

# The Engineering and Mining Journal

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## Dawson to Nome

BY H. E. CHAKO

*SYNOPSIS—Diary of a first trip down the Yukon River in Alaska. Methods of travel to and around the districts of Fairbanks, Ruby and Nome with notes on the Koyukuk, Iditarod and other less accessible points. Boat service uncertain. Roads wretched. Crying need of transportation facilities for interior Alaska. Famous U. S. Government wagon road from Ruby to Long Creek. Adventurous trip across from St. Michael.*

There is coast Alaska and interior Alaska. Coast Alaska is a great country; it is interesting and it is different, but it is accessible. You can visit it at almost any time of year and with reasonable frequency, since the boats run at close intervals. This is especially true of Juneau, which is reached so much more easily than are the most northern parts of the territory as to be really a district by itself.

This article, however, treats of interior Alaska, where

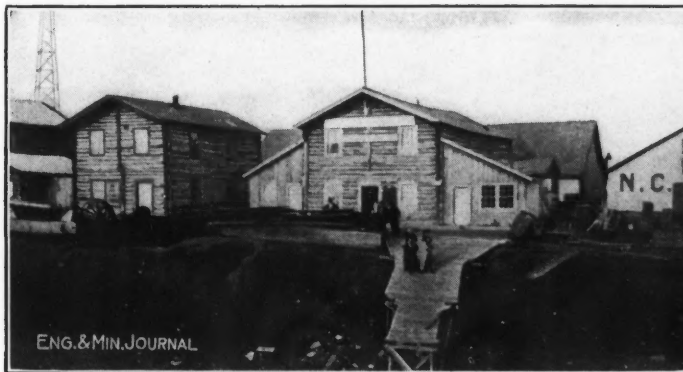
the coast, and the Nome region is distinct from the interior; but Nome and its tributary districts are just as inaccessible as the interior itself. I left the sea at Skagway and reached it again at St. Michaels. But the fun began after I left Dawson.

Perhaps if I put my notes in diary form, they will be as intelligible as in any other shape.

### ON BOAT—AUG. 12

We left Dawson Aug. 10 and are dropping down the Yukon. Below Dawson, 292 miles, we passed Circle. There is nothing in the town; it is 60 miles out over a wagon road to the mines and dredges. You can get across to Fairbanks, 180 miles away, but the trail is bad, following creeks and crossing two summits.

Beaver is about 400 miles below Dawson; I did not stop there. There is a so called government road from



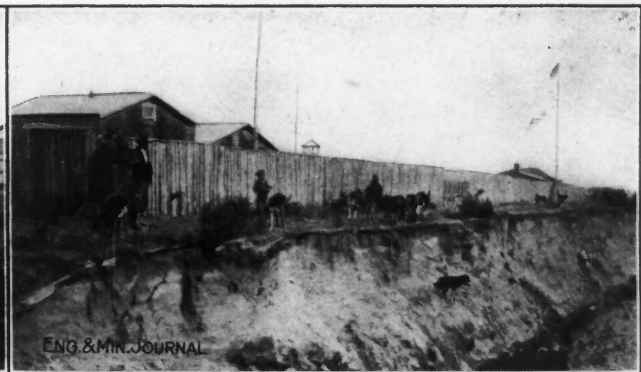
STEAMBOAT LANDING AT CIRCLE

On the bank can be seen parts of the Berry dredge, which will be hauled 70 miles overland this winter and erected.

you may once in a while get a train and often catch a boat, but where mostly you walk—and it is the worst walking that ever I saw. I may not be etymologically correct, but I am convinced that the origin of the term "mushing," lies in the fact that the surface on which you walk is more like mush than any other known substance.

My travel experiences here recorded are no different from those of thousands of other tenderfeet who have gone through Alaska. But described from the *checkako* point of view, they may be illuminating to other *checkakos* who are going to follow my trail in great numbers through this vast country still little known.

I should qualify my statement that this account pertains only to interior Alaska. Nome is, of course, on



FORT YUKON ON THE ARCTIC CIRCLE

The dogs are waiting anxiously for the steamboat to land. The boat steward always saves a sack of meat scraps for the dogs in order to see them fight.

Beaver over to the placer region of the Koyukuk, and the camps of Coldfoot and Wiseman, but it is merely slashed out through the trees and brush and it is all grown up again so as to be hardly discernible. It is rarely used and there are no roadhouses. In fact, no one lives out in that country at all.

I didn't stop at Rampart, although there are some placer mines a mile above town and a number of prospectors working around there. Rampart is 620 miles below Dawson.

### FAIRBANKS—AUG. 16

Left Dawson Monday morning, arrived here Sunday morning just after midnight. Time, six days; distance,

975 miles. We were one day late; got stuck all night on a sand bar opposite Tanana at the junction of the Yukon and Tanana Rivers. Then the boiler tubes began to leak, and it was difficult to keep up steam. The 275 miles up the Tanana River took us three days.

Fairbanks has a population of about 3000, the largest town in Alaska outside of Juneau and the most important interior town. If it does take almost a week to reach it from Dawson, at that it is the easiest town to reach of any in the interior.

Things are quiet here, and business is not over-good. The richest claims are worked out and they badly need capital, railroads, cheaper supplies, cheaper power, cheaper labor, cheaper machinery and cheaper everything else. They ought to get a good many of these things whenever the railroad comes and everyone is hoping that it won't be long delayed.

It has been raining four days steadily and is still at it. Alaska, rain and mud are inseparable in my mind. The autos cannot run to the various creeks, and therefore I am buying rubber "pacs" and will walk and wade it.

#### ON BOARD STEAMER "TANANA"—AUG. 26

Here I am dropping down the Yukon *en route* to Nome, instead of going across country to Chitina, Prince

to me to have to pay about a hundred dollars to walk over a trail like that. Therefore, I decided to come to Nome and make Prince William Sound later.

Sheldon runs a Ford between Fairbanks and Chitina and charges only about a hundred dollars for the trip. He is some auto driver. The Fairbanks people said he would come through if he had to build a raft and float his auto down the last hundred miles. There was no indication, however, that he would start back, and that was what was worrying me.

I find that in Alaska people don't make plans. The steamboats and the weather wait for no man, and so the man lives from day to day and does the best he can. The agent told me I would make an unusually good connection at St. Michael with the boats across the sea to Nome; in other words, I would have to wait only three days there, whereas usually you wait eight to 10 days. But the ticket agents for the boat line can give you little information. They don't even know two days beforehand when the boats will leave their own towns. For instance, from Dawson the boat left four days after it was scheduled to leave, while from Fairbanks they ran an extra boat to connect with the regular boat at Tanana, and this one left four days before it was scheduled. There you have it. The agent said he didn't know when the next boat to



PROSPECTORS SETTING OUT FOR THE HILLS FROM FAIRBANKS



TRAVEL DE LUXE—BUT NOT AVAILABLE IN SUMMER

William Sound and thereabouts. The reason for this is that six days of steady rain made the trail to Chitina on the Copper River & Northwestern about impassable. The Tanana River rose 15 ft. at Fairbanks, washed out the bridge and flooded part of the town. The trail follows the Tanana from Fairbanks about a hundred miles to McCarty. Along this stretch the high water washed out one bridge, one ferry and one roadhouse. The Indians were charging \$3 to take a man across each creek (white men have nothing on these Indians). Road Commissioner Zug had to leave a livery rig out along there and come in on foot. He is still paying about \$10 a day for the team. An army lineman, just in when I left, said that the road was impassable for horses and not any too passable on foot, while the corduroy portions were all floating. It is likely to take them two or three weeks to lay brush on the road and fix the bridge and ferry, and all the while it looked as if another storm was threatening. With such roads it would have taken me over two weeks to walk the 310 miles to the railroad and would have cost me \$7 a day besides for roadhouse service. It didn't look good

Nome would leave—maybe a week, maybe 10 days; there might be one more boat and there might be two, all depending on the freight for Nome; passengers can go to—other places

#### RUBY—AUG. 27

Here I am a little less than two days' time from Fairbanks. After deciding to go direct to St. Michael, I changed my mind and stopped off here. Out on Long Creek there is a good deal going on, about 15 operators working. This is about 30 miles or more beyond Ruby. The stage fare is \$25 per round trip. A horse costs \$15 a day plus \$1 for each feed. The roads are knee-deep in mud and water, so I told the liveryman I would walk just as the others were doing. Expect to start in the morning. It seems the road houses here charge \$1.50 a meal. Even the old-timers curse such a country.

#### RUBY—SEPT. 2

Well, my little Long Creek trip cost me just 92 miles of walking and five days' time. The 60-mile round trip



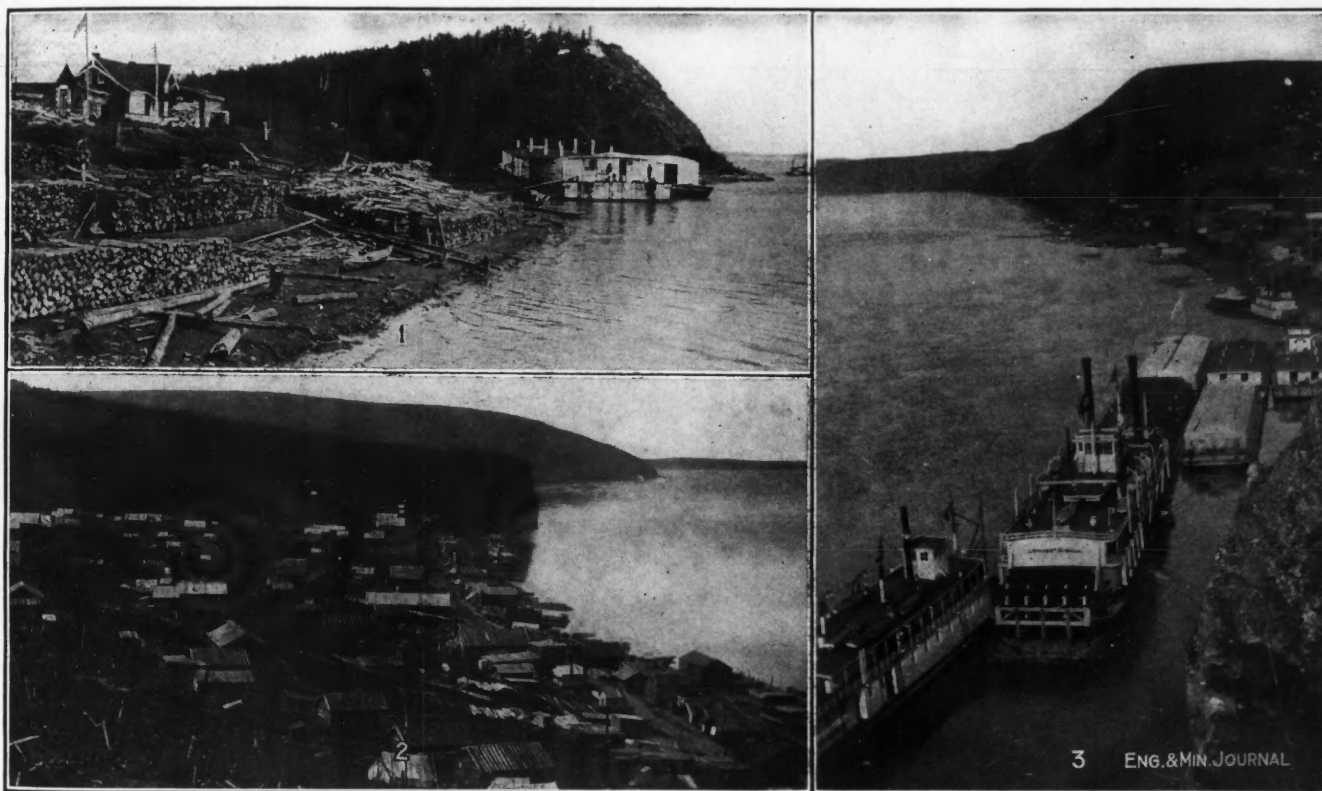
between the Creek and Ruby took three days' time, and then one day I walked 30 miles round trip in the rain to another creek 15 miles away, only to find one operator away and the other just sold out.

Did you ever see a Minnesota tamarack swamp? I suppose an Irish peat bog is very much the same. Well, that's what I've been wading in and walking over for these five days. On the map it is marked "U. S. Government Wagon Road." Lord, what a joke! It is like walking on a feather bed, or tramping back and forth in a haymow freshly piled with hay and with mud and water up over your ankles, or like a New Jersey cranberry bog when the tide has just gone out. Imagine such a feather bed or haymow or cranberry bog; then imagine trying to drive over it a loaded wagon hitched to four or six horses, although the load is light, crossing the little streams by throwing in poles and brush, sinking hub-deep in the

of the real *trails*. It reminds me of a time when I went to see a prospect in a little gully on the wooded side of a New Mexican mountain range. We had to leave the main trail at the top of the range, and as I looked dubiously over the unbroken expanse of oak-scrub and brush, I asked the prospector who was taking me in whether there was a road or trail down to his property. He scratched his head, then shook it, then said, "No, there ain't no road, and I don't know as there's exactly a trail, but down here there's a—a—a sort of a *thing*." A thing was about what this road was and a very poor thing at that.

#### RUBY—SEPT. 3

I asked some of the old-timers what a winter trail was like. They told me that in the winter the Government men go out and blaze a trail and cut out a few trees down



#### YUKON RIVER POINTS

1. Nulato, the starting point for Bettles and the Koyukuk region. 2 and 3. Ruby, distributing point for one of the most promising placer districts.

swamps and making between one and two miles an hour. Then, if this rig gets through, call the tracks it leaves a road and you have an excellent picture of the U. S. Government road from Ruby to Long Creek over the tundra. The two feet of moss over the frozen ground not only acts like a spring, but holds water like a sponge, so the going is as bad on the tops of the ridges as it is in the creek bottoms. There are, however, some delicious blueberries which grow in the swamps and make the journey a little less unbearable. About all the Government road makers could do was to cut out the trees and underbrush, leaving the tree stumps close to the ground. Teamsters drive on the road when they can and to one side when they can't. Without question, this is the worst trail I ever saw in my life and I have seen bad ones. Yet, they tell me that the wagon road is good in comparison with some

to the snow level. Then in the summer these stumps stick up 2 ft. or more, while in the creek bottoms the willows or brush, which had been weighted down with snow and passing loads, straighten up so as to hide all trace of a trail, and consequently a winter trail is impassable in summer. They invariably added, "You can drive dogs anywhere in the winter and don't need winter trails. What we want is summer roads."

It costs \$140 a ton to haul freight for 30 miles from Ruby to Long Creek over that road, and it costs \$200 a ton to haul freight from Ruby to Greenstone Creek. On top of these figures add \$42 a ton freight Seattle to Ruby, which has been raised \$12 per ton since last summer because one boat line absorbed another and obtained a monopoly. Consider these facts awhile, and your predominating sensation will be surprise and admiration

at the resources of both mines and miners which can not only pay wages but even show a profit while carrying such a load.

Lest I may be misunderstood as reflecting too much on the Government, I must add that it is now building a real road, and in four years has completed six miles. The method of construction is to place poles and brush across the roadway on top of the moss, ditch both sides and throw the underlying clay back on the poles. It makes a good road.

But the nerve of these operators! They have just clubbed together and bought a Ford machine in order to start a young man running a stage between Ruby and Long Creek over the road just described. He will not start, however, until the freeze-up comes. All true Alaskans have implicit faith in two things: First, in Alaska; second, in the Ford. There are Fords and there are automobiles, and the latter they assume not worthy of their consideration, for none but a Ford ever went out over one of these trails and got back again.

#### RUBY—SEPT. 11

Stuck here. No boats on the river for over two weeks. When I landed, the agent said he couldn't promise it, but he thought by the time I had walked out to the mines and back again that the boat which was coming up the river would be about ready to return. So I hustled off and hustled back, only to hear that the order had been changed—the boat had turned back farther down the stream. It was said that it ought to be in Sunday and would then return. As a matter of fact, it got in Monday night. Every plan they gave out they changed later. The boat agents know nothing and the captains know less.

The boat is now cleaning and washing her boilers and expects to leave for St. Michael tomorrow. We ought to reach there by the 14th. A U. S. judge and his court had to wait 10 days for a boat upstream. The sheriff and his party got tired of waiting and hired a gasoline launch to go down stream 300 miles, but had to wire Washington first to get authorization for the expense. The Government timber agents and fishing agents have their own rowboats, with Evinrude detachable motors.

The hotel people tell me that salesmen, judges and mine operators are often stuck for weeks at these towns. The hotel people don't mind in the least. Now that there is a monopoly of the river traffic, service is poor and the rates are higher. It is common talk here that poor service is given intentionally over the lower river to Nome, because the company is trying to force everybody to go up the river to Dawson and out over the White Pass & Yukon Route. The hotel people find it profitable and say that they have been lucky this year. The boat people laugh at you and say that a 10 days' wait is nothing. The interior of Alaska is a pocket, easy to get into, but hard to get out of.

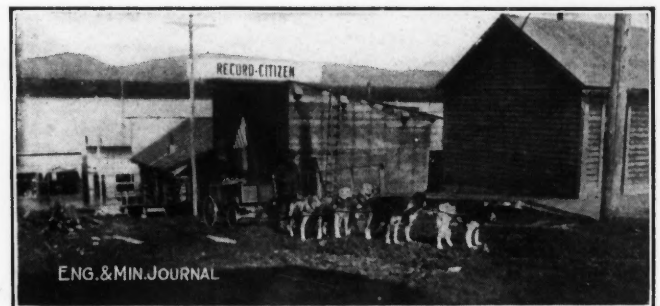
I am convinced that there is only one way to travel through here; that is, to buy in Seattle an Evinrude motor, blankets, tent, mosquito netting, cooking outfit and grub. Then at White Horse, Yukon Territory, buy a boat for \$20 to \$40 and float down. In that way you can stop when you want to and go where you want to and you are not dependent on any steamboat monopoly. The Government men and miners do this regularly, and a

woman not long ago came down to Ruby alone, 1500 miles.

#### ON BOAT—SEPT. 13

We finally got away from Ruby Friday morning. Between Tanana and St. Michael we passed Nulato and Holy Cross. The first is the junction point for the Koyukuk district, and the second the junction point for the Innok-Iditarod. The Koyukuk is an awful place to get into. The mail is supposed to go by steamer four times a summer, but up to the time of my arrival there had been only one mail since spring. The steamer gets to Bettles, or as near as possible; and from there to Wiseman, which is one of the principal points, you go in a poling boat or are pulled in a barge by horses. (Let me say that one difficulty with Alaska is that the trails are too wet and the rivers too dry.) It costs about \$60 from Nulato up to Bettles and about \$40 from Bettles back down to Nulato. This is about 540 miles. The 90 miles from Bettles to Wiseman costs about \$50 and the return trip about \$10. In winter they get up there one mail of 150 lb. per month, brought in on dog sled, 300 miles from Tanana. The carrier camps out in the snow when it is 50° below and has to carry his own grub; shoots rabbits on the trail.

At Holy Cross there is a Catholic mission and a school with a fine garden and nothing else. The hotel and freight office are on a barge or an abandoned steamboat, and the rates are \$4 per day. If you get off, you are likely to be kept there for 10 days or two weeks. There is no telegraph station, no news, nothing. From Holy



THE RUBY WATER WAGON

Seven dogs and the man work all day selling water around the town by the 5-gal. can.

Cross up to Dikeman, the head of navigation, is about 390 miles, and from there to Iditarod is about 80 miles, the distance being made in launches. The round trip is good for about three weeks first and last. In going up from Holy Cross to Dikeman, they carry a horse on the bow of the boat, so as to pull it over the sand bars.

#### STORM BOUND AT PORT SAFETY, 22 MILES EAST OF NOME—SEPT. 16

We got to St. Michael Monday morning, 738 miles in three days down the Yukon. We were told we would have to wait at St. Michael a week to get across to Nome; but in the afternoon a small sailboat with a 30-hp. gas engine in her came along, and six of us, including an army captain, engaged passage.

We left St. Michael at 5 p.m. Monday night. Within two hours a storm came up and we had to run for the lee of an island and anchor there all night. Rough? Wow! We were all seasick. The little boat had no berths. Most of the passengers lay either on two benches or on the floor



of the forward cabin, as it was called. But three, of whom I was one, took two dirty bedquilts and slept on the curved bottom of the boat in the hold aft. I had a cork life preserver for a pillow and oars at my back. I wore everything I had—shoes, hat, sweater jacket, and everything else, trying to keep warm. We had to lie down for two nights and about a day and a half because we could not sit up. There was no place to wash and it was too rough to cook anything and dry bread was all we felt like eating anyhow.

