrates, unloading of ore, and general surface work requiring unskilled labor is done by Mexicans under the direction of an American surface foreman.

For permission to publish this account I am greatly indebted to L. C. Shattuck, general manager of the Shattuck Arizona Copper Co., to whom acknowledgment is duly accorded.

Difficulties of South African Mines

In spite of the premium on gold, the low-grade gold mines of the Rand (Witwatersrand) are finding it difficult to continue operation, in view of the mounting cost of production, according to Trade Commissioner R. A. Lundquist. For the year 1914 the average working cost for the mines of the Rand district was 17s. 1d. ($4.16) per ton milled. For the first three months of 1920 the costs averaged 25s. 9d. ($6.30 at normal exchange).

The increase in working costs has been due partly to higher wages and partly to the increased cost of all materials, and, in addition, the burden of the mines has been increased through the heavy exchange charges imposed by the banks. At present (May, 1920) the banks charge 8 per cent on London sight drafts.

The closing down of many of the low-grade mines seemed imminent last year, in view of the rising working cost, but the premium on gold temporarily eased the situation. However, the prices of all commodities soon began to rise in even greater proportion than the premium on gold, and, furthermore, while the premium on gold has receded to about 26 per cent, as against a maximum of 44 per cent of a few months ago, the cost of labor and commodities has not been reduced.

Many of the mines, therefore, are now operating at a loss and are faced with the proposition of taking out ore only from the richer sections of the property in order to continue. However, some of the mines are unable to carry on this selective mining, and the Princess, the Jupiter, and the Simmer Deep have already announced that they will close down, and Roodepoort United is considering doing so. At several other mines, the Durban Roodepoort, Deep, the Aurora, the New Goch, and the Luidpaardsvlei Estate, the managements have arranged to cut down the number of white miners to a minimum, and are endeavoring to increase the production per man.

Joint meetings of mine officials and of mine labor leaders are being held to consider the situation, which is regarded locally as serious. Nothing has been announced as to the results of the meetings, but it is reported that the labor leaders and the miners themselves appreciate the gravity of the situation, and that the mine workers' union will take steps toward an increased production per man.

The closing down of these low-grade mines will to a considerable extent affect the mining machinery and materials market, but the effect will be lessened by the increased activity on the East Rand, where new mines are being developed. However, the idle equipment of the mines being shut down will be available for the mines coming into development, and this will reduce the demand for any equipment on the East Rand to no small extent. The general economic unsettlement due to the closing down of mines will also, no doubt, react seriously upon the importation of American goods generally.

State Aid for Australian Lead Producers

A relatively large proportion of the Australian production of lead, zinc, and silver is produced by the various mines at Broken Hill, New South Wales, all of which is handled through the State of South Australia, the lead and zinc being treated at Port Pirie by a producers' association which owns the reduction plant there.

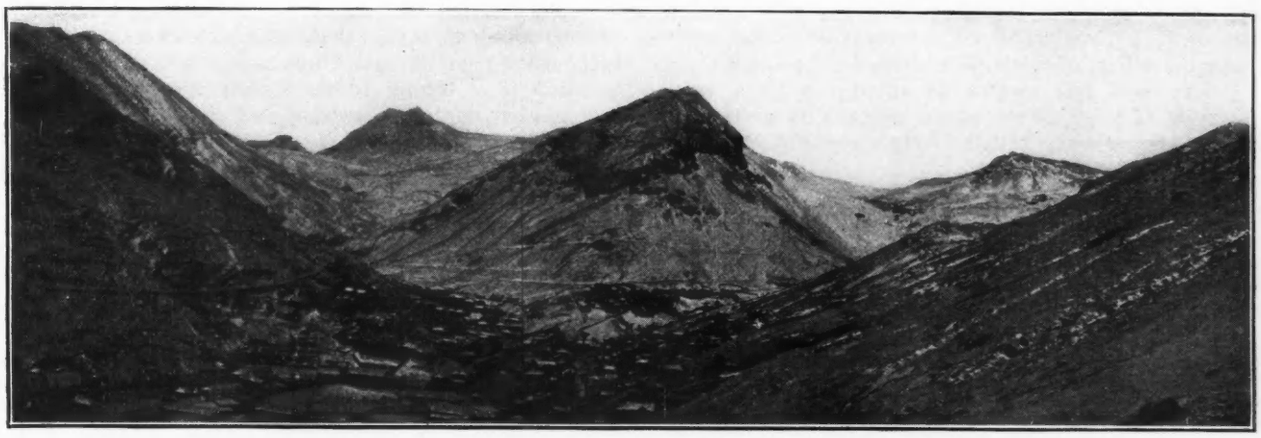


FIG. 1. VIEW OF THE COLQUECHACA MINING DISTRICT

Note rims of old houses surrounding the now inhabited part of the city. The high peak at the head of the valley on the left is Hermoso peak. The rims near the head of the valley on the right mark the site of the ancient settlement of Aullagac.

Revival of the Colquechaca Silver-Tin District, In Bolivia

Ancient Mines in the Andes Mountains Which Have Yielded High-Grade Silver and Tin Ore From Narrow Fissure Veins in Igneous Rocks Are Being Reworked—Present Operations Contemplate Using Flotation To Recover Both Metals

BY JOSEPH T. SINGEWALD, JR.*

Written for *Engineering and Mining Journal*

DESPITE the well-known productivity and importance of the Colquechaca district in years gone by, geological and mining literature on the region is particularly meager. The only readily accessible account is a résumé by R. Peele, Jr., published in the *Engineering and Mining Journal* in 1894, of a private report made by him in 1892. This deals primarily with the operating conditions and treatment of the ores at that period, and was written at a time when only the silver ores were known. Since its publication, the district has passed through a long period of desuetude in silver mining, toward the close of which there was a brief boom in tin mining. It is now in the early stages of what promises to be an important revival in both silver and tin mining. The time seems opportune, therefore, to give an account of the main features of the ore deposits as they are known today and of the new operations that are being initiated.

The close association of silver and tin ores in many of the Bolivian veins has attracted much interest for a number of years. At the beginning of tin mining in Bolivia, there was considerable discussion as to the conformity or non-conformity of the Bolivian tin veins to the normal tin-vein type of Europe. Only in recent years has the completion of the Bolivian railroads made the Bolivian mining districts reasonably accessible, so that the participants in this early discussion were usually familiar with a restricted area only, and were prone to generalize on the basis of what they saw in that area. Thus, some observed no essential difference between the Bolivian tin ores and the European; others could discover no essential points of similarity. Attempts were made also by some investigators to differentiate two distinct types of deposits with different areal distribution.

It has been my privilege in the course of several trips to South America in the last five years to visit almost all of the important mining districts of the Bolivian Andes. My observations indicate with increasing certainty that the mineralization of that range is a genetic unit, and that its exceedingly diverse expressions at different points are only local facies of one general mineralization. At some points, or even over certain large areas, a typical tin mineralization has taken place. As those deposits have been more closely observed, telltale traces of the silver or bismuth minerals often have been noted. At other points, the silver and tin minerals or the bismuth and tin minerals are essential constituents of the ores and are so intimately intermingled as to leave no doubt of their genetic unity. On the other hand, in the light of present scant knowledge concerning them, there are other places where the silver mineralization does not seem to have been accompanied by the deposition of tin or bismuth ores, and where, consequently, a distinct and unrelated mineralization may have occurred.

When consideration is accorded the fact that many of the old silver districts of Bolivia are today producers of silver and tin, with the latter in many instances of predominating importance, and that most of the apparently tin-free silver districts are those that have been quite dormant since the inception of tin mining in Bolivia, suspicions are aroused, and the investigator wonders whether a reopening of those old mines would not disclose tin ores, just as has happened in such districts as Oruro and Potosi. If such were not the case, why should not a tin-free silver mineralization repre-

*George Huntington Williams Memorial Publication No. 4.

sent one extreme, just as the silver-free tin mineralization of such a region as the Quimsa Cruz range represents the other, of a single metallogenic province?

Colquechaca has seemed to stand out as a representative of the tin-free silver type, noted particularly for its great accumulations of the ruby silver ores. It is true that a tin production has been reported from the Colquechaca district for some years, but nothing was known concerning the relation of the tin veins to the old silver veins, and it is probable that the tin ores may have come from other veins in the vicinity, as it is known that such tin districts as Ocuri and Maragua were not far distant. A visit of several days at Colquechaca proved, however, that the Colquechaca veins are both silver-bearing and tin-bearing, and that beyond question they belong to the mixed type of silver-tin ores so abundantly represented in Bolivia.

Colquechaca lies at an elevation of 14,000 ft. at the fork of a deep valley cut into the southern flanks of a group of peaks which rise to an elevation of 2,800 ft. above the city. It is most conveniently reached from Chaliapata, a station on the Antofagasta & Bolivia Ry., between Uyuni and Oruro, with which it is connected by a road eighty miles long, which is now traversable by

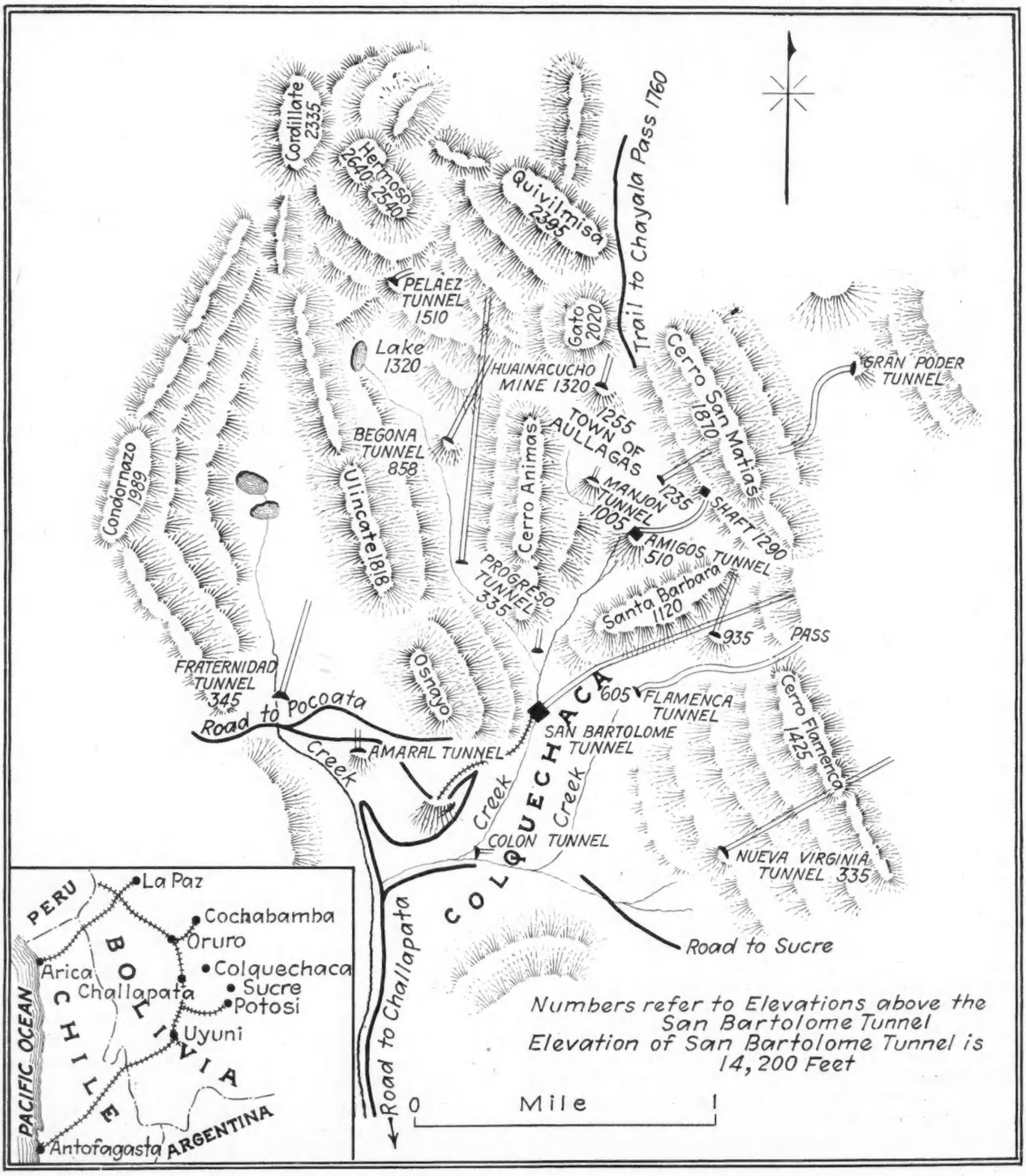


FIG. 2. SKETCH MAP OF COLQUECHACA MINING DISTRICT, SHOWING THE LOCATION OF THE PRINCIPAL MINES

automobile. Colquechaca lies a little north of east of Challapata. Sucre is situated about sixty miles to the southeast, and Potosi about one hundred miles in a direction east of south.

The great antiquity of the Colquechaca mines is attested by the fact that the San Bartolomé tunnel, the longest in the district, was begun before 1700. The city of Colquechaca is the third mining town that has sprung up on the flanks of this group of mineralized mountains. In the canyon between Santa Barbara and Flamenca peaks are the ruins of the completely abandoned town of Anconaza, about which are evidences of ancient workings of considerable extent. South of the Cerro Gata, in the canyon between Animas and San Matias peaks, are extensive ruins of the town of Aullagas, which, except for the presence of a few Indian families, is likewise abandoned. About thirty years ago, Colquechaca had a population of 8,000. A period of decline to almost extinction of the mining industry then set in, so that by 1900 the population of the town had dwindled to a few hundreds, and in 1915 it was mainly a town of roofless walls.

With the increasing activity in the Bolivian mining industry incident to the rising prices of silver and tin during the war, a revival set in at Colquechaca, and the district recently has been the scene of more active operations. The former population is returning in constantly increasing numbers and the bare dobe and rock walls along street after street are again being roofed and converted into habitable houses. The town now presents the curious spectacle of a central inhabited part with newly whitewashed houses surrounded by outlying sections of abandoned walls.

General Features of the District

The prevailing rocks for miles around Colquechaca are a great series of red sandstones, quartzites, and shales, which Steinmann has called the Puca sandstone, from the Quecha word for red. The series is generally made up of three fairly distinct divisions—a lower consisting of red sandstones; a middle, made up of red clays, with which are often associated salt and gypsum; and an upper, which, like the lower, is prevailingly sandy. These beds are for the most part unfossiliferous. Near the base of the shaly division, however, are often fossiliferous limestones, which near Miraflores and between Miraflores and Potosi have yielded Cretaceous forms.

Colquechaca is on the contact between these red sediments and a mass of igneous rock which constitutes the group of peaks in the vicinity of the town on the north, and which has been intruded into and through the Cretaceous strata. The igneous rock is a rhyolite which ranges in texture from a distinctly porphyritic rock, in which there are large phenocrysts up to an inch in diameter, to a rock with very small phenocrysts. The phenocrysts are quartz, feldspar, and hornblende. The quartz crystals are generally less than $\frac{1}{10}$ in. in diameter and quite abundant. The feldspar is usually a glassy orthoclase, and frequently shows zonal structure. Many individuals are over $\frac{1}{4}$ in. in diameter and some are as much as an inch, but most of them are smaller. In some places the rock contains patches of radiating acicular crystals of tourmaline, many of which have pyrite in the center. Often the tourmaline in part replaces the feldspar phenocrysts. Small fractures are also filled with veinlets of tourmaline, but the mineral was not seen in the ores. Locally there is an abundance of inclusions of fragments of sedimentary rocks, chiefly sandstones and quartzites, in the form of rounded pebbles.

All of the workable veins of the Colquechaca district lie within the igneous rock. The most famous and productive has been the vein which to the southeast is called the Embudo and to the northwest the Gallofa. It has been worked through the San Bartolomé, Amigos, Huainacucho, Progreso, Begoña, and other tunnels, almost continuously along the strike for a distance of two miles, and over a vertical range of 2,000 ft. The outcrop of the vein runs in the direction N. 35 deg. to 60 deg. W. near the crest of the mountain on the south side, from the pass between Flamenca and San Matias

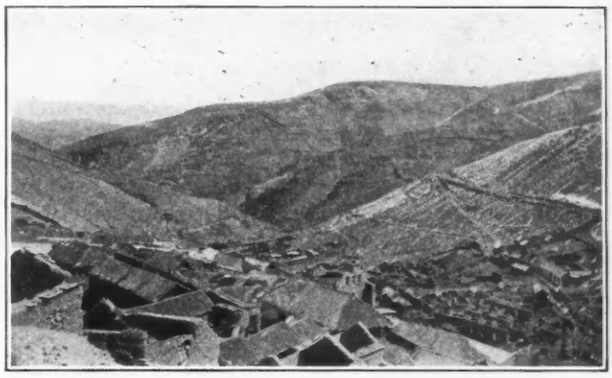


FIG. 3. LOOKING DOWN THE COLQUECHACA VALLEY OVER THE LOWER PART OF THE CITY

The rocks are strata of the Puca sandstone series.

peaks. Its dip is usually steep to the north, but equally steep reverse dips are found. It has yielded only silver ores, and has been especially noteworthy for phenomenally high-grade oreshoots.

The vein is generally a well-defined but narrow fissure filling, rarely over four to eight inches wide. Over most of its extent it consists of low-grade or barren filling, frequently gouge and sphalerite. Irregularly distributed are the small shoots of rich silver ores. The most important ore mineral has been ruby silver. Associated with it, particularly in druses, is wire silver. Argentite and tetrahedrite are also of common occurrence. The most abundant sulphide is sphalerite. Galena is found only locally, and iron sulphides are not abundant. The principal gangue mineral is quartz.

Descubridora Vein Now Worked for Tin

About 300 ft. northwest and parallel to the Embudo vein is the Descubridora, which has also produced large quantities of silver but is now worked primarily for tin. The southeast end of the vein lies on the north side of the crest of the mountain, but toward the northwest it crosses to the south side. It was not encountered in the San Bartolomé tunnel, but was an important vein in the mines west of it as far as the Manjon tunnel. The average width of the vein is eight to sixteen inches, but it attains to widths of three feet or more. On the other hand, it frequently splits up into small stringers to such an extent as to be unworkable. Most of the ore has a massive and compact texture, but locally it is drusy and crustified, and has a banded structure. The gangue minerals are quartz and a little siderite. Sphalerite is the most abundant ore mineral, with cassiterite second.

Much more pyrite occurs than in the Embudo-Gallofa vein, and also a little chalcopyrite and pyrrhotite.

Galena is found in sufficient abundance locally as to necessitate sorting it out of the tin ores to be concentrated. The average grade of the hand-sorted ores is about 15 oz. of silver and 9 to 18 per cent tin. Small pockets and shoots of rich silver ore are frequently encountered that yield a half ton to a ton of ore, with several ounces in silver. The principal silver mineral is the ruby silver. There is considerable similarity, therefore, between the Embudo-Gallofa and the Descubridora veins. The differences are that the Descubridora sliver shoots are not as abundant or large as those of the other vein, and there has been sufficient deposition of tin in the Descubridora to bridge over the gaps between the silver shoots with workable ore and thus make the vein important as a producer of tin ore.

Another Producing Vein

In the Begoña and Progreso tunnels a vein is encountered parallel to the Gallofa but at a distance of 1,000 ft. to the northeast, which is called the San Carlos. In the absence of a vein in the expected position of the Descubridora, the San Carlos is believed by some to be the northwestward continuation of the Descubridora. The filling of the vein is mineralogically the same as

FIG. 4. ONE OF THE REHABILITATED STREETS OF COLQUECHACA. ANIMAS PEAK AT THE HEAD OF THE STREET. HERMOSO PEAK IN THE BACKGROUND

that of the latter vein, but sphalerite and quartz are more abundant, cassiterite is less abundant, and the silver shoots are lacking. Only a small part of the vein is rich enough in cassiterite to yield workable ore under existing conditions.

The Embudo-Gallofa, Descubridora, and San Carlos are the only veins producing at present, but a number of other veins have been worked, some for silver, others for tin, and some for both metals, several of which have yielded large productions. Prospecting is being carried on, and doubtless other productive veins will be developed. By far the most important part of the district has been the side of the mountains facing Colquechaca. On the east side much work has also been done, and considerable production has come from the mines on that side. The north side of the mountains has been but little worked, and the west side still less.

Aliada Mine Formerly Prolific

In Gato and San Matias peaks, on the east side, is the Aliada mine, now idle, but which about 1910 was producing at the rate of 100 tons of 60 per cent concentrates annually from hand-sorted ore carrying 25 per cent tin. The value of the tin production of this mine is said to have aggregated over two million dollars, a figure that is doubtless exaggerated. Lower down in the same canyon in which the Aliada mine is situated, is the Gran Poder mine, which is not now being worked, on account of the complexity of the ore. The Lora is the principal vein in this mine. The tin tenor is said to be high, but the vein is only four inches wide, and carries so much galena that the production of clean tin concentrates is difficult. The Rosario vein, at right angles to the Lora, carries less galena but more sphalerite. The Porfyr vein, northeast of the Gran Poder mine, is being developed by Simon I. Patiño. As thus far opened up and developed it is a narrow vein with highly pyritic ore.

The wall rock of the Colquechaca veins has undergone considerable alteration. For some distance from the vein, it is soft and kaolinic in appearance and impregnated with pyrite. At the vein walls, it is often typical gouge, and shows evidence of mashing, which may warrantably be assumed to be due to slipping along the fractures.

Tin Ore Concentrated Locally in Present Operations

The production of the district comes from the Huainacucho, Santa Teresa, Manjon, and the Gallofa mines. The position of the Huainacucho mine is shown on the sketch map. It is the property of the German commercial firm of Moerch, Bauer y Compañia. Rafael C. Campos and Luis Calvo have operated the mine under lease since early in 1919. Up to August of that year only ten tons of high-grade tin ore had been shipped, the rest of the production being stored at the mine awaiting facilities for milling. At that time they leased La Cruzada mill, situated in the valley a short distance below Colquechaca. The production last year was at the rate of 400 tons of crude ore per month, all from the Descubridora vein.

The Santa Teresa mine is owned and operated by the Gumucio Brothers, and has been worked about three years. The workings are likewise on the Descubridora vein, and lie to the east of and above those of the Huainacucho mine. During the latter part of 1919, the daily production had been brought up to 1½ tons of high-grade ore and 4½ tons of concentrates. The company has rented a small mill at the lower end of the city, to which the ore is brought down on llamas. After a preliminary hand-sorting at the mine, the tin content of the ore sent to the mill is 18 per cent. Concentration with hand jigs makes a preliminary product of 35 per cent tin. This is ground in a Krupp ball mill and classified into three sizes, 2-4 mm., 1-2 mm., and less than 1 mm. The two coarser sizes are concentrated on jigs. The smallest goes to a spitzkasten, the settlings of which are treated on a Wilfley table and the overflow in buddles. The jigs and table make a pyritic middling, which is roasted and reground in a buhr mill, and then reconcentrated. The final concentrate contains 62 to 65 per cent tin. The silver content is such that the concentrates carry 12 oz., the middling 60 oz. and the tailings 20 to 24 oz.

The Gallofa Consolidada is a Bolivian stock company, with headquarters at Sucre. It is operating the Manjon mine and the Gallofa mine, which includes the Progreso and Begoña tunnels. In the Manjon mine only the

Descubridora vein is being worked, and operations are on a small scale. The San Carlos vein is being worked in the Begoña tunnel, and the ore is treated in a small mill equipped with hand jigs and buddles at the Progreso tunnel. The output is 30 to 40 tons of concentrates monthly. In the Progreso tunnel the high-grade silver shoots of the Gallofa vein are being worked. The company is erecting a new mill of 40 tons' capacity a quarter mile below the tunnel to treat the lower-grade silver-tin ores. The ore will pass from a crusher to ten stamps with ⅜-in. screen. The stamp pulp will go to a hindered settling hydraulic classifier. The overflow from this will continue to a Dorr thickener, and the settlings to trommel, which will make a more than 20-mesh product and a less than 20-mesh product. The greater than 20-mesh size will be concentrated in a four-compartment jig, the first two compartments making tin concentrates, the last two middlings, and the tailings being discarded. The less than 20-mesh size will be concentrated on a Deister table. The jig and table middlings will be reground in a Hardinge mill. This mill pulp and the settlings of the Dorr thickener will be concentrated in a Kraut and Kolberg flotation machine. The flotation tailings will be concentrated on Deister and Overstrom tables, roasted, and reconcentrated on slime tables. The ore to be concentrated in this mill is estimated to contain 45 oz. of silver and 5 per cent tin. Flotation experiments with it yielded a 360-oz. concentrate.

The most productive part of the Colquechaca district in the past was that of the Compañía Colquechaca Aullagas de Bolivia, which last year was acquired by Simon I. Patiño, the owner of the Uncia, Huanuni, and other mines in Bolivia. This property is also known as La Unificada, because it represents the consolidation of the workings of the Flamenca, San Bartolomé, Amigos, and other tunnels in their vicinity. It is the purpose of Patiño to reopen these old mines and push their development.

The possibilities of this plan for the rehabilitation of the mining industry of Colquechaca can be grasped by a consideration of a few production figures given in Peele's report. In the twenty-seven years subsequent to 1865, the San Bartolomé tunnel produced $21,000,000 in silver, and from 1884 to 1892 the Amigos tunnel produced $5,700,000. During the first ten months after the consolidation of the properties in 1892, the combined output was 809,000 oz. of silver.

Colquechaca District Has a Bright Future

From the foregoing description, it is evident that the veins of the Colquechaca district are persistent laterally and vertically, but are very narrow. Mineralization is not uniform, but, on the contrary, is very irregular. The veins are characterized by the occurrence of rich oreshoots, between which the grade of the ore in low. This is particularly true of the silver veins with little or no tin content, in which the mineralization is practically devoid of values between the oreshoots. It is true to a less extent in the veins in which the value of the tin exceeds that of the silver.

In the days when only the silver ores were worked, the existence of the mines was precarious. A company was prosperous for a period; then followed a long barren spell, against which resources had not been sufficiently conserved, and a collapse followed. Now that the tin ores are also being utilized, and provision can be made for the recovery of both tin and silver values of the mixed ores, that state of affairs has been considerably ameliorated. Nevertheless, the nature of the Colquechaca veins is such that their successful exploitation can be accomplished only by companies with a far-sighted policy and adequate resources, working on a program that carries them over the lean periods as well as through seasons of prosperity. The performance of these veins in the past, and the developments of the present, make reasonably sure a successful outcome with such a program. The Patiño management, especially, is capable of and has the resources for operating on such a basis, so that Colquechaca should soon again take high rank among Bolivia's mining districts.