We ought to have got into Nome this afternoon, about two days after leaving St. Michael, but another storm came up when we barely made this harbor. There is, of course, no harbor at Nome itself. I am staying in a roadhouse, the only house here, and will let the sailboat take my grips on to Nome while I walk the 12 miles in the other direction to Solomon.

Expect to start tomorrow morning as soon as the storm goes down enough to let the ferry take me across the stream. I am sore from the planks and dizzy from the twisting of the little boat, but otherwise feeling fine.

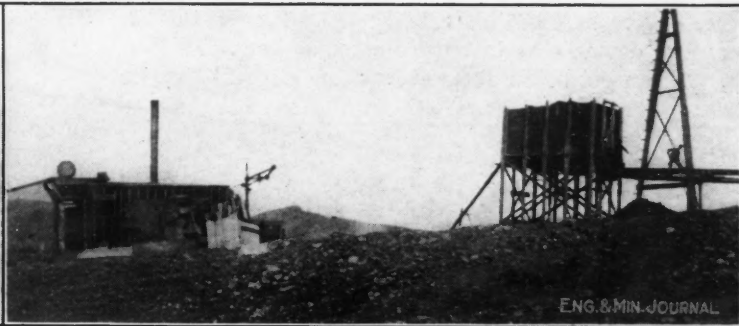
Thursdays, charging \$10 each way. I couldn't wait for a stage so decided to walk it.

I walked the 20 miles from East Fork roadhouse to Hatch's. Hatch and one man were shoveling gravel into a sluice box. I stayed all night in his canvas house and had a fine meal of ptarmigan—much better than chicken. Hatch, besides working 10 hr., does all his own cooking. The next morning I got up early and walked the remaining 11 miles to Council. I heard a bell and thought it must be school beginning, but found out that the bell was in the Eskimo church and someone told me it was Sunday. However, only the Eskimos go to church in Council City, so I visited a hydraulic mine. The next day I hired a horse for only \$7 and rode 30 or more miles, visiting four dredges and one hydraulic mine; and the day after that I walked back the 31 miles to East Fork. Started at seven in the morning and got in at five-thirty in the afternoon. Then the next day the horse car didn't show up, so I walked on back to Solomon, 12 miles, with a side trip of two miles to see a hydraulic plant. The boat didn't run to Nome that day—there weren't enough



A SURF WASHER ON THE NOME BEACH

The material is dumped from wheelbarrows into the hopper and washed down over riffles and an amalgamating plate by the wave action. In the background is the cableway tower of J. J. Sesson & Co., used for unloading cargoes.



A NOME DRIFT MINE

Operated by John Blake. The hoist house, gin-pole, cableway, carrier, sluice, bin, etc., constitute a typical layout for underground placer work.

Winter is setting in, the low hills to the north are already white with snow, and I shall have to get out to Seattle in short order.

#### NOME—SEPT. 25

From Port Safety to Solomon the road was washed out in the big storm of October, 1913. I had to make the 12 miles over yielding beach sand along the edge of the sea. There were two ferries which I crossed at 25c. per. Solomon itself was entirely washed away by the same storm. Even the beach was gone. A dismal place! The wreckage stretched back from the shore for a mile or two—sides and roofs of houses, bales of hay, wheelbarrows, timbers, ties, railroad tracks, etc.—not a stick of the town left standing. A mile back from the old site is Dickson, consisting of roadhouse, store and postoffice.

The first dredge is six miles from Solomon. Then there are four dredges in the next stretch of six miles and two dredges about two miles up Shovel Creek. Finally, there are three dredges 10 to 20 miles beyond East Fork, but two of these are already shut down. There is a railroad, but this is closed, and a man pulls a push car with horses and charges \$2 to ride 12 miles to East Fork roadhouse. I happened to catch a car and rode one way.

There is a stage from Solomon to Council City, 31 miles away, which runs on Wednesdays and returns on

passengers; but the next day, the 24th, I made it all right. The boat is a small gasoline and sailing boat combination called the "Flyer." It cost \$5 for the 35 miles. There used to be a boat called the "Flyer," the pride of Puget Sound. Believe me, this is no relation.

#### NOME—SEPT. 26

There are several districts which can be visited from Nome, although I didn't go. You can get out to the Kourgarok over a railroad by means of a dogmobile; Mr. Matson has leased the right-of-way of the railroad, which is not operating, and will take you 60 miles on a push car pulled by dogs. I believe that there is a roadhouse at Kourgarok.

You reach Teller and York by means of a boat which is supposed to leave three times a month, but is irregular. The trip is stormy and bad. There is a dredge and a mine or two near each of these towns, but several miles out over bad trails. There are no roadhouses; you carry your own grub and bedding and sleep out.

The Deering-Candle district is reached either by water or by land. By water it is 275 miles and by land 180. The trails are bad and you have to take off your clothes and wade waist-deep in ice water to cross two rivers. There are no roadhouses along the route, except along the 60 miles of the railroad out to Shelton on which the

the push cars are pulled by the dogs. The "Silver Wave," a mail boat, is supposed to make three trips a month to the district.

#### MISCELLANEOUS INFORMATION

I left Nome for Seattle on the next to the last boat, without having seen all the operations thereabouts. A good many of them were closing down for the winter and it did not seem worth while to pay the excess fare charged on the last boat for the sake of seeing one or two more dredges. Perhaps some information on fares and prices and other miscellaneous points may be of interest.

It must be remembered that it takes at least all summer to go through the interior. The ice goes out of the Yukon River at Tanana between May 6 and May 18. The first boat from Dawson to Fairbanks leaves about May 22. The ice leaves Lake Labarge June 1 to 10. The first boat from White Horse to Dawson leaves between June 1 and 10. The first boat to Nome leaves between June 10 and June 20. Here are some fares: Fairbanks to Skagway, \$105; Skagway to Fairbanks, \$100; Fairbanks to Seattle, via Skagway, \$135; Fairbanks to Seattle, via Nome, \$120. It costs more to go up the river than it does to go down because it takes twice as long. In general, you can get better rates everywhere if you buy your



AN ALASKAN BURRO

entire ticket in Seattle. From Skagway to Dawson, to St. Michael, to Nome, to Seattle, \$195; excess after Sept. 15, \$50. The side trip to the Atlin district costs \$15; to Fairbanks, \$20; to Dikeman, \$40. The single fare from Seattle to Skagway is \$30. The local fare between St. Michael and Nome is \$20; from Nome to Seattle is \$100.

At Ruby stop at the Williams Hotel; in Fairbanks at the Shaw House. At Dawson, the Royal Alexander is the best hotel; the Regina is more reasonable, and the Rochester is fair. The rooms in Dawson run from \$1.50 to \$2; meals, from 75c. to \$1. A newspaper costs 25c. and magazines, 25c, 50c and 75c. A hair cut is 75c., a shave 25c., a shine, 25c. A horse costs \$4 a day and \$1 for each feed. Here are some prices at Fairbanks: Hotel rooms, \$1 to \$2; meals, 75c. to \$1.50; bath, 50c.; hair cut, 75c. At roadhouses on the creeks: Bunk, \$1; meals, \$1. At the Arcade Café, a T-bone steak costs \$2; coffee and hot cakes, 50c. But the braised caribou with mushrooms is only 75c.; a small moose steak with new potatoes and cream is only \$1; and young moose with dressing is only 75c. Did you ever eat moose? It can't be beat. The ice cream is made of condensed milk. It is much better than

the cornstarch stuff they sell in the first-class Eastern hotels. The smallest coin used is a quarter.

A word about clothing may not be amiss. My advice is to take summer clothes and winter underwear, with sweater jacket and a raincoat and a waterproof hat. The foot gear should be heavy.

Boat and railway agents are polite and obliging and are fine fellows, but look out for them. See that your ticket when you buy it is marked "includes meals and berth" and also "stop-overs allowed."

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### Copper Exports and Imports

The Bureau of Commerce has made public the exports of copper from the United States in October and in November, the latter month lacking two days. The figures are as follows, in pounds, the more important items being stated separately:

Destination:	October	Nov. 1-28	Total
Great Britain .....	23,113,426	17,356,000	40,469,426
Italy .....	22,166,413	4,852,000	27,018,413
France .....	5,874,394	14,361,000	20,235,394
Sweden .....	5,342,340	6,119,000	11,461,340
Norway .....	7,453,411	1,590,000	9,043,411
Denmark .....	358,547		358,547
Other countries .....	623,730	903,000	1,526,730
Total .....	64,932,261	45,181,000	110,113,261
Total, 1913 .....			146,104,698

This is metallic copper in various forms. The exports in ore and matte are not given, but are usually small in proportion to the metal.

Imports of copper for October and November into the United States are reported as follows:

	October	Nov. 1-28	Total
Metallic copper .....	8,873,123	18,375,846	27,248,969
In ore and matte .....	8,060,489	677,426	8,737,915
Total .....	16,933,612	19,053,272	35,986,884

In October the larger imports of metallic copper were 2,927,680 lb. from Australia; 2,434,886 lb. from Peru; 1,294,692 lb. from Chile; 1,011,771 lb. from Canada; 724,892 lb. from Japan. The larger imports of copper in ore and matte were 3,128,095 lb. from Chile; 3,120,435 lb. from Cuba; 1,076,089 lb. from Canada; 380,484 lb. from Spain. The imports for November are only partially divided.

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### The Schneider-Creusot Works

These famous works in France, which have been brought into more than usual prominence by the war, are situated in the district of Saone et Loire, to the west of the town of Chalons-sûr-Saone, which has a population of 40,000 inhabitants, says the *Iron & Coal Trades Review*. The works had their beginning toward the end of the 18th century in a small iron foundry, which was reconstructed and extended in 1835 by Eugen Schneider, who was a native of Lorraine. Apart from the main works at Le Creusot, the present firm of Schneider & Co. is owner of a shipbuilding yard and arsenal at Chalons-sûr-Saone; also of coal mines at Devize and Montchanin, and of iron mines in Spain as well as in Lorraine. It has also a turbo-dynamo works in Champagne, artillery workshops and practice grounds at Le Havre, Harfleur and Toulon, and finally a manufactory for fireproof products at Perreuil. The situation of the main works is not exactly ideal, because the coal mines in the neighborhood can supply only about 25% of the quantity required, and the supplies of iron ore must be drawn either from Lorraine or from abroad.



# Combined Cyanide and Other Processes--II\*

BY HERBERT A. MEGRAW

*SYNOPSIS*—Concentration is not an expensive process when crushing and grinding costs are not charged against it. Other stage processes may include water crushing, oxidation treatment, desulphurization, and ammonia treatment. Amalgamation has been very widely used. Its disadvantages are the cost of mercury lost and expensive labor required. The ultimate profit is the object of all processes and must not be lost sight of.

Sulphides other than pure pyrites are often encountered in precious-metal ores, as are also deleterious minerals which may not be sulphides at all. These compounds may contain other metals than the precious ones, and it may sometimes be an object worth taking some trouble to attain to save these metals as completely as possible, separately from the precious ones. Base metals, such as lead and zinc, may occur in small quantities, and often do occur in silver-bearing ores, but it has usually been considered bad practice to treat them together, that is, to allow the base metals to go through the cyanide treatment with the silver. The undesirability of so doing is due to one or more conditions. The base metals may be in such condition that they will dissolve readily in cyanide solutions, thus resulting in a high cyanide consumption and throwing the base metals into the precipitate, making a base mixture which is hard to melt and which is subject to heavy refining costs. In addition, there is no profit obtained from the base metals. On the contrary, should these have been separated by proper concentration methods before reaching the cyanide treatment, they might have been saved in such condition as to be valuable in themselves in addition to being removed from the cyanide-treatment system, where they would have entailed a high expense for cyanide consumption.

### HANDLING BASE METALS IN ORES

When the precious and base metals occur in chemical combination they are very likely to be difficult or impossible to dissolve in cyanide solutions. In such cases there are two courses which may be pursued. Concentration may be used to separate the insoluble or difficultly soluble portions, allowing the remainder to go to cyanide treatment. The rebellious material is reserved for special treatment, either smelting or some other process especially fitted to its needs. An admirable example of a problem of this kind is that presented by the ores of the Nipissing Mining Co., at Cobalt, Ont. Here the operators were confronted with the problem of its low-grade ore containing rebellious silver minerals which were deemed to be only difficultly, if at all, soluble in cyanide treatment solutions. The problem then was whether to build a concentrating plant and separate the difficultly soluble portions, or to build a direct-cyaniding plant and at the

same time subject the material to some preliminary treatment which would allow extraction of a satisfactory percentage of the metals by cyanide.

### THE NIPISSING TREATMENT PROBLEM

This question was given a great deal of study by the Nipissing company, and James Johnson, in an article in *Bull. of A. I. M. E.*, January, 1914, outlines the reasons for the process which has been worked out and followed. Briefly, it was found that the cost of a mill to treat by cyanide alone 200 tons per day, with an assured extraction of about 90% at an expense of \$3 per ton, was estimated at \$250,000. The probable comparison between such a mill and a concentrating mill, such as has been generally or usually used in that district, is shown in the accompanying table.

CONCENTRATING VS. CYANIDING MILLS	
Assay of mill feed, 32.09 oz. Ag.	
Concentration mill to give 80% extraction, approximate cost, \$160,000.	
80% × 32.0902 = 25.67 oz. @ \$0.52 = .....	\$13.35
Working costs.....	\$1.25
Marketing concentrates, 10%.....	1.33
Difference between corrected and commercial assays on concentrates.....	0.27
	<u>2.85</u>
Profit per ton .....	\$10.50
Cyanide mill to give 90% extraction, approximate cost \$250,000	
90% × 32.0902 = 28.88 oz. @ 0.52 + 0.3c. increased price in marketing.....	\$15.16
Working costs.....	\$3.00
Excess in bullion.....	0.07
	<u>3.07</u>
Profit per ton.....	\$12.09
Difference in favor of cyanide mill, per ton milled....	\$1.59

Based on these figures, it was found that the cyanide mill would return its extra cost after having treated 56,600 tons, a run of 283 days, provided expectations calculated upon were realized. As a matter of fact, regular operation has shown that they were somewhat exceeded, since the mill cost \$254,839; the extraction of 26-oz. ore was 92 to 93%; the milling cost under \$3 per ton, and the tons treated averaged 244 per day.

As a matter of fact, this process as used at the Nipissing is distinctly a two-stage, or rather a two-process combination treatment. The ore is crushed in water and given the aluminum desulphurizing treatment, which breaks down the rebellious sulphide combinations and reduces the silver to a native condition in such fine form that it is readily dissolved by the cyanide solution. This is certainly a two-process combination, and it has been proved to be quite an advantageous one over concentration alone or in combination, since by the former process the tailings would have been of such low value that they might not have paid to cyanide separately, and direct cyanidation of the whole might not have been altogether satisfactory as regards extraction.

### CLEVENGER'S DISCUSSION OF NIPISSING METHODS

Upon the latter point, however, there seems to have been some difference of opinion. G. H. Clevenger, in *Bull. of A. I. M. E.*, July, 1914, discusses the matter at great length. The crux of Clevenger's discussion is the question: "Is the highest possible recovery of silver made at the lowest cost per ounce recovered?"

\*This is the eighteenth of a second series of articles by Mr. Megraw. It deals with the comparative details of cyanide practice, discussing points of possible improvements. Preceding articles of this series appeared in the issues of Sept. 6, Oct. 4, Nov. 1, Nov. 15, Dec. 20, 1913; Jan. 31, Mar. 7, Mar. 21, Apr. 25, May 23, June 20, July 25, Aug. 29, Sept. 12, Oct. 17, Oct. 31 and Dec. 5, 1914. The next article will deal with "Labor Employed in Cyanide Plants," and will appear in the issue of Feb. 13, 1915.

He points out that the mill showing the greatest recovery does not necessarily give the highest ultimate profit, a fact that is perfectly evident, since by operations in the laboratory one can recover 100% of the metal, and the same method could be carried out on a commercial scale if it were not for the factor of expense. Clevenger further points out that some of the combined cyaniding and concentrating mills at Cobalt previous to this time did not make any greater, or in some cases, not so great an ultimate profit from their treatment as was earned by some of the purely concentrating mills, which, while they recovered a much lower percentage of metal, did it at a much less cost. He does not, however, support this statement by noting the examples considered, and his statement, while certainly possible, would be stronger if more facts and figures went with it. Clevenger shows that it may be possible that, due to the brittleness of the minerals within the ores, they are naturally brought to a very fine state of subdivision without any great expense or without any particular pains. The latter point is quite true, and it is also true that were these minerals as tough as the gangue it might not pay to go to the trouble of grinding them so fine. As a matter of actual fact, however, silver-bearing minerals, particularly sulphides, are seldom tough, and almost always brittle. The commonly occurring forms of silver cannot be said to be difficult of subdivision, except in the case of native silver itself, which exists plentifully in the Cobalt ores, but at the Nipissing is mostly separated and treated at the high-grade mill.

#### COST OF CONCENTRATING

The cost of concentrating varies with the ore to be treated and with the object to be gained by concentration. In cases where a complete and careful extraction of certain portions is required, it may be necessary to accomplish concentration in two or more steps, the first one being more or less a roughing-off system, followed by classification of the pulp and reconcentration. In other cases, however, where the ore justifies the practice, the main object is to remove the coarser pyrite, or metal-bearing sulphides, leaving the finer portions to be treated along with the rest of the ore. In this case, complicated methods are not necessary, and concentration may be comparatively inexpensive.

In a mill built for concentrating alone, the entire cost of crushing and grinding must be charged to that process. In a mill designed for the operation of several processes, the crushing and grinding is usually not charged to either of the processes in use, but made into a separate department and its charges segregated. Thus, in calculating the probable treatment cost of a concentrating mill to treat the ores of the Nipissing Mining Co., at Cobalt, Ont., the operators considered the cost of operations in the mills of the camp and decided that a figure of \$1.25 per ton would cover the cost. Since this estimate was carefully arrived at, it may be accepted as a very close figure to the actual expenditure necessary. Such a plant would, of course, provide for careful concentration, probably in several steps. The cost includes crushing and grinding and all mill operating, but does not include marketing of the product. On the other hand, concentrating in mills which use other processes, and in which the concentration is charged with its own expenses only, the figures are very much lower. For instance, at the Montana-Tonopah, the concentration cost 4.1c. per ton of ore milled. At the Goldfield Consolidated, where con-

centration is a carefully designed and carried out process, its cost is 6.3c. per ton. At the Hollinger mill the cost is given as 6.8c. per ton. At the West End Consolidated, Tonopah, the cost is noted at 11.3c. per ton. At the Liberty Bell mill the cost of concentration is 6.75c. per ton. At the Nevada Hills mill the cost is given as 11.9c. per ton. At the North Star, in California, cost is given as 13.1c. per ton.

It may readily be seen from these figures that the cost of concentration depends altogether upon the character of the ore, and consequently the system of concentration used. If the system is one merely intended to remove the bulk of the sulphides, or the rebellious minerals, from the ore pulp, its cost is small indeed, while if more careful concentration is required the cost is naturally somewhat increased. It must be remembered, however, that careful concentration may in some cases prove to be the critical factor which will permit the economical handling of an ore which otherwise could not be successfully treated. An ore which may contain sulphide of zinc, copper, lead, or other combinations may be concentrated in such a way as to remove the rebellious elements entirely or sufficiently to permit the balance of the pulp to be successfully cyanided at a low cost. Of course, every ore is a problem in itself, and must be handled as such, the solution being worked out having in view not only the ore characteristics, but local conditions of every kind.

#### OTHER SEPARATE PROCESSES

Coming within the rôle of separate processes is the preliminary treatment in water or other chemicals, which is often given to ores before they are sent to the department of cyanidation. Crushing in water alone is often given as a necessary and advantageous system, even where amalgamation is not practiced. The reason for this is that in some cases where cyanide solution is used in the batteries or crushing machines, even in those cases where protective alkalinity is carried, there seems to be a development of acidity which, while only momentary and promptly overcome by the lime carried in solution, is nevertheless sufficient to allow the destruction of an appreciable quantity of cyanide during the moment in which the acidity is locally predominant. By crushing in water, this cyanide consumption is avoided and the acidity either neutralized by lime or washed away before entrance into the cyaniding circuit. This alternative adds somewhat to the cost of treatment, of course, but the expense is less than that of the cyanide destroyed if it is not used. The principal objection to the scheme is that it puts the ore into the cyanide circuit containing a certain percentage of water, and this water has to be got rid of in some way or the cyanide solution in the cyanide-treatment circuit will accumulate until it reaches such a point that some of it will have to be thrown away. Water, of course, is always taken into any cyanide circuit, but in such cases it is taken in the wrong place. All water entering cyanide circuits should be taken in with the tailings, where it is used to displace cyanide solution in the final pulp. Water has to be used at that point in any case, no matter how much comes in before, so the problem is to get rid of this water without discarding any appreciable quantity of cyanide solution containing valuable cyanide.

#### OXIDATION OF PULP

Another procedure somewhat similar, and partly the same in effect, is the oxidizing of a pulp before it goes to



the cyanide-treatment circuit. In cases where accumulated tailings are to be treated, they often contain organic matter or other reducing agents which are active cyanicides, and these must be oxidized or removed from the pulp, or they will occasion a high cyanide consumption. This may be accomplished by using lime or calcium hypochlorite, bleaching powder, in a water solution previous to cyaniding. Before proceeding to the cyaniding circuits, pulps which have been treated by water, or by water with oxidizing agents, are carefully thickened to remove as much as possible of the moisture, or in some cases are filtered so that the pulp entering the cyanide circuit will contain about the same quantity of moisture as that issuing from it after the cyanide treatment has been completed.

Ores which contain small quantities of soluble copper may be and often are treated by an ammonia solution before being sent to the cyaniding circuit. The ammonia takes the copper into solution as a hydrate, and the pulp may be washed by decantation or by filtering, and then sent to the cyaniding circuit, where the precious metals may be recovered without high consumption of cyanide due to the copper. Sometimes pulps are treated by ammonia and cyanide together, both in the same solution, but this treatment has not reached a high stage of perfection at present, although it has sufficient promise so that it is by no means impossible of application upon an ore which indicates the necessity for such handling. All of these processes are somewhat similar, and have for their object the removal of cyanide-consuming elements before the ore undergoes cyanide treatment. The necessity for these schemes depends, naturally, upon the cost to accomplish them compared with the cost in cyanide loss in cases where they are omitted.

#### AMALGAMATING AS A COMBINED PROCESS

Amalgamating gold ores before sending them to cyanide treatment is a system which has been in existence since the origination of the application of cyaniding to such ores. As a matter of fact, amalgamation existed as a treatment system before cyanidation came into existence, and cyaniding was considered, in its first application to such ores, as merely an assistant to gather up the gold left in the ores which the amalgamation process could not recover. After exhibiting its efficiency in recovering fine gold, cyaniding became more and more prominent as a process, and amalgamation less so, finally being left in operation simply to recover the coarse gold which could not be dissolved by the cyanide solution in a reasonable length of time. It is an undoubted fact that in the great majority of milling-grade gold ores there is little or no coarse gold to be recovered, and it seems natural to suppose that the use of a single system, if it is efficient, is better than the use of two systems to recover the metal. Consequently, many of the plants which formerly used amalgamation have done away with it and depend entirely upon the cyanide process to recover all the economical value in the ore. The strength of amalgamation, however, as a well known and simple process for recovering gold, has led to its maintenance in many plants where it could probably be well dispensed with. The old axiom that the gold should be recovered as soon as possible has led to its continued existence, since it is believed that money is saved by recovering the gold promptly. As a matter of fact, the advocates of this system seldom calculate upon the losses of mercury and the cost of the system. Mer-

cury losses are considerably more than have been acknowledged or believed, the proof of this statement being shown by the experiments made by the Nipissing Mining Co. in laying out the plan for their new low-grade mill. They came to the conclusion that it was a money-saving proposition to avoid the use of mercury wherever possible. Their handling of mercury in large quantities in the high-grade mill gave them a large amount of extremely valuable experience and data in regard to mercury handling and its cost. A percentage which would probably not be noticeable on the small amount of mercury used in the plate-and-mortar amalgamation of gold ores stands out in high relief when applied to the huge quantities of mercury used in the amalgamation of those high-grade silver ores. Therefore, a much closer approximation of its actual cost and the actual losses involved can be obtained.

Amalgamation costs a definite sum of money, just as concentration or any other process does, and where it can be omitted as a factor in the ore treatment it should be done. It must also be considered, however, that where amalgamation is necessary it is a feature of just as vital importance as concentration or any of the other auxiliary processes which have been heretofore mentioned. All factors must be united to produce a concordant and economical system of ore extraction. Where coarse gold exists, amalgamation is thoroughly justified. Where it does not, and where it can be avoided, it is better not to use it. At the Liberty Bell mill, amalgamation was figured to cost 6.5c. per ton. At the Mother Lode mill, Sheep Creek, B. C., its cost was 8c. per ton. Many other mills using amalgamation ahead of cyanidation figure at costs harmonizing with those given, and varying with the size of the plant and the system of amalgamation carried out. It may be clearly seen, therefore, that if amalgamation can be avoided and the gold can be obtained in another process—that is, in the cyanidation circuit—money will be saved by following that course, notwithstanding the fact that it costs something to recover it in the cyanide circuit.

The crucial test of any combination of processes is, of course, their ability to produce the highest possible recovery at the least possible cost. Cyanide metallurgists are fortunate in having at their disposal such a variety of other processes which may be combined with their own to reach an economical maximum.

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### German Iron Ore

The total iron ore mined in Germany in 1913 was 35,941,285 metric tons, of which Luxemburg supplied 7,333,282 tons. The ore mined outside of Luxemburg is classed as below:

Kind of Ore—	Tons	Av. % Iron
Minette ore, Lorraine .....	21,136,265	31.66
Brown ore, less than 12% Mn.....	3,005,970	34.14
Brown ore, 12.30% Mn.....	330,037	22.86
Red iron ore .....	1,102,067	42.73
Spathic iron ore .....	2,860,811	33.54
Miscellaneous .....	172,753	....
<b>Total .....</b>	<b>28,607,903</b>	<b>32.49</b>

The production in part by districts was as follows: Luxemburg minette, 7,333,382 tons or 20.4%; Lorraine minette, 21,136,265 tons, or 58.8%; Berg and Siegerland, 2,729,341 tons, or 7.6%; Nassau-Oberhessen, 1,102,503 tons or 3.1%. Only 11% of the ores mined came within the bessemer limit of 0.05% phosphorus.

# Men and Machinery of the Comstock--Pioneer Hoisting Works

BY G. W. DICKIE

*SYNOPSIS*—Some idea of the huge mechanical problems which were presented to the engineers of 40 years ago, and solved by them, can be had from the details of the hoisting engines given in this article. It must also be remembered that there were not only no precedents to follow, but also that few present-day facilities existed for machining large work. Hoists with flat steel ropes, which weighed over 25 tons and lifted 1800 tons a distance of 1700 ft. every 24 hr., are not common even today. Though many still cling to the hope of a bonanza at the Comstock, the romance of the '70s will never return.

Before taking up the actual hoisting works as built for the mines on the Comstock, I will give a hurried description of the hoisting machines that had to be installed to handle the pit work, some of those being very heavy. The best example that I know of is one designed by myself and built by the Risdon Iron Works to handle the heavy work installed in the shaft and hydraulic pumping station at the Chollar, Norcross and Savage combination shaft.

Fig. 1 is a side elevation and plan of this pumping compartment hoist, which at that time was the most powerful of its kind that had ever been built for any mine, and for all I know may still be the biggest of its class. The pit head pulley was 20 ft. diameter, and from it the rope passed over the tops of the cylinders of the beam pumping engine to another pulley mounted on cast-iron columns behind the engine, and thence descended to the hoist. Fig. 1 is very clear, so that little description is needed to make it understood. It is taken from a lithograph I made from my original drawing in 1876. Each of the two side frames was cast in one piece; they carry the bearings for all the shafts and the engines.

The two engines had cylinders 14 in. diameter and 20 in. stroke. The cranks were set at right angles, and the disks carrying the pins were made large to serve as brake wheels. The engine shaft, as will be seen, carried two pinions, one being keyed fast to the shaft and the other fitted with a sliding clutch. The first pinion geared with a spur wheel 10 ft. diameter on the intermediate shaft; the face was 10 in. wide, with teeth pitched  $2\frac{1}{2}$  in. The other pinion geared with the main spur wheel. The intermediate shaft also carried a spur pinion fitted with a sliding clutch which geared with the main spur wheel. On each end of the intermediate shaft there was a winch end or gypsy head, to which the hauling part of a tackle could be taken for lifting heavy pieces in the engine house. The hub of the main spur wheel was made 56 in. diameter and formed the reel center. The diameter of this spur wheel was 15 ft. 8 in., and the reel arms extended to its outer circumference and wound 3000 ft. of  $7\frac{1}{2} \times 3\frac{3}{4}$ -in. steel rope.

This hoisting machine could be run in either double or single gear, and in double gear with the reel full of rope could handle a load of 20 tons, and with the rope all out could lift 50 tons. The working platform was placed 9 ft. above the floor, and from it all the movements of the

machine were controlled. This was an excellent arrangement of pump hoisting machine, and did well all the work for which it was built; without it, we could never have installed the huge hydraulic pumps and all the heavy pipe work in the short time in which it was done. The fact that such a machine was built at all shows the character of the men who were carrying on the work of trying to wrest from its rock matrix the secret wealth of the Comstock.

## HOISTING 1800 TONS A DAY

On the Comstock mines, with one or two exceptions, the hoisting works were built for flat ropes, and with one exception, that on the Consolidated Virginia and California combination shaft, were all geared. These hoisting works were much alike except in size; the illustration on p. 519, Sept. 19, showing the pumping and hoisting plants at the Silver Hill, Dayton, Caledonia, New York and Ophir mines, shows these geared arrangements at their best. They were seldom run balanced, as in most of the mines one compartment of the shaft might be working from a level several hundred feet higher or lower than the other. In the case of the Consolidated Virginia and California, there was the great Bonanza orebody to be exhausted as rapidly as possible, with a fixed loading station below and a fixed landing platform above, which were new conditions on the Comstock. The proposition was to install hoisting works that would deliver from the 1700-ft. level 1800 tons of ore each 24 hr., which was a capacity beyond anything hitherto required.

The order for these hoisting works was placed with the Union Iron Works. The designing was done by I. M. Scott and W. R. Eckart. I would have liked to have secured an accurate description of this great hoisting plant from Mr. Eckart, but he is too feeble to do anything of that kind now. He was one of the noted engineers of the Comstock, and his great ability and untiring energy impressed themselves on the character of the machinery produced in San Francisco during the '70s for the Comstock mines. He and I were usually opposed to each other, being leaders in hostile camps, but we were good friends for all that, and have remained so during all the years since those truly stirring days.

Mr. Scott and Mr. Eckart wisely adopted for these works flat rope reels with engines direct-connected to the reel shaft. The diameter of the cylinders was 36 in. and the stroke 96 in. The valves were of the double-beat type, actuated by eccentrics, and had a variable cutoff worked from the reversing gear, so that one lever controlled the engine, leaving the operator with one hand free to work the control valve of the brake gear. The brake wheel was 15 ft. diameter, with a 12-in. face. The post brakes were operated by a hydraulic cylinder controlled by a differential valve-gear, the control for which was at the operator's left hand. The crank disks were 12 ft. diameter and polished all over; this was one of the show engines of the Comstock, not altogether because of its appearance, but because each day's work it did brought to the surface \$480,000 worth of Bonanza ore. It was an impressive machine when at its full speed



of 74 revolutions. The piston speed of 1184 ft. per min. was far beyond anything known at that time.

#### VIBRATION OF CONNECTING-RODS

Only one trouble developed in its working; about two months after it was started, one of the connecting-rods broke close to the crank disk end; fortunately, this was discovered before it actually parted, so that it did no

made a block of stiff clay and set it on a good foundation under the middle of the connecting-rod at half-stroke, carefully adjusting it so that when the engine was just turning over, the middle of the connecting-rod barely touched the clay. Then the engine was started and very slowly brought to its full speed. Up to 40 revolutions, there was little change, but above that the connecting-rod began to beat down the clay, and at the full speed

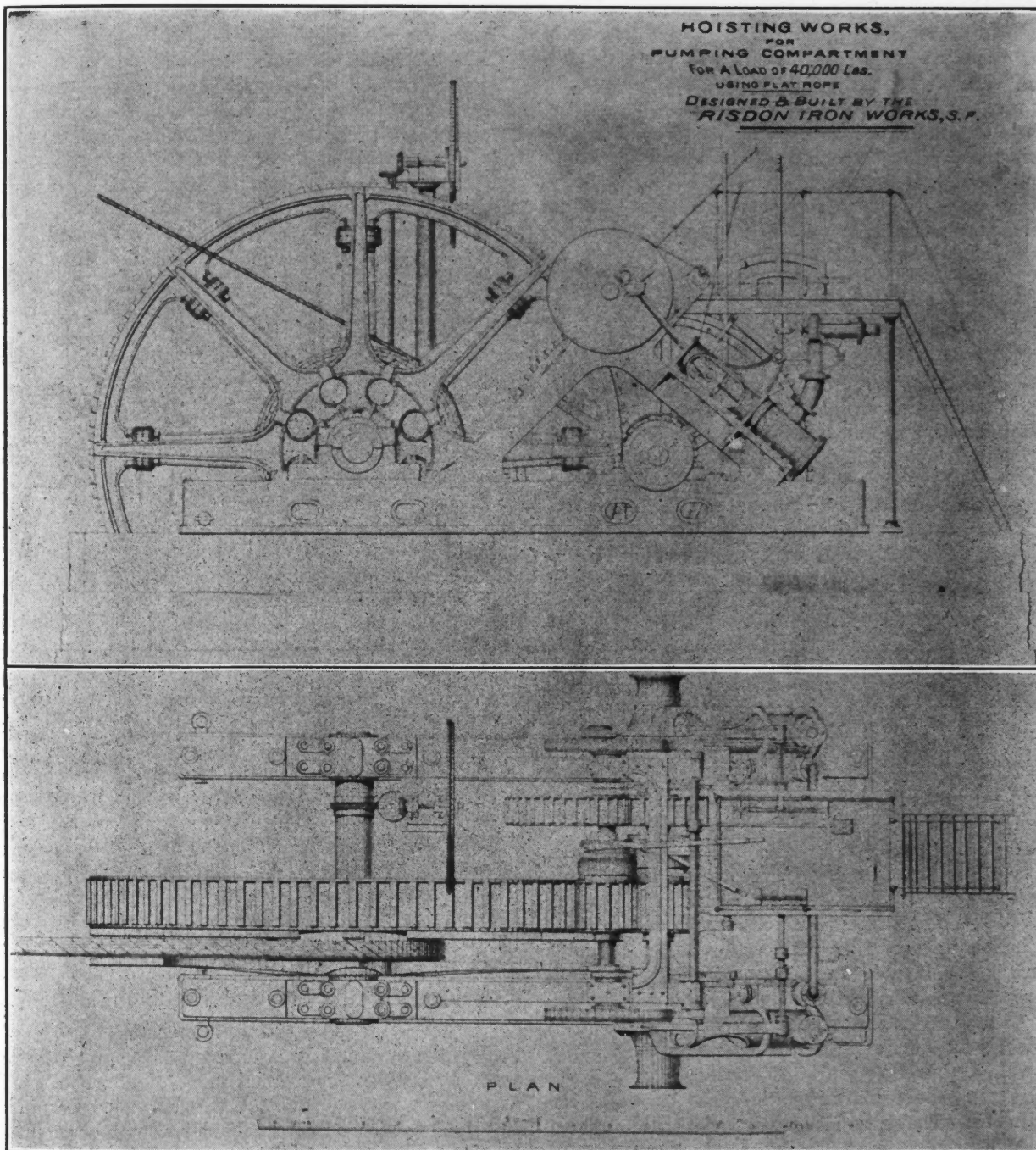


FIG. 1. HOIST FOR THE CHOLLAR, NORCROSS AND SAVAGE MINES

damage. It was considered to be a case of defective forging. These connecting-rods were 24 ft. long between centers, 12 in. diameter at the middle and 8 in. in the necks. A new one was made without change.

Mr. Eckart, however, was not satisfied, and when the new rod was in place, he determined to find out if a suspicion he had was correct. He thought that the accident had been caused by vibration in the rods, so he

of 74 revolutions, the clay had gone down  $1\frac{1}{4}$  in., due to the vibration of the connecting-rod; the rods were thereupon braced, and no further trouble occurred.

From the date of these engines up to the present time, hoisting works on important shafts have been built with the engines direct-connected to the reel shaft where flat ropes are used, but this one has never been equaled in size.

I have already stated that in vertical shafts, flat ropes were all but universally used, and while the system of working each reel independently was adhered to, flat rope had the advantage, as the machinery was more simple and compact, which meant that it was also cheaper, than for round rope. The rope winding on itself gives the reel an ever-changing diameter, the engine thereby gaining leverage as the load increases. To work a shaft of, say 2500 ft., by round rope requires winding drums of large diameter to get the width within working limits; this made gearing necessary, and if the ropes had to run independently of each other, the great weight of the winding drums made starting through a clutch a serious matter. But the short time that a flat rope lasted and the constant repairing it required during its useful life led to a strong desire among mining superintendents for hoisting works using round ropes which would have all the other advantages possessed by those using flat ropes. That desire was never quite satisfied.

#### BRAKING WITH ENGINE CYLINDER

In most of the geared hoists—and the round-rope ones were all geared—the engine cylinders were used as a kind of air brake. In lowering, the reversing link was notched up or set for running the other way, air was drawn into the cylinder through the exhaust and compressed between the piston and the cylinder heads; a spring-loaded relief valve was fitted at each end of the cylinder to prevent dangerous pressures. This brake was effective, but I never could help thinking that the system was, to say the least, crude in itself as well as destructive to the machinery. The brake power required when unbalanced, with a great weight of pendant rope added to that of the cage and car, was very great. The excessive speed of most of the geared hoists on the Comstock was hard both on engines and gears, and only high-class workmanship saved them from running themselves to pieces. I knew of an instance of a hoisting engine with cylinders 20 in. diameter by 36-in stroke making regularly 175 r.p.m., equivalent to a piston speed of 1050 ft. Both engines and foundations suffered at these speeds.

When it was determined to sink three shafts on the Comstock that ran into an incline between the 900- and 1200-ft. levels, the length of this incline made large hoisting works a necessity. The incline hoisting works of the Crown Point mine was the first of the larger class. I. F. Thompson, consulting engineer to the Crown Point company, determined to use a large winding drum and round rope to work the incline only, but with the hoisting works at the surface. The requirement was that the drum should wind 2100 ft. of 2-in. diameter steel rope. These works were designed by me in 1873; no drawing is extant, but I have notes covering the main points of the arrangement. They were built by the Risdon Iron Works. There were two horizontal steam engines set 22 ft. apart between centers, with their shafts coupled together and cranks set at right angles; the diameter of the cylinders was 20 in. and the stroke 42 in.; they were handled by the Stevenson link and reversing lever. There were two flywheels, one on each side of the winding drum, each 16 ft. diameter and weighing 10 tons. These wheels were turned up true on the rims and fitted with the usual post brakes. The bedplates that carried the drum shaft extended back under the engine shaft and carried the intermediate bearings for it, as in Fig. 2.

The spur pinion keyed to the engine shaft was  $55\frac{3}{4}$  in. diameter, 6 in. pitch and 19 in. face. The engine shaft was 10 in. diameter and the drum shaft 14 in. The spur wheel to which the drum was secured was built in segments and was 21 ft. 1 in. diameter at the pitch line, 6 in. pitch and 19 in. on the face. The teeth in both the pinion and the spur wheels were cut, and we had to build a special machine for the purpose. On one side of the rim of the spur wheel, a heavy flange was cast to take one side of the drum, and two cast-iron rings carried the outer edge and the center of the drum castings. Hardwood staves were fitted and bolted to the rings and the flange on the spur wheel, the drum castings grooved for the rope being fitted to the wood. The whole was turned up true by fitting a tool rest and slide on the bedplates, then driving the drum by the spur pinion worked by a wormwheel on the engine shaft, using a small engine to drive the worm. In those days, we had to do big things with small jobs. The drums when finished to receive the rope were 6 ft.  $11\frac{1}{2}$  in. wide, 21 ft. diameter at the center line of the rope, and took 33 turns of the rope.

These hoisting works did very well as far as working goes, but a slight increase in engine power would have been an advantage in starting the load. As to economy in working, this arrangement left much to be accomplished. The hoisting works being on the surface, there was a dead load of rope equal to 7000 lb. always hanging in the shaft besides the weight of cars and rope in the incline unbalanced, making the actual work done a small part of the power used. In other words, the brake friction in lowering absorbed about as much power as the engines developed in hoisting.

The other two large hoisting works of this class on the Comstock, those of the Savage and the Ophir mining companies, for which Mr. Thompson was consulting engineer, were designed by me and built in the beginning of 1875. The Savage works were built by the Union Iron Works, except that we cut the gears for them at the Risdon Iron Works, which built the works for the Ophir. These two sets of hoisting works were in their main features alike; the slight difference in the style of engines was only the result of a difference in taste in the design of details in the two shops. The Ophir Works, however, possessed one distinct feature in a hydraulic balance for the weight of rope in the vertical shaft and the weight of the car in the incline. Outside of this balancing arrangement, the description I am about to give of these works applies either to the Savage or the Ophir.