U. S. Quicksilver Production Declined in the Second Quarter of 1920

From April 1 to June 30, 1920, inclusive, 3,685 flasks of quicksilver of 75 lb. net was produced in the United States, according to F. L. Ransome, of the U. S. Geological Survey, who obtained the figures from the producers. This is 1,214 flasks less than was produced in the first quarter of 1920 and 255 flasks less than was produced in the second quarter of 1919. Only thirteen mines were reported as productive—eight in California, one in Nevada, one in Oregon, and three in Texas. California produced 2,704 flasks, Texas 952 flasks, and Nevada and Oregon together 29 flasks.

The chief cause of the decrease in production during the second quarter was the destruction by fire on June 20 of the reduction plant of the New Idria mine, in California, and the consequent loss of quicksilver already reduced during the earlier part of that month. Because of this misfortune the production for the third quarter of 1920 will probably be still smaller than that for the second quarter. Reconstruction is in progress, and it was thought that the plant would be in partial operation in August or September of this year. Other causes that contributed to the decrease in production were a shortage of efficient labor and a reduction in the average grade of the ore.

At a time when initiative in the quicksilver-mining industry is at a low ebb and the tendency is rather to abandon enterprises already begun than to embark on new ones, it is of interest to note that the former productive Klau mine, in San Luis Obispo County, Cal., has been reopened under capable management as the Carson mine, and that its 50-ton furnace has been put in repair, so that the mine is likely to become a considerable producer.

The Styrian Iron Industry

A few weeks ago, according to *The Ironmonger*, the last blast furnace of the Alpine Montan Co., in Styria, was blown out. Styrian ore, the chief product of the country, can no longer be smelted locally, because not enough coke is coming from Czecho-Slovakia. The Styrian iron and metal industry is now entirely dependent upon foreign iron, and Czecho-Slovakia, taking advantage of the situation, recently raised its prices of iron for delivery in Austria by 16,000 Austrian kronen per ton, and a further increase is under consideration. The Austrian government has been asked to take speedy measures to obtain supplies of fuel, to avert the complete ruin of the Styrian iron industry.

The Declining Quicksilver Production

Drop in United States Output of Mercury Especially Marked During the Summer—World Production Also Has Been Declining, but Present Prices Make It Difficult To Operate Domestic Properties Profitably

BY MURRAY INNES
Written for *Engineering and Mining Journal*

THE Geological Survey has estimated the United States quicksilver production for the first quarter of 1920 at 4,900 flasks. The estimate for the second quarter has not yet been published, but cannot fully reflect the decline in production during June, July, and August, which has been so rapid as to indicate a collapse of the industry. Two-thirds of the mines that were producing in the first quarter are no longer operating. The extensive works of the New Idria mine were destroyed by fire in June, and the California output has declined to 300 flasks monthly. The total United States monthly production is now less than 700 flasks, and though the New Idria Co. will gradually rebuild, it is doubtful if the United States output for the second half of the year will average 1,000 flasks monthly, which compares with 3,000 flasks per month during 1917 and 1918.

A COMPARISON OF COST OF PRODUCTION AND PRICES

The cost of mining and reduction has steadily increased. As a rule twelve to fifteen tons of ore are mined and roasted to produce a flask of quicksilver, and thus any increased cost per ton is multiplied in like ratio.

The present New York price (about $75) compares with $105 to $125 per flask during 1917 and 1918, and therefore, though the average cost of production has doubtless increased at least $25 per flask, the market price has declined even more, and as a result there is now no incentive to operate even a well-developed and well-equipped property.

During 1919 the average selling price was somewhat higher, and the average costs of labor, fuel, and other items, considerably lower than at present, but even under the conditions then prevailing the profit of the largest producer on a production of 7,400 flasks amounted to only $1,051.81, or about 15c. per flask.

The New York market has lately been depressed by the dumping of Italian metal, made possible because of exchange conditions, and also from the dumping of re-sale metal from Japan, where a financial crisis has prevailed, and even from the dumping of the small stock held by our Navy Department, amounting to about 1,400 flasks. It would seem (at least to the quicksilver miner) that there was no urgent need of sacrificing this metal at $25 per flask below what it cost the Government.

Prior to the war the average quicksilver consumption in this country was about 2,500 flasks monthly, and at present the country is producing about a quarter of this amount, with small likelihood of permanent increase.

THE ATTITUDE OF INTERESTED PARTIES

The position of the miner is simple. He can no longer operate. The Western metal miner is an optimist, but there is usually a limit to the period in which he can operate his mine as a charitable institution.

The position of the quicksilver importer is also simple. The smaller the domestic production, the larger the imports and the larger his business and profits. In other words, he profits by the death of the domestic industry.

The position of the manufacturers of explosives and mercurials and the other larger consumers, who have always the lion's share of profits from quicksilver, has been, I think, rather shortsighted and for the following reasons:

Notwithstanding war demand, the quicksilver production of Europe has also shown a considerable decline during the last few years. For example, the annual production of Spain, including the great Almaden mine, was 23,300 flasks in 1916, 24,300 flasks in 1917, and 16,600 flasks in 1918, or an average of 21,000 flasks for this three-year period. This compares with an average of over 40,000 flasks prior to 1912. As far as figures are available, the production of Italy and Austria also shows a decline, with mine operation becoming increasingly difficult, owing to strikes and Bolshevist activities.

As compared with the United States production of 1917 and 1918, our output at the present rate will show an annual decrease greater than the entire output of Spain, and the United States consumption on a pre-war basis would absorb not only our present output but also the entire output of Spaiu.

THE QUESTION OF THE TARIFF

With declining world production, it might therefore profit our large consumers, now that the domestic production is in collapse, to look about and insure their future requirements. Domestic stocks are negligible, and as most of the European supply is in strong hands, there is a possibility that those who control it may some day decide to do much manufacturing in Europe. If this should happen, the ultimate consumer will doubtless pay through the nose.

The production of quicksilver is not a large business, and the few engaged in it have no influence; but it is a fairly useful metal to have in the country, and when war comes it is an essential. Possibly in a year or two years some old-fashioned protectionist may suggest that it might do no harm to keep the industry alive. Right then we will doubtless hear from the importers and also from the assorted blatherskites who will raise a howl about taxation for the benefit of a few wealthy mine owners. It is to be hoped that the consumers will, if only for their own benefit, take a broader view and show more of the spirit of live and let live than they have shown in the past.

[Since this article was written the quicksilver production estimate of the U. S. Geological Survey for the second quarter of 1920 has been received and will be found on page 767 of this issue of *Engineering and Mining Journal*. It confirms the decline in United States quicksilver production mentioned in Mr. Innes' paper.—EDITOR.]

Mining Engineers of Note

Pope Yeatman

POPE YEATMAN told a story on himself at a dinner given by the Mining and Metallurgical Society of America, on March 21, 1918, at which time he was presented with the Gold Medal of the society for Distinguished Service in the Administration of Mines. The story was to the effect that he had admitted to his young son that he had never killed a bear, an elk, or a man. His son thoughtfully replied, "Too bad; you're not much of a hero." From this we gather that we may be judged by different standards. Although Mr. Yeatman may receive the same opinion from his fellow engineers with regard to his heroic qualities in the use of firearms, there is little doubt as to how he stands professionally and in the esteem of his colleagues. Mr. Yeatman was born in St. Louis on Aug. 3, 1861. After receiving his degree from Washington University in 1883, he was first employed at the plant of the St. Genevive Copper Co., near St. Louis. From there he went to New Mexico, Mexico, and then Colorado, where he engaged in mining. Later he accepted the position of superintendent of the mine, mill and smelter of the Doe River Mines, in Missouri, and in 1891 took charge of the properties of the Empire Zinc. Co., at Joplin, Mo. In 1895 he went to South Africa, where he remained until 1904. During this time he was successively assistant consulting engineer for the Consolidated Gold Fields, general manager of the Robinson Deep mine and later of the Simmer and Jack mine, and finally consulting engineer and general manager of the Ranfontein Estates Gold Mining Co., Ltd. The nine years spent in the Transvaal by Mr. Yeatman were eventful ones in the history of the gold-mining industry of that country, and his part of the development during that time was most notable.

POPE YEATMAN

Returning to this country, Mr. Yeatman entered consulting work. This was at a time when the copper industry was undergoing a change and methods of mining and treating low-grade ores were receiving attention. In his administration of the Nevada Consolidated Copper Co. he demonstrated that excellent ability for organization which also characterized his work at the Braden and Chuquicamata mines, in Chile.

When the Great War arrived, Yeatman was one of the first engineers to offer his services to his country, for he comes of a military family; and he took steps to enter the Engineering Corps of the Army. At about that time Bernard Baruch was organizing and developing the War Industry Board into a great system which eventually kept track of and controlled the industries of the whole country. He got J. Leonard Replogle, head of the Replogle Steel Co., to come to Washington and take charge of iron and steel problems, and then he cast around for a suitable head for his division to take charge of the other metals — copper, lead, zinc, and such trifles. Yeatman was the man who seemed best fitted, and Baruch asked him to contribute his services. Mr. Yeatman explained to Baruch that he wanted to enter the army, but would go where duty called him, although a desk at wartime did not at first impression arouse in him much enthusiasm. Baruch thereupon had Yeatman appointed a Lieutenant-Colonel of Engineers in order to try to please his new division chief, but when Yeatman heard of it he refused the commission and said he had least of all the ambition to be a swivel-chair officer. So it is *not* Colonel Yeatman, but we love him the better for it. His war record, as it was, left nothing to be desired in the way of being the right man on a big war job.

It is such a record in a Government position, combined with his signal achievements as an engineer, organizer, and operator, that has led many of the mining fraternity throughout the country to hope for a man of his type to head the Bureau of Mines. Those who have worked with him testify to the breadth of his knowledge of details as well as principles, whether it was the detail of sampling procedure or the geology of such a complicated problem as Chuquicamata.

Among the societies in which Mr. Yeatman is a member are the A. I. M. E., the A. S. C. E., the Institute of Mining and Metallurgy, and the Mining and Metallurgical Society of America.

By The Way

Too Much Variety

"These days, m'son," said Cap'n Dick, "a man mus' naw jus' w'ot 'e's doin', an' it does'nt 'ardly do to confuse 'is work so that 'e becomes one o' these 'ere jack-o'-h'all-trades. This is tha h'age o' specialization, they do say, an' tha business o' tryin' to do too many things at once does'nt work h'out some'ow. Sometimes a chap gets h'all h'upset h'over tryin' to suit h'everybody. Take tha case o' Jan Williams, tha blacksmith. W'y, 'e were a good blacksmith too, but they bloody near spoiled 'e w'en they tried to give 'im somethin' to do besides blacksmithin'. 'Ere's 'ow it 'appened. The super, one day, h'asks Jan to keep track o' tha time 'e puts on h'each job in tha shop so that they could make tha right h'appropriations in tha h'office. So Jan said 'e would, but, dam-me, tha more 'e tries tha worse 'e gets tha charges mixed h'up. Tha chief clerk kep' after 'im to get tha h'accounts straight, but Jan wuz poor at figgers, so 'e could 'ardly make 'ead or tail out o' they. Finally one day Jan gets mad, an' after swearin' aroun' 'e sez to tha chief clerk, ''Ere, you, be I a blacksmith or be I a bloody book-keeper?'—an', dos't thee know, m'son, they let 'im alone h'after that for 'e come mighty near quittin'."

Reviews of 1920

Those who hold that engineers should take a more active interest in what is going on about them, aside from their own particular work, will be glad to learn that the U. S. Bureau of Standards has recently issued a paper on the subject of "Adjustment of Parabolic and Linear Curves to Observations Taken at Equal Intervals of the Independent Variable." It is high time that our scientists turned their attention to the national game, the ins and outs of which are readily seen to be susceptible of much investigation. Such manifestation of interest will also serve to awaken in the esoteric a keener appreciation of its finer points and, on the other hand, will perhaps imbue those of the exoteric class with a desire to become esoteric, thus tending to raise standards throughout the country. This is where the Bureau comes in. Lack of space unfortunately prevents quotations at length from this admirable paper. Let it suffice that it starts out with "$Y = A + BX$," to which we echo "Y indeed," and after a reference or so to the "Theory of Errors," that umpire's handbook, arrives at the expression $Y = 0.0285 + 0.009141\ X$. Here is the answer, then, and the reason why only a few become proficient in curves is readily apparent. We have but one criticism to offer, and that is that the author spends too much time on "least squares." Some authorities hold that this should be "diamonds" rather than squares, and there are some who go even further and sweepingly declare that there is nothing square about the thing at all. The pamphlet costs but five cents and may be obtained from the Superintendent of Documents at Washington.

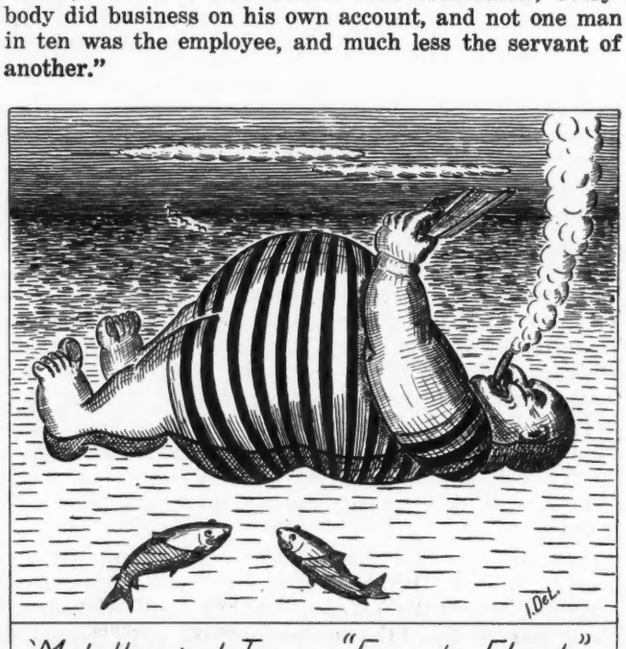
Another paper that is worthy of more than passing comment is Professional Paper 128-A of the U. S. Geological Survey, entitled "The Fauna of the Cannonball Marine Member of the Lance Formation." It is one of the shorter contributions to general geology, being only sixty-six two-column pages in length. The title has a post-bellum sound, but this is merely an accident, the article being a discussion of all the known animal fossils from the Cannonball member. The fauna is strictly marine. Among the good things which all will be glad to hear about are the Solemya bilix White, the Fasciolaria (Mesorhytis) dakotaensis Stanton, and the Otodus obliquus Agassiz and their numerous faunal relations. Those interested should apply to the Director for a copy of this pamphlet.

A Consulting Food Expert

"Dr. Beef, the well-known lady authority on food values, has accepted an invitation from the Rand Mines, Ltd., to visit the mines and report on the question of mine natives' food," says the *South African Mining and Engineering Journal*. Thus opens a vista of jobs for the jobless, not to say beef for the beefless.

Equality

"Next to the tendency of life in the mining regions to remove all restraints and bring into prominence all the vices that were lurking, perhaps unknown to themselves, in the breasts of many of the first comers," says Hittel's "History of California," "one of the most noticeable features of the times was the extraordinary leveling tendency of that life—a tendency upon the effects of which have been based to a great extent the readjustments and developments on new lines that have constituted the peculiarities of California civilization. Every man, finding every other man compelled to labor, found himself the equal of every other man; and, as the labor required was physical instead of mental, the usual superiorities of head-workers over hand-workers disappeared entirely. This condition of things lasted several years. Men who had been governors and legislators and judges in the old states worked by the side of outlaws and convicts; scholars and students by the side of men who could not read or write; those who had been masters by the side of those who had been slaves; old social distinctions were obliterated; everybody did business on his own account, and not one man in ten was the employee, and much less the servant of another."



"Metallurgical Term: "Easy to Float."

CONSULTATION

Method of Marketing South African Gold

"It is not quite clear to me exactly how the South African gold producers market their gold so as to obtain the benefit of the 'gold premium' in London. I can readily understand that it is due to the depreciated currency of Great Britain and the relatively high gold price in the United States that a premium exists, but the exact manner in which the result is brought about is unknown to me. Can you enlighten me upon the subject?"

Without entering into a discussion of the history of the gold premium, a subject which has frequently appeared in the columns of the *Engineering and Mining Journal*, suffice it to say that the South African gold producers are enabled to realize a premium over the normal local currency value of their gold by being allowed to sell their product in the general world market and receiving in exchange the equivalent of $20.67 per troy ounce in their own depreciated *paper* currency.

In marketing their gold, the South African gold mines rely on an agreement made on July 24, 1919, between the Imperial Government, the Union Government, and themselves, whereby they agree to ship all gold refined and unrefined which has been produced by them, to England, consigned to the Bank of England, with, naturally, the exception of such amounts of metal as are necessary to meet local currency requirements. The unrefined exported gold is refined upon arrival at the Bank of England by the gold producers' refiners. The sale of all the refined gold is negotiated by the producers' agents at the best market price obtainable. The fluctuations in the London price of gold reflect the discount on foreign exchange; when exchange is low the price of gold is correspondingly higher, and vice versa.

The Bank of England has authority from the Treasury to issue licenses for the re-exportation of the gold at any time within the period of five weeks from the date of its arrival at the bank. Under ordinary conditions, a period of five weeks is assumed to be amply sufficient to allow the gold to be disposed of to the best advantage. Furthermore, as the amount of each shipment is cabled to London, additional time is afforded in which to market the gold, a total of possibly eight to nine weeks. The assurance is given the producers that in the event of interruption in export facilities due to unforeseen circumstances, an extension of time will be granted. Should sovereigns be required for export, the Bank of England will make payment in sovereigns for gold sold to it at 77s. 9d. ($18.89 at par of exchange) for the standard ounce of gold, .916½ fine. All charges for freight, insurance, refining, assaying, and marketing are borne by the gold producers. Another provision whereby the Bank of England undertakes to advance an amount equal to 76s. ($18.46) per standard ounce, subject to interest, is included in the agreement.

This arrangement is of great benefit to the producers. In contrast to the 77s. 9d. received before and during the war, about 117s. is now being received for the standard ounce.

Abnormal Relation Between the New York And St. Louis Lead Markets

"For six days the price of pig lead is quoted at less in the New York market than f.o.b. St. Louis, and this we cannot understand, because all the lead comes from the West, and the price generally is higher in New York than out here [Missouri]. Is it due to the fact that imported lead has weakened the New York market to this extent?"

The abnormal disparity between New York and St. Louis lead markets was due solely to the fact that heavy importations of foreign lead were laid down in New York alone, which was offered at lower prices than lead transported from the Middle West to the Atlantic seaboard. It is estimated that about 11,000 tons of foreign pig lead were received in the port of New York during the month of September, and more is still arriving. Under such a state of affairs the New York and St. Louis markets are influenced by another market element, one that does not ordinarily assume such importance—importations of lead. In fact, these importations are still influencing the trade and neutralizing the normal differential between the two markets. Attention was directed to this situation in the market report for the week in question. The disparity will gradually adjust itself as the domestic price of lead meets the London quotations and makes the cost of importing lead unprofitable.

In 1916 a similar condition arose, with this exception: exportation of lead from the Pacific Coast to Asiatic points was taking place, so that the New York lead market necessarily had to lower its level in order to meet the competition of the Middle West, where producers took advantage of the shorter haul westward.

Uses and Production of Calcareous Marl

"I have been unable to get much information regarding calcareous marl. What it is used for, prices and production? Any information you can give me will be appreciated."

The calcareous marl industry is relatively small. An idea of the production for the past four years can be obtained from the figures of sales given by the U. S. Geological Survey, with average prices:

CALCAREOUS MARL SOLD IN THE UNITED STATES

Year	Quantity (Short Tons)	Value	Average Price per Ton
1916	58,088	$144,768	$2.49
1917	73,900	165,223	2.24
1918	98,694	261,082	2.65
1919	91,437	327,294	3.58

Calcareous marl is of both marine and fresh-water origin. In 1916 and 1917 the entire output was used in agricultural work. In 1918 and 1919 a part of the production, about 15 per cent, was used in the neutralization of acid waters and the preparation of patent fertilizers. Production jumped during the war.

The method of preparation for marketing is usually simple screening and drying, but rotary kiln drying, crushing, screening, and pulverizing may also be used.

California, North and South Carolina, Pennsylvania, Virginia, West Virginia, and Arkansas are the chief producing states.

THE PETROLEUM INDUSTRY

The Prospects for Petroleum Production In Peru and Bolivia

The High Cost of Development, Difficulties of Transportation, High Royalties Asked, and an Objection to Long-Term Concessions Are Drawbacks to the Exploitation Of Oil Possibilities in These Countries

BY CHARLES S. HALEY
Written for *Engineering and Mining Journal*

SINCE the close of the war, the opportunities in the South American field for mining and oil investment have been attracting the attention of American and English capital. Considerable money has been invested there in the last two years, and it seems that more interest is being taken with regard to future development possibilities than has ever been evinced before.

The importance of this field should not be underestimated, nor should its disadvantages be overlooked. It is with the intention of giving a brief survey of the good and bad points of the situation, more especially with regard to the two most prominent republics from a mineral standpoint, Peru and Bolivia, that this article is written. Both of these countries have been famous for centuries for their mineral production, and justly so. Potosi Hill, in Bolivia, has a recorded production valued at more than seven billion dollars, and has been in continuous operation for more than three centuries. Other and less known districts in Bolivia have been adding their steady contribution to the wealth of the world for many decades and even centuries.

PERU IMPORTANT MINERAL PRODUCER

Peru, from a mineral standpoint, is one of the most attractive countries in the world today. The greater portion of the country is occupied by the high Andes and the river valleys between their slopes. Much of it is inaccessible to ordinary methods of travel, and a large portion of it has never been traveled by anyone save the natives. In the colonial days of Spanish rule, many mines were worked at a tremendous profit by means of slave labor, amid difficulties of transportation and operating conditions which would stagger attempts at production even now. And still the heart of the country is as yet unknown and practically unprospected, from a mining standpoint. All over the country one encounters tales of old colonial mines which were abandoned at the time of the revolution, when the colony of Peru threw off the yoke of Spanish dominion. In many places the natives are making an easy living from the crudest forms of placer mining; and what work has been done by the Peruvian government engineers has shown that there exist in that country deposits of almost every known economic mineral within the range of civilization's present horizon.

The petroleum possibilities of Peru have long been known, as have those of Bolivia. Denouncements and concessions have been made in both countries for many years, but as yet the only field of economic value that has been developed has been a very limited one on the northern portion of the Pacific coast of Peru. This field at present produces around one-half of 1 per cent of the world's total production of petroleum.

PROSPECTIVE PETROLEUM FIELDS INACCESSIBLE

The reason for this apparently small development of what appears a great prospective field is obvious. The principal prospective petroleum fields of both Peru and Bolivia lie in the most remote and inaccessible portions of both countries. This does not impress the governments of either of these countries as it should, and still less is it taken into consideration by the average owner and holder of concessions. The main thing that appeals to this individual is that—according to everything he reads—the world's visible supply of petroleum is steadily growing less. He has petroleum, or at least he thinks he has, under the surface of his ground. Therefore the world must come to him and tamely submit to being his oyster. And the petroleum—if it is there—still lies under the ground, and lies, and lies, and lies.

One of the most attractive prospective fields is that extending in eastern Bolivia southerly from the Santa Cruz region through the Azero into the Argentine. Seepages can be found over the entire distance from Embarcacion, in the Argentine, to the north of Santa Cruz, and the structure seems favorable. Until a careful examination can be made, and a few holes put down, that is all that can be said. To date, the presence of slightly productive oil sands has been proven by two shallow wells. The cost of a careful examination of the country is greatly enhanced by the fact that most of it is several hundred miles from the nearest railroad, and the expense of getting material in for development is bound to run from three to five hundred dollars per ton up—as there is absolutely nothing but muleback transportation into the country. Supplies are correspondingly high, and the native labor is notoriously uncertain and inefficient. The result is that in beginning operations in the country, without considering the enormous cost of getting the oil out to a world market, a tremendous overhead is thrown upon the work from the start, in the way of interest and amortization.

DRAWBACKS OF TRANSPORTATION

The most feasible route for the transportation of the oil to a market is by way of the Rio de la Plata. To avoid rehandling and towing of barges—a condition which

makes costs prohibitive when the back haul is considered—a pipe line of from three to four hundred miles in length would have to be built from the most accessible part of this field—this, through a country absolutely without roads or other feasible means of transportation. Such represents the overhead with which the pipe-line company would have to contend. A prohibitive charge for the transportation of the product of the development company would have to be made to amortize the pipe line within a reasonable time.

Product Would Compete With Mexican Oil

After the oil has been safely delivered to tankers of sufficient draft to navigate the Atlantic, geographic troubles enter in. The world's principal petroleum market is the United States, and will be for some time to come. And from the mouth of the Rio de la Plata it is three thousand miles to the east of the market, and eight thousand miles to the south of it. How much of this oil—which by this time represents an investment that approaches in cost the perfumes of Araby—will one have to expend in pushing the rest of it on a back track to the market, and how is the operator going to compete with Mexican petroleum produced at the very front door of the United States?

Considering taxes and royalties, the standard royalty in the United States has for years been 12½ per cent of the gross production. This condition exists in a country where railroad facilities are excellent, where a constant supply of skilled labor is to be had, and where the principal materials for development are produced within easy distance of the property. The Bolivian government is demanding a 15 per cent royalty on gross production, applied universally over the country on all government lands, and private owners are naturally following its lead. So petroleum still lies under the promising prospective territory.

Value of Field Purely Prospective

The entire value of this ground, as has been stated before, is purely prospective. The extent of the territory is so enormous, and its geological history is so favorable, that it seems likely that some day in the future very productive fields may be developed. But this is all indeterminate at present. No corporation which has not been deprived of its financial reasoning powers is going to the expense of making a careful and detailed geological examination of the country, and to the further enormous expense of sinking the first few wildcat wells, until it is assured of at least having a chance for fair return on the investment. In negotiating with private owners, a very definite trend is noticeable toward hard and immediate cash in hand—and the more immediate the better. This tends to disillusion the confiding purchaser as to the owner's faith in the future production of the property.

The attitude of the government is largely influenced, of course, by the political situation. As soon as a large concession is granted, some patriotic individual will come out with a passionate appeal in the papers to the people at large not to permit their political masters to sell their inheritance and birthright for a mess of pottage—and such emotions, properly fanned, may mean revolution. In other words, it is better to have a stable government in an undeveloped and povery-stricken country, than a revolution in an effort to better conditions.

The metal-mining situation in Bolivia is much better. For some reason, the government does not have to contend with the same popular attitude that it does in regard to oil, and the taxation scheme introduced in 1920 seems rather fair and liberal, although a bit too hastily devised. It is perfectly possible to secure a good title to mining property in Bolivia, although the recent revolution has undoubtedly stirred things up to some extent, and to work a small high-grade property, or a large low-grade, on conditions which compare favorably with those in the United States. The attitude of the government which existed until July of this year was both friendly and liberal, with regard to mining.

The same applies to mining conditions in Peru. Peru probably has the most liberal mining laws of all countries in the world. The government is stable—in spite of some revolutions it always recognizes the foreign obligations of former governments—and the general policy of the present administration is to encourage foreign capital by every means possible to come into the country. The continued existence and strength of the powerful and prosperous Cerro de Pasco company through various changes of government demonstrates clearly the possibility of absolutely stable conditions.

Personnel of Peruvian Government Excellent

The present president of Peru, Sr. Augusto B. Leguia, is probably the most capable and able leader that Peru has had in a generation, and the people as a whole seem to be solidly back of him. He has been fortunate in being able to surround himself with a body of ministers whose efforts show that they have the best interests of their country sincerely at heart. In Peru, also, a system of propaganda, instituted by Sr. Oscar Salomon, is being given aid and support by the government, with the idea of educating the people up to the necessity and desirability of getting foreign capital into the country. This propaganda is bearing fruit; and my impression is that the attitude of the Peruvian nation in general toward the United States is the most friendly of all the Latin American republics.

Peru Objects to Long-Term Concessions

The petroleum situation in Peru is not so difficult from either a geographic or a governmental standpoint as it is in Bolivia, but a tinge of the same attitude—that the world must come to them—is visible in certain circles. This tendency, fortunately, is held in check by the wiser and more far-seeing heads of the government. The inaccessibility of the best prospective field—on the drainage of the Amazon—is fully recognized, and excessive royalties are not expected. The government will not charge duty on machinery brought in for development, and will grant all facilities in its power as to right of egress and appropriation of natural resources of power and timber. The chief drawback seems to be a hesitancy to grant long-term concessions—an absolute necessity, in view of the enormous first cost involved—and an unwillingness to give a sufficient time for preliminary prospecting, with a cautious expenditure of money until the ground is sure. This reluctance can be readily understood in the case of fly-by-night companies and irresponsible individuals, who should of course be discouraged from the pre-emption and holding of large territory at all times. But in the case of a well-known production company, of undoubted financial strength and responsibility, it hardly seems necessary or advisable to take these precautions.

The geographical situation of the most promising prospective petroleum territory of Peru—that of the *montaña*—though more favorable in many respects than that of Bolivia, is still far from being ideal. In fact, it is in its own way more or less prohibitive. Practically all the territory of this field is tributary to the Amazon and its headwaters. These are navigable to a far greater extent than those of the Plata, and barges of five- to seven-foot draft can come directly to the region of some of the best seepage indications. This, of course, merely affects the handling of machinery, for barge transportation is out of the question in handling oil, on account of back haulage.

This field is much closer to the west coast of South America than are the Bolivian fields, and as the west coast of Peru is almost due south of New York, the transportation problem is much simpler from there on. But the question which causes the greatest difficulty, and which seems on first consideration to be an insurmountable obstacle to the development of these fields, is the problem of getting this oil to the west coast.

Inaccessibility of Peruvian Oil Fields

The main *cordillera* of the Andes forms a barrier from 14,000 to 17,000 ft. high between this oil and the coast, under the most favorable conditions that can possibly be selected. The distance is only 300 or 400 miles—compared to 4,000 miles by the other door (the Amazon)—but the enormous cost of installing a pipe line with successive pumping stations to overcome this lift is appalling. The country through which the pipe line would have to pass is absolutely without transportation facilities. It takes from one to two months of steady muleback travel to even reach it from the coast. A railroad could not be developed into a financially paying venture, owing to the thin population of the district and the primitive character of the major portion of the inhabitants. Wagon roads and truck roads would have the same drawback. How, then, is the heavy material required in a pipe line of this character to be brought into the country? Discarding Zeppelins and other ultra-modern ideas, there remains transportation by main strength and awkwardness—in other words, by trail. The cost of four hundred miles of such an installation is so extremely high that it could be justified only by the discovery and careful development of a field which would be rich enough and extensive enough to surpass any at present known to the world.

There is, of course, a possibility that on the eastern slopes of the lower Andes such a field may exist. That, however, is highly problematical, and would require many years of careful prospecting and the drilling of many wildcat wells to be susceptible of proof. Again, the spectre of overhead comes in even before the pipe line can be considered. Transportation of complete blacksmith and machine shop equipment 4,000 miles up the Amazon, and transshipment on barges, will make the first oil produced—if it is produced—worth much more than its weight in gold.

It would then appear that it is absolutely imperative that time should be given to prospect carefully and feel the way before money be wasted needlessly. All necessary guarantees should be exacted, but the mere tying up of a corporation's money in prospecting, not to speak of development work, should be the greatest guarantee of all. The more money that is spent in successive years, the more the company will be loath to leave it. A long-term concession is absolutely necessary to give the development company a chance to get its money back. This does not take into account the still longer time which would be necessary before the pipe-line portion of the work could begin to exhibit a profit.

These conditions I believe the Peruvian government will realize, as it appears to have the best vision of all of the Latin-American republics of South America. But the Bolivian attitude appears hopeless for some time, unless the new government which has recently come in adopts an attitude far different from that of its predecessor.

Latin America Should Utilize Foreign Capital

In brief, the situation is this: Now is the accepted time for the Latin-American republics to use our capital —as well as that of England, the only European nation which has it to spare—in the development of their own natural resources and the transformation of themselves into prosperous industrial communities, such as their immense natural resources seem undoubtedly to warrant. Mexico is beginning to realize this fact, and under the new and progressive government has already made great strides toward regaining the confidence of American capital. In the next few decades she will begin to reap the reward of this enlightened and progressive policy.

It is entirely up to Latin America. For years she has neglected to take advantage of her opportunity, partly because of a distrust of the United States, which seems to have been partly justified by some of the acts of our Government in the past, but mostly on account of lack of vision among the statesmen of the Latin republics.

Supplementing the vision of her public men, she must educate her people up to the standpoint where they do not take the vision for the reality. Otherwise the petroleum resources will still continue to lie where they are. To convert any vision into reality, the effective presence and co-operation of hard cash is needed and absolutely essential. To invite this co-operation, and the confidence of pioneer capital, liberal facilities must be offered, and exaggerated ideas of undeveloped riches must not be too strongly held; or, rather, the fact that they are undeveloped, and will continue to be unless such facilities are offered, must be impressed on the minds of the people. Latin America, and more especially Peru and Bolivia, have a brilliant future just around the corner, if they will but recognize their opportunities and give the United States a chance to work with them for our mutual benefit.

A Record Well

In a recent issue of the Standard Oil *Bulletin*, information is made public of the Packard No. 1 Well in California, which is the deepest well in the state, having reached a depth of 6,240 ft. The well turned out to be a "dry hole." Drilling was begun in July, 1919, and completed in March, 1920. The "deepest well in the world," the Lake No. 1, drilled by the Hope Natural Gas Co. on the Lake farm, twelve miles east of Fairmont, West Virginia, was sunk for gas and was abandoned at 7,579 ft. when gas was not found. Europe's deepest well at Czuchow, Silesia, is 7,345 ft. in depth.

NEWS FROM THE OIL FIELDS

Oil Company Sued for Violation of R.R. Commission Rules

State Gas Survey To Be Made in Texas —Recent Completions in Breckenridge, West Columbia, and Hull Fields

From Our Special Correspondent

Suit has been filed in the fifty-third district court of Travis County, Texas, by County Attorney John W. Hornsby, for the State of Texas, against the Montour Oil Co., a corporation of Delaware, with Texas headquarters at Fort Worth, for $870,000. This sum represents penalties for alleged violations of several of the rules of the Railroad Commission, these violations having taken place after March of this year. This is the second suit of this nature filed against the same company. The first, filed in March, asked for penalties amounting to $1,000,000.

A survey of the gas industry of the state will be made by R. D. Parker, newly appointed chief engineer of the gas utilities division of the Railroad Commission. An attempt will be made to fix a fair price for gas sold by the eighteen gas companies placed under the supervision of the commission by the Cox gas law.

The new 18-in. gas main, twenty miles long, from Joshua Junction to the Dallas-Fort Worth trunk line, has been completed, and an additional supply of 50,000,000 cu.ft. of gas will be furnished by the West Texas fields to these cities. It is believed that this increase in supply will prevent any shortage of gas in Dallas this winter.

Recent completions in the townsite pool at Breckenridge, Stephens County, have been made. The W. G. Harding well, a joint well of the Cooper Henderson Co. and employees of that company, located just north of town, came in making 4,000 bbl. It caught fire, but was quickly extinguished. The Cooper Henderson Co. well No. 1 Walker Caldwell, on the east edge of town, has 2,000 ft. of oil standing in it. The Stoker No. 4 well of the Gulf company was shot, and its flow increased from 350 bbl. to 1,500 bbl. daily.

West Columbia holds the attention of all the operating companies on the Gulf Coast. Recently the Humble Oil & Refining Co.'s. No. 28 Japhet well came in making about 15,000 bbl. of oil. The Monarch Oil & Refining-Stribling No. 1 Smith well came in at 3,287 ft., making over 1,000 bbl. of oil. This well is about 1,300 ft. north of the Texas Co.'s Abrams No. 1 well.

At Hull several producing wells were recently completed, including the No. 4 Thomas well of the Gulf Production Co. flowing initially over 2,500 bbl. The total production of this field has been steadily increasing the last few months and is now nearly 15,000 bbl. daily.

Damaged Valve Causes Losses in Mexican Oil Field

From Our Special Correspondent

Well No. 4 of the Transcontinental Petroleum Co. on Lot 134, Chinampa, is running wild, making about 40,000 bbl. a day. The well was flowing under heads at regular intervals, when just before it was brought in one of the gate valves was damaged by the drilling tools; and the other was blown out by the well pressure while the operatives were trying to close in. Temporary pumps and boilers have been set up in an effort to save as much of the oil as possible. About two thousand barrels a day are being saved.

Special apparatus will be necessary gain control of the well, and it is probable that the well will continue wild for a week or ten days at least. The task of getting a new valve on the well is a very difficult one, as the material used is necessarily heavy and has to withstand great pressure. The workmen also have to contend with the gas given off by the well. This gas suffocates, and in some cases proves fatal. This accident will not help the Amatlan-Chinampa pool; as this great daily draught will aid the encroachment of the salt water.

It is reported that one of the International Petroleum Co.'s tests in Zacamixtle has brought in salt water, and that the Aztec hole is drilling in brown limestone at 2,806 ft.

British Interest in Roumanian Oil Development

A new British oil company has been organized to complete, with French and Roumanian groups, a syndicate to acquire a controlling interest in the Steaua Romana Oil Co, according to *Commerce Reports*. The British group will be called the British Steaua Romana Co. and will be floated jointly by the Anglo-Persian Oil Co., Stern Bros., and James Dunning & Co. The French members of the syndicate will be La Banque de Paris et des Pays-Bas, Mirabaud et Cie., La Société d'Etudes et d'Entreprises, Mallet Frères et Cie., and an industrial group represented by M. Mercier. The Roumanian group will include La Banque Marmorosch Blank, La Banque Romanesca, La Banque Générale, and La Banque du Crédit Roumain.

The Technical Sub-Committee of the Committee on Standardization of Petroleum Specifications, appointed some time ago by President Wilson, will hold a meeting at the offices of the Bureau of Mines, Washington, D. C., on Oct. 18, to give further consideration to Government specifications on gasoline, kerosene, fuel, and lubricating oils.

Shallow Well Completed in Poison Spider, Wyo., Field

From Our Special Correspondent

Gas has been turned into the mains of the New York Oil Co. from the Poison Spider field, in Wyoming, for delivery to the oil refineries at Casper. Mains in Casper are also being laid. The completion of the New York Oil Co.'s No. 9 South Casper Creek well at shallow depth on its 2,000-acre lease, making 75 to 100 bbl. of oil, is considered an important development.

The Consolidated Royalty Oil Co., at its annual meeting held in Casper recently, declared the regular quarterly dividend of 2½ per cent payable Oct. 20 to stockholders of record Oct. 15. New officers elected were: B. B. Brooks, president; T. A. Dines, vice-president; C. B. Richardson, vice-president; R. N. Matson, secretary and treasurer; R. S. Ellison, H. D. Schoonmaker and S. A. Lane, directors.

The Sage Creek Petroleum Co. has spudded in for a second well on the Winkler Dome, Fremont County. This well will be drilled on the side of the formation. The first well, on the apex, came in as a large gas well. The same company will also resume drilling at 2,420 ft. in its Buffalo Basin well, Fremont County. It is stated that some oil and gas showings have been obtained here.

The Producers' & Refiners' Corporation has struck a third gas sand in its well at the Wertz camp, between the Ferris and Lost Soldier fields. The first sand was at 3,200 ft., the second at about 3,400 ft., making 2,000,000 cu.ft., and the third at 3,440 ft. with a flow between 7,000,000 and 9,000,000 cu.ft. This same company has completed its No. 2 well in the Osage field at 1,525 ft. making 150 bbl. by pumping. No. 1 well is making good progress and will be completed soon.

The Western States Oil & Land Co. has completed its No. 31 well on Sec. 5-39-78 of the Salt Creek field at a little over 2,300 ft., making an initial production of about 500 bbl. The oil-bearing sand is said to be over 60 ft. thick.

Oil in Alberta Sands

That oil in sufficient quantities to supply the world for 600 years will be released when the problem of separation of oil from oil sands lying to the North of Edmonton has been solved is the opinion expressed by Dr. H. M. Tory, principal of the University of Alberta. Dr. Tory stated that a member of the faculty of the university has been working on the problem of separation for ten days, and that if he continues to make progress as rapidly as he has done hitherto, the problem will be solved in six weeks.

COURT DECISIONS IN MINING CASES

By Wellington Gustin

Principles for Determining the Legality of Unsigned Contracts

West Virginia Court Propounds Conditions Under Which Reduction to Writing of Verbal Agreements Is Necessary.

In these days of innumerable leases on oil, gas, and mineral properties, their proper execution may well be considered. The Supreme Court of Appeals of West Virginia determined the legal aspects of such issues in deciding the case of Herndon et al vs. Meadows, affirming judgment of the land owner.

The facts appear that after some negotiations a conclusion was reached to the effect that Meadows would lease his land to his grandson, Tolley, and Herndon upon certain terms. A writing was prepared purporting to be between Meadows as one party and Herndon and Tolley as second parties, with provision for the signatures of all parties to the contract. Meadows signed and acknowledged it before a notary. It was subsequently signed by Herndon, but Tolley never did execute the instrument. Herndon had a lease prepared according to the terms of the contract, but Meadows refused to sign this, and sold the land to others. Thereupon Herndon brought this action for breach.

In its opinion the Supreme Court says that where the parties to a contract reduce their agreements to writing, with the purpose and expectation that the same shall be signed by all the parties before the agreement is completed, the failure or refusal of one party thereto to execute will excuse all of the parties from performance. Where, however, the agreement of the parties is complete, and the writing is simply treated as a memorial of the contract already entered into between them, and its execution not necessary to the completion of the contract, the parties will be bound.

The court found the writing in this case to be in a form which contemplated execution by all of the parties, and further, one as is required to be in writing to be enforceable under the statute of frauds. It was said that where a contract in writing is executed by only one of the parties, and the other party waives the execution by accepting performance, or by doing something under the contract which shows that the parties did not contemplate its complete execution as a prerequisite to a valid contract, it will be binding; but where a contract is reduced to writing, and the subject matter is such that people do not ordinarily contract in regard to it without expressing their agreements in writing, and the paper on its face indicates that it is the intention that all the parties shall execute it, and nothing is done under the contract to indicate that the parties intend their agreements to be binding, whether the writing is signed or not, it will be held that there is no completed contract, unless all the parties thereto execute the same.

Therefore judgment for the land owner was upheld, for the reason that there had never been a completed contract between the parties.

Upper Locator Liable for Damages to Lower

Judgment in Favor of Allison's Mines Co. Reversed by California District Court of Appeals

The District Court of Appeals of California has reversed the judgment rendered against J. W. Dripps in his action to recover damages for injury to his placer mining claim, situated in Laurel Gulch, Los Angeles County, by the Allison's Mines Co. The Allison company located its mining claim to the north of Dripps' claim and further up the gulch. Plaintiff's evidence was that tailings from defendant's mill accumulated on plaintiff's land along the stream the entire length of his claim, and from six inches to two feet in depth; that large rocks and boulders, aggregating many tons, rolled down the steep sides of the gulch; that this was caused by the trail built and used by defendants; that it would cost $25,000 to remove the rocks, and several thousand dollars to remove the tailings, necessary to work the claim; that the water in the stream is made "muddy and riley" by the tailings from defendant's mill; and that this "gums up the riffles," so that this placer mining claim cannot be worked profitably.

In reversing the judgment the court said it was now settled that the first locator on mining ground has no right, by custom or otherwise, to allow tailings to run free in the gulch and render valueless the mining claims of subsequent locators below him. And where the land of the lower locator is actually invaded by "tailings," "slickens" or other material from the claim of the upper locator, it makes no difference how carefully the latter may have worked his mine. If his work in fact injures the property of another, he is none the less liable.

As for the water, the prior locator cannot insist that the stream above him shall not be used by subsequent locators for mining purposes; neither may the subsequent locator so conduct his operations as unreasonably to interfere with the fair enjoyment of the stream by the prior locator. The reasonableness of the use is a question of fact in each particular case. The spirit of the law is "live and let live."

Dey Loses Action To Recover Laurel Canyon Mines

Failure to Appeal from Former Judgment in Favor of Arizona Mining Company Renders Later Action Void

In the action brought by Richard V. Dey against the Laurel Canyon Mining Co., in Graham County, Ariz., to recover possession of certain mines and improvements, the grounds alleged were that the mining company had forfeited its lease of the premises by breaching certain covenants of the lease. But shortly after this was begun, Day instituted another action under the Landlord and Tenant Act of Arizona, to recover possession of the mines. This case was tried and resulted in a judgment in favor of the Laurel company, which was never appealed, and therefore became final.

The lease was a working lease with option of sale. It contained covenants to pay lessor certain royalties and to keep mill in continuous operation, and to keep same and other improvements in repair; to work the mines in a miner-like manner, and to timber, where necessary; to pay promptly all debts incurred; and to keep property free from liens, and similar charges. The violations of these covenants were alleged as the grounds for suit. The court found the violations cover the period in both suits, that the object of both suits was the same, both being possessory actions to dispossess the Laurel company. In the last case brought, the court said Dey was unable to establish the breaches claimed, and a final judgment in that case, therefore, has forever settled his contentions.

American Metals Co. Denied Removal of Suit to Federal Court

Federal Judge Smith of the District Court at El Paso, Tex., has remanded the suit instituted by the Compania Minera y Compradora de Metales Mexicano, S. A., against the American Metal Co. and the Compania de Minerales y Metales, S. A., to the Texas state court from which the American Metal Co. sought to remove it.

The plaintiff in this case seeks to recover of the defendant, Compania de Minerales y Metales, S. A., damages for an alleged breach of contract between them, and alleges that this company, in making and breaking said contract, was acting as the authorized agent of the American Metal Co.

Grounds for removal of a cause from a state to a Federal court are purely statutory, and Judge Smith ruled that no proper showing was made bringing the suit within the statute.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

Safety Devices on Winding Engines*

Nearly all accidents in hoisting are due to two general causes: Failure of the hoist machine to function, and failure of the hoist operator or engineer to act correctly.

Failure of the hoisting machine to function is caused by faults in design, defective material, poor workmanship, overloading and neglect. No safety devices can prevent the failure of a hoist under any of these conditions, but they can prevent to a large extent injury to life and property due to hoist failure from such causes. But in some cases the finest of safety apparatus will be powerless to prevent accident unless backed up by sufficient strength, proper design, and care of the hoisting machine. With respect to strength, however, a factor of safety of not less than five should be used. Most hoist drums should be provided with an indicator positively driven by chain or gearing from the drum or other hoist part having motion coincident thereto.

Of the utmost importance are adequate brakes, and every hoist should have at least one efficient brake applied to the drum. For long hauls or for deep shafts where heavy loads are lowered by gravity, two brakes are advisable, to be used alternately in order to prevent overheating and probable breakage due thereto.

The hoist operator should be protected as much as possible, and the operating levers should be so placed as to keep him out of the way of a possible flying rope. Safety devices or other mechanism that cause operators' levers to move are dangerous and should be avoided.

The hoist should be designed for the maximum load it will be called upon to handle, and this load should be known to operator and cage tenders. Before men are handled on any hoist, trial trips should be made to test the equipment for possible flaws in materials and workmanship.

The most common dangers incident to hoisting may be enumerated as follows: Cage or trip passing prescribed or safe limits, traveling beyond a prescribed or safe speed, starting the hoist in the wrong direction, improper application of brakes, failure of brake to hold, accidental release of clutched drum, backing away of hoist due to power failure, and inability to stop hoist in emergency.

Protection from these dangers cannot be had without some form of power-operated brake engine, which automatically applies the brake and brings the hoist to rest through actuation of the safety devices. Such brake engines may be of steam, compressed air, or oil type, according to the power available or preference of the hoist owner. Usually they are of the weighted type, the engine being provided with two cylinders, each having a movable piston, the piston being fitted to a common rod to which, by suitable means, a set of weights is attached, and which also acts to move the brake bell crank. In one cylinder the motive field acts to keep the weights in a suspended position ready to be released for application of the brake. The other cylinder contains oil, which is by-passed through an adjustable valve from one end of cylinder to the other, effecting a smooth motion of the piston rod. There is a valve provided at the power end of the brake engine to release the pressure against the piston, allowing the weights to apply the brake. When weighted brakes are not used, the brake is both held in the released position and applied by direct fluid pressure on the engine cylinder. Either type of brake is normally controlled by the operator by means of hand lever or valve which governs the admission of motive fluid to the brake engine cylinder and its release therefrom. But when the operator fails to act properly, the safety devices take control of the brake from him and use it according to their functions.

*Abstract of a paper by L. F. Milten delivered at the Ninth Annual Safety Congress, Milwaukee, Wis., Sept. 27-Oct. 1, 1920.

Requirements of Rescue Training for Metal Miners*

It is of vast importance that the men to be selected for places on the rescue crews should be given careful consideration. It is just as essential to have physical fitness in rescue or recovery work as it is to have mechanical fitness in the type of apparatus which is used. Each of these factors is dependent on the other, and each without the other is dangerous, not only to the one man but to the entire crew. Therefore, each candidate should be subjected to a thorough physical examination prior to any instruction. Inasmuch as a considerable part of actual emergency work with apparatus is dependent upon the absolute understanding and execution of instructions, men who are to be selected for the training should be mentally as well as physically efficient.

All candidates should be thoroughly familiar with the mine workings, and should know the conditions existing in each level and ladder-way. It is also important that they should be able to do any of the various kinds of work underground as might be necessary, such as timbering, constructing brattices, drilling, mucking, etc.

With apparatus and men selected, the next thing to be considered is the place of training. The preliminary instructions should be given on the surface, so that any room large enough to accommodate the number of men in training will serve this purpose. Also, the first couple of days can be spent in the open air until the men become familiar with the apparatus and "get the feel" of it while wearing it in the preliminary work.

Following this period many instructors take the crew into the mine for further practice. The course of training is for the purpose of teaching the men something entirely new, a phase of mining work that requires courage, and one that is not without hazards. Therefore, the work must be done in a manner and under conditions that will instill in the men absolute confidence in their machines and in their ability to use them. It is important that they should be able to carry on their work under similar conditions as exist underground. To this end the training chamber, or smoke room, should be constucted to meet these conditions, and most metal mine conditions can be represented here.

An arrangement of apparatus which offers practically all of the mine conditions, eliminates the generation of smoke and fumes in the mine, and, further, establishes confidence in the men during the training period, has been designed and built in the First Aid building of the New Jersey Zinc Co. at Franklin, N. J..

Five half days, at least, should be allotted for the preliminary training. Six half days are not too many. This preliminary course endeavors to carry the candidate gradually from an understanding of the fundamental principles of rescue work to as thorough a knowledge of the details as is possible in the time allotted. It is natural that, in the training period, many unforeseen things will occur that the men will not understand. Reducing valves will require adjustment, by-pass valves will accidentally become opened, men will overexert themselves, etc. It is the duty of the instructor to explain carefully the reasons for all such occurrences and instruct the men how they may be corrected or prevented.

It is advisable that a half-day each month be allotted to each crew for practice. In these periods the apparatus should be worn for at least one and one-half hours and the work should be varied so as not to become monotonous.

*Abstract of a paper by R. H. Seip delivered at the Ninth Annual Safety Congress, Milwaukee, Wis., Sept. 27-Oct. 1, 1920.

Special Committee of National Tax Association Reports on Mines Taxation*

The Committee on a Model System of State and Local Taxation recommends for general adoption by the states three principal taxes, viz, a personal income tax, an ad valorem tax on tangible property, and a tax on business. Concerning the taxation of mines it said "We are agreed that mines should pay, under whatever method may be adopted, a tax commensurate with that paid by other real estate in the same taxing jurisdiction."

How should the tax on mines be imposed and collected? Our answer is in precisely the same manner that taxes are imposed and collected on other real estate. The Committee on Model System would retain the ad valorem tax on other forms of real estate with modernized administration. In our opinion the equalization of the taxes on mines with those on other real estate requires that no exception be made in the case of mines.[1]

The populations of the typical mining communities of the United States are almost entirely dependent on the mines. So long as the mines exist other real estate has value, but when they are exhausted it has no value or only nominal value. The mines must pay most of the taxes, it matters not under what system they are levied.

If the ad valorem tax on mines is abandoned in favor of a tax on income or product, the local community will lose control of its main source of revenue, and in lieu of the ad valorem tax it will receive such portion of the tax on income or product as may be prorated to it by the state, and this portion will be an annually fluctuating sum. In periods of low income the main burden of the taxes would fall on other property. The effect would be that the tax rate on other property would fluctuate inversely with the productivity of these taxes.

The interests of the local taxing jurisdictions are paramount in any system of taxation devised for the American state. The bulk of the public expenditures is made by the cities, villages, townships, school districts, and other local jurisdictions. The tax on property has been the mainstay of the local community. It would be under the proposed Model System. Taxes based on the production or on the income of mines are ill adapted to the requirements of the local communities. The necessary control of the rates of such taxes by the state deprives the local mining jurisdiction of control over its own finances to an embarrassing degree, and imposes on it a tax system which would starve the treasury in some periods and flush it in others.