#### ENGINES WITH CORLISS FRAMES

The illustration, Fig. 2, is from a lithograph made 40 years ago, when I presented my design. The winding drums were placed about 120 ft. back from the pit head sheaves, which were 14 ft. diameter, with wrought-iron arms. This distance was necessary owing to the width of the drum, which required the rope to deflect 7 ft. each side of the center line. The illustration is a side elevation and plan of the Ophir works and gives a clear idea of the general arrangement. The engine power consisted of two horizontal noncondensing engines having cylinders 24 in. diameter, 48 in. stroke, and link reversing gear. The valves were double-beat miter valves, with Cross' variable cutoff. The engines rested on feet cast to the cylinder and the main pillow block, these two points being connected by a frame which formed the guide for the



crosshead. This style of frame having been adopted by Mr. Corliss for his horizontal engines, it is sometimes called the Corliss frame.

The engines stood about 30 ft. apart, with the shafts coupled near the center pillow block, as shown. The cranks were set at right angles. There were two flywheels, one near the main bearing of each engine; these were 16 ft. diameter and weighed 25,000 lb. each. The main bedplate that carried the bearings for the winding drum extended under the shaft and carried bearings for it outside the flywheels, which with the center bearing made five bearings for the engine shafts. The spur pinion was the same as that of the Crown Point hoisting works, being  $55\frac{3}{8}$  in. diameter, 6 in. pitch and 19 in. face. The engine shaft to which this pinion was keyed was 11 in. diameter. The spur wheel was also from the same pattern as that for the Crown Point, being 252.1 in. diameter to the pitch line, 6 in. pitch and 19 in.

spur gear, weighed 131 tons and was a great piece of work, considering the tools we had to make it with.

#### HYDRAULIC BALANCE FOR HOIST

The hydraulic balance consisted, as will be seen in Fig. 2, of two hydraulic engines applied directly to the drum shaft. This was applied only at the Ophir shaft, where there was a length of 1500 ft. of rope in the vertical shaft, making the need of some such appliance more apparent. Instead of taking the weight of descending rope and the cages on the brakes in lowering, it was taken by the hydraulic cylinders. These for the time were acting the part of pumps forcing water from a tank in the engine house through a line of 10-in. pipe up the side of Mount Davidson at the back of the works to a reservoir constructed at a height of 500 ft. above the floor of the engine house. When the motion of the drums was reversed for hoisting, these pumps became

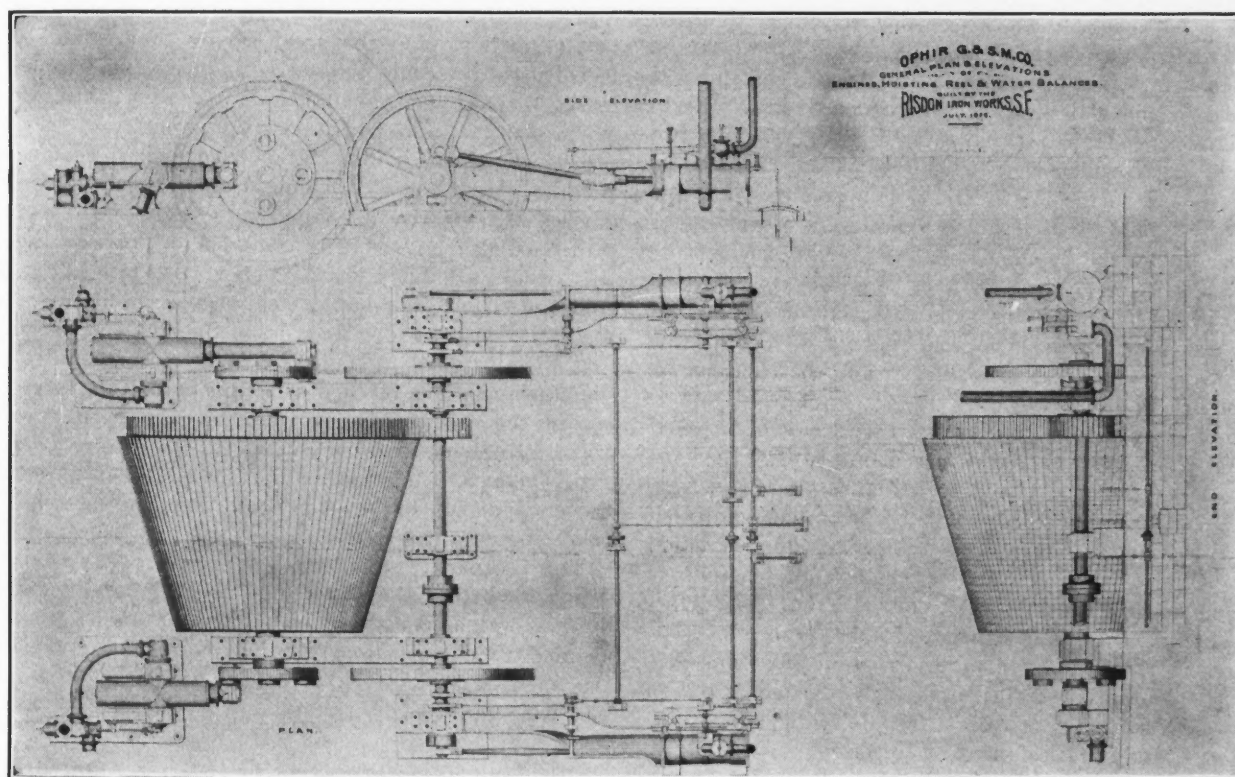


FIG. 2. HOISTING ENGINES FOR THE OPHIR MINES—BUILT IN 1875

face. The drum shaft was 15 in. diameter and 17 ft. long between bearings. The drum was built tapering, as shown, having diameters of 23 ft. at the large end and 14 ft. 3 in. at the small end. It was 14 ft. 6 in. in width and was able to wind 4000 ft. of  $2\frac{1}{4}$ -in. diameter round steel wire rope. The large end of the drum was carried on a cast-iron ring, which was bolted to flanges cast on the segments of the spur wheel; the rest of the drum was carried on three cast-iron rings, one at the small end and two intermediate. These rings were supported by wrought-iron arms bolted to cast-iron centers keyed to the shaft. The outside of the drum was built of white mahogany staves 6 in. thick, outside of which was the covering of cast-iron plates grooved for the rope. The same tools were used for cutting the gears as for the Crown Point job, and the drum was turned up in the same way. The drum complete, with shaft and

hydraulic engines, and the power that was stored up in lowering was used to help the steam engines in hoisting, or it might be used for other purposes, as I will show further on.

On each end of the drum shaft, a large cast-iron crank disk was securely placed. These crank plates were 91 in. diameter, and each had four crankpin holes bored so that the crankpin would fit either of them; this admitted of the stroke of the rams being either 54 in., 60 in., 66 in. or 72 in., according to the amount of dead load to be balanced. The crankpins were 9 in. diameter and 15 in. length of bearing. The ram heads took hold of the pins directly. The rams were 18 in. diameter and of sufficient length for a stroke of 6 ft. The cylinders were carried by trunnions in the center of their length. These trunnions were 14 in. diameter and had a bearing 16 in. long. The water was introduced and dis-

charged through one of the trunnions. The valves were operated by a pin on a sliding plate that was fitted to the other trunnion. This sliding plate was attached to the ram of a small hydraulic cylinder by which the engineer could at once from his platform slide the pin to the center of the trunnion and so throw off the hydraulic balance. The bedplates, which were massive castings, had the trunnion blocks cast upon them. The valve arrangements differed little from that used by Sir William Armstrong in his largest hydraulic engines. The whole work was set on massive foundations and was without doubt the finest incline hoisting works in existence in 1875.

#### UTILIZING BRAKING POWER

I stated that the power used in lowering might be used for other purposes besides assisting the hoisting. The ore extracted from the Ophir mines was sent by rail to the mills, and as the railroad reached the Ophir at an elevation of about 40 ft. above the works, so that the ore had to be raised about 56 ft. to the bins, whence it was loaded into cars for the mill, a hydraulic elevator was designed by me and built by the Risdon Iron Works to do this work. It had two balanced rams working two balanced cages, which elevated the cars from the level of the shaft neck to the bins. The working of this machine was perfect, and it used but a small part of the water pumped up by the balance rams on the incline hoisting works.

It will be observed that the position of the Ophir works was very favorable to the working of a hydraulic balance. It was a great opportunity, and the results were satisfactory in every way.

Before closing this, the last of this series of articles, I would like to say a few things about two of the men who were an important part of life at the mines. Anything about the Comstock would be incomplete unless it recalled to memory Sam Curtis, the genial superintendent at the Ophir mine. Large in person and generous of habit, he had big ideas of what the equipment of surface work should be for the comfort of those who had to do business in the hot, damp lower drifts of the Comstock. He had splendidly equipped bath and rest rooms; one of his special equipments was a needle bath which discharged a fine spray of alcohol for use after the warm bath to contract the skin so it would fit, for it was surprising how loose the skin got after a couple of hours in the mines. There was also a nip or two of Sam's best Scotch near-by to enable the stomach to do justice to the dinner that he had awaiting the friend.

Then there was Hank Smith, of the Belcher, the handsomest fellow, and the best dressed on the Comstock, very popular and urbane, a delightful man to meet, who always left a memory of good cheer and hospitality freely offered to his friends and business associates. There are but few of them left. Sometimes I meet one of them still holding on to life and hope, still renewing his spirit and the buoyancy of youth at the mention of what we did in the '70s, what manner of men we were, and how our deeds, though done in the dark depths of the mines, were not to be ashamed of. Many people still cling to the hope of another Bonanza at the Comstock, and that hope is not without a good foundation. But the romance, the wildness, the glory of the '70s will not return even with the discovery of rich lodes. The great machines

we built then will be supplanted by the compact devices made available by the process of engineering science. Electric transmission applied to great motor-driven three-stage centrifugal pumps will do with ease what we found so hard to accomplish.

### Pyrite Smelting

By E. D. PETERS\*

In 1893 the condition of the Mt. Lyell company was about as follows: The great body of pyrites in the north-west corner of Tasmania, known as the Mt. Lyell mine, was owned (or was under option, and subsequently was purchased) by the company. After considerable development by the company, during 1891 and 1892, the property was examined by Dr. Peters in 1892-93. His report was favorable, and he recommended treatment of the ore by blast-furnace smelting.

Coke was very expensive at the mine, and Peters, of course, recognized the suitability of this massive ore for pyrite smelting and the great saving that would be effected if the ore could be used as the main fuel supply, but feared to advocate beginning work with this process which, at that time, had failed commercially at the three places at which it had been tried; viz., Toston and Boulder, Mont., and Kokomo, Colo. Peters, therefore, advised the Mt. Lyell company to begin with ordinary stall-roasting and smelting, as most of the ore then in sight would average 4 to 5% copper, with fair amounts of gold and silver, and should yield a good profit in spite of the high cost of coke. He advised the company, after the first metallurgical difficulties had been surmounted and the enterprise had reached a paying basis, to change over one of the coke-burning furnaces to the pyrite process, and, if this should prove successful, to change over the entire plant in the same manner. He also recommended the engagement of an American metallurgist who had had experience in pyrite work.

The company, which was in excellent financial condition, owing to the opportune discovery of an extraordinarily valuable body of secondary ore on the footwall, decided to engage Robert Sticht to erect and manage the smelting works, feeling that his experience at Boulder and Kokomo fitted him peculiarly for the Mt. Lyell problem.

Sticht, in his address, told us that his work in pyrite smelting in the United States was based originally upon ideas gleaned from Balling's "Metallurgische Chemie" and from Holloway's admirable monograph on the bessemerizing smelting of the Rio Tinto ore, and supported by Austin's work at Toston, Mont. The trouble both at Boulder and at Kokomo was that the originators of those enterprises undertook to do pyrite smelting with ores that contained but little pyrite and were extremely siliceous. Whenever a reasonable proportion of good pyrite could be kept on the furnace charge Sticht found no difficulty in running the process pyritically.

\*Professor of metallurgy, Harvard University, Cambridge, Mass.

NOTE—The November meeting of the Boston section of the American Institute of Mining Engineers was of particular interest to many of the members present. The speaker was Robert Sticht, general manager of the Mt. Lyell Mining & Railway Co. August H. Eustis, secretary of the section, persuaded Dr. Peters to write these notes of the meeting, which are based on an abstract from memory of Mr. Sticht's remarks, to which Dr. Peters added a few words of his own to indicate certain important advances in the process of pyrite smelting, which appeared to him to have been the direct outcome of Mr. Sticht's early practice at Mt. Lyell.



As soon, therefore, as he saw the apparently unlimited supply of massive cupriferous pyrite offered by the Mt. Lyell orebody, he determined to omit the inaugural roasting-smelting stage proposed by Peters, and to erect a plant at once for pyrite smelting. His confidence and evident grasp of the situation thus induced the directors of the Mt. Lyell company to adopt his views and to base their metallurgical future upon a comparatively new method that had never yet been commercially successful.

The results almost at once justified this decision. Although having only one experienced assistant, and without any workmen accustomed to the management of copper blast furnaces, the starting of the new plant proceeded with little difficulty, the only serious delay being caused by an insufficiency of slag pots, and the consequent necessity of arranging to granulate the slag by water.

The furnace was run with what was considered at that time a large volume of air and with hot blast, and selected for itself, under these conditions, a slag that had a silicate degree of about 4:3, being thus somewhat more basic than a bisilicate. As the main purpose of the Mt. Lyell smelting operation was to flux the maximum quantity of iron with the minimum amount of (barren) silica, this slag was too siliceous for the most economical work. The ratio of concentration was between 6:1 and 7:1, and the resulting matte contained below 25% copper, thus requiring a second pyritic fusion to make it fit for the converters.

After long and careful study and experimentation, Sticht discarded the hot blast, heightened his ore column, doubled the volume of air, and at once brought his slag to the condition of a monosilicate, containing only about 30% silica. Over 90% of the iron in the charge was scorified at a single operation, the ratio of concentration established itself at about 20:1, and the grade of the matte rose to 40-45% copper. About 1% of coke was used.

This characteristic pyritic smelting was continued unbroken until changing conditions demanded some slight modification of practice. The Mt. Lyell pyrite has dropped to about 0.5% copper, but the grade of the furnace mixture has been kept up to its normal standard of nearly 2.5% copper by substituting the 7% quartzose copper ore of the North Lyell mine for the barren silica formerly used. The low-grade massive pyrite ore of the old Mt. Lyell mine thus plays the rôle of flux and fuel, the profit being derived from the North Lyell ore. Owing to an increase of earthy constituents in the furnace mixture, the coke has been increased to about 3 per cent.

Sticht's work and investigations at Mt. Lyell have, in my opinion, enriched our practical knowledge of pyrite smelting by two important contributions; I might indeed say by three, for it is certainly an important contribution to any doubtful process to demonstrate that it can be used permanently on a large scale with successful commercial results, and I know of no one previous to Sticht who had demonstrated this fact to the satisfaction of miners, metallurgists and owners.

Sticht's two striking contributions, to which I refer, are: (1) That the increased furnace activity produced by an increased volume of air (with corresponding heightening of the ore column), rather than a heated blast, is the essential feature in bringing about the conditions necessary for the production of a more highly ferruginous slag—the slagging of the maximum amount of iron with

the minimum amount of silica being the great desideratum in pyrite smelting.

(2) That *true* pyrite smelting is a bessemerizing operation, presenting but little analogy to roasting; that, in normal running, the process of oxidation, from the oxygen of the blast, occurs in a circumscribed area that extends only a comparatively short distance above the tuyeres; and that, consequently, above this zone the gases contain free oxygen only in negligible quantity.

Doubt having been expressed as to the correctness of Sticht's series of analyses of his furnace gases from the fact that he made use of iron pipes which might have absorbed the free oxygen that was contained in the hot gases, he has had the experiments repeated lately by a skilled observer, and with the use of a water-cooled pipe for the withdrawal of the hot gases from the furnace shaft. The record of these analyses is now before me, and I find that the results agree closely with the original determinations.

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## Manganese in South Carolina

BY CLAUD HAFFER\*

An interesting deposit of manganese occurs at McCormick, S. C., at the old Dorn mine. The Dorn was originally worked as a gold property, and produced some remarkably rich ore; it is stated on good authority that more than a million dollars was taken out. The owner, Dorn, is said to have worked the manganese deposit also, grinding the ore fine and hauling it by wagon to Augusta, Ga., whence it was shipped via the Savannah River.

The veins are in schist and parallel, the manganese vein being about 300 ft. to the southeast of the gold vein. Their trend is northeast-southwest and they dip steeply to the northwest, conforming more or less to the planes of schistosity of the country rock.

The manganese vein is from 8 to 25 ft. in width and has been located for three-fourths of a mile by shallow shafts 20 to 80 ft. in depth, and by numerous pits. Development is said to reveal solid manganese oxide in the center of the vein nearly 4 ft. in width; leaner ore on each side will require crushing and jigging to make a shipping product. In 1911 and 1912, some development was done on the property and four carloads of ore averaging 41% Mn was shipped. Last summer the property was worked by the Eureka Manganese Co., which shipped 18 cars. The work has been carried on in an extremely small way, and all of the old dumps of ore taken out previously were picked and shipped. No work is being done, but the prospect deserves further exploration.

Across the Savannah River, in Georgia, there are outcrops of manganese ore at the Magruder mine. These occur near a deposit of copper, under nearly the same conditions as the McCormick deposit, but as yet they are unexplored.

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## Arizona Eighty-Per Cent. Law

A case to test the constitutionality of the Arizona 80% American-labor law was filed at Tucson in the Federal court on Dec. 15. Michael Riach, a cook, asked for an order restraining his employer from discharging him on the ground of violating the spirit of the Fourteenth Amendment and Section 1979 of the Federal statutes.

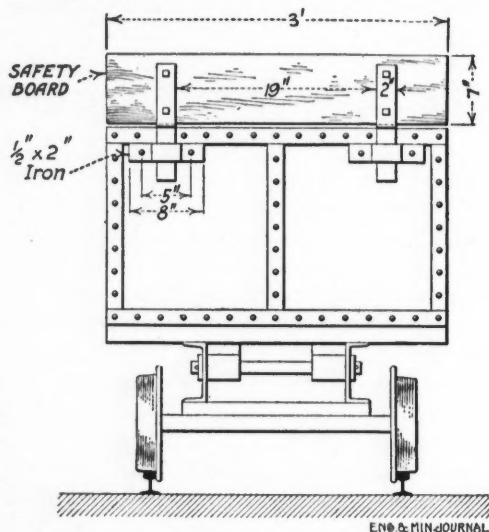
\*Mining engineer, Candor, N. C.

## Details of Practical Mining

### Safety Boards for Tram Cars

By H. H. HODGKINSON\*

In loading cars from chutes, chunks frequently roll off the top of the car, especially when the car is almost full or when there is a sudden rush of muck through the chute. It is at this time that the man loading the cars receives a badly injured foot, or in an effort to protect his feet, he tries to hold the chunks on the car and the result is a badly bruised hand.



LOADING BOARD FOR TRAM CARS

The safety boards shown in the accompanying sketch prevent the chunks from rolling off the cars and injuring the men, and can be easily removed when the car is full.

### Record Tunnel Driving

The Canadian-Pacific is driving a tunnel under the Selkirk Mountains on its through line. The work is being carried on in novel fashion, inasmuch as instead of confining the advance to two headings or obtaining additional working faces by sinking shafts, small pioneer tunnels are being driven on one side of the main-tunnel line, and from these crosscuts are being run over to the tunnel line and thus a number of working points established, says a communication from the Ingersoll-Rand company.

Some fast work is being done on the pioneer tunnels, and during November progress was made on the tunnel from the west which is believed to be the record for a month's work on tunnels of this size in North America. For the 30 days' work, Nov. 1 to 30, inclusive, the advance was 817 ft., while for 31 days' work, Nov. 1 to Dec. 1, inclusive, the advance was 852 ft. The tunnel is  $7\frac{1}{2} \times 10$  ft. in section, and the rock traversed during the month was slate containing quartz stringers. The work was performed with three Leyner machines, mounted on a

9-ft. 6-in. crossbar. The gang consisted of three machine-men, two helpers, eight muckers, one trackman, one pump-man and one walking foreman for two headings. The tunnel is being driven down a 1% grade, and a pump had to be placed in the face before dropping the bar to drill the lifters. The muck is hauled out by mules. The bar was set up above the muck pile in the usual fashion for drilling the top holes, and after these were finished, dropped to drill the lifters.