The property tax, the elastic element in the Model System, will practically disappear if mines are excluded from its provisions in the typical mining jurisdictions where the value of the mines comprehends from 50 to 95 per cent of the value of all property.

We believe that mines should be taxed for revenue only and condemn the super-taxation of mines on the one hand, and exemption or under-taxation on the other. A classification of real estate for taxation opens the door to exploitation of the numerically weaker elements in the population by the dominant elements. We find no reason why city property and mines should pay more taxes in proportion to *value* than rural property.

It is the outstanding merit of the Model System that all able-to-pay elements of the population will be reached and fairly taxed.

There are no insurmountable obstacles in the way of taxing mines as other real estate is taxed, and the rule of uniformity should govern. Subsidies on the one hand and penalties on the other, administered to industry through the device of taxing, are a dangerous perversion of the taxing power of the state. It is opposed to inter-state comity in taxation, fostered in the provisions of the Model System, and introduces an unnatural disturbing element in the economics of the internal commerce and development of the country.

It is assumed that mines and other real estate will be subject to both state and local taxation. It is not conceivable that the local jurisdiction can dispense with the tax on mines, but if the state abandon the property tax, the principle of equalization of the tax on mines would require that it also abandon the tax on mines.

We believe that ad valorem taxation of mines by state and local jurisdictions under direct administration by a state tax commission or tax commissioner is a thoroughly practical method of taxing mineral wealth. If the assessments are made by township, city, and village assessors, it cannot be operated satisfactorily. But the Model System contemplates a state tax commission or tax commissioner in every state, with power of original assessment of certain property and presumably with power to maintain such expert assistance as may be necessary. Such a centralized administration is indispensable for a satisfactory administration of the ad valorem tax on mines. It has proved its worth in several states.

Approved methods of determining mining values for taxation should not differ in principle from those used in ordinary commercial transactions, for whatever a property is worth commercially, it should also be worth for taxation. The value sought should be the amount which the mine should command in the event of sale at the time of assessment. In this connection we may add that prescription by state legislatures of formulae for the valuation of mines is a usurpation of an important function of the Tax Commission or Tax Commissioner.

In our opinion idle mines ought to be taxed if they are valuable. There is no more reason why idle mines should be relieved of taxes than non-productive property generally should be. Neither are we impressed with the often voiced opinion that ad valorem taxation for revenue only, at the same level as other real estate, restrains, too seriously, the development of ore reserves and discourages development of new mines. The tax is merely an element of cost and will be reckoned with precisely as other costs are. Of course, there is no pyramiding of the taxes on unmined mineral as an actual fact of accounting and financing. Obviously, all charges in excess of or advance of income are capitalized, and taxes are no exception.

Summary

Summarizing the recommendations, your committee approves the principle of equalization of taxation of mines and other real estate, opposes the classification of real estate (including mines) for taxation at different levels, or by different methods, and advises the inclusion of the ad valorem system of mines taxation, under centralized state authority and control in the Model System of State and Local Taxation.

*An abstract of the report by a committee of the National Tax Association, presented at its thirteenth annual conference on taxation, held in Salt Lake City, Sept. 6-11, 1920, to appear (in full) in vol. 13 of the annual proceedings of the Association.

[1]This report should be read in connection with the "Preliminary Report of the Committee on a Model System of State and Local Taxation." Proceedings Eleventh National Conference, 1918.

New York Section of A. I. M. E. Hears Discussion of Ancient and Modern Mines

The first of the fall meetings of the New York Section of the American Institute of Mining and Metallurgical Engineers was held at the Machinery Club the evening of Oct. 6. Following the regular dinner, E. P. Matheson, chairman of the section, introduced Courtenay De Kalb, who spoke on the subject "A Visit to Some of King Solomon's Mines." Mr. De Kalb, as a special commissioner in the Bureau of Foreign and Domestic Commerce, spent some time in Spain, and while there visited the different mining sections of that country. The first part of his talk was given over to that period of early Biblical history pertaining to the mines of the ancients, and he quite definitely established the fact that many of the mines in Solomon's time which were of great value are the same properties that are worked today in parts of Spain. Following this introduction a number of stereopticon views were shown of the Rio Tinto and Almaden mines and also of some of the iron-ore mines and plants near Segundo. During the showing of the pictures, Mr. De Kalb gave a most interesting talk on the geology, history, and development of the mines. Further views of the Rio Tinto mine were shown by Col. A. S. Dwight, who related his experiences on a visit to the property in 1903. Both of the speakers were well received, and the attendance and interest indicate a most successful series of monthly gatherings to be held this season.

Technical Papers

Mineral Statistics—Recent separates of the *Mineral Resources* series issued by the U. S. Geological Survey, Washington, D. C., and which may be obtained on request, include: "Thorium, Zirconium and Rare-Earth Minerals in 1919," pp. 32; "Magnesium in 1919," pp. 4; "Bauxite and Aluminum in 1919," pp. 7; "Gold, Silver, Copper, Lead, and Zinc in Colorado in 1918," pp. 56; and the "Preliminary Summary of Mineral Resources in 1919," pp. 128.

Tennessee Oil—The oil and gas resources of the northeastern part of Sumner County, Tenn., form the subject of a thirty-nine page booklet recently issued by the Tennessee Geological Survey, Nashville, Tenn. To the date of writing, no oil had actually been discovered in Sumner County, but several wells were producing in Allen County, Ky., adjoining. This report deals principally with geological conditions.

Manganese Ore—Two pamphlets have been issued by the U. S. Geological Survey on this subject. Bulletin 715-C (pp. 3) describes a small deposit in the Laramie Mountains of Wyoming, and Bulletin 715-D (pp. 12) discusses several occurrences in Colorado. They may be obtained on request. *The Mining Magazine* for September (Salisbury House, London Wall, London, E. C. 2.; price 1s. 6d.) contains an illustrated six-page article on the manganese deposits of Tchiaturi, Caucasus. The deposit there is probably the largest producing property in the world. Methods of mining and milling and economic conditions are described.

Air Lift Pumping—The continuous air lift requires a depth of submergence which often does not make it feasible. The lift may, however, be made in sections and operated with low-pressure air, a device of this kind having possibilities for unwatering or regular pumping work, which could only be reached with mechanical plants at greater cost both of installation and maintenance. The advantages and methods of installation and operation of the low-pressure air lift are discussed in a three-page article in the August number of the *Mining and Oil Bulletin* (Los Angeles, Cal., 25c.).

Flotation—*The Boletin de Minas* for June 30, 1920, contains a fifty-eight-page article in Spanish describing the general principles of the flotation process and the machines used therein. Some space is also given to the Murex process whereby oil is mixed with pulverized magnetite before being brought in contact with the sulphide minerals, the latter then being separated from the gangue by a magnetic process. A copy of the *Boletin* may be obtained on request from the Escuela de Ingenieros, calle Calleo 5a. (Espíritu Santo) Apartado de correo: 1301, Peru.

How To Get Government Publications

United States—Each of the various departments of the U. S. Government issues its own publications, which are printed at the Government Printing Office. These departments include, among others, the Bureau of Standards, the Geological Survey, and the Bureau of Mines. A part of each issue is ordinarily reserved to the branch which publishes it, for free distribution in the United States. Requests addressed to the individual bureau at Washington, D. C., within a reasonable time after publication, will usually secure a free copy, or one may be obtained from a congressman. The remainder of the issue is customarily kept in stock by the Superintendent of Documents, and sold by him at a price to cover the cost of printing—ordinarily 10 or 15c. Remittances should be made in advance to the Superintendent of Documents, Government Printing Office, Washington, D. C., by coupons, postal money order, express order, or New York draft. Foreign orders should be accompanied by international money order or New York draft. Postage stamps, coins defaced or worn smooth, foreign money, and uncertified checks will not be accepted. Coupons that are good until used in exchange for Government publications sold by the Superintendent of Documents may be purchased from that office in sets of twenty for $1. No charge is made for postage on documents forwarded to points in the United States, Alaska, Guam, Hawaii, Philippine Islands, Porto Rico and Samoa, or to Canada, Cuba, Mexico, or Shanghai. To other countries the regular rate of postage is charged.

The only publications furnished free by the Superintendent of Documents are the lists of the various department publications, with their prices. Separate price lists are devoted to such topics as Mines, Engineering and Surveying, Chemistry, Labor, Maps, Finance, Transportation, Health, Agriculture and Geography and Geology. These lists are revised once or twice a year.

Those who wish to be advised of all new publications issued by any department should write to the department in question and ask to have their name put on its free mailing list for announcements. Those who wish to be advised of all new Government publications should subscribe to the Monthly Catalogue of U. S. Public Documents, the subscription price of which is 50c. domestic and 75c. foreign, from the Superintendent of Documents.

State Publications—In addition to the above, each state bureau publishes numerous books and pamphlets, e.g. the State Mining Bureau, San Francisco, Cal.; the Kansas Geological Survey, Lawrence, Kan., or the Oregon Bureau of Mines and Geology, Portland, Ore. These bureaus may be situated at the state capital, at the leading city, or at a state-endowed university. In general, the publications issued may be obtained free on request, or a list will be supplied by addressing the bureau in question. Those who wish to be advised of all state publications as issued should subscribe to the Monthly List of State Publications, price 50c. per year domestic or 75c. foreign, from the Government Printing Office, Washington, D. C.

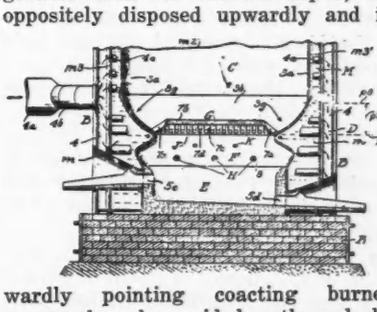
Canada—As in the case of the United States, both the central government and the individual provinces issue books and pamphlets. There is, however, no general catalogue issued, and no central office from which publications may be obtained. Requests for publications should be sent to the individual bureaus, as the Canada Department of Mines, Mines Branch, Ottawa; the Geological Survey, Ottawa; the Ontario Bureau of Mines, Toronto, and the British Columbia Department of Mines, Victoria, B. C. Ordinarily, Canadian government publications are supplied free of charge. Regular monthly lists of new publications are mailed on request by some of the departments.

Great Britain—Most British publications are sold through His Majesty's Stationery Office, Imperial House, Kingsway, London, W.C. 2. That office issues frequent free lists as well as annual lists of all government publications. The publications of the Geological Survey can be purchased from the Director General of the Ordnance Survey, Southampton.

Recent Patents

1,351,451. Smelting Furnace. Randolph G. Ward, New York, N. Y., and William R. Ward, Bethlehem, Pa., assignors to Independent Mines Smelting Co., Inc., New York, N. Y. Filed Oct. 4, 1916.

The combination of a horizontally elongated charge chamber having the lower part of its walls downwardly and inwardly curved to form a furnace hearth provided with a central elongated hearth opening having a width greater than its vertical depth; and oppositely disposed upwardly and in-



wardly pointing coacting burners arranged under said hearth and disposed in opposed pairs and adapted to combine their flames at a point just beneath said opening and to project the concentrated flames up through said hearth opening to points considerably above the opening.

MEN YOU SHOULD KNOW ABOUT

A. H. Brooks has returned to Washington after three months in Alaska.

Arthur Keith is making a study of the structure of the Taconic Belt in Vermont.

Norman Carmichael, general manager of the Arizona Copper Co., is in New York for a short time.

E. C. Pierce, of Los Angeles, is inspecting the mill of the Cora Miller mine, near Tyrone, N. M., which he designed.

W. L. Creden, mining engineer, is now manager for the Cascade Mines & Mills Co. in the Neihart district, Montana.

Edwin J. Collins, mining engineer, has returned to Duluth, Minn., from an inspection trip in New Mexico and California.

K. C. Heald is inspecting the Geological Survey's field parties in the oil fields of the Big Horn Basin and the Lost Soldier region.

William J. Hamilton, of Westmount, Que., general manager of the Cerro de Pasco Copper Corporation, sailed for Peru on Oct. 6.

C. Erb Wuensch has returned to Golden, Cal., after four and one-half months spent in Salvador, C. A., in geological examinations.

L. Salazar Salinas, director of the Geological Survey of Mexico, is in Washington studying the methods and organization of the U. S. Geological Survey.

E. L. Hawes, mining engineer, who has been the copper country representative of the Ingersoll-Rand Co., will leave soon for South America for the same company.

J. C. Martin is engaged in field work for the U. S. Geological Survey in Connecticut, where he is continuing the study of the high-calcium and dolomitic limestone.

H. M. Robinson, formerly a member of the U. S. Geological Survey, is in Washington making a compilation from the files of the section of foreign mineral resources.

E. J. Ruh is now at the U. S. Bureau of Standards as research assistant, appointed by the International Nickel Co. to assist investigations on the properties of nickel alloys.

S. Z. Krumm, formerly assistant professor of metallurgy at Colorado School of Mines, has accepted a similar position with Case School of Applied Science, Cleveland, Ohio.

P. J. Creighton and **John McPhilips** of Syracuse, N. Y., have been in Butte, Mont., on their return home after an inspection of the Brady Development Co. property in Idaho.

A. W. Newberry, mining engineer, has returned to New York City from a recent trip to Canada. He has moved his offices to 2 Rector St., that city (Phone, Rector 1421).

Herbert Hoover has been appointed by Secretary Payne to serve as consulting mining engineer on the advisory board of the Super-Power Survey authorized in April, 1920.

J. T. Pardee, of the U. S. Geological Survey, was a recent visitor in Seattle, Wash. He is now engaged in working out certain glacial problems in Montana and in eastern Washington.

William B. Milliken, graduate of Colorado School of Mines in 1883, is reported dead. Mail addressed to him at Ipoh Perak, Federated Malay States, via China, has been returned so marked.

W. H. Webster, assistant general manager of the Copper Queen branch, Phelps Dodge Corporation, has returned from a visit to the principal mining camps of Grant and Hidalgo counties, N. M.

Alfred W. Stickney, the geologist reported to have been roughly treated by the Bolsheviki in Moscow, has reported from Riga to the Department of State that he is safely out of Soviet territory.

R. D. Idema, of Grand Rapids, Mich., formerly with the Tennessee Coal, Iron & Railway Co., has taken a position with the engineering staff of Pickands, Mather & Co. on the Gogebic Range, Michigan.

W. C. Bridgeman, M. P., has been appointed the first Secretary of Mines under Great Britain's new Mining Industry Act. He has selected **E. A. Gowers** as Permanent Under-Secretary for Mines.

J. W. Russell, manager of Oxford Cobalt Mining Co., and member of the staff of Woodstock College, Woodstock, New Brunswick, Can., has been appointed professor of geology at Western University, London, Ont.

W. Z. Price is the newly appointed assistant professor in mining engineering and **W. A. Copeland has been** appointed instructor in metallurgical and mining engineering at the Carnegie Institute of Technology, Pittsburgh, Pa.

Charles Hoyle, general manager; **W. A. Gardiner,** superintendent; **Joseph Dietrich,** mine foreman, and **Forest Godden,** assayer, of the Esperanza Mining Co. of El Oro, Mexico, captured and held by Pedro Zamora, a bandit, have all been released or escaped from detention.

Harry O. Robinson, mining engineer, is in New York City on a brief visit from Venezuela, where he is engaged in professional work. His address is care of American Institute of Mining and Metallurgical Engineers, 29 West 39th St., New York City.

E. Martin Thorniley, mining engineer, of 625 I. W. Hellman Building, Los Angeles, Cal., is sailing for Jamaica, B. W. I., where he will spend several weeks in the examination of a copper property for British interests. Mr. Thorniley will go from Jamaica to London, and expects to return to Los Angeles early in 1921.

W. B. Plank, formerly with the U. S. Bureau of Mines, has been appointed to the Markle professorship of mining engineering and head of the department of mining engineering at Lafayette College, Easton, Pa. Recent reports erroneously stated that Professor Plank was an instructor there.

C. J. Whittlesey has been appointed by the Gypsum Industries Association as a research associate to work at the U. S. Bureau of Standards. He will study particularly the technical data regarding gypsum now available, and assist in further investigations of the properties of this material.

Albert H. Fay, consulting mining engineer, formerly with the U. S. Bureau of Mines, is now a valuation engineer, Oil and Gas Section, Internal Revenue Bureau, Washington, D. C.

Rolland C. Allen, geologist and vice-president of Lake Superior Iron Ore Association, Cleveland, Ohio, is chairman of the special committee on mines taxation appointed by the National Tax Association. The committee includes Ralph Arnold, J. Parke Channing, Celcus P. Link, C. M. Zander, Samuel T. Howe, Ernest L. Bogart, and L. E. Young.

The delegates to the Stewart, B. C., meeting of the Canadian Institute of Mining & Mettallurgy included H. M. Roscoe, secretary of the North Coast Division of the Institute; J. Tuttle, Jr., mine superintendent at Hidden Creek; N. E. Nelson, field engineer; John Dillon, Anyox smelter; W. L. Wetmore, mechanical engineer; William Weir, chemist; A. B. Wing, superintendent at Swamp Point, Granby Co.; Dr. Stuart A. Scofield, Canadian Geological Survey; and G. W. Bain.

OBITUARY

Spencer W. Clawson, who died lately in Los Angeles, was best known in the Southwest as superintendent of mines for the Copper Queen at Bisbee for twenty-three years. He went to Arizona in 1880, then connected with the Contention, at Tombstone. After leaving Bisbee he had an office as consulting engineer in Los Angeles, Cal. For a time he was in charge of a gold mine near Parral, Mexico, before being driven out by revolution.

SOCIETY MEETINGS ANNOUNCED

The California Metal and Mineral Producers Association meets at San Francisco on Oct. 24.

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

New Mexico Chapter of American Mining Congress Organized

C. T. Brown, of Socorro, Governor, and Burton Bunch, of Silver City, Elected Secretary

Organization of a New Mexico Chapter of the American Mining Congress was completed Oct. 4 by the naming of fourteen directors, election of officers and adoption of the Arizona Chapter's constitution and by-laws as a temporary guide. The officers elected were: C. T. Brown, Socorro, Socorro County, governor; I. J. Stauber, Lake Valley, Grant County, first vice governor; I. R. Kirchman, Silver City, Grant County, second vice governor; Powell Stackhouse, Jr., San Antonio, Socorro County, third vice governor; Ira. L. Wright, Silver City, treasurer; and Burton Bunch, Silver City, secretary.

A committee on constitution and by-laws was appointed composed of Percy Wilson, Silver City; Frank W. Vellacott, Silver City; and John M. Sully, Hurley. The finance committee is as follows: D. W. Boise, Hurley; Donald G. Miller, Tyrone; and J. B. Gilchrist, Silver City. The personnel of other committees was not announced.

The fourteen directors elected were: C. T. Brown, Socorro; E. M. Sawyer, Tyrone; J. M. Sully, Hurley; Ira L. Wright, Silver City; Powell Stackhouse, Jr., San Antonio; B. B. Hanger, Albuquerque; S. J. Kidder, Mogollon; M. W. Porterfield, Silver City; J. H. McCutcheon, Chloride; L. M. Kniffin, Fierro; Norval J. Welsh, Gage; F. W. Vellacott, Silver City; I. J. Stauber, Lake Valley; and R. I. Kirchman, Silver City.

Dispute Over Engineer Group at Atlin, B. C., To Be Heard

The question of ownership of the Engineer group of mineral claims in the Atlin district, B.C., is expected to be brought before the courts for decision about Oct. 20. Because the property is valued at considerably more than $1,000,000, being rated as one of the most promising of the lode gold mines of the province, the suit will be followed with much interest. The action has some interesting features. In the first place the original stakers will seek to establish their right to title. It is understood that it will be alleged that the late Captain Alexander, the accepted owner during his lifetime and whose heirs will be the defendants, occupied the ground before it had become vacated.

WEEKLY RÉSUMÉ

In Utah an attack on the powers of the State industrial commission under the workmen's compensation act has been begun by the Utah Fuel Co. In the extreme southern part of the state, the McQuatters Corporation, of New York, is reopening the old property of the Silver Reef Consolidated Mines Co., about forty miles from a railroad; this was formerly a producer of high-grade but is probably a milling proposition now. In Nevada, the Bullfrog-Goldfield railroad has been taken over by the Tonopah & Tidewater, and is to be continued in operation. In the Coeur d'Alenes of northern Idaho, financing of the U. S. Copper Co. has been provided for; the Kill Buck stockholders have elected a new directorate controlled by the Interstate Callahan; and the development plans for the two Flynn groups are being pushed by the Coeur d'Alene Syndicate. In British Columbia the dispute over the ownership of the Engineer group at Atlin is to come up in court soon. In the Southwest, the advisability of licensing engineers is again urged. The docks of the Texas Gulf Sulphur Co. at Galveston, Tex., were recently burned.

At Washington a general economic study of the mineral resources of Alaska has been completed by Alfred H. Brooks and O. C. Ralston.

Silver Reef Being Reopened by McQuatters Corporation

The McQuatters Corporation, of New York, took over the property of the old Silver Reef Consolidated Mines Co. in Washington County, southern Utah, in the last few months and is engaged in putting it in shape for operation. Tests have been made on the ore and diamond drilling is to be undertaken. The property was formerly a producer of high grade but is now probably a milling proposition. It is about 40 miles from Leeds, the nearest railroad point, which is on the Salt Lake route.

Butte Ballaklava Property Sold at Sheriff's Sale

The property of the Butte-Bullaklava Copper Co., at Butte, Mont., including buildings and machinery, has been sold at public auction by the sheriff to satisfy a judgment obtained by John G. Williams and other bondholders residing in Duluth. The sale was made to the bondholders' committee for $225,000, which is approximately $5,000 less than the claims of the judgment and costs. It is the intention of the bondholders to reorganize the company and start operations at the property just as soon as all details can be arranged. The company had defaulted on payment of interest.

Northern Mexico Under Peace Conditions

Good Times Ahead — Crops Can Be Harvested—Banks Again Opening —Labor Scarce

Special Correspondence

Chihuahua, Sept. 18—People are still wondering who surrendered, Villa or the government. At all events everyone is well satisfied and Northern Mexico is in peace for the first time in eleven years. People are coming into the towns in buggies, wagons and on horseback, disclosing vehicles and saddles that have been in hiding for a long time. The roads are now free and one can even take a ride or walk in the outskirts of a town or city and get back without being deprived of his clothes by some underfed and unpaid Carranza soldier. The present federal soldiers are of a better class and are constantly being improved, better clothed and fed and, for a wonder, being drilled. The improvement is very marked. The markets also show an improvement.

Villa reached the main line of the old Mexican Central railroad at Bermajillo on Tuesday, Aug. 31 with six hundred men, about seven hundred horses and mules, a Ford and a U. S. Army wagon. Wednesday he sent two hundred men north under General Aranda and made his people a farewell address. In the afternoon he received a party of Americans and told them that he had no ill feeling toward the Americans in Mexico in that he felt that they were in no way responsible for the acts of their government, that he did not think that he had any enemies in the U. S. except one and having been double crossed by that particular person he could not regard him as anything but an enemy. Friday morning he left for Mapimi where he spent a day as guest of an American mining company. Saturday he left the railroad for his new home with over two hundred men, fifty fully armed and all officers with side arms. It was as good as a county fair to see all the fine horses and mules that he had with him and the men in gala attire and in a happy mood. Villa closed all the saloons wherever he went and was very strict in compelling good order.

He was hard pushed in Chihuahua and made one of his remarkable moves, crossing the worst desert in Mexico, the Bolson de Mapimi, and turned up unexpectedly in an important region that had few federal troops at a time when the Secretary of War was away, thus

enabling him to deal directly with the President. Crossing the desert he traveled forty-five leagues (120 miles) in twenty-nine hours without water, losing 172 horses and no men. At Sabinas he took the town and after enquiring for the names of the richer merchants assessed them twenty thousand pesos. He paid cash to all the smaller dealers for what he required of them. He compelled the telegraph operator to put him in direct communication with provisional President de la Huerta and arranged for the surrender that is so satisfactory to everyone in northern Mexico.

There seems to be no doubt that the country is in for an era of rebuilding and improvement. Crops can be harvested and marketed this fall without molestation. It will require some years for the herds to accumulate. There never was such pasture, gramma grass thick enough to be cut with a mowing machine. With no stock on the ranges and the abundant rains of the last three years the grass has re-seeded and is remarkably heavy. Work animals turned out on it now will not even eat their grain, as they like the gramma better.

Ten years ago a prospect was hardly in ore before some "expert" was on the ground. Now even small profitable mines that gave promise are idle and filled with water and rubbish. Some have been robbed of visible ore and others have had shots put in them in such a manner as to make the extraction of ore impossible without some preliminary work. The smelters are nearly all operating but are short of the rich siliceous ores that have been hand sorted from the smaller mines, mines that could not afford a mill.

Labor is scarce, the more energetic of the working men having gone to the United States. Even now the trains are crowded with them going north. The demand for labor is constantly increasing and, of course, wages, particularly of those who have some mechanical experience, are increasing. The day wage for eight hours, except along the border, is from one and one half to two pesos.

Banks are opening in the larger towns but there is no such use of checks as has become the practice in the north. The people have had such an experience with paper money that it will be years before it will circulate again. At one time men were receiving the equivalent of four cents American money per day and five dollars would buy a ticket that entitled one to a ride on the railroad from the City of Mexico to El Paso. There is very little small change—a few coins of one, two, five, ten and twenty cents made of copper, fewer nickels and very little silver. The principal coinage is gold, two, two and one-half, five, ten and twenty pesos coins. In the north, American money is in circulation and it is now reaching well south along lines of communication. American nickels pass for ten centavos and a dollar for two pesos.

The railroads are bady run down both in regard to the track and rolling stock. The shops cannot turn out the repair work fast enough. The military carry no tents and are living in trains. The large smelting companies are operating their own trains largely using rebuilt cars. The merchants are bringing in their goods by express which adds to the H. C. L. The native still gets off light with his tortillas and beans.

Protection Against Outside Competitors Asked for Trail Smelting Industry

The attitude of the management of the Consolidated Mining & Smelting Co. of Canada with respect to protection against metal imports was forcibly presented to the Canadian Tariff Commission which recently toured British Columbia. J. J Warren, president of the company, complained of the removal of the 7½ per cent war tax, asserting that, in the confident belief that this impost would remain in force, the company had made investments of a substantial character. Over $250,000 had been expended in developing fluorspar deposits and committments of equal amount had been assumed in the construction of a rod mill and other additions to the plant at Trail. He declared that there was no protection against Great Britain or the United States and, although competition from the latter source was not keen at present owing to properties having been overworked and little development having been done during the war, under normal conditions the competition for the Canadian market would be active. The United States duty was $1.50 per ton and he felt that Canada should have at least the same protection.

The company's output in lead was about equal to the Canadian consumption, he said. Until 1919 the Canadian tariff was the normal 15 per cent plus the 7½ war tax as against a United States rate of 25 per cent. Last year the whole was removed and a specific duty of 1 per cent per pound imposed.

It was stated by Mr. Warren that his company had paid $150,000 in taxes in 1919, over 16 per cent of the net income. Half a million of the 10 per cent dividends had been taken from reserve funds.

The increase in railway freight rates, Mr. Warren contended, was a direct contribution to the railways because no corresponding increase in selling price could be made. The Trail Board of Trade submitted to the commission a memorandum emphasizing the importance to the Trail smelting industry of adequate protection.

Texas Gulf Sulphur Co.'s Docks Burned

The sulphur-loading docks of the Texas Gulf Sulphur Co. at Galveston, Tex., were recently destroyed by fire, together with about 50,000 tons of crude sulphur, forty freight cars, and a great deal of surrounding property.

Chinese-American Company Working in Yunnan Province

Engineers of Yunnan Ming Hsing Mining Co. Engaged for Some Time in Northwestern Part

"The government of Yunnan Province, China, and the Orient Mines Co. of New York, have jointly formed a Sino-American company called the Yunnan Ming Hsing Mining Co. for the development of mining property in Northwestern Yunnan," says *Millard's Review of the Far East.* "Thirty-odd American engineers have been working there with J. W. Finch, as engineer-in-chief. Silver and lead in large quantities have been discovered.

"American activities in that province are being favored by both the people and the provincial government. Large sums have already been spent by the American partners during the last three years in investigation and development work. The first group of American engineers sent from America to prospect for silver and lead began work in March of 1918. Finding that the property was worth developing, a company was formed in September, 1919. It was a Sino-American undertaking, but it is a purely Chinese corporation operating under a Chinese charter.

"The Yunnan Ming Hsing Mining Co. is the first attempt really to operate a mining enterprise under a Chinese charter. Its promoters declare that thus far it has been successful, and do not believe they will encounter any difficulty in dealing with the Chinese authorities. In their opinion, all Chinese-American enterprises should be run upon that basis and on no other if genuine co-operation of the Chinese is desired.

"The president of the company is Wu Shih-shun, former chief of the Yunnan Bureau of Finance, a man of considerable modern business experience although he has been in contact with foreigners for only a short time. Its engineer-in-chief is Mr. Finch. One of the best known mining engineers in America, Mr. Finch, has been general manager of some of the largest mining enterprises in the United States. All credit for the successful formation of the company belongs to him. Having been in China for a number of years investigating mines, he has come to know the Chinese people thoroughly. This knowledge of the people among whom he is now working has helped him greatly in his negotiations with the Yunnan authorities with regard to the formation of the company. Had it not been for his able handling of the negotiations, they might have ended in failure.

"It is interesting to know that as a result of the growth of American influence in that remote province in recent times, Yu Yun-lung, former Civil Governor of Yunnan, several months ago made a trip to the United States, accompanied by C. Y. Chiu, an American returned student, who has held several important positions in Peking,

one of them being English Secretary to the Senate when C. T. Wang was Vice-Speaker after the death of the late President Yuan Shih-kai. The trip of Mr. Lu to America was undertaken to study conditions in that country. Since the arrival of so many American engineers in Yunnan, the interest of the people in that province in commercial conditions in America has been greatly aroused.

"Besides working the silver-lead mines, a number of American engineers are investigating the tin mines in Cochiu and the Tungchwang copper mines, both of which are famous as they are supposed to contain the largest quantity of tin and copper, in the belief of foreign engineers, who have made a study of them. The Americans plan to eventually develop those mines together with the silver-lead ones. Dr. H. Foster Bain, the famous mineral authority, is in charge of the investigation of both the Cochiu and the Tungchwang mines.

"America is destined to play a part—an important part—in the opening up of Western China, and in the development of her mineral resources. When the development work of the Yunnan Ming Hsin Mining Company is well under way, railway communications will undoubtedly be introduced to facilitate transportation of ores. The need has been already deeply felt, the authorities of the company experiencing difficulty in sending a sufficient number of coolies to the region where their property is located. The mining region is mostly unpopulated, and for this reason the import of labor becomes a necessity. The transportation question is now being tackled. Its solution means that Yunnan will be more accessible to the outside world, and its general development will be accelerated.

"Reports from Yunnan indicate that the Yunnan government is appreciative of the fair spirit manifested by the American partners of the mining company. The Chinese own half of the interest, but they do not have to bear the initial expenses such as expenses for purposes of investigation and for the sending of American engineers into Yunnan. Nearly a million dollars have been spent upon the investigation work, which made possible the formation of the company.

"The capitalization of the company is two million dollars to begin with. The company's by-laws provide that it can be increased to any size the board of directors may decide in the future. It has five directors, three of whom are Americans, and there is one auditor-in-general who checks all the expenditures. Many American returned students are being employed to assist the American engineers, and are getting much practical training in mining gineering.

"There appears to be no surer way of insuring the independence of China and maintaining her sovereignty than by encouraging foreign investment in her land and especially the investment of American money. It is said that if America or Great Britain had invested one hundred million dollars in Shantung, the issue of the Shantung question at the Paris Peace Conference would have been entirely different. General Tang Chi-yao, Military Governor of Yunnan, who is the real ruler and authority in that province, seems to understand this situation, and, understanding it, has gone into full cooperation with one of the largest mining companies in the world, the Orient Mines Co. of New York, in which many big American financiers are interested.

"Following the break-up of the age-long idea of spheres of influence which all the enlightened nations are detesting, Americans, Britons, Frenchmen, or other foreigners can go anywhere in China and help the people to develop natural resources. Americans have apparently thrown in their lot with Yunnan, which province is, however, large enough to accommodate activities of other foreigners. In the meantime, the interior provinces such as Szechwan, Sinkiang, Mongolia, and Tibet are awaiting development. They would welcome more men of Mr. Finch's caliber if the latter would go to them in a spirit of helpfulness and friendliness.

"Yunnan, situated on high tablelands, abounds in minerals. Covering 146,718 sq.mi., it is next to Szechwan in size, but it is the least populous province of China, its inhabitants being about 12,721,500 or 86 to the square mile. The extraction of ores, tanning, the preparation of tea, and the mining of copper, iron and tin, occupy a large number of the Yunnan people. In Yunnan, four cities are open to foreign trade, namely, Mengtze Hsien in Linngan Fu, Hokow in K'aihwa Fu, Szemao Ting in P'ueul Fu and Tengyueh T'ing in Yungchang Fu. The treaties provide also for the opening of Yungchang Fu itself.

"Numerous routes radiate from Yunnanfu, the provincial capital of Yunnan. Starting from the city, the following, according to Richard's Comprehensive Geography, deserve to be mentioned: The road to Kweichow, via K'utsing Fu; the road to Szechwan, via Tungchwan Fu and Chaotung Fu; the road to Burma, via Tali Fu and Yungchang Fu; a road forks off at Tali, and leads to Tibet, via Atentze; the road leading to the Laos country, via P'ueul Fu and Szemao T'ing; the road to Tongking, via Mengtze hsien and Manhao; the road to Kwangsi, via Kwangnan Fu. The new railway line, which will bring Yunnan into direct and rapid communication with Tongking, starts from Laokwi, follows the Namti valley, and has its terminus at Yunnan Fu, via Mengtze hsien, and Ami Chow."

The Tintic district in Utah, lying in Juab and Utah counties, produced over half of the total silver output of Utah in 1919, according to the U. S. Geological Survey, having produced 6,815,008 oz. as compared with 11,649,961 oz., for the entire state. The Chief Consolidated at Eureka was the largest producer in the district and in the state.

Utah Fuel Co. Attacking Powers of Industrial Commission

Claims Body Acting Under Workmen's Compensation Act Is Usurping Judicial Functions

The powers of the Utah industrial commission as conferred by the amended workmen's compensation act of 1919 are being opposed by the Utah Fuel Co. on the ground of unconstitutionality. The case will shortly come before the state supreme court, which alone, according to the amended act, is empowered to review the proceedings of the commission. It is held that review by the district courts as permitted under the Act of 1917 would result in frequent appeals, which would be prejudicial to the proper functioning of the law.

The case in point concerns an award of $12 weekly to be continued throughout the period of disability that was made to a former employee of the Utah Fuel Co., who is now supposed to be suffering from progressive or creeping paralysis. The fuel company holds that there is no evidence to connect the man's present condition with his employment with the company about a year ago before the hearing was held, and that the evidence proves the disease to have attacked the employee in question before the time of his entry into the service of the company. The fuel company challenges the right of the commission to make decisions between litigants as to ultimate liability, holding that the commission, an administrative body, is thus usurping judical functions, and that if the law as amended, does attempt to give it such judicial power, this would make it in legal effect a court, and that the law would therefore be unconstitutional and void. Contention is made also for the right of appeal to district courts.

Tonopah and Tidewater Acquires Bullfrog-Goldfield Road

The Bullfrog-Goldfield railroad, which is 75 miles long and extends from Goldfield to Beatty, in Nevada, will be operated in the future by the Tonopah & Tidewater railroad, the control of the stock having been recently bought from the Althouse-LaGrange syndicate, of New York. The road was built during the boom days of Goldfield and of late years has been far from a paying investment. When the Althouse-La Grange syndiate secured control it was with the intention of scrapping the line and selling the equipment at the high prices then prevailing for such material. This was prevented and the road has now passed into control of those who are interested in having it continue operations, and it is expected that a much improved service will result.

The Bullfrog-Goldfield R.R. Co. has been re-organized with R. C. Baker, president, and C. B. Zabriskie, vice-president and treasurer. The general offices will be in Los Angeles. Mr. Baker, the new president, is also president of the Pacific Coast Borax Co. and the Tonopah & Tidewater R.R. Co.

Chisholm, Minn., Seeks More Taxes from Wellington Mine

Steel Corporation's Property Said to Contain Million Tons of Ore—Drilling Results Concealed from Tax Commission

Alleging under-assessment of mining property a petition was recently filed with the state tax commission of Minnesota asking that the commission make a full examination and re-assessment of the Wellington mine, owned by the United States Steel Corporation on the Mesabi Range. The petition states that this property has paid only nominal taxes during the last thirteen years and that the state is entitled to more than $100,000 in additional taxes from the property.

It is alleged that this property was thoroughly drilled in 1907, but that the results of drilling were not disclosed to the tax commission. From 1907 to 1919 the Wellington mine was assessed on the basis of approximately 140,000 tons of ore reserves and on a valuation not to exceed $14,000 in any one year. The annual taxes never exceeded $610, when it is claimed, they should have reached $10,000.

The petition is filed by George H. Spear, attorney of Duluth, and signed by J. Austin, president of the village council of Chisholm, Minn., and E. Drew, president of the school board. The mine is located in the village limits of Chisholm.

The Oliver Iron Mining Co., the iron mining subsidiary of the U. S. Steel Corporation, is now sinking a shaft on the property preparatory to opening up the mine for operation. It is alleged that the mining company has admitted to the board of equalization of the village of Chisholm that the property contains more than 1,000,000 tons of ore.

Licensing of Engineers Urged in Southwest

Mining and civil engineers of Arizona and New Mexico are to try to pass through their next legislative sessions bills for the licensing of engineers. It is urged that the profession assuredly is as technical as that of the law, the bar and of teaching, all of which have strict license regulation that protects the individual and the state alike. The legislatures will be asked in each state to create a board of engineering examiners.

Would Open All Indian Reservations to Mining

The support of engineering and mining societies and much official aid have been enlisted in support of the movement to throw open for mining all the Indian reservations of the nation. Especial interest attaches to this movement in Arizona, which state has large deposits of coal on the Navajo reserve, asbestos on the Apache reserve and mica on the Pima reserve, while on all are understood to be valuable prospects of copper, gold and silver.

Wage Scale Agreed on Last May Still Effective in Slocan, B. C.

The wage scale effective at present in the mines of the Slocan district, British Columbia, is given as follows:

MINE WORK

Class of Work	New Scale
Miners	5.75
Muckers	5.25
Timbermen	6.25
Timbermen's helpers	5.75
Blacksmiths	6.25
Blacksmith's helpers	5.75
Carpenters	6.75
Compressor men (steam)	6.25
Compressor men (other than steam)	5.75
Tramway operators (head end)	6.25
Mule drivers (underground)	5.75
Brakemen on mule trains	5.25
Teamsters	6.25
Common labor	5.25

MILL WORK

Jig men	6.25
Table men	5.75
Flotation men	5.75
Roll men	5.25
Crusher men	5.25
Common labor	5.25
Carpenters	6.75
Repair men	6.75
Repair men's helpers	5.75

This scale became effective May 12, 1920, following the strike called by the O. B. U. on May 1, at which time the men demanded a wage increase of $1 per day and other concessions as given on page 688 of the *Engineering and Mining Journal* of Oct. 2. On May 12 the operators of the district, excepting the Silversmith Mines at Sandon, made an agreement with the International representatives granting an increase of 75c. per day but also increasing the price of board 25c. per day. They also agreed not to employ any I.W.W. or O.B.U. members but reserved the right to employ non-union men.

"As matters now stand four months since the strike was called," says one of the operators, "nearly all the mines have resumed, but, most of them are stilll shorthanded, though labor has recently become more plentiful. The strike is meeting the fate of all movements founded on misrepresentation and false promises, and, is dying a natural death. Conditions will probably return to normal by the spring of 1920.

"One of the most deplorable features of this trouble particularly from the standpoint of international good feeling has been the spectacle of the ex-District Attorney of Spokane coming to British Columbia, and, making an arrangement which gives aid and comfort to the avowed enemies of established government, for the sake of putting a few dollars in his pocket."

According to the State Mine Inspector, Arizona now is employing about 20,000 men in its mining industry, compared with 30,000 a year or so ago.

Labor Survey Now in Progress in Northern Ontario

Mines Short of Men—Operators See Importation of Foreign Labor Only Relief

Despite the fact that large numbers of men are being laid off in the various industries in southern Ontario, the mines of northern Ontario are very short of men. Unfortunately, men who have been employed in shops and factories are not generally suited for the mines, and it is doubtful if the operators will be benefited to any great extent by this surplus. Practically every company operating in northern Ontario reports a shortage and a slowing down in development and exploration, and, in many cases, of production. The labor turnover has been high and in the Cobalt camp will undoubtedly average 25 per cent a month. This is due to the fact that there has been no immigration of foreign labor, and that the Government has been consistently opposed to such immigration. An official of the Labor Department from Ottawa is now making a survey of this northern country in order to get first-hand information, and it is hoped that some definite action may be taken. Unless the operators are allowed to import foreign labor they can see practically no hope of relief for the future.

Recent Production Reports

Calumet & Arizona's September production was 3,038,000 lb. copper compared with 3,650,000 in August.

New Cornelia produced 3,314,000 lb. copper in September against 3,842,040 in August.

North Butte produced 1,434,159 lb. copper in September against 1,286,137 in August.

Shattuck Arizona in September produced 166,513 lb. copper, 921,912 lb. lead, 57,008 oz. silver, and 523 oz. gold compared with 194,003 lb. copper, 563,452 lb. lead, 34,661 oz. silver and 406 oz. gold.

Oriental Consolidated, in Korea, reports its September cleanup as $76,500, compared with $75,500 in August. The entire property has been operated with hydro-electric power since July 13. The Tongkol mine has been unwatered and the Chintui mine is now being pumped out. Labor shortage is holding up prospecting work. Exchange continues unfavorable. Chinese labor continues absent and Koreans are more difficult to handle than formerly.

Greene Cananea produced 3,500,000 lb. copper, 159,600 oz. silver and 910 oz. gold in September. The August output of copper was also 3,500,000 lb.

U. V. Extension produced 3,327,644 lb. copper in September as compared with 5,805,568 lb. in August.

Anaconda produced 11,100,000 lb. copper in September against 11,800,000 in August.

Phelps Dodge produced 7,998,000 lb. copper in September, compared with 8,365,000 in August.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Mining in Alaska Less Affected Than Elsewhere, According to Col. A. H. Brooks

Loss of Experienced Miners Worst Feature of Situation; Scarcity of Common Labor Next

The most careful general economic study ever made of the mineral resource of Alaska just has been completed by Col. A. H. Brooks, in charge of Alaskan mineral resources of the U. S. Geological Survey, and O. C. Ralston, of the U. S. Bureau of Mines. This comprehensive study of the entire Alaskan situation from the mineral standpoint, was made at the instance of the Secretary of the Interior, in connection with the program of stimulating Alaskan activities so that sufficient tonnage may be found to make the Alaskan railroad pay. There is also the general consideration of speeding up the development of this territory which has been so generously endowed by nature.

One of the matters to which particular attention is given is the increasing demand in Alaska for a Government smelter. That phase of the matter will be reported on by Mr. Ralston on his return Nov. 1.

Considering the world-wide depression in gold and copper mining, Colonel Brooks was of the opinion that the mineral industry in Alaska is doing very well indeed. Although both gold and copper mining has been affected very seriously by the depression in those metals, Colonel Brooks believes that Alaska has been less affected than any other mining region depending largely on those metals. The fact that Alaska seems to be better off than other mining regions is regarded as an indication that Alaska possesses a fundamental vitality which is certain to exert itself as the situation improves. The worst feature of the situation, in Colonel Brooks' opinion, is the loss of experienced miners. Many of these men have been working in Alaskan camps for twenty years and are thoroughly familiar with conditions. Now a great many of them have returned to the United States and find that they can do better in this country. A great many of them have been attracted by the petroleum industry since the lure of oil carries with it more chances of reward than does gold mining under present conditions.

Another serious feature in the Alaskan situation is the loss of common labor. These men have returned to the United States in great numbers. It was from their ranks that most of the prospectors in Alaska was drawn. It is going to be very difficult, Colonel Brooks believes, to induce these men to return or to get men of their type to take their place.

Despite the depression in gold mining, Colonel Brooks reports great activity in prospecting for gold lode claims in southeastern Alaska. Promising discoveries have been made in the Sitka district. The success of the Chichagoff mine is also having an important influence. It is interesting to note that the Sitka district was the scene of great prospecting activity nearly half a century ago. After a long period during which it was practically abandoned by prospectors it again is the scene of the greatest activity.

At the special request of Secretary Payne, Colonel Brooks made a general survey of the oil possibilities of the territory. He calls attention to the fact that geologic conditions are particularly good for the occurrence of oil at a number of places in Alaska. In addition there is the direct evidence of oil seepages. Due to the increased price of petroleum and to the enactment of the new mineral leasing law, Colonel Brooks expects active drilling to start at a number of points in Alaska next spring. Colonel Brooks visited the Katalla field where drilling and refining are in progress on a patented claim containing 160 acres. This is a field of small pumping wells, but a superior grade of gasoline and distillate are being produced. The petroleum is coming from sands at depths of 300 and 800 ft. In Colonel Brooks' opinion, these wells will continue to produce for a long time to come. There is a ready market locally for all that this field can produce, especially since the product is superior to the imported gasoline.

War Minerals Awards

Awards aggregating $5,812.25 were recommended during the week ended Oct. 2, 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): E. E. Taylor, chrome, $300, 100 per cent; Frank M. Liscom, chrome, $148, 16 per cent; W. S. Tolbard, manganese, $5,364.25, 31 per cent.

With the foregoing awards, 239 war minerals claims have been allowed in full or in part. The total amount claimed in these 239 cases was $5,938,-748. The amount recommended for award was $1,912,368.23, or 32.2 per cent. In all the commission has acted on 1,032 claims.

The administrative expenses of the commission, on Oct. 2, totaled $302,-248.14, or 2.22 per cent of the total amount of the claims settled.

Geologic Study of Homestake Mine, at Lead, S. D., Completed

Sidney Paige Follows Up Earlier Work for Government by Comprehensive Examination

A thorough geologic study of the Homestake mine at Lead, S. D., has just been completed by Sidney Paige. This is the first comprehensive study ever made of this mine by a Government engineer. Due to the fact that the Homestake deposit is unique in the United States, there has been the greatest interest in its geology. It has been the policy of the company, however, not to permit of studies of its ore deposits by outside agencies. An exception was made in 1913 when Mr. Paige was allowed to make limited observations underground. During the present visit, however, Mr. Paige was given every opportunity to make a careful study.

As a result of his study in 1913, Mr. Paige published a short paper on the origin and structure of the ore deposit. His latest examination supports the ideas which he published at that time.

"The mine is really a replacement deposit of a closely folded pre-Cambrian series of schists and carbonate rocks," says Mr. Paige. "The ore, in the main, is confined to beds which probably comprised magnesium and calcium carbonate layers. An important zone of shearing and faulting determined the locus of the ore in this series of carbonate beds. The folding of the beds in large measure determined the shape and pitch of the orebody."

Rumors to the effect that gold existed in the Black Hills became current early in the 19th Century. Owing to the hostility of the Indians, few efforts were made to prospect the hills. In 1874, however, General Custer made a military reconnaissance of the region in an effort to establish whether rumors of gold had foundation. The Custer expedition was accompanied by N. H. Winchell, a geologist. Gold was found to exist in the stream beds of the Harmey Peak region. A further examination was made by Government geologists in 1875, but the party did not reach the region of the Homestake mine.

The facts concerning the discovery of the Homestake deposit are not known but it is said that the Homestake and Old Abe deposits were discovered by two French boys, Moses and Frederick Manuel. The property was mentioned in print as early as 1876. Its real worth was established in 1877. Since that date more than $100,000,000 in gold has been taken from the Homestake orebody.

NEWS BY MINING DISTRICTS

Special London Letter

Mining Companies Finding Difficulty in Obtaining Funds—West Rand Consolidated in Sorry Plight

London, Sept. 28—At least half a dozen mining companies acknowledge that they are in need of funds, and five of them are specifying the amount that should be raised. Four of the companies own tin areas, one is a gold mine, and the last, the Broken Hill Proprietary, which owing to demands made upon it is compelled to extend its iron and steel works. Three tin mining companies, namely, the Killifreth, the Dolcoath and the Grenville United are in Cornwall, where the industry is sadly in need of additional financial resources. While tin was selling at a high price and wolfram and arsenic were in great demand the mines of the Duchy earned fairly substantial profits; but since the war, and owing to the action of the Government in regard to the price of the metal, coupled of course with increased wages, the rise in coal, transport rates and raw materials, matters have become much less rosy. Attempts were made to induce the Government to loan £100,000 for development purposes; the authorities, however, refused, deciding that the mining industry must find its own capital. The famous old Dolcoath wants something like £100,000; Grenville United, which for some months worked from hand to mouth, experiences great difficulty in obtaining funds; while Killifreth, which has acquired two adjacent properties, is compelled to provide £20,000 additional capital, and is creating 50,000 new £1 shares.

Money is by no means plentiful, and can only be procured on onerous terms; in fact large lenders of capital to mining companies in the past are deciding to sit still and do nothing because, where machinery is required, early delivery cannot be guaranteed, and they argue that if money is raised on debentures the interest will be paid out of the money that is provided.

An illustration of the unfavorable effect of increased cost of labor, transport, materials, etc., is acorded in the case of Northern Nigeria (Bauchi) Tin Mines. This company designed a hydro-electric plant at the Kwall Falls, to be erected by Messrs. Vickers. The original estimated cost was £85,000, and it will be exceeded by no less than £65,000. To complete the mine equipment will require another £75,000, making £225,000 in all. The directors have expended £100,000, of which £45,000 is borrowed, and they must now raise £125,000. Ten thousand tons of tin concentrates is proved, having an estimated value at the current price of tin of £1,680,000, on which the profit should be £600,000. The issued capital is approximately £300,000.

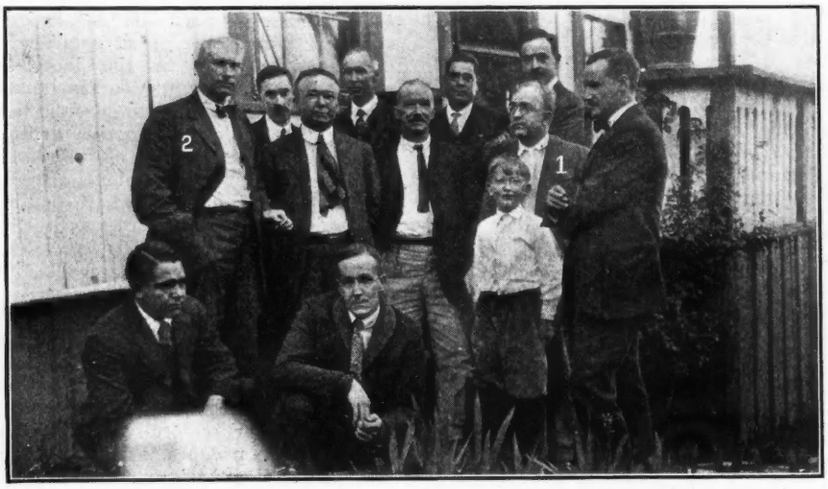
The Broken Hill Proprietary proposes to spend £3,500,000. It has rather over £1,000,000 in reesrves; it will issue £1,500,000 in 7 per cent debentures at 97 and 420,000 shares at £2 5s. For the iron and steel works this sum is fairly certain to be found.

The West Rand Consolidated Mines is in a very sorry plight, for it needs money and has decided to postpone for three years payment of interest on its debentures, and also redemption of the debentures. Further, it will suspend the first charge of the debenture holders to enable the company to raise up to £100,000 at 8½ per cent on a floating first mortgage. The General Mining & Finance Corporation will advance the money, but only as and when required. The property is a low-grade area in the western part of the Witwatersrand, about which great things were predicted some years ago. The mine, however, has never come up to expectation.

Peregrina—The Peregrina mill continues operating on a reduced scale pending the conclusion of important development work which it is expected will open up a large tonnage of very good ore. W. T. Kendall is superintendent for the company of both mine and mill.

La Luz District — The Guanajuato Reduction & Mines Co. is building a mill and cyanide plant on its properties at San Pedro in the district of La Luz. The plant is designed to handle 200 metric tons per day and was laid out so as to permit of the tonnage being readily increased. The counter-current system is to be used with Dorr thickeners and agitators. Precipitation will be effected by the Merrill zinc dust system, using the Crowe vacuum process in conjunction with same. The ore from the crusher will be screened, the fines going direct to 5 by 6-ft. Allis-Chalmers driect-driven ball-mill; the coarse being passed through twenty stamps before going to the ball mill. Three 5 by 16-in. tube mills are to be used for the fine grinding, working in closed circuit with Dorr classifiers. Construction work is progressing.