The average advance per day for the 30 days was 27.84 ft. The best day's work was that of Nov. 27, when 37 ft. was made. The best week's work was Nov. 23 to Nov. 29, when 220 ft. was driven. The fastest round drilled occupied 3 hr. 40 min. on Nov. 28. Four, five and even six rounds per day were shot. At the beginning of the month the portal was in 2285 ft., and at the end of the 31 days, 3137 ft. The work is being done under contract by Foley Bros., Welch & Stewart. The best previous month's record known in America was that made on the Mount Royal tunnel in Montreal by McKenzie, Mann & Co.

### Resoiling Dredged Areas in Victoria

Much attention has been directed in Australia to the resoiling of dredged areas. Of the areas dredged during the last 14 years, 7028 acres, about 200 acres have been classified as agricultural. The land usually dredged is confined to river and creek beds, beaches, low-lying flats, old worked mining ground and other land of poor quality. As a rule, the owners of private land held under mining lease have received satisfactory compensation for same. In the recently issued report for the State of Victoria, the engineer in charge, D. B. Sellars, discusses this matter at some length, as follows:

"The question of preservation from injury of land actually used for mining purposes has not been given force of law by enactment. Resoiling, however, is provided for in covenants of the amended form of lease now in use. Leases issued in the early days of dredge mining did not provide for resoiling. The first lease issued containing any such provision was in January, 1907. Some of the present dredges (five) are still working under those old leases, while 10 others have been thus operating until recently.

"It should be remembered that the introduction of dredging plants as an aid to mining, 14 years ago, was a departure from methods then in use. Comparatively little was known about them and it was a difficult matter to lay down precise regulations and conditions for the proper and satisfactory working of same. For instance, as a result of the type of plant then used, such being provided with an elevator for the stacking of tailings, the dredged ground was left in a most objectionable state, as exemplified by the early workings of the Ovens Valley dredge at Porepunkah, and by the original Maori Queen

\*Mining engineer, Franklin Furnace, N. J.



plant at Freeburgh. Continuous efforts, however, were made by the Departmental officers to get rid of the elevating appliances installed on seven of the pioneer plants, and eventually they were discarded in favor of the sluice box. The last one disappeared in 1904. By the use of a sluice box, the coarse refuse matter is well leveled off instead of being left in high, stony, detached ridges and pinnacles, and thereby a great improvement was effected. In the same year, 1904, further advance was made by the introduction of silt distributors, whereby a large proportion of the fine material from the working face is deposited to a useful depth and spread in an even layer on top of the dredged ground.

"In view of the improvements that had been effected in the working of the bucket dredges, it was decided in 1906, as a matter of policy, that dredging leases over good agricultural ground should not be issued unless the lessees were prepared to replace on their gravel tailings a substantial thickness of the original surface soil. A covenant was therefore inserted in each dredging lease providing for advance stripping and resoiling when the earthy overburden reached a certain thickness. The distances specified to which the advanced stripping must extend, viz., 'to any depth that may be found to 7 ft. below the surface,' is no doubt a reasonable thing in the case of deep rich fertile soils, but it is questionable whether or not the fulfillment of this stipulation is desirable when the earthy overburden comprises only a few inches in depth of sandy loam overlying deep beds of clay and inferior earthy matter. Indeed, it is on record that some of the land holders about Porepunkah strongly object to the putting back of this clayey and inferior material on top of the dredged ground. They much prefer a useful layer of the fine stuff deposited by the silt chutes, on which wattles and other useful forms of vegetation can, and do, grow luxuriantly.

"The most satisfactory and effective way to conduct resoiling operations is by the use of belt conveyors, but for these appliances the pontoons must be specially constructed. A majority of the plants now working, having been built before the resoiling clause came into force, are too small and otherwise unsuitable to sustain the extra weight and working strains of a belt conveyor. Many of them, however, have been working in ground where the depth of earthy overburden was not such as to necessitate, under the resoiling covenant, advance stripping. Some others have been working in areas in which detached patches of earthy overburden exceeding the prescribed depth were occasionally met with. In these places most of the dredges were specially equipped with soil chutes, whereby—provided the depth of earthy matter was not less than about 3 ft., and the water level in the operating pond could be raised up to or above the surface of ground—a good layer of such earthy material as might be found could be deposited and evenly spread over the dredged ground. A difficulty, however, in this connection was due to the varying thickness of the stratum of overburden. In places such thickness fluctuated erratically from a few inches to some feet. This, of course, prejudicially affected the resoiling work by chute, besides giving it a patchy, uneven and unattractive appearance.

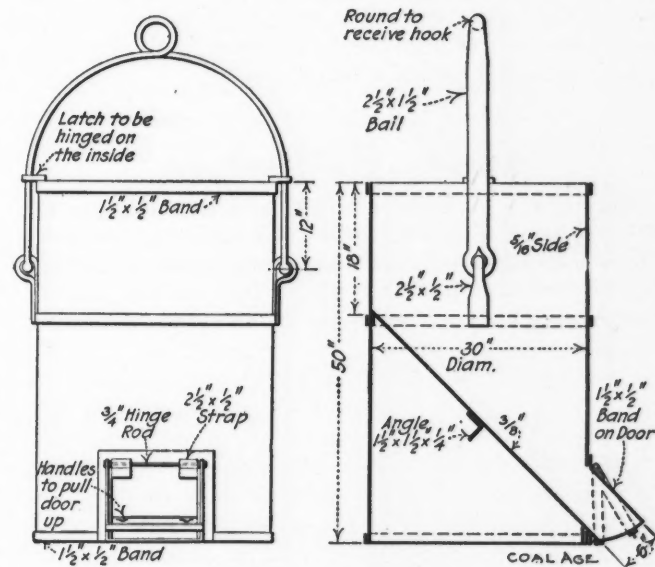
"The Briseis dredges Nos. 1, 2 and 3 have all been built since the resoiling regulations came into force, and in each case advance-stripping has been done. The ground dealt with is a creek bed and low-lying swampy flats ad-

jaacent thereto. Nos. 2 and 3 are the most upto-date bucket dredge-mining plants in the state and probably there is nothing equal to them, for the purpose intended, outside of Victoria. With these plants, the company is advance-stripping and resoiling in conformity with the lease covenant, but much of the replaced overburden has yet to be leveled off. This is now being done; meantime, the material, having been brought up from a depth of several feet below the surface, is undergoing improvement by exposure to atmospheric action. Briseis No. 4 is also an upto-date plant designed to work an area which comprises creek bed and old worked mining ground, consequently it has no resoiling appliance. Possibly there may be some small isolated patches of soiled ground left among the old-time workings, but it was never intended that the resoiling covenant should apply in cases of that kind.

"Since the beginning of 1909, as a further provision to safeguard agricultural interests, the practice has been to refuse mining leases over all ground valued by the dredging inspector at more than £3 per acre."

### Shaft-Concreting Bucket

The Bunsen Coal Co., of Danville, Ill., recently sank two shallow, rectangular shafts and, after completing sinking, lined them from the bottom up with concrete (Coal



SPECIAL BUCKET EMPLOYED FOR LOWERING CONCRETE INTO THE SHAFTS

Age, Nov. 7, 1914). For pouring this the bucket here illustrated was used. The inclined partition reduced its capacity somewhat, but made it much more convenient.

### Repair Jobs with Iron Cement

The following examples of the use of Smooth-On for repair work are given by F. E. Meredith in *Power*.

A West Indies power plant was operated condensing and had a rather antiquated rotative dry-vacuum pump for a spare unit. One day the air piston rod broke at the crosshead, the piston being driven back against the cylinder head. The force of the blow was not sufficient to break the head on the air-cylinder side, but it cracked the water jackets of the head on the out-

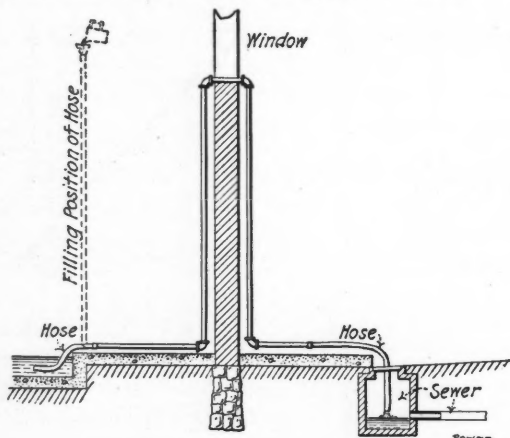
side. The cracks were radial from the center of the head and caused the cooling water to leak considerably. In making the repair, first all the paint was scraped from along the cracks to get the metal clean. Then the water inlet of the head was piped to the vacuum line from another pump and the other outlets covered with pieces of heavy sheet packing. Air was drawn in through the cracks in the head; these were covered with a fairly thin mixture of Smooth-On cement which was quickly drawn into the breaks and sealed the cracks after being allowed to harden. The pump has been operated regularly for three years and the water jacket does not leak.

The same general method was used to stop a leak in an 8-in. steam line, carrying 125 lb. pressure. This leak was around the threads at a flange in a section of the main which could be shut off from the rest of the system, but connected with a 238-hp. boiler.

One day, when the boiler was cold, it was filled with water and then, with all the valves closed, including the sectioning valve on the steam main, the pressure was taken from the leaking part. All the metal around the leak was cleaned as thoroughly as possible and the main valve opened. Next, the blowoff valve was opened wide, causing air to enter through the small leak. This air leakage was then stopped by a thin Smooth-On paste as in the other case. When the steam was turned into this section of the header there was no sign of a leak, and although the job was meant to be temporary only, the place is still steam-tight after a year's service.

### Starting a Siphon

The practice of filling a siphon and then opening the outlet to start it is well known. While effective under proper conditions, it is not always practicable to use this



SIPHON FILLED FROM INLET END

method, says A. P. Connor, in *Power*. The manner of starting here described and illustrated is efficient under most conditions and it permits the pipe line for the siphon to be arranged to best advantage before the siphon action is started.

Place the hose or pipe line in position, with its outlet end a few feet or so below the water level to be acted upon. Raise the inlet end above the highest level of the head to be overcome. The inlet is filled until the water begins to flow from the outlet. As soon as the flow occurs, the inlet end is closed and lowered into the water and reopened;

this last operation will take but little time and it will not break the flow of the siphon.

While a hose is most desirable, it is not essential in all cases. Pipe may be used, it being necessary only to have it swing easily from a vertical to a horizontal position in order to change the inlet end from the filling to the drawing position.

### Large-Scale Sampling

At a recent meeting of the New York section of the Mining & Metallurgical Society of America, Sidney J. Jennings described some unusual sampling expedients found necessary by the U. S. Smelting, Refining & Mining Exploration Co. in its work on the Ebner property, near Juneau, Alaska, which it has under option. His description follows:

The ore was supposed to carry \$2 in gold, from which a profit of 75c. per ton was expected. An error of 25c. per ton in sampling might cut 33 $\frac{1}{3}$ % from our profits. The question was, were we taking specimens or samples? We were cutting channels 6 in. wide by 2 to 3 in. deep, 5 ft. apart in the crosscuts; and while one might suppose that if there were enough crosscuts the law of averages would hold and errors would balance themselves, we found that successive 5-ft. samples would assay from a trace to \$12 or even higher per ton; hence, it seemed unwise to depend on averages, when the total number of samples would necessarily be small.

We therefore took samples over a strip 2 $\frac{1}{2}$  ft. wide along the crosscuts for the full height, getting 30-ton samples for each 12-ft. crosscut. These we ran through a five-stamp mill. At first 30-mesh screens were used, but finally a slotted screen equivalent to 60 mesh. The pulp from the stamp was run into a 12-in. launder and the stream was cut at periodic intervals, taking out 1 $\frac{3}{4}$ % as a sample. This sample was amalgamated, and the tailings from the amalgamating barrel were sampled, which could be done with accuracy to within 4c. per ton.

Yet we were never satisfied that the gold recovered in the amalgamating barrel was the right proportion of that in the original ore. Suppose you took 32 samples of  $\frac{3}{4}$  lb. each from the same ore, crushed to 40 mesh. If you crushed each sample to 100 mesh and split it, the halves would vary by, say, 4c. But if you took another of the original 32 samples, the variance between it and the first might be from \$1.50 upward, showing that even with 40-mesh material individual pieces of gold would go through the quartering process and not be proportionately distributed. Our millman finally put in a Wilfley table to concentrate the original 30 tons. We concentrated out about 1 $\frac{1}{2}$ % of the original, which carried all the free gold, the pyrite, galena, etc. The tailings from this table could be sampled accurately. The concentrates were amalgamated in a barrel, the tailings from which could also be sampled. In order to ascertain the value of the original sample of 30 tons we had the following factors: Net dry weight of ore crushed; weight of concentrates recovered; total amount of gold recovered in the amalgamating barrel; assay of the tailings from the barrel; assay of the tailings from the Wilfley table; total amount of gold remaining in the sand around the dies in the battery. This plan has been working three to four months and we really have secured results that check.

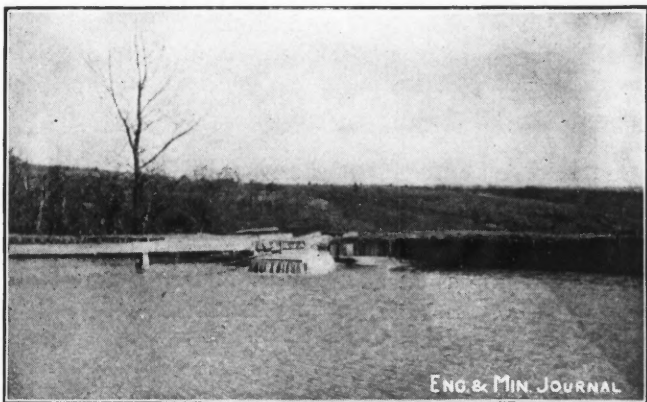


## Details of Milling and Smelting

### Settling-Pond Sludge Box

A simple but efficient device is in use at the settling pond of the North Unity mill, in the Platteville district of Wisconsin. The North Unity mine and mill are owned by the Vinegar Hill Zinc Co., and are situated about  $1\frac{1}{2}$  miles from Day's Siding, in turn about 20 miles from Platteville. The mill uses about 700 gal. of water per min., and because the mine does not supply this amount regularly, it is necessary to return the water for further use. A settling pond is provided for this purpose, into which the water and sludge from the mill ordinarily would flow. This pond is adjacent to the mine and mill and is circular, 80 ft. diameter and 6 ft. deep.

With the water flowing directly into these ponds, experience has shown that the rapid deposition of the sludge soon fills them, necessitating cleaning out every week. This condition was unsatisfactory because the work had to be done on Sunday when the rest of the plant was not operating. The work was hard and dirty, and



SETTLING-POND SLUDGE BOX

it was difficult to get men to do it. In fact the cost of cleaning has run up to \$25 per week.

The sludge box shown in the accompanying illustrations was designed and installed to overcome this frequent cleaning, and has worked successfully. It is believed now that under ordinary circumstances it will be necessary to clean the pond only twice a year. The box is rectangular, 4 ft. wide, 32 ft. long and 9 ft. deep, made of concrete, with walls 12 in. thick. The edges of the box, on the end which projects beyond the pond embankment, are raised somewhat above the edges of the opposite end. The launder leading from the mill discharges into the end outside the embankment. The overflow from the box is at the other end and into the pond. The box readily provides additional settling capacity, the sludge settling in the box instead of in the pond. The latter has sufficient capacity so that no water flows out of the pond during the day. At the end of each shift, the sludge is flushed out of the box and down the creek. The flushing is accomplished through

6-in. pipes set in the concrete ends of the box, near the bottom. The outlets through these pipes are controlled by valves operated by stems extending above the top level of the box.

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### Leaching Experiments on the Ajo Ores\*

The various conditions under which Mr. Croasdale's experiments were run, and the types of ore at Ajo have already been given in previous excerpts from his paper. Some of the sections on the leaching experiments themselves follow.

#### LABORATORY EXPERIMENTS

It should be noted that on a 2 per cent. ore, a variation of 0.01% in the percentage of copper in the tailings makes a difference of 0.5% in the percentage of extraction. This must be kept in mind when comparing the results of these experiments, for several hundredths of 1% may be within the limits of error in sampling and chemical analyses.

They were made on raw oxidized ores only, with acid from 3 to 10%, ore crushed to from 8 to 2 mesh. These experiments showed that circulating the lixiviant increased the extraction of copper without seriously increasing the consumption of acid; that crushing to 8 mesh increased the consumption of acid without materially increasing the extraction of copper; and that increasing the strength of the lixiviant increased the extraction of copper and also the consumption of acid when the lixiviant was circulated through the ore. The fine ore produced in crushing to 8 mesh seriously interfered with the percolation of solutions.

Analyses of the lixiviant from a number of leaching experiments showed that a certain amount of iron passed into solution simultaneously with the copper. This averaged from one-third to one-half of the amount of copper in solution, or from 0.8 to 1.1% of the solution. Sometimes, with high iron and much kaolinized ores, it amounted to more than this. The iron was about equally divided as ferric and ferrous sulphates. Using 10% acid, the lixiviant passing from a charge of leached ore contained from 4 to 6% free acid in addition to the copper, iron, alumina, etc.

This combination of circumstances enabled me to use the partly neutralized lixiviant from a leached charge of ore for the first lixiviant on a new charge of ore and thereby not only neutralize the free acid in the lixiviant and at the same time enrich it in copper, but have a solvent for the cuprite (or metallic copper if formed) in the form of ferric sulphate. Since ferric sulphate was always present and the lixiviant was always circulated, it is scarcely possible that any cuprite could escape solution. As soon as the first lixiviant was neutral, it was

\*Excerpts from a paper by Stuart Croasdale, presented at the Salt Lake meeting of the American Institute of Mining Engineers.

sent to the precipitating vats. If it was left on the ore beyond the neutral point, some of the copper was reprecipitated in the ore. A new 10% acid lixiviant followed the first and finished leaching the ore, which in turn was neutralized on a new charge of ore.

#### EXPERIMENTAL PLANT TESTS

A pipe 10 in. in diameter and 18½ ft. in length was used for an experimental percolation vat. For convenience in testing the various columns of ore, it was made in sections. The lower end of this vat was closed with a plate in which there was a 3-in. opening which served as a discharge gate for the ore and also for pipe connections to measure the flow of solution. This could also be attached to a centrifugal pump for circulating the solutions to the top of the vat if desired and in this way the working conditions of a commercial plant could be produced. Aside from a small screen to protect the valves, no filter was used in the vat. The ore itself corresponded to the gravel filter that was expected to be used in practice.

The height of any ore column in this vat was the same as that used in any commercial plant. The filtering area was 78.54 sq.in., or 0.545 sq.ft., which corresponded to the same section of a full-sized vat. The area of any commercial vat divided by this area and the result multiplied by the number of gallons per minute flowing through a given column of ore would give the approximate amount of solution that would have to be handled by circulating pumps in a large plant.

The ore absorbed 6% of its weight or 14.4 gal. of water per ton. To cover the 4-mesh ore required 27.7% of its weight or 66.5 gal. per ton.

Experiments were run on various heights of column, on charging ore into water and into dry tanks, and with upward and downward percolation.

It was decided that with both 2- and 4-mesh ore that height or ore column has no retarding effect on the rate of percolation, unless the ore is much disintegrated and produces a good deal of lime. If anything, the rate is increased with increased height. Vats can therefore be constructed with any convenient depth, but will probably not be practicable beyond 10 or 15 ft., depending, of course, upon the character of ore and method of rushing. The ore should be charged dry or only moist.

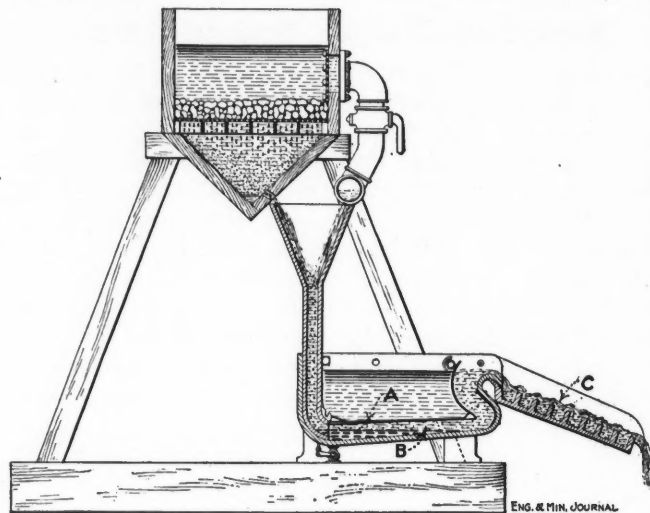
Lixivants can be introduced best from the bottom of the vat or down one side of the vat from the top of the ore. This allows the free escape of air and carbon dioxide gas and permits a rapid saturation of the ore and filling of the vat. After the ore is covered, the percolation of the lixiviant through the ore should be downward. This permits better control of solutions and the washing of the ore with the minimum quantity of water. By keeping the ore covered with solution and having the pumping or circulating capacity a little above the rate of percolation, channels through the ore can be detected and remedied.