A new three-compartment shaft is being sunk in the south end of the Rosario mine, to be used as the principal hoisting shaft for operations in the Rosario, Purisima and San Pedro mines. The old Rosario shaft is being timbered through caved ground, for use as an auxiliary shaft. An adit is also being driven north in the Pili mine at the north end of the company's La Luz group. This mine will be connected with the others by a surface tram. The company expects to have its mill in operation early in November, unless something unforeseen arises.



GROUP INCLUDES CHARLES HOYLE (1), MANAGER OF ESPERANZA MINING CO.; W. A. GARDINER (2), SUPERINTENDENT, AND THREE OTHER EMPLOYEES OF COMPANY, WHO WERE RECENTLY CAPTURED BY PEDRO ZAMORA, BANDIT, IN JALISCO, MEX., AND HAVE SINCE ESCAPED OR BEEN RELEASED

MEXICO

Guanajuato

San Matias Mill Running After Two-Year Shut Down—Guanajuato R. & M. Co. Erecting 200-Ton Mill

Guanajuato—On Sept. 8, the San Matias mill of the Mexican Milling & Transportation Co. resumed operations after having been closed down for over two years. The mill has been entirely overhauled and some important changes made in the flow sheet and system of treatment, which brings the daily capacity up to over 300 tons. The ore is being supplied from the Esperanza group of mines by an aerial tramway 11,000 ft. long, which has recently been installed. P. R. Hudson is mine superintendent and O. W. Johnson mill superintendent.

Durango

Mining Active in Avino and Panuco Districts

Mining is becoming very active in the Avino and Panuco districts in Durango. They are located near each other and at one time were the most flourishing camps in the state. A large amount of English capital was invested there.

Gabriel Segura, of Durango City, has filed on a number of delinquent claims in that vicinity and is preparing to operate them.

The Avino Mines Co., Ltd., are seeking to obtain from Juan F. Flynn, former manager, the titles to the Maverick group of mines near Avino.

CANADA

British Columbia

Re-definition of Canada-Alaska Boundary Progressed During Summer—Opening Berniere Mines

Victoria—Dr. V. Dolmage, of the Canadian Geological Survey, has returned after a summer's field work which has resulted in the obtaining of the information necessary to complete the geological map of the west coast of Vancouver Island. Dr. C. H. Clapp and Dr. G. N. Dawson have already completed the geological survey of the southern and northern sections of the west coast of the island.

Vancouver—The re-definition of the Alaska-Canada boundary line, particularly in the Portland Canal and Salmon and Unuk River regions, make considerable progress during the past summer. J. D. Craig, head of the Canadian party, has returned and states that he worked north and westward from the town of Stewart and that the United States surveyors, led by Jesse Hill, worked south by the Unuk River. The duty of these parties was to indicate the boundary clearly by means of monuments and by the cutting of timber where there is timber. It is stated that some miners and prospectors have made the mistake of staking in American territory and recording the same with Canadian officials and that the error has been as frequently made conversely.

Trail—Ore shipments received at the Consolidated smelter during the week ended Sept. 30 totaled 12,744 tons, coming from the following shippers:

Mine and Location	Gross Tons
Emerald, Salmo	33
Florence, Princess Creek	95
Iron Mask, Kamloops	45
Josie, Rossland	448
Monarch, Field	78
North Star, Kimberley	224
Paradise, Athalmer	57
Providence, Greenwood	47
Queen Bess, Alamo	40
Sally, Beaverdell	37
Twin, Princess Creek	26
Velvet, Velvet	28
Washington, Sandon	37
Company mines	11,549
Total	12,744

Revelstoke—The Berniere Mines, situated near Scott Creek, Camborne, are being opened up and a contract has just been let for the construction of cabins, blacksmith shop and other buildings, it being the intention to continue work this winter. The Beatrice Mines, of the same district, are shipping silver-lead ore to the Trail smelter.

Ontario

Temiskaming Shareholders Ratify Coal Mine Deal—To Continue Sinking at Vipond

Cobalt—F. C. Sutherland & Co., of Toronto, have taken an option on the Penn Canadian mine, which has been closed since the strike last year. There is about 8,000 tons of ore broken in the mine and about 150,000 tons of old tailings, which, it is believed, can be retreated at a profit.

At a general meeting of the shareholders of the Temiskaming mine a deal for the purchase of a half interest in the Blue Diamond coal mines in Alberta was ratified. The coal property is being taken up jointly by the McIntyre and the Temiskaming. Four hundred and fifty thousand dollars has already been paid on the purchase price. It is stated that the mine is already making a profit, which will be largely augmented when the new equipment ordered is on the ground.

According to the terms of the agreement between the Dominion Reduction Company and the Peterson Lake, for the retreatment of old tailings belonging to the Peterson Lake, the Dominion Reduction is to receive 35c. per ton over the cost of treatment, and one-third of any profit remaining after this.

The Casey Cobalt Co., which has produced 2,500,000 oz. of silver, has gone into voluntary liquidation.

Porcupine—Following the decision to reopen the Vipond mine, it has been decided to continue the shaft from the 600 to the 1,100-ft. level. A big program of development work has been outlined.

Elk Lake—The Matachewan Gold Mines in the Elk Lake district has recently concluded 15,000 feet of diamond drilling. The results of this drilling, together with the underground development that has been done, is sufficient to satisfy the management as to the orebodies. It is probable that the property will not be opened up in a large way until hydro-electric power is available.

It has been officially stated that the shareholders of Dome Extension will participate in the dividend of 25c. per share on Dome stock, payable Oct. 20. The deal for the purchase of the Dome Extension property by the Dome on the basis of 30 shares to one was recently ratified.

Manitoba

Herb Lake—The Rex is working three shifts per day underground and the mill running 24 hours per day. Ore reserves have been blocked out ensuring steady operation of the mill.

ALASKA

Rae Wallace Co. in Willow Creek District Installing Gibson Mill

Allen G. Kennedy, of Wallace, secretary of the Rae-Wallace Gold Mining Co., recently returned from an inspection of the company's property in the Willow Creek district, Alaska. Most of the stock of the company is held in the Cœur d'Alene district and the manager in charge at the mine, Don S. Rae, has been in Alaska twenty years and prior to that time was engaged in mining in the Cœur d'Alenes. The development on the Rae-Wallace at this time consists of a series of tunnels which have proved the vein for a distance of 3,500 ft. and exposed enough ore to keep the 50-ton mill, which is now being erected, running for several years. However, the company plans to drive another tunnel just above the mill site which will open up the vein to a depth of 1,200 ft. and then increase its milling capacity. A Gibson mill in two units of 25 tons each is now being installed, and it is hoped to have one unit running before the mining season closes this fall. The ore is free milling and Mr. Kennedy estimates that from $40 to $50 per ton will be recovered by amalgamation.

CALIFORNIA

Construction of 500-Ft. Tramway Begun at Kelly Gold Mine at Quincy

Quincy—Construction of a 500-ft. tramway to connect the mouth of the tunnel with the stamp mill at the Kelly gold mine on Crescent Hill, near Quincy, began on Oct. 1. The work is under the supervision of H. C. Martin, building contractor, who has just completed several other large construction jobs in this district. Martin will also erect an ore storage bin and other buildings. The Kelly mine embraces 180 acres containing nine claims and now employees a force of nine men. The plant is hard to reach by tractors or trucks as in order to get machinery and supplies to the mine a 27-per cent up grade must be overcome.

Sutter Creek—Morris Brinn, of San Francisco, has completed an examination of the Central Eureka property in which he is heavily interested. Power shortage has curtailed the output, but large reserves are being developed.

Jackson—The water in the Kennedy shaft has been lowered to a point below the 2,800 level, with a corresponding progress in the connected Argonaut workings. Last week some delay was caused by one of the large water skips getting caught in the shaft and tearing out some of the timbers. The pumps are working steadily in both mines in addition to the water skips. The shaft as thus far unwatered is in first-class condition. The greater part of the east shaft of the Kennedy is in hard greenstone and is not affected by the water. James Spiers, superintendent, is looking after the present work, which is being done at the expense of the Argonaut company, the Kennedy not desir-

ing to resume operations on its own account during present abnormal conditions.

San Francisco—Fletcher Hamilton, state mineralogist, has been touring the mining districts of the state and giving addresses on the development of mineral resources. H. A. Jenison, geologist for the United States Geological Survey, is engaged in making a survey of the principal copper mines of the state, starting with the Engels and Walker mines in Plumas County.

Engelmine—R. A. Kinzie, present manager of the Engels Copper Co. states that on the No. 6 level, or 600-ft. level, of the Engels upper mine one orebody is 840 ft. long with on average width of 70 ft. Another to the south is 200 ft. long and 60 ft. wide, while two other known orebodies have both been developed sufficiently to have their limits known. These bodies average between 2.75 and 3 per cent copper as they are broken down, also carrying gold and silver.

The Reinmiller Copper Co. has about completed the road leading to the site for the crosscut tunnel which will tap the main vein so far developed at a depth of 400 ft. below the collar of the shaft. A boiler and compressor are on the ground and will be installed at once, after which the tunnel will be rapidly pushed with two shifts until it reaches its objective.

Portola—Between 8,000 and 9,000 tons of concentrates is at the Walker mine at this time ready to ship over the new tramway, which is now in operation, according to J. R. Walker, who is interested in the company. These concentrates are said to be worth over $80 per ton at the present price of copper. The Walker company is making the camp and headquarters for operations close to the mill,

NEVADA

Cactus Nevada Silver Makes First Shipment

Cactus Peak—The first shipment of ore by the Cactus Nevada Silver Mines Co. was recently made, going to the Goldfield Development mill at Goldfield. A new vein is reported to have been opened up in the east drift on the 265-ft. level.

Goldfield—The winze from the 900 level of the Spearhead is down over 200 ft. and will be continued to a depth of 500 ft. It is being sunk on an incline of 76 deg. and is going through a series of faults, the formation being alternately quartz and alaskite.

Gold Hill—Crosscutting on the 475 and 575 levels of the Co. Imperial is in progress. When the vein has been crosscut, sinking of the shaft will be resumed. Twenty men are at work at the portal of the haulage tunnel on open cut work and construction of buildings to house machinery and supplies. The United Comstock Mines Co. is employing 78 men altogether.

Cortez—With the completion of the installation of a compressor and other necessary equipment the driving of the Arctic tunnel at the Cortez Consolidated mine is progressing steadily. It is now in 1,400 ft. from the portal and within another 600 ft. is expected to cut the downward extension of the main vein at a vertical depth of 600 ft. below where the latter was mined in the No. 1 tunnel. Geo. L. Kaeding is in charge.

Tonopah—The Tonopah Extension report satisfactory progress in sinking their Victor shaft, which is now 100 ft. below the 1,760 level. Present plans are to sink 75 ft. before crosscutting, the last 50 ft. to be used as a sump. The McCane shaft workings have been connected to the No. 2 shaft workings and after some delay in repairs this shaft is to be sunk to the level of the 1,540 of the Victor. In development work fair progress is reported and mill tonnage from the mine is given as 1,750 tons.

In the Tonopah Belmont mine drifts have been started on the 729 vein from what has been designated the 550 level. This is an intermediate level from a raise driven from the 700 level. The drift shows two feet of fair ore. Regular development from the 700 to the 1,200 levels has disclosed nothing new of importance, ore showings and tonnage mined being normal.

In the West End mine development on the West End, Footwall and Ohio veins has proceeded with few changes. August profits were $47,466.64 from 4,396 tons of mine ore and 496 tons of Jim Butler lease ore mined from the

MILL AND MACHINE SHOP OF ENGELS COPPER MINING CO., PLUMAS COUNTY, CAL. DEPOT OF INDIAN VALLEY R.R. IN FOREGROUND

West End shaft with a total gross value of $112,775.79.

The Rescue continues regular shipments of ore of good grade and it is said that a substantial treasury is being accumulated.

Divide—In the Tonopah-Divide mine conditions are stated to be very good. On the 165 level a crosscut at a point 350 ft. southeast of the original strike on this level has shown the vein to have a width of 36 ft., 12 ft. of which is shipping grade ore and 24 ft. ore of milling grade. Development workings in the vein on other levels have satisfactory showings and crosscutting on the 800 and 1,000 levels has been started.

Pioche — Shipments from the district for the week ended Sept. 30 show a steady reduction on account of the freight increases and it is only hope and assurances of an adjustment in the rates that is keeping the majority of the properties on the active list. Many shutdowns will result in the near future unless some action is taken. Shipments in the week referred to totaled 2,995 tons from the following shippers: Prince Con., 1,700 tons; Virginia Louise, 650; Combined Metals, 245; Bristol Silver, 200; Black Metals, 100; Campbell-Bristol Lease, 50, and Con. Nev. Utah, 50.

ARIZONA

C. & A.'s New Air Shaft in Operation —Considerable Leasing in Tombstone District

Bisbee—The Irish Mag Leasing Co. has finished its first six months' period of operation. The Irish Mag shaft has been opened and retimbered from 40 ft. below the 450 level to a point 20 ft. below the 750 level. Work of opening the shaft and retimbering will be continued. It is planned to start prospecting on the 950 and 1,050 levels. Approximately $17,000 has been spent in repairing the shaft, which work was started April 1, 1920. Two shifts have been working in the shaft continuously.

The Boras and Night Hawk leasing companies have resumed operations after a week's shutdown due to a lack of electric power. The Bisbee Improvement Co., which furnishes these mines with power, was forced to curtail due to a shortage of fuel oil. This is now being received and no immediate shortage of power is anticipated.

At the Calumet & Arizona the new air shaft near the Briggs mine has been connected with the fire area and is now being used for ventilation.

Tombstone—There is considerable leasing going on in the Tombstone district. The Bunker Hill Mining Co. is at present doing no company work. Small leases have been given both on the surface and underground in several of the mines. It is reported that the Mellgren property, comprising about 60 claims, has been examined by Eastern interests. The property is said to be bonded.

The Winter's property has been sold to Boyd, Hughart & Bloodworth, who have formed a closed corporation to develop it. A new shaft is being sunk as the old one has not been found suitable. The present mill will not be operated.

Altogether there are about thirty different operators including lessees in the Tombstone district.

Swansea—The Swansea is now employing more than 100 men, mainly Mexicans, and producing about 140 tons of ore per day. Most of this is milled, yielding a 24-per cent concentrate which is shipped to Humboldt, as well as a small quantity of high-grade ore that is valuable in the furnaces because of its high iron. The Swansea lease has been taken from the Clark interests by the Consolidated Arizona Smelting Co. of Humboldt, as recently stated.

NEW MEXICO

Bonney Con. Makes Strike of High-Grade Copper Oxide

Lordsburg—Frank M. Manson, who recently made an investigation of the possibilities of southern Arizona, southwestern New Mexico and northern Sonora, with the object of locating ore-buying agencies in this section, has announced the intention of the Western Ore Purchasing Co., of Reno, Nev., to establish a number of agencies in this section, which will buy all kinds of salable ores in any quantities. One or more sampling mills will be erected at points later to be decided upon.

A new strike of very high-grade red oxide of copper has been made at a depth of 35 ft., on the Manilla claim of the Bonney mine. Work has been started to cut this from the 100-ft. level of No. 1 shaft.

Ore shipments from the Lordsburg district in September totaled 89 cars, or 4,072 tons, valued approximately $61,080.

White Signal—At Camp Kithil mining of torbernite ores has ceased. The representative of the Radium Company of Colorado, who has been here for several weeks, has returned to Denver. The Merry Widow shaft has been sunk to a depth of 200 ft. and various other openings made which has demonstrated an ample quantity of ore. It is understood however that considerable difficulty has been experienced in perfecting a process for handling the torbernite which differs from the ores heretofore used by the Radium company in the production of radium.

COLORADO

Silver Mountain Mines Suspends — Guadaloupe Mine Changes Hands

Ouray—Silver Mountain Mines has suspended work and is reported to be offering its equipment for sale. The equipment of this property was good and a fair start was made, but subsequent mine development was neither very effective nor successful.

James A. Lannon, of Ouray, formerly manager of the Atlas M. & M. Co., has taken over the Guadaloupe mine for a group of outside men and is actively engaged in equipping it. The construction of a line to transmit electric power to the mine is under way and mining machinery will be installed soon. The mine has been sporadically worked for years but never well developed; the new operations promise to give the mine a good try-out and the prospects are good for success, the mine having produced ore of very good grade at intervals.

Camp Bird has continued active development ever since the new crosscut tunnel, two miles long, was connected with the old workings above by a 400-ft. raise for ventilation. The intervening ground around this raise was opened up by several levels, then the vein was explored on the main tunnel or crosscut level. Drifting over 2,000 ft. east was first done, and now drifting west along the vein is in progress out under the most productive of the old workings. Ore encountered is stored in a stock pile at the tunnel portal. The intermittent manner of adding to this pile indicates that no large or continuous orebody, as compared with the old mine, has been encountered. Considerable ore has been encountered, however, and undoubtedly the mill will again be operated some time in the future.

UTAH

Utah Sulphur's New Leaching Plant Ready Soon—Seek Injunction Against Tintic Standard

Morissey—The new leaching plant of the Utah Sulphur Co. is expected to be in operation early in November. The new plant will have a daily capacity of 250 tons, and with the retorts and sublimer also working, the total capacity, it is stated, will be 350 tons daily. The latter have been doing satisfactory work, but the leaching plant can produce sulphur at a considerably lessened cost, it is said. The sublimer is used only for making the highest grade of sulphur. It is reported that the company is arranging also to produce fertilizer made of sulphur and phosphate rock combined, and that it is going to construct a plant having a capacity of 150 tons daily for this purpose.

Eureka—Tintic shipments during the week ended Oct. 1 totaled 131 cars as compared with 143 cars the week before.

An injunction is being sought against the Tintic Standard by the East Warm Creek Irrigation & Canal Co. to prevent the former from using water from Warm Springs and Warm Creek near the site of its mill which is in process of erection.

Park City—Shipments for the week ended Oct. 1 amounted to 2,153 tons coming from six mines, the Ontario and Silver King Coalition heading the list, with 704 and 554 tons respectively.

Alta—The South Hecla shipped 35 cars of ore during August and the September output is expected to amount to about 25 cars. Labor is scarce.

IDAHO

Cœur d'Alene District

Cœur d'Alene Syndicate Installs Compressor—Financing of U. S. Copper Arranged—Kill Buck Reorganized

Wallace—The Cœur d'Alene Syndicate, of which Rush J. White, mining engineer, is manager, has completed the installation of a large compressor to be used in developing the two Flynn groups which the syndicate has under option. The development consists of the extension of the Black Bear tunnel into the Flynn ground. This has now been extended about 700 ft. since crossing the common line, making the distance from the portal about 4,500 ft. A crosscut is being run south to the Flynn vein which is expected to be cut at any time. The great depth from the surface, 2,000 ft., and the fact that there are no intermediate workings, make it impossible to estimate accurately the position of the vein.

The United States Copper Co. is to be financed by E. R. Day, of the Grasselli Chemical Co., and J. W. Munroe, both of Cleveland, Ohio. Both these gentlemen inspected the company's holdings about a month ago in company with H. V. Edwards, of Wallace, manager, with the result that a permanent wagon road is now being built to the property which will enable the delivery of a compressor and all necessary equipment and building material early in the spring. A vein from 5 to 40 ft. wide outcrops for a distance of over 3,000 ft. A prospect tunnel has been driven 200 ft. on the vein, showing an average of 3 ft. of ore ranging from 2 to 30 per cent copper and some gold. In the spring a crosscut will be run about 1,200 ft. which will cut the vein 350 ft. below the present tunnel.

The Kill Buck stockholders have elected the following directors: Donald A. Callahan, James F. Callahan and Dr. L. E. Hanson, of Wallace; C. W. Newton, of Interstate, and John Borg, of New York. Control was recently purchased by the Consolidated Interstate-Callahan from Senator W. A. Clark, of Butte. The meeting of stockholders was called for the purpose of effecting re-organization with the representatives of the Interstate-Callahan in control. The directors are also identical with those of the Chicago-Boston Mining Co., also controlled by Interstate-Callahan. The two properties adjoin and will be developed through the same shaft, although operated by independent companies.

MICHIGAN

The Copper District

C. & H. Subsidiaries to Get Power From Lake Linden—Tamarack Reclamation Plant Site Cleared

Houghton—Sinking of the New Baltic shaft of the Arcadian Consolidated has been resumed, and at this writing is about 20 ft. below the 600-ft. level. The corner is in the lode.

The steel for the addition to the Calumet & Hecla flotation plant at Lake Linden is expected to arrive soon. This building is being erected by the American Bridge Co.

The site of the Tamarack reclamation plant is practically cleared of the old Tamarack stamp mill and equipment. Excavation for the flotation and leaching buildings are well under way.

Gogebic Range

"C" Pabst Shaft Lining Being Repaired

Ironwood—"C" shaft of the Pabst mine will be shut down for two or three weeks while repairs are being made to the shaft lining. Three shifts will be put on and the work pushed as rapidly as possible. The shaft is vertical, starts in the hanging and passes into the footwall near the 17th level. The pillar left to support the shaft was not adequate and the ground has caved until the shaft is several feet out of plumb. It is now crushing where it passes through the ore and dyke, and has to be retimbered between the 9th and 13th levels.

Menominee Range

McKinney Steel Electrifying Tobin and Dunn Mines Owing to High Cost of Coal

Crystal Falls—The McKinney Steel Co. is to re-equip the Tobin and Dunn mines and will move all the equipment at the Odgers property, all three of which are in the Crystal Falls field. The present steam plants at the Tobin and Dunn are to be scrapped and replaced with new electric hoisting engines and compressors. The present electric hoist at the Odgers will be moved so as to serve the new shaft which was recently completed. The hoisting engines at all of the properties will be housed in new buildings of brick construction. The high cost of coal was the determining factor in causing the company to discard the steam equipment and substitute electric machinery. The work of moving the Odgers equipment has been under way for several weeks and will soon be completed. In addition to erecting a new engine house at the Dunn, the company will also build a new change house for the men and put up a new steel headframe.

MINNESOTA

Cuyuna Range

Armour No. 2 Begins Stockpiling—Transfer of Hopkins Expected

Ironton—The Armour No. 2 mine, operated by the Inland Steel Co., has completed its season's shipments and has begun stockpiling. This property, one of the largest on the range, had the advantage of an early start, three boatloads of Armour ore having reached the lower lakes in May, and is the first to complete its schedule. Most of the Cuyuna Range properties are somewhat behind schedule at this time owing to the delay in boat and car service during the summer.

Irondale Township—The Hopkins mine, located on the NW¼ of SE¼ of Section 3, is expected to pass into the hands of new operators soon. This property was leased to the E. N. Breitung Ore Co. in 1915 and was opened and developed by them as an underground mine. A 3-compartment shaft was sunk to a depth of 171 ft. and development work proved up about 475,000 tons of available iron ore and manganiferous iron ore. In 1918 the operators shipped 37,257 tons of manganiferous ore and in 1919 loaded their stockpile of 5,849 tons. The mine has been idle since the winter of 1918-19.

ALABAMA

Quest for New Ore in State Continues—Prospecting for Gold in Clay County

Birmingham—Satisfied that there is considerable iron ore in Alabama that has not heretofore been considered, engineers and geologists are at work prospecting, mainly in the Birmingham district. The Sloss-Sheffield Steel & Iron Co. has been core drilling on the southern end of Red Mountain, near Parkwood, on the main line of the Louisville & Nashville. This will be a deep mining project if operation be decided upon. The same company has been prospecting on the upper end of the mountain also, not far from what is known as the Ruffner mines in the vicinity of Trussville. This is another deep mining proposition.

The Gulf States Steel Co., after three or four years of development work at the Shannon mines, expects to be obtaining a good supply of ore by Jan. 1. It has been stated that when the Shannon mines are in full operation the company will not only have a visible supply of ore for its own use for years to come but will be able to go on the open market with some of its ore. Smaller mines now supplying the Gulf States will be given up when the Shannon mines are producing as anticipated.

The Tennessee Coal, Iron & R.R. Co. has done some drilling and private parties are now dickering for acreage, on which boring has shown good ore, near the Parkwood property of the Sloss-Sheffield company. Brown ore mines at Cave Springs, Ga., on the northeastern Alabama-Georgia boundary are being operated and the ore is being hauled by trucks to a point of consumption. Other negotiations are on in the state in further prosecution of ore development.

The Woodward Iron Co. reiterates that the shaft sunk to ore during the last 12 months, some distance from its mines on Red Mountain, will be held in reserve until more ore is needed.

Clay County—Prospecting for gold in Clay County, Ala., is again under way, Louisville people being interested, and there is some talk of erecting a mill. The Kentuckians are asking for no financial assistance and appear to be well equipped in that respect to handle the project, which is being done quietly and effectively. For some years prospecting for gold has been under way in the eastern part of Alabama but the results have been encouraging.

THE MARKET REPORT

Daily Prices of Metals in New York

Oct.	Copper	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
7	17.10	40.50	42.25@42.50	7.20@7.25	7.20@7.30	7.35
8	17.10	40.50	42.25@42.50	7.15	7.15	7.25@7.30
9	16.85	40.50	42.00@42.25	7.15	7.15	7.25@7.30
11	16.75	40.25	41.00@42.00	7.10	7.10@7.20	7.25
12	.....	.....	.....	....	....	....
13	16.50	39.25	39.75@40.00	7.00@7.10	7.00@7.20	7.25

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. All prices are in cents per pound.

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

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

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

London

Oct.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3 M		Spot	3 M	Spot	3 M	Spot	3 M
7	98½	98	112	267	272½	34⅜	34¼	40¾	41⅞
8	98	97	110	266	270¼	34⅜	34¼	40⅜	41⅜
9	....	....	...	....	....	...		...	
11	96½	95½	109	263¾	269	34⅝	34½	40½	41⅞
12	95	94	109	259	263½	34½	34⅜	40½	41¾
13	96½	94½	108	256	260¾	34¼	34	40	41¼

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

Silver and Sterling Exchange

Oct.	Sterling Exchange	Silver			Oct.	Sterling Exchange	Silver		
		New York, Domestic Origin	New York, Foreign Origin	London			New York, Domestic Origin	New York, Foreign Origin	London
7	349	99½	87	56⅛	11	349½	99½	83	53⅜
8	350	99½	87½	56¼	12	....	...	..	54¼
9	350¼	99½	85⅜	54⅞	13	348¼	99½	87	56¼

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.

On the authority of the Secretary of the Treasury, we quote 100c. per oz. for silver, 1,000 fine, delivered at the option of the Director of the Mint to the New York Assay Office or to the mints in Philadelphia, Denver, or San Francisco, and proved to the satisfaction of the Treasury Department to have been mined, smelted, and refined in the United States. This quotation is retroactive to May 13.

Metal Markets

New York, Oct. 13, 1920

The metal markets record another week of trade dullness. All the major metals remain comparatively inactive, and the sales reported are relatively small. The importance of general financial and economic conditions is especially pronounced in the metal trade, and the effect of strained credit is forcing many producers to create a market at a loss, and as consumers, for similar reasons, are not overly anxious to participate in the market, the tendency is still downward. The market is evidently seeking a new level from which trading can be resumed with confidence by both producer and consumer. The London market in copper and tin took a decided slump during the week, whereas the market for lead and zinc remained at substantially the same level.

Copper

The downward trend of last week has continued. Large producers are no longer holding aloof and are entering into the market at prices representative of the lower level. Large quantities can be bought today at 17c. or less delivered, and it seems as if the copper-consuming industry is attempting to close the year with as small a copper stock inventory as possible. Price concessions have not reached a level which has induced much business, bearing out the impression prevalent in the trade. The summer and fall seasons for construction work are closing, and the demand for copper products is slackening, which partly accounts for the lack of interest in the market. The low price at which the red metal can be obtained is creating a low level for the year and making it increasingly difficult for some producers to operate. There is little interest in futures.

Lead

The official A. S. & R. price remains at 7.75c., N. Y., which is a wide deviation from the general market. There have been few inquiries in the lead market, and the dullness noted last week still prevails. This respite from the recent pronounced activity in the market is enabling producers to complete their unfilled orders and contract deliveries that have long been delayed. Consumers are buying only small quantities and manifesting little interest in the market. The metal can be obtained at practically the same price in both the New York and St. Louis markets. Quotations in the Western market are nominal, and there is little interest in futures.

Zinc

There has been a further decline in the market in spite of a statistical position that is inherently good. The demoralization of the automobile trade is looked upon as of benefit to the zinc trade, in that it will deflect black sheets used by the automobile factories to the galvanizing trade, which has hitherto felt a shortage in supply. On the other hand, there is the unchanged European situation, the foreign-exchange question, and the determination of European nations such as Germany (which was formerly a large zinc-consuming country) to market all available supplies of the metal in order to realize cash. These tactics on their part have acted and are acting as a depressing influence on the domestic market. Interest in futures is largely nominal.

Tin

The effect of the slump in the London price of tin amounting to about £11 for the week has practically killed all interest in a dull market. Supplies of tin are still being liquidated.

Straits tin for future delivery: Oct. 7th, 43.25@43.50; Oct. 8th, 43.50@43.75; Oct. 9th, 42.75@43.25; Oct. 11th, 42.75@43.00; Oct. 13th, 41@41.25.

Arrivals of tin in long tons: Oct. 5th, Penang, 125; 8th, Hongkong, 5.

Silver

The cessation of the sale of Reverse Council Bills in India previously reported has had a weakening effect on Indian exchange, which in turn has had an influence in the lower price of silver. Exchange rates on China have also continued to fall, so that support from China banks at higher prices has been lacking, although buying from that quarter continued moderately.

The result has been a continued fall in the price of silver to 53⅜d. in London on Oct. 11 and on the same day in New York to 83c., which is the lowest figure since June 16. At these low rates, however, it is reported that speculative buying has developed in London, with a resultant sharp advance to 54¼d. and 56¼d. on the 12th and 13th respectively. The New York market has also risen in sympathy.

Mexican Dollars—Oct. 7th, 66½; 8th, 66⅜; 9th, 65¼; 11th, 63¼; 13th, 66⅜.

Gold

Gold in London on Oct. 7th, 117s. 3d.; Oct. 8th, 117s.; Oct. 11th, 117s. 3d.; Oct. 12th, 117s. 6d.; Oct. 13th, 117s. 6d.

Foreign Exchange

The European exchange market has generally been steady, but slightly downward for the week, with no pronounced fluctuations. On Monday, Oct. 11th, francs were 6.58c.; lire, 4.01c.; marks, 1.52c.; New York funds in Montreal, 8.4 per cent premium.

Other Metals

Aluminum—For 50-ton lots: ingot, 99 per cent and purer, 35c.; 98@99 per cent, 34.8c. Virgin metal still obtainable in open market at about 32.5c. for 98@99 grade.

Antimony—Spot metal, 7c. per lb. Cookson's "C" grade, 12½@13c. Chinese and Japanese brands, 7⅛@7¼c. W. C. C. brand, 8½@9c. Chinese needle antimony, lump, firm at 7@7½c. per lb. Standard powdered needle antimony (200 mesh), 9½c. per lb. Market dull.

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

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

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

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

Iridium—Nominal, $400@$450 per oz.

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

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

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

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

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

Palladium—$100 per oz.

Platinum—Firm at $105 per oz.

Quicksilver—Market quiet; $72 per 75-lb. flask. San Francisco wires $72.50 @$75. Market weak.

Ruthenium—$200@$220 per troy oz.

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

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

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

Metallic Ores

Bauxite—About 52 per cent alumina content, less than 2 per cent iron oxide, up to 20 per cent silica and artificially dried to contain not more than 4 per cent free moisture, $10 per gross ton at mine; 54 per cent alumina and about 15 per cent silica, $11; averaging 57 per cent alumina, 8 to 12 per cent silica, less than 3 per cent iron oxide, $13 on basis of 8 per cent free moisture.

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

Manganese Ore—60@70c. per unit, seaport; [1]chemical ore (MnO_2) $70@$90 per gross ton, lump; $80@$100 per net ton, powdered.

Molybdenum Ore—85 per cent MoS_2, 70@75c. per lb. of contained sulphide, New York.

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

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

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

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

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

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

[1]Zirkite—According to conditions, $70 @$90 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 9—Zinc blende, per ton, high, $46.50; basis 60 per cent zinc, premium $41; Prime Western, $40@ $37.50; fines and slimes, $37.50@$35; calamine, basis 40 per cent zinc, $32@ $30. Average settling prices: Blende, $44.86; calamine, $36; all zinc ores, $44.49.

Lead, high, $97.90; basis 80 per cent lead, $75. Average settling prices, all grades of lead, $93.53 per ton.

Shipments for the week: Blende 10,120; calamine 343; lead 2,205 tons. Value, all ores for the week, $672,760.

The labor situation at the Arkansas smelters is unchanged, with negotiations still pending. Fire at Henryetta consumed the Victor Metal company's roaster, putting that company out of smelting for three weeks. Production at the mines continues strong, with buying declined to around 9,000 tons per week. Several buyers offered only $37.50 basis this week and over 500 tons were purchased on that basis. Aside from 500 tons purchased Monday, reported as last week's purchase on $42.50 basis, the bulk of blende sold on $40 basis.

No further decline was made in offerings on lead ore.

Platteville, Wis., Oct. 9—Blende, basis 60 per cent zinc, $45 base for high grade; lead ore, basis 80 per cent lead, $75 per ton. Shipments for the week: Blende, 1,099; lead, 4,398; sulphur ore, 43 tons. Shipments for the year: Blende, 53,701; calamine, 2,459; lead, 4,398; sulphur ore, 1,284 tons. Shipped during the week to separating plants, 2,052 tons blende.

Non-Metallic Minerals

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

Barytes—Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $24@$30 in bags, carload lots; (off-color) $22@$26 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $12 per gross ton; ground (white) $23@$25; ground (off color) $16@$19 per net ton, f.o.b. Cartersville, Ga. 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, not less than 98 per cent, $11@ $11.25 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—Domestic, extra light, 5@6c. per lb.; light, 4½@5½c.; heavy, 4@5c; English, extra light, 5@7c.; light, 5@ 6c.; dense, 4½@5c. per lb., all f.o.b. New York.

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

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

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

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

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

Graphite—The 90 per cent crucible grade is held in Alabama for 9c. per lb. and 85 per cent grade is practically unobtainable, prices being 7@9c. The higher lubricating grades sell for 11@40c., according to carbon content. In Ceylon, some of the largest producers have closed their mines until prices advance to meet increased production costs, and stocks at Colombo were lowered only 3,000 tons in the first five months of 1920. Surplus stocks on Jan. 1 amounted to 20,000 tons.

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

Gypsum—Plaster of Paris in carload lots sells for $4.25 per 250-lb. bbl., alongside dock, New York.

Kaolin—See China Clay.

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

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

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

Mica—India block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20@$1.40; No. 4, $2@$3; No. 3, $4.25@$5; No. 2, $5.50@$7; No. 1, $8. Clear block: No. 6, 55c.; No. 5, $2; No. 4, $3.50; No. 3, $5, No. 2, $6.50; No. 1, $8; A1, $10; extra large, $25, all f.o.b. New York; ground, $150 per ton, Philadelphia. Domestic, uncut, f.o.b. Franklin, N. C., as follows: Scrap, $45@$50 per ton; punch, 10c. per lb.; circle, 15@25c.; 1½ x 2 in., 75c.; 2 x 2 in., $1.15; 2 x 3 in., $1.65; 3 x 3 in., $2.10; 3 x 4 in., $2.50; 3 x 5 in., $2.75; 3 x 6 in., $3.75; ground 165 mesh, $240 per ton; ground roofing mica, $60; mica washers, 75c.@$2 per lb.; 1¼-in. disks, No. 1, $1.60 per lb.; No. 2, $1.30.

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

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

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

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

Quartz—(Acid tower) fist to head, $10; 1¼ to 2 in., $14; rice, $17, all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines. F.o.b. Wausau, Wis., the price is $16 per ton in car lots, and $22 in less quantities, including bags.

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

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

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

Mineral Products

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

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

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

Ferro Alloys

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

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

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

Ferromanganese—For 76 to 80 per cent, prompt delivery, $170@$180, freight allowed; last half, $170; English, $170, c.i.f. Atlantic seaports. Spiegeleisen, 18@22 per cent, $82.50@$85, f.o.b. furnace.

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

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

Ferrotungsten—70 to 80 per cent W, 90c.@$1.05 per lb. of contained tungsten, f.o.b. works.

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

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

Ferrovanadium[1]—Basis 30 to 40 per cent, $6.50@$8.50 per lb. of V contained, f.o.b. works.

Metal Products

Copper Sheets — Current New York price, 29½c. per lb.; wire, 22¼@23c.

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

Nickel Silver—Unchanged at 39½c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 26¾c.; sheathing, 25¾c.; rods, ⅜ to 3 in., 23¾c.

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

Refractories

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

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

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

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

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

Iron Trade Review

Pittsburgh, Oct. 12, 1920

Production of steel ingots in September was at the same rate as obtained in August, about 42,700,000 tons per annum. Physical conditions affecting steel production had improved and the failure of production to increase confirms recent reports of some mills slackening their operation on account of cancellations of orders and suspensions of deliveries. The individual mill prefers to do this rather than cut prices in a search for additional business, since the cutting of prices tends to jeopardize the contract business on books.

Pig Iron—Quotable prices on pig iron decline only as purchases are made, fixing new levels, and purchases are rare. Following the decline shown in Valley foundry by a small sale, from $50 to $47, Valley, a sale of 3,000 tons of Valley basic is reported, at $45, furnace, setting the market quotation at this figure against $48.50 formerly quoted. Bessemer remains nominally quotable at $48.50, Valley. Freight to Pittsburgh is $1.96.

Steel—Steel mills call the market $60 for billets and $65 for sheet bars, but these figures have not been tested lately, and a firm bid at $5 less might result in a sale.

Charcoal and Coke

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

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

Market for Phosphate Rock

Production Confined to the South, in Florida And Tennessee — Export Trade Particularly Heavy

PHOSPHATE ROCK, used principally by the fertilizer trade, is mined in Florida, Tennessee, and to a limited extent in Idaho and South Carolina. In Florida, which is the chief center of production, there are two kinds of rock—Florida land pebbles and hard rock. The pebbles vary in size from grains up to "fists," are found in a matrix of sand or clay, and are recovered by placer mining. After being washed down, they are picked up by pumps and sent direct to a washer, which removes all extraneous matter except 6 or 7 per cent—insolubles. The pebbles amount to about 20 per cent of the material mined, and are 68 to 79 per cent tricalcium phosphate. They are found chiefly in Polk County, about forty-five miles west of Tampa. The mines produce from 150 to 3,000 tons each per day.

The hard rock is found about 100 miles north of the pebble fields, in Florida, and is mined by dipper dredges. Production at the various properties averages fifty tons per day. The rock is of higher grade than the pebbles, running from 77 to 89 per cent tricalcium phosphate.

Production of Tennessee

Tennessee produces two kinds of rock—brown Tennessee lump, which looks like brown sandstone but is softer, disintegrating easily, and blue rock, which is hard and dense and of a slate blue. The blue rock occurs in veins two to three ft. thick, and shows 70 to 72 per cent tricalcium phosphate, against 72 to 78 for the brown lump. Both grades are recovered by steam shovel or by pick and shovel. Present demand and high prices make this work profitable, but in normal times the cost is too great to encourage production.

Deposits of phosphate rock have been found in Idaho and neighboring states, but have not been developed importantly as yet. The tonnage from South Carolina also is negligible.

Algiers and Tunis produce a pebble running about 56 per cent tricalcium phosphate. There are deposits also in France and Belgium which supply the home consumption.

Fertilizer Makers Principal Buyers

Perhaps 95 per cent of the demand for phosphate rock is from fertilizer manufacturers, the rest going to the chemical trade, baking-powder manufacturers, and for minor uses generally. The demand from the fertilizer makers extends from October until February, when the manufacturing and shipping season opens.

The principal nations importing from the United States are the United Kingdom, the Scandinavian countries, Holland and Spain. Previous to the war Germany was the leading foreign buyer, but that country has not entered the market since. The foreign demand is particularly heavy at the present time.

The market is very strong. The Tennessee product is sold up months ahead, and much the same situation exists in Florida. The recent car shortage was acute in Florida, seriously interfering with shipments, which, however, are now going forward.

Producers Market Own Product

Most of the business in phosphate rock is carried on directly between the producers and the fertilizer manufacturers. Of course, some tonnage is handled through brokers in fertilizer materials, but for the most part producers market their own product. A thousand tons is considered a small sale, the usual contract being for 2,000 tons and up, on ninety days to a year. A fertilizer plant producing 12,000 to 15,000 tons of acid phosphate per season is rated small. Acid phosphate, sometimes called superphosphate, is made of about equal parts of 50-deg. sulphuric acid and phosphate rock.

Discoverers of new phosphate rock deposits in Tennessee might be able to mine and market the rock themselves under the present favorable conditions. In Florida, however, the situation is different. There a power plant costing $2,000,000 or more is required for commercial operation, with electric-driven mining outfit, dredging pumps, and motors for the mills. The discoverer of a new deposit in Florida would ordinarily try to interest one of the ten or twelve large operators by making test borings and submitting samples for analysis.

Phosphate Production in the Society Islands

Phosphate is the only mineral produced in or exported from the Society Islands, according to Consul Howard F. Withey, in *Commerce Reports*. It is produced and exported by one company, the Compagnie Francaise des Phosphates, a French corporation with head offices in Paris, and with a capital stock formerly of 6,000,000 fr., all French owned, except for a relatively small amount held in Tahiti. The capital stock is now 11,000,000 fr. This concern, organized in 1908, has the exclusive mineral rights of the Island of Makatea, which is about 120 miles north of Tahiti and has an area of roughly 1,200 acres. Two piers about 300 meters long, a part of which length however is on shore, have been constructed. Mooring buoys and lighters are used by the loading vessels.

The phosphate, as exported, is virtually the soil itself, which is dug with pick and shovel and loaded on cars on a short narrow gauge railway and drawn to the works, where it is put through crushing and drying processes. It is sold on a moisture percentage basis. After going through the drying process the product is stored in bins awaiting shipment. Most of the machinery used is of French manufacture.

At the present time nearly all the phosphate is exported to New Zealand. Before the war much of it went to San Francisco, some to Europe, particularly France, and a considerable quantity to Honolulu. It is expected that in the future the product will recover the markets of the prewar period.

The phosphate soil shipped runs about 80 per cent phosphate, according to the statement of the manager of the company. Before the war the annual production was from 80,000 to 90,000 metric tons. In 1919 the production was approximately 40,000 metric tons, and it is reasonable to expect that the production will rapidly increase.

The great difficulty encountered in this enterprise, as in all enterprises in this colony, is the difficulty of procuring suitable labor. At present the company employs about 500 workmen and employees, many of whom are Japanese. The French government recently enacted a decree providing for the importation of foreign labor and fixing the conditions of such importation. It remains to be seen whether it will prove profitable to import such labor under the conditions prescribed, but the probabilities are that it will, at least for the phosphate company.

Latest Rand Gold Production

During August, the gold production of the Rand, in South Africa, amounted to 702,083 oz., a decrease in output from the July figure, 736,099 oz. A table summarizing production since 1917 follows:

RAND GOLD OUTPUT 1917-1920

(Fine Ounces)

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

COMPANY REPORTS

American Smelting & Refining Co's. Earnings Increase

The report of the American Smelting & Refining Co. for the six months ending June 30, 1920, shows a decided improvement over a similar period in 1919. The net income for the six months, after deducting depreciation, ore depletion and bond interest, aggregated $4,030,840.88. Preferred-stock dividends aggregating $2,115,417 were declared. Dividends upon the common stock, on the basis of 1 per cent quarterly, have been declared, aggregating $1,219,960.

The six months in question show a profit, over and above dividends and bond interest, of $695,463.88, as against a deficit for the corresponding period of last year of $1,195,463.84, or a net betterment of $1,890,927.72. The earnings for the last six months of last year, over and above the same dividends and bond interest, amounted to $109,806.16. The earnings of the first six months of this year, therefore, were better than the last six months of last year to the extent of $585,657.72. The increased earnings have been due to the better conditions of the Mexican operations, the increased volume of business in the United States, and to increased treatment charges on many ores, more nearly comparable with our present costs. There are still some old, long-time contracts which are unsatisfactory.

The usual charge has been made to the profit-and-loss account for depreciation and depletion of ore reserves, and provision has been made for the estimated Federal income taxes for the period.

Mexico is now experiencing the general increases in wages and other costs which have been so prevalent in the United States during the last few years. The company is, however, glad to note that the prospects of a stable government in that country look brighter at present than at any period since the revolution of 1912. It is believed that at last a steady operation of Mexican properties is reasonably certain. Incidentally, it may be remarked that the military activities attending the end of the Carranza government commandeered most of the railroad equipment owned by the company, with consequent disruption of service and loss of earnings for a considerable period. The equipment has now been restored, and railroad conditions are as good as can be expected.

A statement summarizing operations follows:

SUMMARY OF CONSOLIDATED INCOME AND PROFIT AND LOSS, AMERICAN SMELTING & REFINING CO.

	Six Months Ended June 30, 1920	Six Months Ended June 30, 1919	Comparison	
Net earnings of smelting and refining plants and industries immediately dependent thereon	$6,678,412.10	$5,285,698.03	Inc.	$1,392,714.07
Net earnings from mining properties	2,070,773.12	428,080.65	Inc.	1,642,692.47
Total net earnings of operating properties	$8,749,185.22	$5,713,778.68	Inc.	$3,035,406.54
Other income—net:				
Interest, rents, dividends received, commissions, etc	941,902.11	307,904.85	Inc.	633,997.26
Gross income	$9,691,087.33	$6,021,683.53	Inc.	$3,669,403.80
Charges against gross income:				
Administrative expenses	665,347.17	481,995.46	Inc.	183,351.71
Research and examination expenses	49,681.41	40,695.40	Inc.	8,986.01
Corporate taxes (including estimated Federal taxes)	502,771.47	412,354.99	Inc.	90,416.48
Interest on American Smelting & Refining Co. 5 per cent first mortgage bonds, outstanding with public	795,187.47	796,792.50	Dec.	1,605.03
Interest on Rosita Coal & Coke Co. 6 per cent collateral trust bonds, outstanding with public	39,070.00	.....	Inc.	39,070.00
Depreciation and depletion of ore reserves	2,788,653.07	2,140,685.52	Inc.	647,967.55
Miscellaneous profit-and-loss adjustment	819,535.86	.....	Inc.	819,535.86
Total charges	$5,660,246.45	$3,872,523.87	Inc.	$1,787,722.58
Net income for six months	$4,030,840.88	2,149,159.66	Inc.	1,881,681.22
Less dividends:				
On preferred stocks:				
American Smelting & Refining Co	1,750,000.00	1,750,000.00		.....
American Smelters Securities Co., Preferred "A"	287,982.00	292,146.00	Dec.	4,164.00
American Smelters Securities Co., Preferred "B"	77,435.00	82,517.50	Dec.	5,082.50
Total preferred stocks	$2,115,417.00	$2,124,663.50	Dec.	$9,246.50
On American Smelting & Refining Co., common stock	1,219,960.00	1,219,960.00		.....
Total dividends	$3,335,377.00	$3,344,623.50	Dec.	$9,246.50
Income transferred to profit-and-loss surplus	695,463.88	1,195,453.84(a)	Inc.	1,890,927.72
Profit-and-loss surplus at beginning of year	25,974,571.20	27,060,228.88	Dec.	1,085,657.68
Total	$26,670,035.08	$25,864,765.04	Inc.	$805,270.04

(a) Deficit.

Tonopah Belmont Development Co.

Gold, Silver; Nevada

The Tonopah Belmont Development Co. has issued the following statement covering operations for the quarter ending June 30, 1920:

OPERATING RESULTS

Received and receivable for ore	$384,594.12
Mining, milling and administration expenses	302,967.12
Net earnings for three months	$81,627.00
Miscellaneous income	7,433.32
Total net income for three months ended June 30, 1920	$89,060.32

AVAILABLE RESOURCES, JUNE 30, 1920

Due from smelters	$198,791.46
Due from others	13,324.83
Liberty bonds	22,250.00
Loans on collateral	50,000.00
Cash in banks	48,478.17
Total	$332,844.46

The net earnings for the quarter ended June 30, 1920, of the Belmont Surf Inlet Mines, Ltd., of which stock this company owns 80 per cent, were $77,535.28.

Output of Mexican Mines

Statistics showing the production of metals in Mexico from 1916 to September, 1919, have been published in "Inciativa de la Ley de Ingresos" for the fiscal year 1920. The following table, taken from the publication mentioned, gives the production of 1916, 1917, 1918, and 1919 (January to September), quantities being stated in kilos of 2.204 lb. each:

Metals	1916 Kilos.	1917 Kilos.	1918 Kilos.	1919 Kilos.
Gold	11,748	23,543	25,313	22,944
Silver	926,142	1,306,988	1,944,542	1,949,673
Copper	28,411,248	50,985,923	70,223,454	50,893,612
Lead	19,970,986	64,124,752	98,837,154	67,378,353
Zinc	37,449,226	14,757,333	20,698,995	8,665,413
Antimony	828,767	2,646,544	3,268,546	627,704
Tin	292	9,214	13,537	2,117
Tungsten	12,250	187,637	140,486	29,292
Molybdenum	.....	.....	27,371	2,356
Manganese	.....	73,387	2,878,383	2,849,979
Mercury	.....	33,132	163,598	113,865
Arsenic	.....	1,284,820	1,881,011	2,188,333
Amorphous graphite	470,343	420,046	6,190,819	5,011,619