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**A Combined Smelting and Sulphur-Recovery Process** has been patented by J. A. and W. R. Heslewood, of Oakland, Calif., the patents being assigned to the Hydro Vacuum Smelting Co. They propose to smelt sulphide ore and to recover sulphur in elemental form. By means of an aspirator, atomized fuel oil and air are to be drawn into a furnace at the focus, and steam is introduced in the shaft with the idea of breaking up the metallic sulphides, H<sub>2</sub>S and SO<sub>2</sub> reacting to produce elemental sulphur. The charges are to be introduced through an air-tight chamber so as to avoid interference with the suction "blast." Settling tanks are suggested for the collection of the reduced sulphur.

## The Thibault Amalgamator

This device is an addition to the already large field of claimants for the honor of most effectively recovering free gold. Its operation is simple, depending upon the pressure developed by slight head to force the pulp stream between a copper plate *A*, amalgamated on the under side,



THE THIBAUT AMALGAMATOR

and a bed of quicksilver *B* in the bottom of the receptacle. A riffle *C* is provided as a precautionary measure to avert loss of quicksilver or amalgam. The device was invented by Eugene E. Thibault, 166B Case St., San Francisco, Calif., and is made and sold by him.

## Briquetting of Iron-Furnace Dust

A process for the agglomeration of flue dust from iron blast furnaces is patented by William Cooper of Denver, Colo. (U. S. pat. 1,103,400.) In his process the flue dust is piled in heaps, and a pipe with a number of small holes in it (like a well point) is driven down into it. A very thin emulsion of cement or milk of lime is then pumped through the pipe until the bottom layer is saturated; the pipe is then raised a little and the process repeated; and so on until the pile in that part is saturated to the top.

The pipe is then driven to the bottom of the pile in another place and the process repeated, and so on until the entire pile has been treated. The mass is then allowed to set, after which it is broken up into chunks for smelting.

## A New Flue-Gas Scrubber

What appears to be a new idea in flue-gas scrubbers is patented by Ernest L. Gagnon of Billings, Mont. (U. S. pat. 1,116,053.) The gas is conveyed through steel pipes which run vertically down into a water bath of constant depth. Co-axial with and below the tube or tubes discharging gas into the scrubber is placed a cone with its vertex up. The device is supposed to spread the gas out, and prevent its coming through in large, unwashed bubbles, as it does in most of this type of scrubbers.



# The Assayer and Chemist

## A Rapid Method for Washing Gold Beads

By WILLIAM SPENCE BLACK\*

The process of hand decantation in the washing of gold beads is always slow, and is at best not a cleanly procedure. To avoid the necessity of handling each individual parting cup, and also to eliminate the possibility of spilling silver nitrate, I suggest the following method, which consists in drawing off the acid and wash water by means of a small suction pump with a connection of flexible rubber tubing ending in a glass tip.

For a suction pump the small laboratory type, known as Richards' suction pump, is suitable. It works on the principle of an ejector, and if not already in the labora-

is so designed that if a gold bead should be drawn up, it will not get beyond the tip. These tips consist of pieces of glass tubing from 6 to 10 in. long, in which have been blown one or two spherical or cylindrical bulbs. If a bead should be drawn up, it will be caught in the bulbs, and after cutting off the suction by releasing the pinch-cock, it may be forced back into its cup by a little pressure on the tubing. With proper manipulation, this is a rare occurrence.

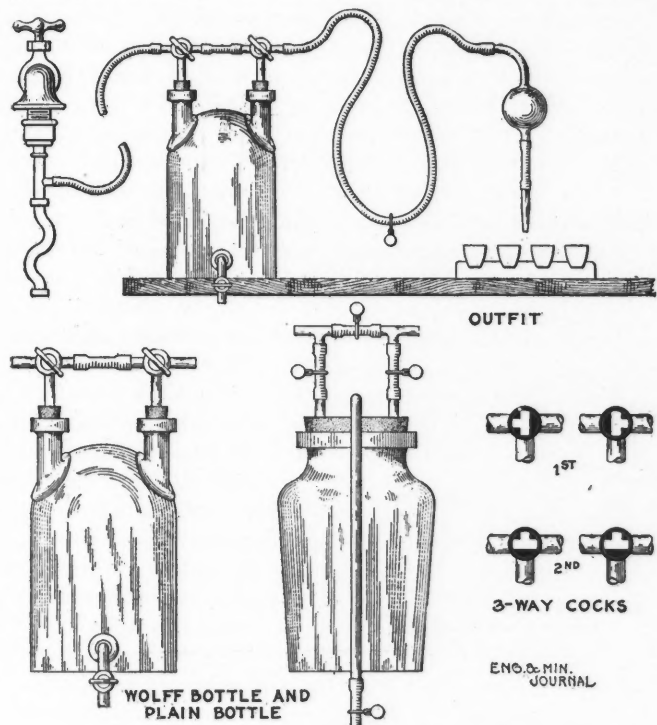
One end of the tip should be drawn to a jet with a smooth opening of about  $\frac{1}{8}$  in. in diameter. At the other end, which is connected to the rubber tubing, a smooth right-angle bend should be made. The purpose of this is to prevent the rubber tubing from kinking, which it is apt to do with a straight connection. A short piece of rubber tubing should be slipped on the tip for a grip, otherwise it will become uncomfortably warm when drawing off hot acid.

The suction bottle serves to save the silver nitrate and also to prevent corroding the pump. The most suitable style of bottle is the Wolff, which has two necks and an outlet at the bottom. If a bottle of this type is not available, an equally satisfactory substitute can be made from any wide-mouthed bottle for which a cork stopper can be obtained.

The connections to the suction bottle are made through two 3-way stop-cocks. The purpose of these stop-cocks is to divert the acid and silver nitrate into the bottle and to bypass the wash water directly to the pump. Connections for both styles of suction bottle are shown in the cut and should require no further explanation. The outlet at the bottom of the Wolff bottle serves to draw off the accumulated silver nitrate without disturbing the other connections. In the plain bottle, this result is secured by a siphon, and when using it the pinch-cock on the tip should be opened to admit air.

In manipulating, the operator turns on the suction and then, having the parting cups in a tray or rack before him, he opens the pinch-cock and allows the suction to start, at the same time bringing the tip just to the level of the acid in the first cup. This will cause a mixture of acid and air to be drawn up. The operator should gradually lower the tip, so that it stays just at the surface until the last of the acid is drawn off. The purpose of keeping the tip at the surface in this way is to prevent any currents being set up which would tend to disturb the bead. It will generally be found that the bead lies well to one side of the bottom of the cup, and as the last of the acid is being drawn off, the cup should be tipped slightly so as to leave the bead on the high side, at the same time applying the tip at the lowest part of the cup, directly opposite the bead. In this way there is little danger of disturbing the bead and it gives a thorough decantation. When all the cups have been treated in this manner, the wash water should be added from an overhead water supply through a piece of rubber tubing, the flow being controlled by a pinch-cock.

The wash water is drawn off in the same way as the acid,



APPARATUS FOR WASHING GOLD BEADS

tory equipment it will be found to be well worth its small cost, both for this work and for assisting in slow filtrations. It may be attached to the water-supply line and works well even under low heads.

In operating, a piece of light rubber tubing about 3 ft. long is attached to a suction bottle and this, in turn, is connected with the pump. Light rubber tubing is more satisfactory than the heavy kind, which is ordinarily used. The tendency of the light rubber tubing to collapse under suction is of little consequence, as only a moderate suction is used; furthermore, the flexibility of the light tubing will be found an asset.

A pinch-cock with a good, stiff spring is attached to the tubing. The tip is made from  $\frac{1}{4}$ -in. glass tubing, and

\*Aurora Consolidated Mines Co., Aurora, Nevada.

except that the three-way stop-cocks are set so as to bypass the water directly to the pump and not into the suction bottle. Two applications of wash water will be found ample in most cases, as the decantations are thorough.

Care should be taken as to the strength of the dilute parting acid, for if too strong acid is used, the gold will break up and cause difficulty in decanting. A parting acid made from one part concentrated nitric acid and six, or even better, seven parts distilled water, will give satisfactory results.

When the assayer has obtained a little experience in the manipulation of this device, he will be astonished to find how rapidly and how cleanly he can cover this stage of fire-assay determinations. As each individual parting does not have to be handled, and as the decantations are made successively, and likewise the additions of wash water, the general efficiency is apparent.

### Substitute for the Blast Lamp

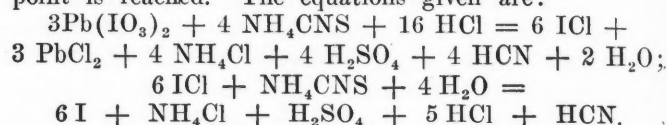
A substitute for the blast lamp, suggested by Paul J. Fox (*Journ. Ind. Eng. Chem.*, November, 1914), consists of an ordinary assayer's crucible of convenient dimensions, of which the bottom has been ground or sawed off, forming a jacket of truncated conical shape, open at both ends. Thus prepared, the jacket is placed over the crucible or dish to be ignited, with the larger end down. The top is partly closed by a porcelain crucible cover which can be easily adjusted to secure the maximum amount of heat without unduly impeding the draft. Using a Tirrill burner of ordinary laboratory size, it is possible to convert even large amounts of calcium carbonate to the oxide. The crucibles in which the ignitions take place should be covered, but with the lid partly placed to one side to leave a small opening. Besides doing away with the necessity of compressed air, this method of ignition also avoids the strong air current of a blast lamp by which small amounts of light precipitates may be lost. A platinum crucible, also, appears to be less attacked than when a blast lamp is used.

A convenient size of assayer's crucible is the Denver Fire Clay No. 9, which measures 3 in. in diameter and 5½ in. high. If a clay ring piece of the same diameter as the assayer's crucible is available, it may be advantageously used as a rest for the triangle that carries the platinum or porcelain crucible containing the sample. This has the effect of extending the jacket below the triangle.

### Volumetric Method for Lead in Ores

A new volumetric method for lead in ores is given by Alder and Coolbaugh (*Journ. Ind. Eng. Chem.*, p. 398, 1914; abstr. *Journ. Soc. Chem. Ind.*). From 0.5 to 1 gram of ore is treated with nitric acid and, if necessary, with hydrochloric acid, and evaporated with a few cubic centimeters of concentrated sulphuric acid. The residue is treated with 100 c.c. of water, boiled vigorously, 10 to 15 c.c. of alcohol added, and the lead sulphate filtered off, washed with a mixture of 1% sulphuric acid and 10% alcohol and then with alcohol, and dissolved in 10 to 15 c.c. of a hot 10% solution of sodium hydroxide, the filter being washed successively with hot water, hot water acidulated with nitric acid, and water containing a little sodium hydroxide. The solution is treated with a few drops of phenolphthalein and a slight excess of potassium

iodate, heated, and a slight excess (15 to 29 drops) of nitric acid of sp.gr. 1.2 added. The whole is heated to boiling, cooled slightly, treated with 15 to 20 c.c. of alcohol, cooled, filtered, and the filter washed with dilute alcohol (1:3) until the wash water gives no test for iodate when treated with hydrochloric acid, ammonium thiocyanate, and chloroform. The filter and precipitate are transferred to a flask, treated with 40 to 50 c.c. of dilute hydrochloric acid (1:1.5) and 3 to 5 c.c. of chloroform, and titrated with ammonium-thiocyanate solution (2.5 grams per liter), until the chloroform is colored violet. With ores rich in lead, 10 to 15 c.c. of hydrochloric acid of sp.gr. 1.1 should be added before the end point is reached. The equations given are:



### The Pearce Assay for Tin

The Pearce assay for tin consists essentially of a fusion with sodium peroxide in an iron or nickel crucible; solution of the melt in water; acidulation with HCl; reduction by nickel; and titration with standard iodine. E. A. Wraight and P. Litherland Teed offer some interesting observations on manipulation, interferences, etc., in this method (*Bull. I. M. M.* No. 113).

The ore must be at least 100 mesh. Nickel crucibles are superior to iron, as the reduction period is shortened. With tailings, iron should not be used, as the large amount of iron in solution, as compared with the tin, will give high results. There should be about 125 c.c. of HCl present, and the bulk of the solution before reduction should be about 400 c.c.

The temperature of the solution at titration should not be over 70° F., and the standard solution should not contain over 11 grams of iodine and 20 grams of potassium iodide per liter, nor less than one-third this amount. The calcite put in the flask to secure a neutral atmosphere should entirely dissolve before titration.

If titanium is present, the ore should be given a preliminary fusion with four or five grams of potassium bisulphate, the melt dissolved by heating with about 60 c.c. water and 7 or 8 c.c. of sulphuric acid, and the insoluble residue fused with sodium peroxide as usual.

Tungsten can be removed by filtering off the blue precipitate after reduction, washing the residue thoroughly, then reduce the solution again, to overcome atmospheric oxidation during filtering and washing, and titrate as usual. Bismuth is eliminated in the same manner, being reduced to metal during reduction. Copper in quantity may interfere. It can be washed out by a preliminary treatment with nitric acid. Iron in quantity will interfere, therefore nickel crucibles are preferable to iron, and nickel should always be used for reduction.

In the discussion (*Bull. I. M. M.* No. 116), it was pointed out that the cost of nickel crucibles per assay amounts to about 15c., nevertheless the authors hold the opinion that it is preferable to use the nickel for all operations, and essential when dealing with low-grade material, such as tailings. In *Bull. I. M. M.* 119, Arthur Jarman recommends a sodium-hydrate fusion in an iron crucible as being equal to the peroxide fusion. The hydrate is melted and the tin ore added to it.



## The New Home of the Engineering and Mining Journal

The accompanying pictures show the Hill Building, at the corner of 36th Street and 10th Avenue, New York, which is the new home of THE ENGINEERING AND MINING JOURNAL and its four sister engineering journals. This building has been erected by the Hill Publishing Co., owning these publications, and was especially designed for their purposes. The ground area is 100x175 ft. There are 12 stories, each one 14 ft. in the clear, an unusually great height. The 12th story, where are the offices, is of double height, having a gallery along two sides. About 3900 tons of steel were used in this building, the steel framing being heavier than in any other building of its height in New York City. The permissible floor load is 300 lb. per sq.ft. The side walls are largely of glass, being approximately 70% of the total wall surface; otherwise the exterior of the building is covered with white tiling. The steel columns of the framework are protected by cement poured in from the top, 31,000 bbl. of cement being used.

The ventilation of the building is artificial. In the basement there are three blowers capable of delivering 47,000 cu. ft. of air per min. each. These draw the air through three air-washing machines, which remove the dust and give the proper degree of moisture to the air before it is forced through the building. On the roof there are two exhaust fans, each with a capacity of 67,000 cu.ft. of air per min. There are a number of small auxiliary fans. In summer the air can be cooled, and in winter it is heated somewhat before being forced to the floors, but the main heating of the building is done by means of a hot-water circulating system.

The supply of drinking water for the building is drawn from the city mains through large filters. It is cooled in a refrigerating plant having a capacity equivalent to three to five tons of ice per 24 hours. The filtered

and cooled water is distributed to sanitary fountains.

The power plant comprises three 250-kw. direct-current generators. The coal for the steam boilers is delivered to hopper bins, whence it is taken mechanically to the automatic stokers that fire the boilers. The ashes also are removed mechanically. Mechanical conveyances are to be found throughout the building for other purposes wherever necessary. Thus, between the offices and the composing room, which is on the eleventh floor, there is a pneumatic-carrier system. From the bindery, on the

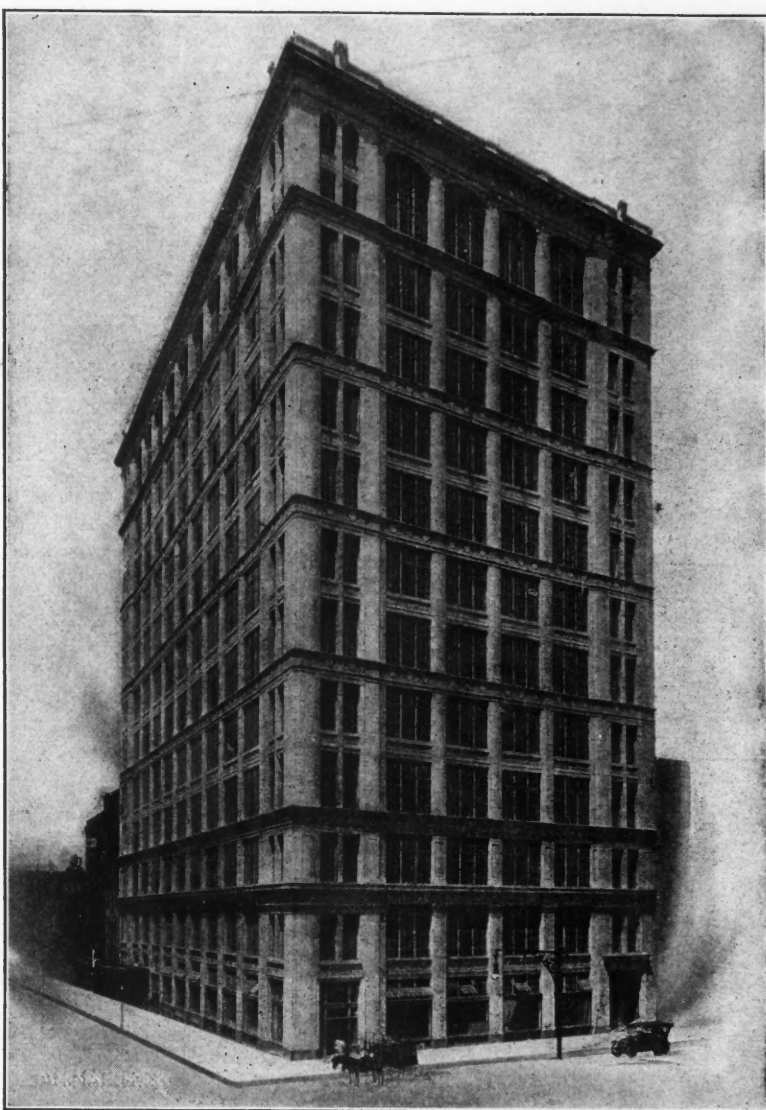
10th floor, the mail bags going to the post office are dispatched to the truck on the ground floor via a spiral chute. This chute might also serve as an auxiliary fire escape in case of emergency, although the need for it is hardly conceivable.

Probably no other building was ever so thoroughly safeguarded against fire. The building itself is chiefly of steel and cement. The furniture and fittings are of steel. The building is equipped with a sprinkling system throughout. There are two main stairways at opposite corners of the building. Each of these is isolated in an independent shaft, communication with the several floors being through doors that are closed when not actually in use. Besides these provisions there is an adequate fire-alarm system.

The lighting of the editorial rooms and general offices is done by the indirect system.

The floors are covered with interlocking rubber tiling, which is both noiseless and durable. A noiseless typewriter also is used. With these aids toward the abolition of noise, the sounds in this large office, which is occupied by 225 persons, are scarcely more than those of a reading room in a public library.