MINING STOCKS

Week Ended October 9, 1920

Stock	Exch.	High	Low	Last	Last Div.	
COPPER						
Adventure	Boston	*65	*65	*65		
Ahmeek	Boston	56	55	56	Sept. '20, Q	.50
Alaska-B.C.	N. Y. Curb.	⅜	⅜	⅜		
Alloues	Boston	24	23½	23½	Mar. '19,	1.00
Anaconda	N. Y.	53½	51½	51½	Aug. '20, Q	1.00
Ariz. Com'l	Boston	9	9	9	Oct. '18,	.50
Big Ledge	N. Y. Curb.	1/16	⅛	1/16		
Bingham Mines	Boston	9¼	9	9¼	Sept. '19, Q	.25
Calumet & Ariz.	Boston	56½	55½	56	Sept. '20, Q	1.00
Calumet & Hecla	Boston	285	275	275	June '20, Q	5.00
Canada Copper	N. Y. Curb.	....	....	⅛		
Centennial	Boston	....	....	9½	Dec. '18, SA	1.00
Cerro de Pasco	N. Y.	42	39	39½	Sept. '20, Q	1.00
Chief Consol.	Boston Curb	3¼	3¼	3¼	Feb. '20, Q	.10
Chile Copper	N. Y.	14¼	13¾	14		
Chino	N. Y.	27½	26½	26½	Sept. '20, Q	.37½
Colu mbus Rexall	Salt Lake	....	....	*37½		
Con. Ariz.	N. Y. Curb.	....	....	¼	Dec. '18, Q	.05
Con. Copper M.	N. Y. Curb.	*65	*61	*61		
Copper Range	Boston	35	33	34½	Sept. '20, Q	.50
Crystal Copper	Boston Curb	*38	*33	*34		
Davis-Daly	Boston	7⅛	7⅛	7⅛	Mar. '20, Q	.25
East Butte	Boston	10½	10	10	Dec. '19, A	.50
First Nat'l	Boston Curb	*85	*80	*80	Feb. '19, SA	.15
Frankl'n	Boston	2 1/16	2	2 1/16		
Gadsden Copper	N. Y. Curb.	....	....	*70		
Granby Consol.	N. Y.	34⅞	34⅞	34⅞	May '19, Q	1.25
Greene Cananea	N. Y.	28¼	27⅛	27⅛	Aug. '20, Q	.50
Hancock	Boston	4	4	4		
Houghton	Boston Curb	....	....	*40		
Howe Sound	N. Y. Curb.	3⅛	3⅛	3⅛	July '20, Q	.05
Inspiration Con.	N. Y.	46⅝	44⅛	44⅛	July '20, Q	1.00
Iron Cap	Boston Curb	8⅛	8	8⅛	Sept. '20, K	.25
Isle Royale	Boston	26	25⅛	26	Sept. '19, SA	.50
Kennecott	N. Y.	25	23¼	23½	Sept. '20, Q	.50
Keweenaw	Boston	....	....	1⅜		
Lake Copper	Boston	3	2⅜	3		
La Salle	Boston	....	....	2½		
Magma Chief	N. Y. Curb.	....	....	*21		
Magma Copper	N. Y. Curb.	....	....	17	Jan. '19, Q	.50
Majestic	Boston Curb	*12	*12	*12		
Mason Valley	Boston	1⅛	1⅛	1⅛		
Mass. Con.	Boston	2⅜	2⅜	2⅜	Nov. '17, Q	1.00
Mayflower-O.C.	Boston	5⅜	5⅛	5⅜		
Miami	N. Y.	19⅝	19¼	19¼	Aug. '20, Q	.50
Michigan	Boston	3⅜	3⅛	3⅛		
Mohawk	Boston	58	56	56	Aug. '20, Q	1.50
Mother Lode (new)	N. Y. Curb.	5⅛	5⅛	5⅛		
Nevada Con	N. Y.	11⅞	11⅛	11⅛	Sept. '20, Q	.25
New Arcadian	Boston	....	....	2½		
New Baltic	Boston Curb	....	....	3		
New Cornelia	Boston	18⅜	18	18⅛	Aug. '20,	.25
Nixon Nev.	N. Y. Curb.	....	....	*9		
North Butte	Boston	15⅜	14½	14½	Oct. '18, Q	.25
North Lake	Boston	....	....	¼		
Ohio Copper	N. Y. Curb.	....	....	1/16		
Oilbway	Boston	....	....	1½		
Old Dominion	Boston	23½	23	23	Dec. '18, Q	1.00
Osceola	Boston	36½	35	35	June '20, Q	.50
Phelps Dodge	Open Mar.	†190	†170	...	July '20, Q	2.50
Quincy	Boston	45	44½	45	Sept. '20, Q	1.00
Ray Con	N. Y.	15⅛	14⅜	14⅜	June '20, Q	.25
Ray Hercules	Boston Curb	....	....	*50		
St. Mary's M. L.	Boston	37	35	35	June '20, K	2.00
Seneca	Boston	16	15	15		
Shannon	Boston	1⅛	1 1/16	1⅛	Nov. '17, Q	.25
Shattuck Ariz.	N. Y.	8⅜	8⅛	8⅛	Jan. '20 Q	.25
South Lake	Boston	2	2	2		
South Utah	Boston	*16	*10	*10		
Superior	Boston	....	....	4½	Apr. '17,	1.00
Superior & Boston	Boston	3⅛	3	3		
Tenn. C. & C.	N. Y.	9⅞	9⅛	9⅛	May '18, I	1.00
Tuolumne	Boston	*51	*50	*50	May '13,	.10
United Verde Ex.	Boston Curb	31	30½	30½	Aug. '20, Q	.50
Utah Con.	Boston	6⅜	6¼	6¼	Sept. '18,	.25
Utah Copper	N. Y.	63½	59½	59⅝	Sept. '20, Q	1.50
Utah M. & T.	Boston	1⅛	1⅛	1⅛	Dec. '17,	.30
Victoria	Boston	....	....	1⅞		
Winona	Boston	*50	*35	*50		
Wolverine	Boston	13⅛	13	13	Jan. '20, Q	.50
LEAD						
Hecla	N. Y. Curb.	4 1/16	4 1/16	4 1/16	Sept '20, QX	.15
St. Joseph Lead	N. Y.	14⅛	14	14	Sept '20, QX	.50
Stewart	Boston Curb	....	....	*13	Dec. '15,	.05
Utah Apex	Boston	2⅛	2	2⅛	Nov. '18,	.25
ZINC						
Am. Z. L. & S.	N. Y.	12	11⅛	11⅛	May '17,	1.00
Am. Z. L. & S. pf.	N. Y.	46	45	45	Aug. '20, Q	1.50
Butte C. & Z.	N. Y.	7⅛	6⅞	6⅞	June 18, I	.50
Butte & Superior	N. Y.	19⅛	16⅝	17	Sept. '17,	1.25
Con. Interst. Cal.	N. Y.	10⅛	9⅛	9⅛	June '20, Q	.50
New Jersey Z.	N. Y. Curb.	178	175	176	Aug. '20, Q	4.00
Success	N. Y. Curb.	5	4	4⅛	July '16,	.03
Yellow Pine	Los Angeles	....	....	*95	June '20, Q	.03

Stock	Exch.	High	Low	Last	Last Div.	
GOLD						
Alaska Gold	N. Y.	1⅛	1⅛	1⅛		
Alaska Juneau	N. Y.	2⅛	1⅞	2		
Carson Hill	N. Y. Curb.	23⅛	23⅛	23⅛		
Cresson Consol. G.	N. Y. Curb.	1	⅞	1	June '20, Q	.10
Dome Ex.	Toronto	*40	*39½	*40		
Dome Mines	N. Y.	11⅛	11⅛	11⅛	July '20, Q	.25
Golden Cycle	Colo. Sprgs.	‡	....	*73	Sept. '20, Q	.02
Goldfield Con.	N. Y. Curb.	*9	*7	*8	Dec. '19,	.05
Hedley	Boston	....	....	4½	June '19,	.10
Hollinger Con.	Toronto	5.75	5.65	5.70	Sept. '20, X	.05
Homestake	N. Y.	47	46	47	Sept. '19,	.50
Kirkland Lake	Toronto	*49	*49	*49		
Lake Shore	Toronto	1.10	1.10	1.10	Oct. '19,	.02½
McIntyre-Porcupine	Toronto	2.06	2.02	2.04	Sept. '20, K	.05
Porcupine Crown	Toronto	*29	*29	*29	July '17,	.03
Portland	Colo. Sprgs.	‡	....	*60	July '20, Q	.01½
Reorgan. Booth	N. Y. Curb.	5⅛	4⅛	5	May '19,	.05
Silver Pick	N. Y. Curb.	*6	*4	*4½		
Teck Hughes	Toronto	*8⅛	*8	*8⅛		
Tom Reed	Los Angeles	1.30	1.00	1.20	Dec. '19,	.02
United Eastern	N. Y. Curb.	3⅛	2⅛	2⅛	Apr. '20, Q	.21
Vindicator Consol.	Colo. Sprgs.	‡	....	*18	Jan. '20, Q	.01
West Dome Consol.	Toronto	*6⅜	*6⅛	*6⅜		
White Caps Min.	N. Y. Curb.	*8	*7	*7½		
Yukon Gold	Boston Curb	....	....	1⅛	June '18,	.02½
SILVER						
Arizona Silver	Boston Curb	*35	*18	*21	Apr. '20, M	.03
Beaver Con.	Toronto	*40	*38	*38½	May '20, K	.03
Coniagas	Toronto	....	†2.50	2.55	Aug. '20, Q	.12½
Crown Reserve	Toronto	*29	*27	*27	Jan. '17,	.05
Kerr Lake	Boston	3⅜	3⅜	3⅜	Sept. '19,	1.00
La Rose	Toronto	*32	*32	*32	Apr. '18,	.02
McKinley-Dar.	Toronto	*51	*51	*51	July '20, Q	.03
Mining Corp.	Toronto	1.65	1.63	1.64	Sept. '20, Q	.12½
Nipissing	N. Y. Curb.	9	8½	9	July '20, Q	.25
Ontario Silver	N. Y.	5⅛	5⅛	5⅛	Jan. '19, Q	.50
Ophir Silver	N. Y. Curb.	⅛	⅛	⅛	Jan. '12,	.10
Peterson Lake	Toronto	*14½	*14½	*14½	Jan. '17,	.01½
Temiskaming	Toronto	....	....	*35½	Jan. '20, K	.04
Trethewey	Toronto	*26½	*24½	*25	Jan. '19,	.05
GOLD AND SILVER						
Atlanta	N. Y. Curb.	*2	*1	*1⅛		
Barnes-King	Butte	‡	....	1.11	Aug. '20, Q	.05
Bost. & Mont.	Boston	....	....	*63		
Cashboy	N. Y. Curb.	*8⅛	*7⅛	*8		
El Salvador	N. Y. Curb.	1	⅞	1		
Jim Butler	N. Y. Curb.	*16	*14	*16	Aug. '18, SA	.07
Jumbo Extension	N. Y. Curb.	*9	*6	*6	June '16,	.05
Louisiana Con.	N. Y. Curb.	1/16	1/16	1/16		
MacNamara M.	N. Y. Curb.	....	....	⅛	May '10,	.02½
N.Y. Hond. Rosar	Open Mar.	†12½	†11	....	July '20, QX	.50
Tonopah-Belmont	N. Y. Curb.	1⅛	1 1/16	1⅛	Jan. '20, Q	.05
Tonopah-Divide	N. Y. Curb.	1 1/16	1 1/16	1 1/16		
Tonopah Ex.	N. Y. Curb.	1⅛	1⅛	1 1/16	July '20, Q	.05
Tonopah Mining	N. Y. Curb.	1⅛	1⅛	1 1/16	Oct. '19, SA	.15
West End Con.	N. Y. Curb.	1 1/16	1 1/16	1⅛	Dec. '19 SA	.05
SILVER-LEAD						
Caledonia	N. Y. Curb.	*18	*16	*16	July, '20, M	.01
Consol. M. & S.	Montreal	25	24½	24½	July '20, Q	.62½
Daly Mining	Salt Lake	2.50	2.45	2.50	July '20, Q	.10
Daly-West	Boston	4½	4½	4½	Sept. '20, Q	.25
Eagle & Blue Bell	Boston Curb	....	....	2 1/16	Apr. '20, Q	.10
Electric Point	Spokane	*10	*12	*12	May '20, SA	.03
Fed. M. & S.	N. Y.	....	....	12	Jan. '09,	1.50
Fed. M. & S. pf.	N. Y.	33½	32	32	Sept. '20, Q	1.75
Florence Silver	Spokane	....	....	*25	Apr. '19,	.01½
Grand Central	Salt Lake	....	....	*37½	June '20, K	03
Iron Blossom	N. Y. Curb.	1/16	¼	1/16	Apr. '20, Q	.02½
Judge M. & S.	Salt Lake	....	....	3.97½	Sept. '20, Q	.12½
Marsh Mines	N. Y. Curb.	*17	*14	*15		
Prince Consol.	N. Y. Curb.	⅜	1/16	⅜	Nov. '17,	.02½
Rambler-Cariboo	Spokane	....	....	*9	Feb. '19,	.01
Rex Con.	N. Y. Curb.	*6	*6	*6		
South Hecla	Salt Lake	*90	*88	*88	Sept. '19, K	.15
Stand. S. L.	N. Y. Curb.	⅜	1/16	1/16	Oct. '17,	05
Tamarack-Custer	Spokane	2.30	2.30	2.30	Dec. '19, K	.03
Tintic Standard	Salt Lake	3.07½	3.00	3.00	June '20, Q	.10
Wilbert	N. Y. Curb.	*5	*4	*4½	Nov. '17,	.01
NICKEL-COPPER						
Internat'l Nickel	N. Y.	19⅛	17⅞	17⅞	Mar. '19,	.50
Internat'l Nick.pf.	N. Y.	83	81½	81½	Aug. '20, Q	1.50
QUICKSILVER						
New Idria	Boston	....	....	5	Jan. '19,	.25
TUNGSTEN						
Mojave Tungsten	Boston Curb	*10	*10	*10		
VANADIUM						
Vanadium Corp.	N. Y.	68⅜	68⅛	63½	July '20, Q	1.50
ASBESTOS						
Asbestos Corp.	Montreal	103	94½	102½	July '20, Q	1.50
Asbestos Corp. pf.	Montreal	104	103	104	July '20, Q	1.75
MINING, SMELTING AND REFINING						
Am. S. & R.	N. Y.	63¼	59½	60	Sept. '20, Q	1.00
Am. S. & R.pf.	N. Y.	92½	90⅜	92½	Sept. '20, Q	1.75
Am. Sm. pf.A	N. Y.	73½	73½	73½	July '20, Q	1.50
U. S. Sm. R. & M.	N. Y.	57½	55½	55½	July '20, Q	1.50
U.S.S.R.& M. pf.	Boston	44	42¼	42¾	July '20, Q	.87½

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

CURRENT PRICES OF MATERIALS AND SUPPLIES

IRON AND STEEL

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

Blue Annealed	Large Mill Lots Pittsburgh	St. Louis	Chicago	San Francisco	New York Current	New York One Yr. Ago
No. 10	$3.55–7.50	7.09	7.13	8.65	$7.23–8.00	4.57
No. 12	3.60–7.55	7.09	7.18	8.70	7.25–8.05	4.57
No. 14	3.65–7.60	7.09	7.23	8.75	7.33–8.10	4.67
No. 16	3.75–6.70	7.09	7.28	8.85	7.43–8.20	4.77
Black:						
*Nos. 18 and 20	4.15–8.30	8.10	7.90	10.60	8.41–9.80	5.30
*Nos. 22 and 24	4.20–8.35	8.10	7.95	10.65	8.46–9.85	5.35
*No 26	4.25–8.40	8.10	8.00	10.70	8.51–9.90	5.40
*No. 28	4.35–8.50	8.10	8.10	10.80	8.61–10.00	5.50
Galvanized:						
No. 10	4.70–8.50	9.60	8.60	....	8.91–11.50	6.20
No. 12	4.80–8.60	9.60	8.70	11.35	9.01–11.50	6.25
No. 14	4.80–8.60	9.60	8.70	11.35	9.01–11.60	6.30
Nos. 18 and 20	5.10–8.90	9.60	9.00	11.65	9.76–11.90	6.60
Nos. 22 and 24	5.25–9.05	9.60	9.15	11.80	9.41–12.05	6.75
*No. 26	5.40–9.20	9.60	9.30	11.95	9.56–12.20	6.90
*No. 28	5.70–9.50	9.60	9.60	12.25	9.86–12.50	7.20

* For painted corrugated sheets, add 30c. per 1000 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 Current	Pittsburgh One Year Ago	Chicago	St. Louis	San Francisco
Standard railroad spikes, ⅜ in. and larger	$4.00	$3.35	$3.40@$4.00	$5.34	$7.75
Track bolts	6.00–6.50	4.35	4.60@ 5.00	....	9.25
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 $2.55 places named:

	Mill Pittsburgh	New York Current	New York 1 Year Ago	St. Louis	Chicago
Beams, 3 to 15 in.	$2.45@$3.10	$4.58	$3.47	$4.04	$3.97
Channels, 3 to 15 in.	2.45@ 3.10	4.58	3.47	4.04	3.97
Angles, 3 to 6 in., ¼ in. thick.	2.45@ 3.10	4.58	3.47	4.04	3.97
Tees, 3 in. and larger	2.45@ 3.75	4.63	3.52	4.09	4.02
Plates	2.65@ 4.00	4.78	3.67	4.24	4.17

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

Current	One Month Ago	One Year Ago
$4.00@$5.00	$4.00@$5.00	$2.25

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL

	Mill Pittsburgh	New York Current	New York One Yr. Ago	Warehouse Chicago	Warehouse St. Louis	Warehouse San Francisco
½ in. and larger	$4.50	$6.00	$4.72	$5.73	$5.69	$7.05
CONE HEAD BOILER						
½ in. and larger	4.60	7.10	4.82	5.83	5.79	7.15
⅝ and ¾	4.75	7.25	4.97	5.98	5.94	7.40
⅞ and 1	5.00	7.00	5.32	6.33	6.19	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, 22½–2½% off on bright.
Western and California Territory:
20%, plow steel; 22½%, galv. iron rigging and guy rope.
Montana, Idaho and Arizona
15, plow steel, 27½, 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..... $2.35@$4.00 Steel bars..... $4.27@$4.50

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

New York	Cincinnati	Birmingham	St. Louis	Chicago	Denver
$0.10	$0.16½	$0.18	$0.11½	$0.15	$0.18

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham	Denver
Solid	12@14c.	13c.	15c.	14½ 21c.
Hollow	18c.	...	...	

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

BUTT WELD

Inches	Steel Black	Steel Galv.	Iron Inches	Iron Black	Iron Galv.
⅛ to 3	45 to 57½	41½ to 44	⅛	15½ to 25½	+ 1½ to 11½
			¼	19½ to 29½	1½ to 11½
			⅜ to 1½	24½ to 34½	8 to 18½

LAP WELD

2	47 to 50½	34½ to 38	2	20½ to 28½	6½ to 14½
2½ to 6	50 to 53½	37½ to 41	2½ to 6	22½ to 30½	9½ to 17½

BUTT WELD, EXTRA STRONG, PLAIN ENDS

2 to 3	53 to 56½	40½ to 44	⅛ to 1½	24½ to 34½	9½ to 19½

LAP WELD, EXTRA STRONG, PLAIN ENDS

2	45 to 48½	33½ to 37	2	21½ to 29½	8½ to 16½
2½ to 4	48 to 51½	3½ to 40	2½ to 4	23½ to 31½	11½ to 31½
4½ to 6	47 to 50½	35½ to 39	4½ to 6	22½ to 30½	10½ to 18½
7 to 8	43 to 46½	29½ to 33	7 to 8	14½ to 22½	2½ to 10½
9 to 12	38 to 41½	24½ to 28	9 to 12	9½ to 17½	5½ to+2½

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

	Black New York	Black Cleveland	Black Chicago
⅜ to 3 in. butt welded	40%	40%	40@54%
3½ to 6 in. lap welded	35%	42%	40@50%
	Galvanized New York	**Galvanized Cleveland**	**Galvanized Chicago**
⅜ to 3 in. butt welded	24%	31%	30 @ 40%
3½ to 6 in. lap welded	20%	27%	27½@37½%

Malleable fittings, Class B and C, from New York stock sell at list plus 23%. Cast iron, standard sizes, net.

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

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Hot pressed square	+$6.00	$1.50	List	$2.25	+$1.15	$1.05
Hot pressed hexagon	+ 6.00	1.50	List	2.25	+ 1.15	.85
Cold punched square	+ 6.00	1.50	List	2.25	+ 1.15	1.00
Cold punched hexagon	+ 6.00	1.50	List	2.25	+ 1.15	1.00

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

	Current	One Year Ago
New York	30%	50–10%
Chicago	50%	50%
Cleveland	50%	60–10%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	+20%	25%	20%
Larger and longer up to 1 in. by 30 in.	+20%	25%	10%

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

For wrought-iron washers:

New York..... List Cleveland..... $2.50 Chicago..... $3.00
For cast-iron washers the base price per 100 lb. is as follows:
New York..... $7.00 Cleveland..... $4.50 Chicago..... $4.75

CONSTRUCTION MATERIALS

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

	New York 1-Ply c.l.	New York 2-Ply l.c.l.	New York 3-Ply c.l.	Philadelphia 1-Ply c.l.	Philadelphia 2-Ply l.c.l.	Philadelphia 3-Ply c.l.
No. 1 grade	$2.50	$3.00	$3.55	$2.40	$2.90	$3.45
No. 2 grade	2.25	2.70	3.20	2.15	2.00	3.10

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $4.25 per roll in carload lots and $4.50 for smaller quantities.

Shingles, red and green slate finish, cost $8.75 per square in carloads; $9.00 in smaller quantities, in Philadelphia.

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

Tar felt (14 lb. per square of 100 sq.ft.), per roll	$3.55
Tar pitch (in 400-lb. bbl.), per 100 lb.	2.25
Asphalt pitch (in barrels), per ton	56.50
Asphalt felt (light), per ton	132.00
Asphalt felt (heavy), per ton	138.00

HOLLOW TILE—

	4 x 12 x 12	8 x 12 x 12	12 x 12 x 12
Minneapolis	$0.1192	$0.2086	$0.3278
Seattle	.13	.175	.30
Los Angeles	.10	.175	.....
Cincinnati	.125	.2186	.8286

LUMBER—Price per M in carload lots:

	8 x 8-In. x 20-Ft. and Under			12 x 12-in. 20 Ft. and Under	
	P.	Fir	Hemlock	Spruce	P.	Fir
Boston	$73.00	$70.00	.....	$65.00	$85.00	$75.00
Kansas City	51.00	51.25	$51.25	51.25	60.00	51.25
Seattle	.....	32.00	.....	.....	.....	32.00
New Orleans	49.00	.....	.....	.....	55.00	.....
Baltimore	70.00	.....	.....	.....	80.00	.....
Cincinnati	45.00	50.00	50.00	.....	55.00	55.00
Montreal	87.00	87.00	70.00	85.00	79.00*	110.00
Los Angeles†	.....	57.00	.....	.....	.....	59.00
Detroit	67.00	.....	.....	.....	79.00	79.00
Denver	.....	43.75	.....	.....	.....	44.75

	1-In. Rough, 10-In. x 16-Ft. and under			2-In. T. and Gr. 10 In. x 16 Ft.	
	P.	Fir	Hemlock	P.	Fir
Boston	$110.00	$102.00	$52.00	$105.00	.....
Kansas City	102.00	106.50	106.50	113.00	$112.75
Seattle	.....	37.50	.....	.....	38.50
New Orleans	.....	42.00	.....	46.50	.....
Baltimore (box)	56@60	.....	.....	64@67	.....
Cincinnati	50.00	55.00	50.00	45.00	50.00
Montreal	80.00	80.00	70.00	85.00	85.00
Los Angeles	.....	58.00	.....	.....	.....
Detroit	50.00	.....	49.00	44.00	.....
Denver	.....	39.75	.....	.....	40.25

*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:

	Mill Pittsburgh	Denver	Chicago	San Francisco
Wire	$4.25	$5.40	$4.45	$6.45
Cut	.....	5.90	6@8	8.95

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

	Current	One Month Ago	One Year Ago Without Bags
New York (delivered)	$4.10	$4.25	$2.30
Jersey City (delivered)	4.39	4.25	2.27
Chicago	2.35	2.35	2.00
Pittsburgh	2.42	2.20	2.05
Cleveland	2.73	2.73	2.32
Denver	3.25	3.80	2.67
Los Angeles	3.10	3.10	2.78
San Francisco	3.09	2.88	2.43

NOTE—Charge for bags is generally 25c. each, $1 per bbl.

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 200-lb. Barrel	
	Finished	Common	Finished	Common
New York	$21.00	$20.00	$3.80*at plant	$3.60*
Kansas City	27.20	26.20	2.50	2.40
Chicago	.....	.....	.....	1.65
St. Louis	25.00	21.00	.....	2.50
San Francisco	25.40	22.00	.....	2.25
Minneapolis	29.50	23.00	2.00†	1.85†
Denver	32.00	.....	1.05 (bu.)	.....

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:

	New York		Chicago	
	Current	Year Ago	Current	Year Ago
Raw per barrel (5 bbl. lots)	$1.25	$2.15	$1.40	$2.37
5-gal. cans	1.40	2.30	1.65	2.57

1-gal. cans $1.45

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

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

MINING AND MILLING SUPPLIES

HOSE—

	FIRE
Underwriters' 2½ in.	50-Ft. Lengths $0.85 per ft.
Common, 2½-in.	30%

AIR

	First Grade	Second Grade	Third Grade
¼-in. per ft.	$0.60	$0.40	$0.30

STEAM—DISCOUNTS FROM LIST

First grade..... 20% Second grade.... 30% Third grade..... 45%

LEATHER BELTING—Present discounts from fair quantities (½ doz. rolls):

Light Grade	Medium Grade	Heavy Grade
30%	25%	20%

RAWHIDE LACING—For cut, best grade, 25%, 2nd grade, 30%. For laces in sides, 79c. per sq.ft.; 2nd, 75c. For semi-tanned: cut, 40%; sides, 83c. per sq. ft.

MANILA ROPE—For rope smaller than ¼-in. the price is ½ to $0.02 extra while for quantities amounting to less than 600 ft. there is an extra charge of $0.01. The number of feet per pound for the various sizes is as follows: ⅜-in., 8 ft., ½ in., 6; ⅝-in., 4½; 1-in., 1½-in., 2 ft. 10 in.; 1¼-in., 2 ft. 4 in. Following is price per pound for ⅜ in. and larger, in 1200-ft. coils:

New York	.29	Kansas City	$0.30½
Cincinnati	.35	Seattle	.28
Chicago	.27½	St. Louis	.26½
Minneapolis	.29½	Denver	.30
San Francisco	.27	Los Angeles	.31

PACKING—Prices per pound:

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

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

Material	7 In. x 9 In. by 8 Ft. 6 In.	6 In. x 8 In. by 8 Ft.
Chicago—Plain	$2.00	$2.25
Chicago—Creosoted	2.25	2.50
San Francisco—Douglas fir, green	1.35	.96
San Francisco—Douglas fir, creosoted	2.50	1.92

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

Untreated A Grade White Oak 6x8x8		Untreated A Grade Red Oak 6x8x8	
No. 1	$0.80	No. 1	$0.60
No. 2	.90	No. 2	.70
No. 3	1.00	No. 3	.80
No. 4	1.25		

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

	New York	Chicago In. Bbl.	Chicago Carloads
Pure steam-distilled pine oil, sp.gr. 0.93-0.94	$2.30	$1.90	$1.85
Pure destructively distilled pine oil	1.80	1.90	1.85
Pine tar oil, sp.gr. 1.025-1.035	.48	.38	.37
Crude turpentine, sp.gr. 0.900-0.970	2.00	1.56	1.47
Hardwood creosote, sp.gr. 0.96-0.99*	.35	.12	.10½

*F.o.b. Cadillac, Mich.

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

	New York			
	Current	One Year Ago	Cleveland	Chicago
White	11.00–15.50	13.00	16.00	11.00–14.00
Colored mixed	7.00–10.50	9.00–12.00	12.00	9.50–12.00

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

	13½x13½	13½x13½
Cleveland	$55.00	$65.00
Chicago	41.00	43.53

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

	Low Freezing	Gelatin			Black
	20%	40%	60%	80%	Powder
New York	.....	$0.3325	$0.3625	.....	$2.30
Kansas City	$0.2475	.27	.30	.34	2.40
Seattle	.18	.205	.225	.29½	2.60
Chicago	.2175	.2525	.2975	.34	2.45
Minneapolis	.2272	.2629	.2935	.....	2.90
St. Louis	.25	.285	.315	.3575	2.60
Denver	.2250	.26	.29	.3325	2.80
Los Angeles	.22	.27	.31	.....	2.95
Atlanta	.2575	.2975	.3225	.3650	2.55
Cincinnati	.2275	.2525	.2725	.....	2.30
Montreal	.30	.32	.37	.38	4.10

CHEMICALS

SODIUM CYANIDE—New York price is 25@30c. per lb.; Chicago, 30c.; St. Louis, 34c.; Birmingham, 45c.; Denver, 40c.

SODIUM SULPHIDE—New York price per pound is 9c.@10c. for concentrated, Chicago, 5c. for concentrated, 3½c. for crystals. Denver price is 6c. for crystals. St. Louis, concentrated 10½c., crystals 11c. Concentrated comes in 500-lb. drums; crystals in 440-lb. bbl.

ZINC DUST—For 350 mesh the New York price is 11@12c. per lb.; Chicago 12½c.

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

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

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