The composing room and electrotyping department are on the 11th floor. The printing and binding department are on the 10th floor. All of these departments are equipped with the most up-to-date machinery and methods, and are supposed to exemplify the last word in printing-house-construction equipment. There are seven linotype composing machines and three monotypes. The press-



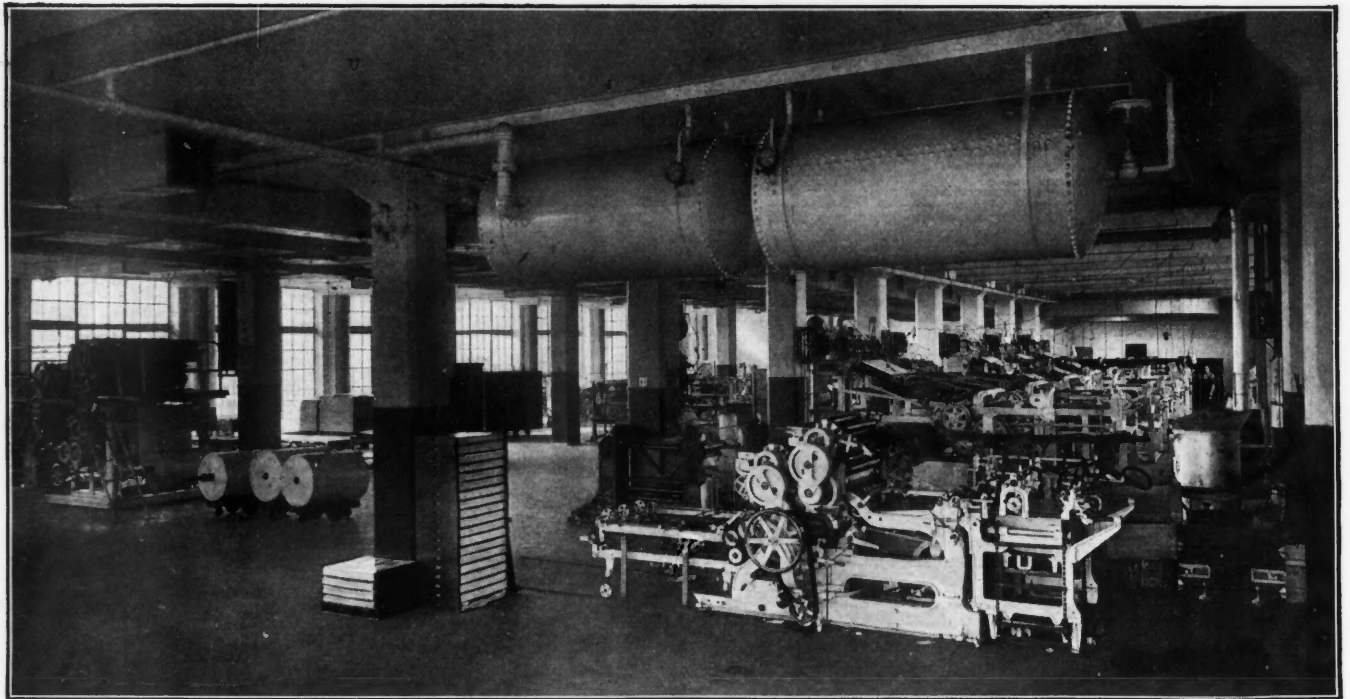
THE NEW HOME OF THE ENGINEERING AND MINING JOURNAL

room contains nine presses for the regular runs on the several papers. The regular weekly editions of the *JOURNAL*, *Engineering News*, *American Machinist*, *Power* and *Coal Age* amount to 100,000 copies and the output of printed

for the Hill Publishing Co. The supply of paper is obtained from the ground floor. With its power plant in the basement and a restaurant for employees on the roof, this printing building is about as thoroughly equipped



GENERAL VIEW OF OFFICE, SHOWING STEEL FURNITURE, MEZZANINE FLOOR AND INDIRECT LIGHTING



PRESSROOM AND BINDERY FLOOR, SHOWING WEB, TWO-COLOR AND ROTARY PRESSES

paper weighs 41 tons. The handling of this from the time the white paper is received in rolls to the time when the printed papers, wrapped, addressed and sorted into mail bags, are taken by automobile truck to the general post-office is as thoroughly mechanical as can be.

The floors of the Hill Building that are not occupied by the company are rented to concerns in similar or allied lines of work. Thus the floor immediately under the pressroom is occupied by the engraver who does the work

as anything of the kind can be. The design and construction throughout reflect the mature experience of John A. Hill, the president of the company.

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**The Number of Byproduct Coke Ovens** in the United States at the close of 1913 was 5688, according to the U. S. Geological Survey; in addition there were 504 new ovens under construction. The coke made in byproduct ovens in 1913 was 12,714,700 short tons, or 27.5% of the total production of coke. The total value of byproducts from coke ovens was \$16,925,941; the figures including gas not used or consumed in the coking process.



## Copper Creek District of Arizona

BY CLAUD HAFFER\*

The Copper Creek district lies west of Prescott, in the St. Cloud mountains, in Yavapai County, Arizona. It is about 27 miles west of Hillside, and along Copper Creek, which is the main drainage channel of the district. In general the country is granite, and it is this mineralized granite, or porphyry as it is locally called, that is the source of the copper ore that has been exploited by the Arizona-Nevada Copper Co. and others who own claims in that section. The granite exposures in the district vary from normal, coarse granite, through the finer grained, altered granite porphyry, to rock resembling altered rhyolite.

Surrounding the granite on nearly all sides are more basic rocks, such as diorites and schists. North of Copper Creek the granite is capped with basalt, forming high, flat mesas, while to the south, basalt is not present, as the country is much rougher and deeply scored by numerous streams.

The property of the Arizona-Nevada Copper Co. lies along Copper Creek and comprises some 3000 acres. Of these, about 10 acres have been prospected with hand drills, and much ore has been disclosed by adits driven



COPPER CREEK CAMP, ARIZ.

into the hillside. There are said to be several million tons of commercial ore developed, and it is estimated that there are about 200 acres of ground on which the prospect for finding ore as good as that already developed is favorable.

The great bulk of the ore is simply the porphyry that has been impregnated with solutions of copper, and which is now found as the mineral chalcocite. It is said to lie in a comparatively horizontal series of lenses and also planes of ore-bearing zones that dip at small angles. The country is traversed by a series of faults, some being east and west and others north and south. The most profound faults are the east and west ones, and one in particular passes through the best portion of the property. The ore beds are from 100 to 150 ft. in thickness, and there is a barren capping varying in thickness with the topography from 100 to 300 ft.

There is much pyrite in the oxidized surface rock, from which it is inferred that the concentration of the copper was done by nearly neutral solutions which attacked the copper more readily than the iron. In some of the tunnels there are small veins and quartz stringers containing softer minerals with molybdenite as an accessory, and in

\*Mining engineer, Candor, N. C.

some of the fissures native copper occurs. In the conglomerate bodies copper occurs in the cement.

Of the holdings of the Arizona-Nevada Copper Co., about 1300 acres are patented, and when the patent was applied for in 1911 it was the largest in the history of Arizona. The company also owns dam and mill sites on Burro Creek, into which Copper Creek empties. The railroad connection with smelting and refining works, and the market, will be at Yucca or Seligman, on the main line of the Santa Fé.

The camp has an elevation of 3200 ft. Several other properties are near it, of which the Mammoth, to the west, and in similar country, is developed by tunnels and shafts. The development shows the formation to be impregnated with chalcocite.

At the King mine on Alum Creek the shaft, 350 ft. deep, was full of water. An opencut revealed a mineralized zone 15 ft. or more in width, containing blende and calamine, iron pyrite and copper carbonate. Alum Creek is so named on account of the stringency of its waters. About eight miles to the north, in the Hillside mine, there have been developed some interesting veins, the valuable contents of which are gold, silver, lead and zinc. T. A. Rickard in Vol. XXVI, *Trans. A. I. M. E.*, says: "The lode occupies a strong fissure cutting almost vertically through the horizontal layers of a quartz schist." This schist appears to be siliceous and sericitic such as is common in Arizona and the Southern states, and was until a few years ago called talcose schist.

## Shannon Copper Co.

Report of the Shannon Copper Co. for the third quarter of 1914 shows that 60,713 tons of ore were treated, 49,254 tons being Shannon ore and the rest from the company's outside properties. From it 2,964,764 lb. of copper, 412 oz. of gold and 18,449 oz. of silver were produced. Average cost of copper was 11.396c. per lb. August and September production, 1,996,500 lb., was stored, there being no open market.

Net smelting profit for the quarter was \$25,536, based on 13.223c. received for copper sold and 11.5c. for copper stored. Railway earnings were \$1026. A large part of the stored copper was sold after the end of the quarter at an average of 12.242c., increasing the earnings about \$13,000. Operations were suspended in September. Financial statement shows the company to be in excellent condition.

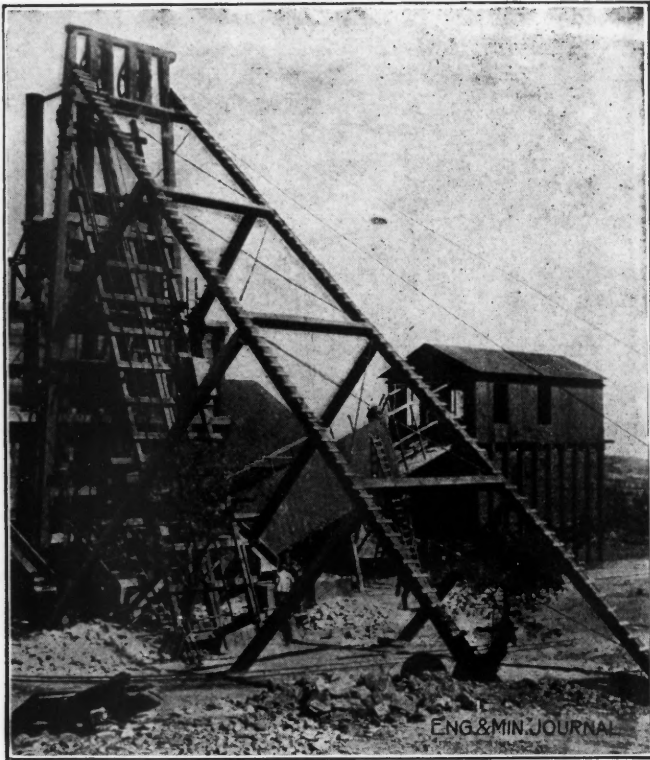
## Mineral Output of Prussia in 1913

The output of mineral products in Prussia during 1913 and 1912 is officially reported as below, in metric tons. Statistics of labor relate to 1913 only.

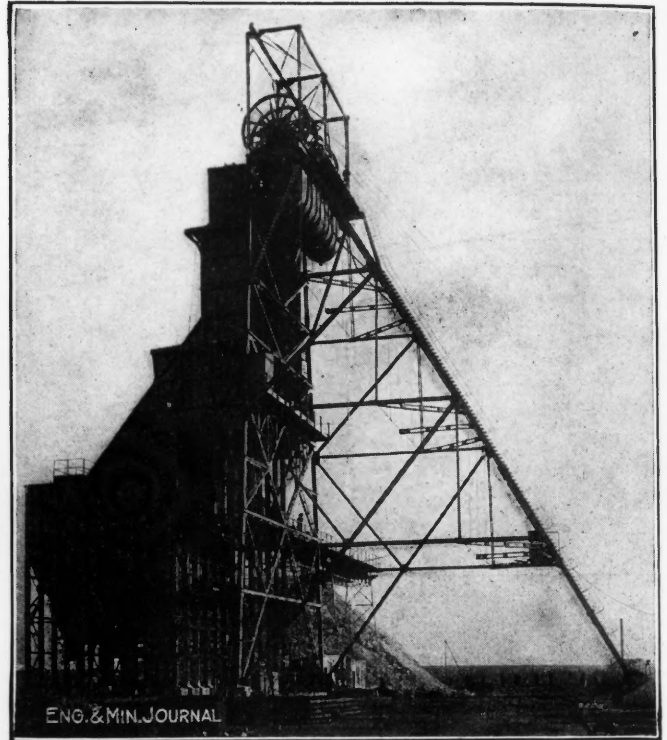
	1912	1913	Workmen 1913
Bituminous coal .....	165,302,784	179,861,015	639,094
Lignite .....	65,803,959	70,051,871	59,866
Asphalt .....	21,241	17,795	44
Petroleum .....	87,443	71,178	1,004
Ores of:			
Iron .....	5,331,240	5,461,670	21,773
Zinc .....	647,081	649,695	13,920
Lead .....	140,158	143,799	7,608
Copper .....	967,785	941,402	14,290
Nickel .....	12,091	13,538	196
Manganese .....	92,474	(b)	...
Arsenic .....	4,870	5,008	229
Pyrites .....	233,397	228,405	749
Salt (a) .....	8,071,114	8,610,541	26,023

(a) Rock salt, carnallite, kainit, sylvanite, etc.  
(b) Included in "Iron Ore."

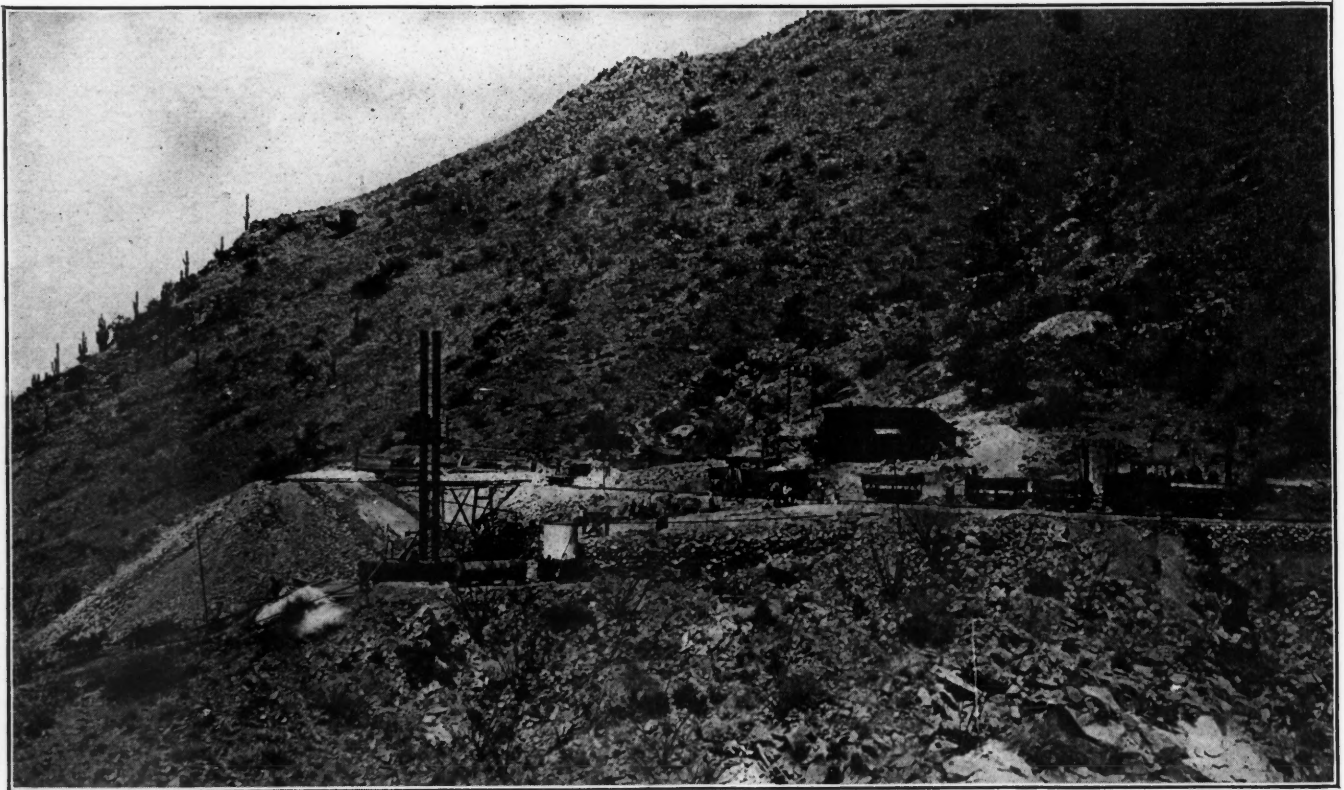
## Photographs from the Field



**CALUMET-SONORA HEADFRAME, CANANEA, MEX.**  
Noteworthy because of long timbers used. It was erected in one night by Mexican labor.

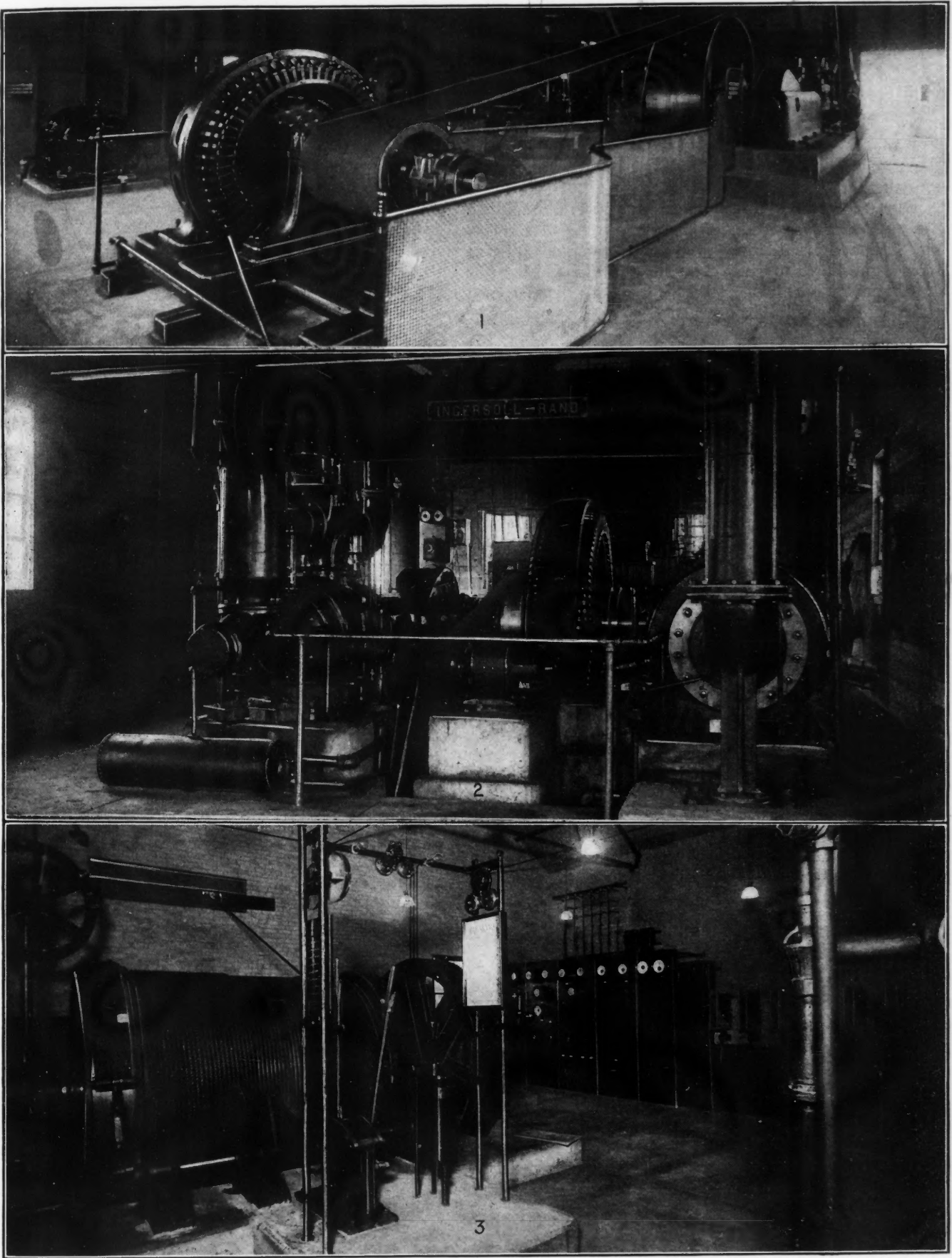


**THE CINDERELLA HEADFRAME, ON THE RAND**  
Steel construction over 4440-ft. shaft, which cuts a vein averaging 9 dwt. over 42 in.



**DEVELOPMENT EQUIPMENT AT COPPER CREEK, ARIZ.**  
Preliminary operations at what is expected to be a large copper mine. The locomotive had to be hauled in by team.





TYPES OF ELECTRICALLY DRIVEN MACHINERY IN THE IRON RIVER DISTRICT

1. Compressor, hoist and motor-generator at Florence mine, Florence, Wis. 2. Compressor at the Wickwire mine, Iron River, Mich. 3. Hoist at Bengal mine, Stambaugh, Mich. Power for the operation of these plants is furnished by the Peninsular Power Co.'s plant at Twin Falls, Mich., which also furnishes current to many other of the companies of the iron-mining district.

## Correspondence and Discussion

### The "Joiner"

Misther Editor:

'Tis a foine thing to be a mimber av an organizayshun. It gives a felly a feelin' av importance and a sinse av his obligayshuns to his profissional brithren. Whin I was a kid I used to carry drills in wan av the big copper mines up in Michigan. There was a felly there named Tim Dillon, stopin' on a contract an' savin' out money enough to get an edicayshun.

About tin years later I was down in Arizony, bossin' a gang av Mexicans that were condescendin' to shovel concentrates whin they wasn't too busy rollin' corn-husk cigareets or discussin' the chances av the re-iliecton av Porfirio Diaz in the land av their fore-mothers. Along comes a foine-lookin' felly dressed in brand-new khaki clothes, wearin' gold-rimmed glasses an' a nice pointed beard like wan av these here osteopath docthors.

"Hello, Bill," sez he. "Hello, Bill, yerself," I raysponds, "are ye an Elk?" "Sure thing," he grins, "but aren't ye raymimberin' me?"

"How much is it I owe ye," sez I, thinkin' he might be the felly that fixed me up the time av me last celebrayshun down in Tucson.

"Ye owe me nothin' but the pleasure av yer company at dinner tonight, to talk over owld times." And with that he hands me his card:

Cable Address	All codes.
"Dilmont, Newyork"	Phone Hanover 4711
T. MONTMORENCY DILLON	
Consulting Civil and Mining Engineer	
Member A. I. M. E., A. C. S.,	
A. S. C. E., A. A. A. S.,	23 Broad St.
Can. Min. Inst., etc.	New York City

Well, if it wasn't me owld frind Tim, av the Osceola. Whin he finished his corryspandince coorse he got a job as surveyor's helper an' j'ined a minin'-engineers' society as associate. Wan av the full members he met at the Lake Superior meetin' tuk a fancy to the boy an' hired him to be his sampler. Tim kept on j'inin' more societies an' makin' more friends an' more money.

Whin we got to the p'int av drinkin' the little tay-cups av coffee an' smokin' the big 50-cint seegars that Tim insisted on havin', he confided to me that he was now rich an' indipident; the secret av his rise bein' the joodishus workin' av the privileges afforded him by the twinty-siven societies he had managed to j'ine.

Durin' the time I spint on the hard rock work in the subways av New York, I tried several times to find Tim in his foine office. The first time, the little stinnygrafter says, "it's too bad, but he's out in Dinver at the annual meetin' av the American Minin' Congress." Next time he was on his way to Japan on a pleasure jaunt with the American Institute av Minin' Engineers.

Another time he was an hon'ry mimber av a commission av Civil Engineers to go and take a luk at the Pannyma Canal and swap opinions about how much sooner the ships might be runnin' through if the individool mimbers av the commission had only been consulted in time.

Wan day I asks the sweet little lady whin wud be a good time to find Tim. She studies a little red book and then says, "he'll have to be in the city next month, on account av the coort calendar; his case for the collection av the fees for his last profissional work comin' up after two years' delay."

Well, to make a long story short, I have a contract for extindin' some av the subways over in Brooklyn; an' this mornin' whin I tuk a luk at the long line av applycants for jobs, to me surprise there was me owld frind Tim Dillon. I called him into me private shack, and whin we were all alone I sez to him, "Well, Mr. T. Montmorency Dillon, an' is it investigatin' fer graft ividence ye're up to now?"

"Fer God's sake, Bill," sez he, "don't joke with me, for I'm up against it hard. 'Tis plain honest work I'm lookin' for, with a payday ivery Saturday."

"An' cud yer societies give ye nothin' rayspictable for a gintleman to do," sez I, lightin' me favorite pipe an' motionin' him to me only chair.

"Societies—hell, Bill," sez Tim, "I overplayed me hand on that game. Whin the money was comin' it was foine and grand, an' I attinded all the meetin's, convintions, congresses an' the pleasure trips, broadenin' me mind an' extendin' me social acquaintance. But the Mexican revolutions cut off the best part av me income an' I cud not pay the dues for all av thim societies, much less pay railroad fare to the meetin's. For the last three years I've been droppin' out av wan after the other, for I cud not honestly feel that there was still anny particular merit or profit in the mimbership."

"But," sez I, reachin' for another match, "ye're still a mimber av the first wan, are ye not? 'Twas that wan that put ye on yer feet an' showed ye the way to success."

"No, Bill," sez he, bitin' the ind off av wan av me Porto Rico big-smokes, "that was the first wan I dropped. I've paid dues to that wan for so manny years that I began to grudge them the money. But 'tis no use to talk av that now. The sheriff closed me out last week, and now I'm ready to get me hands on a drill again."

Tim starts work tomorry, but I'm goin' to stake him to re-iliecton in wan av his societies, provided he'll choose the wan where he belongs. An' I think I'll j'ine it meself, if I'm iligible. But wan will be a plenty.

BILL MCGINTY.

New York, Dec. 8, 1914.

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### Finding Fault with the "Faultless Faultfinder"

In the JOURNAL of Nov. 14, Messrs. Weeks and Huntington accuse me of having unjustly designated as unreliable certain charts prepared by them.

The truth is that at the time of studying their paper I did not deem it necessary to check, personally, the readings which they offered as correct solutions obtained from their own charts. Quite naturally, I assumed that



the authors would be extremely anxious to advertise the faultlessness of their charts by showing that they permitted of correct and faultless readings rather than to demonstrate the reverse. Thus I felt justified in taking it for granted that these readings coming from the authors themselves were the best the charts permitted. Being, however, anything but faultless and differing in one instance by  $2\frac{1}{2}^\circ$  in angle and by as much as 100 ft. in distance from a correct solution, I felt quite safe in pronouncing the charts unreliable.

The authors now explain that they gave these faulty readings to simplify exposition, but that the charts themselves were correct. Without having recourse to the reproductions published in the Aug. 15 number of the JOURNAL, I am quite willing to accept the authors' explanation and wish to apologize to them for any rash statement made by me regarding the accuracy of their charts, a statement which obviously resulted from my total failure to grasp their conception of simplified exposition.

THEODORE SIMONS.

Butte, Mont., Nov. 24, 1914.

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### Electric Smelting for Southeastern Alaska

It may be of interest to the mining fraternity to know that the Ketchikan mining district of Southeastern Alaska affords an excellent field for the installation of an electric smelting plant. Such a plant should be primarily for the purpose of smelting the copper-bearing magnetites of this district. By this means a large tonnage of iron ore could be profitably converted into electric steel instead of being thrown over the slag dumps as waste. Abundant hydro-electric power and suitable charcoal may be obtained at a comparatively low figure, and the smelting of copper concentrates and other ore should also be found practicable by this means. By utilizing instead of wasting the magnetite ores of this district a material factor would be introduced, making for the reduction of iron and steel prices on the Pacific Coast.

An effort will be made to have such a plant installed and operated by the Government under the Bureau of Mines. Inasmuch as this will make for the popularization rather than the monopolization of the mining industry, it is to be hoped that the plan will have the approval of the mining press and profession generally.

Under the circumstances existing in this district an electric smelting plant operated under the direction of the Bureau of Mines should yield the Government a substantial revenue, to which it is entitled as a return for the sums expended in geological and topographical work. It would also stimulate and assist mining and development to a greater extent than has so far been done by the Geological Survey, and would, therefore, bring greater returns on the money invested.

A plant of this kind with its accompanying laboratory would have the advantage of immediate contact with actual conditions in a developing mining district, so that new processes and discoveries and the utilization of natural resources could be developed under real conditions and be made of practical use and benefit to the industry, as well as a source of direct revenue to the Government.

The nearest smelting works on the American side are

over 600 miles distant so that it cannot be said that the field is now occupied by any American enterprise.

As further justification for a Government smelting plant I can say from ten years' mining experience in this district that since the smelting of Alaska ores is either done or controlled by but one company, its policy is now to ruin the independent producer, eliminate him from the business, and at leisure secure his property for a trifle. During the last three years I have satisfied myself by repeated appeals to smelting officials for justice and honest returns that all such efforts are a mere waste of time and energy. The fullest advantage has been taken of the wreck of the copper market to bleed the independent producer to death.

U. S. RUSH.

Rush & Brown Mine, Kasaan, Prince of Wales Island, Alaska, Nov. 27, 1914.

[The manner in which the Government runs the post-office, the greatest single piece of business in the United States, and a monopoly at that, is a soul-satisfying exhibition of bureaucratic, or governmental, mismanagement. We do not want to have Washington run the railways of the country, or the telegraphs, or the smelting works. However, those experiments may, perhaps, be tried. For the smelting experiment Alaska would be as good a place as any other, but as to electric copper-smelting we must remark that at present it is an unknown art.—EDITOR.]

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### Utilization of Tin Scrap

A subscriber inquires: I would like to know if there is a process, and will it pay, to remelt tin scrap such as buckets, cans, and similar material in large quantities just for the solder and tin? Is there enough of the metal to justify the expense of an outlay? Where can a market for the products be found?

[We do not know of any working on a large scale of a process of desoldering and detinning by melting. This used to be done by Chinamen, and is yet, around mining camps and some Western city dumps, but their scale of living permits them to do what is not feasible for Americans.

However, the business is growing increasingly precarious, even for the Chinamen, because of the much smaller quantities of tin and solder on the modern machine-made can, as compared with the can of even 15 years ago. Old buckets give no returns whatever, the tin does not melt off, it merely oxidizes. The ordinary can for food carries a little over 2% of tin, as this minimum is fixed by some governments as the lowest permissible. A recent test on some gasoline cans gave only 0.27% Sn. This is exclusive of that in the soldered joints.

Bright tin scrap from a can or bucket factory can be profitably used in the East for electrolytic detinning. This is done by the Goldschmidt Detinning Co., Chrome, N. J., and the Vulcan Detinning Co., of Sewaren, N. J., and Streater, Ill.

We think that neither in this country nor Germany has detinning of dirty scrap, "swill cans," etc., been successful. Certainly the only present buyers of dirty scrap in the East are the sash-weight makers. The tin in the melted pig makes it cold-short and it can only be used in sash-weights, bed-plates, and other castings where weight and little strength are required.—EDITOR.]

## Editorials

### Some War Notes

The progress of the war has caused some revision of ideas respecting the effects upon the world's finances. In spite of the enormous expenditures, we are seeing easy money in all the great financial centers. Apparently too much attention has heretofore been fixed upon expenditures expressed in terms of gold, and not enough upon the expenditures in the form of material, which, of course, are the real expenditures. Thus, the stock of gold held by the Imperial Bank of Germany has been increasing, but, of course, the wealth of Germany has not been increasing at all; quite the contrary.

It is held by some economists that the hypothesis that the result of the war will be determined by the side whose financial resources last longest is a fallacy. It is pointed out that Germany is practically independent of any such consideration, and that in her case the determinative factors will be the loss of life. In other words, Germany is practically a completely integrated entity, supplying within her own borders about all the things she needs. In her case, therefore, it is a question of how many men she can keep in the field and what proportion of her population she must retain engaged in production at home, in order to keep things going. With England, France and Russia, the situation is different, for the reason that they do not, themselves, supply so large a proportion of the things they need, either because of deficiency in their natural resources, or the less perfect organization of their industry and domestic affairs as compared with the German organization.

If this hypothesis be correct, a nation like Germany ought to be able to carry on war for a very long time if it can obtain enough prisoners from the enemy to make good the loss of life in the field and put them at work producing; but, of course, the conditions could hardly be permitted to arise where all the Germans would be in the field and all of the men at home would be Russians, French, Britishers, etc. Obviously, also, this plan assumes that there will be no friction among the people of Germany over the division of wealth and that everybody will be satisfied with paper money in exchange for their goods, which is hardly to be expected to continue to be the case.

We have several times referred to the use of captives in the practice of modern warfare. But little has been told of how the Germans are handling theirs, but it may be imagined that some of them have been converted into hewers of wood and tillers of the soil. An interesting report comes from Russia, where large numbers of Germans and Austrians, especially the latter, are held. The problem of caring for these is said to be becoming acute, and as the number increases the government will welcome any plan which will enable them to be self-supporting. A large number have been sent to Semipalatinsk in Siberia. This is in that part of Siberia through which Mr. Knox traveled, as related in the remarkably interesting article published in a recent issue of the JOURNAL.

A good deal of important mining development is going on in that region. Having transported its prisoners thither, Russia lets them loose, knowing that they cannot get away. Their freedom is complete, even to the extent of finding work among the mining companies of the region. Thus, the mining companies are pleased to obtain a bountiful supply of labor by unexpected immigration, the captives also are pleased in finding work, and the government is relieved. This is a very pleasant part of Siberia and one that is destined to become of great importance in the world's affairs. It would not be surprising if many of the Austrian prisoners transported thither involuntarily, should elect to remain there after the war, and send for their families to join them.

Arthur Hunter, an eminent life-insurance actuary, has pointed out another economic result that may happen. At a life-insurance convention a few days ago he said that if Russia can enforce the prohibition ukase, the saving in human life will in 10 years make good the loss of 500,000 men that may be suffered in the war. Thus, by prisoners and prohibition together, Russia actually may come out ahead in the matter of producers.

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### Selling Copper to Europe

John D. Ryan, in the current number of *The Americas*, reverts to the theorem that the copper producers of the United States have heretofore been at a disadvantage in selling copper to Europe because of their highly competitive method of doing business on the one hand and the organization of Europe's buying on the other. "Repeatedly," says Mr. Ryan, "the dealers and consumers of Europe have entered into agreements by which they forced American producers to unload at concessions." This has reference, of course, to those operations toward the bottom of a declining market, when buyers by their abstention have caused stocks to accumulate in the producers' hands, and finally have relieved them by taking over blocks at low terms. Just how much collusion there has been in this and how much is due to the natural difference between the European and American methods of doing business is perhaps not quite easy to determine.

American consumers buy, each for himself, according to their manufacturing requirements. They are seldom disposed to buy when copper is low unless they are covering orders already on their books. The European manufacturer probably figures in the same way, but in Europe there are great financial and speculative houses which step in when copper is low and may not exert themselves unduly in swinging a block of 50 million pounds, which they plan to turn over to consumers at a profit, and often no doubt so do. Mr. Ryan implies that large consumers may participate in these operations, and figures that during the 10 years ending with 1913 Europe got its copper from America for about 5/8c. per lb. less than American consumers did. He argues that this has been an immense handicap in the development of our export trade in cop-



per manufactures. This looks rational. Why should we export wirebars, cakes and ingots, and not wire rods, sheets and brass? The entire cost of drawing wire is but a trifle more than  $\frac{5}{16}$ ¢. per lb.

Mr. Ryan's remedy is to permit agreements among the producers for handling the export business, which would compel Europe to pay our terms for copper instead of our having to accept hers. He doubts if the Sherman law were ever intended to apply to the export trade or in fact does, but in order to make sure he proposes amendatory legislation specifically exempting it. We fancy that a measure of this sort will be introduced in Congress before long. The general desire to help the copper industry in its adversity may give this a chance.

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### Mining in the Caucasus

In previous articles we have mentioned the direct effect of the war upon the mining and metallurgical industries of Belgium and Poland. Now come reports of disturbances on another frontier, this time the Turko-Russian, where cable dispatches last week reported the wounding by the Turks of R. T. White, a well known American engineer, who is the general manager of the Caucasus Copper Co. There have been no reports of the Turkish troops having entered Russia, and from mail advices of a previous date we are disposed to think that the trouble came from Kurds, not Turks. However, that there has been interference with mining in this part of Russia is certain.

Petrograd had news as early as Nov. 23 that the Caucasus and Kedabeg companies had been obliged to close down on account of their proximity to the scene of military operations and especially because of the disorders created by Kurd brigands, who took advantage of the situation. These mines produce normally about 20% of the copper of Russia.

The war between Russia and Turkey has also about put an end to manganese mining in this region. It is likely, moreover, that the production of petroleum will be materially curtailed. All of these industries are conducted near the frontier, and besides, commerce on the Black Sea has been stopped.

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### The Railway Rate Decision

The Interstate Commerce Commission signalized last week by granting the application of the Eastern railways for an increase of 5% in freight rates. This will do much toward rehabilitating the railways in the eyes of investors, will enable them to float their bonds, and sooner or later will make them purchasers of material, including metals, which will increase domestic consumption. It was an absurd idea that everyone might raise rates except the railways, which had to torment themselves while the Rip Van Winkles of the Interstate Commerce Commission slept.

The increase in railway rates is, however, another revolution in the vicious circle. The employees get increases, then the railways, and next the employees will be threatening once more and after that the railways begging again, all on the ground of the increased cost of living. What the great middle class wants is something that will produce a decrease in the cost of living.

It is possible that the railways, having got their increase in freight rates, will stop raising passenger fares. Also they may continue to save money by cutting off unnecessary trains, and perhaps the legislatures of some states will permit them to dispense with the salaried passengers that some of the railways now have to carry.

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### Steel Balls vs. Flint Pebbles

The star of the flint pebble in certain kinds of tube-mill work seems to be about to wane, even if it be not going to set, unless we err in drawing too sweeping conclusions from reports of mill men that reach us. The tube mill was developed from the ball mill, in which the crushing media were a steel lining and a set of steel balls. The consumption of steel per ton of material crushed was always high, although both balls and lining were made of manganese steel, in some cases at least, from an early date. For this reason chiefly flint pebbles were early substituted in the tube mills of metallurgical practice, and various expedients were adopted to reduce the wear of steel on the linings.

Lately, however, some enterprising mill men have reverted to the use of balls of manganese steel or chrome steel, which may be of superior hardness to what were used in the early days of the ball mills; as to this we do not know. Anyway, it is found that with a given mill, the capacity is greatly increased by the use of steel balls, so much so in certain cases that two mills are able to do the work for which three were previously required.

In the previous paragraphs we have had reference especially to the use of the tube mills in connection with processes of mechanical concentration. In connection with hydrometallurgical processes there may be other considerations. While cost and service may be paramount in many cases, there still remain to be considered those instances where metallurgical effect must be regarded. It is possible that by adding finely ground iron to a pulp destined for cyanidation, an excessive cyanide consumption would result. Should this happen, the steel balls could not be used in cyanide plants. If they are hard enough to avert that difficulty, however, there is no apparent reason why they should not be used.

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### Copper Buying Halts

The little recession in the copper market this week is no cause for alarm. Since about the beginning of November there was rather steady buying during which contracts for a very large quantity of the metal were made. Business could not be expected to maintain itself on such a scale without interruption. On the other hand, the desire of some sellers to dispose of stocks, which without any doubt are large, was bound to cause some reaction whenever a lull in the demand should transpire.

We think that a little recession is good for the market, which otherwise might have led people to forget that the industry is on a 50% basis. There would be a danger then that some producers might be tempted to increase production. Nothing could be more unfortunate just now. It is gratifying to observe that the leading interests recognize this and exhibit no disposition to try any experiment. Most of the producers are better off in selling 50% of their normal output at 13c. than 100% at 11 or 10c.

Indeed, they are far better off than two months ago they had any reason to expect. As things are now copper stockholders may expect some dividend. If their metal were to be sacrificed they would not get any. The copper that is being left in the ground is not evaporating and some day will be marketed at fine profit if owners have patience.

The supplies of which Germany is most desperately in need seem to be copper, rubber and nitrate of soda, all of which are of direct military requirement, the nitrate being needed for making nitric acid, which is essential in the manufacture of explosives. German newspapers report that all of the nitrate in the Empire has been requisitioned by the Government, while an edict has lately been published prohibiting the sale of automobile tires, either new or repaired, by anybody, which will lay up all private automobiles and taxicabs in order that the military motor cars may be kept running. There is also some wonder about what Germany is doing for gasoline.

### BY THE WAY

The Chamber of Mines and Oil of Los Angeles has begun the publication of a new monthly, the *Oil and Mining Bulletin*, as a means of boosting the interests of the Los Angeles region.

Our German correspondent in a letter dated Nov. 4 (which we received on Dec. 3) said: "Heretofore, it has been impossible to send any letter by post abroad, written in any other language but German. For this reason I have been unable to communicate with you since the outbreak of the war. Yesterday I learned, however, that this military order has been modified lately so that now open letters and post cards may be written in certain foreign languages. The regular time consumed by mail matter in reaching here from New York is between 21 and 24 days."

According to a dispatch from London, dated Dec. 15, the classification of copper as contraband of war is not new, but really 120 years old. The dispatch says:

It has been discovered here that copper, which is the most disputed point in the controversy about the British interpretation of what is and what is not contraband of war, was specifically mentioned in the Anglo-American treaty of 1794. In Article XVIII of that treaty there is a list of contraband articles. Sheet copper is one of them. The copper which is now being shipped is not sheet copper, which in those days was used for shipbuilding, but is in other forms. The fact, however, that copper was then considered contraband is now regarded as bearing on the present case. England declares copper absolute contraband, although it is now being used for different purposes than was the case when the ancient treaty was made.

In 1794 the United States bought its copper from Europe. Now it is entirely the other way.

### Coal Rates to Philadelphia

The Pennsylvania Public Utilities Commission has entered a decision on the application of several business associations in Philadelphia, ordering a cut of 40c. per ton in rates on anthracite coal to that city. The base rates on Schuylkill coal by the Reading road to Philadelphia have been \$1.70 per ton on prepared sizes; \$1.40 on pea and \$1.25 on smaller sizes. The new rates will be \$1.30, \$1 and \$1, respectively. The reductions apply also to the

other roads, Lehigh being cut from \$1.86 to \$1.46; Wyoming from \$2.10 to \$1.70; and Pennsylvania R.R. coals from \$1.80 to \$1.40 on prepared sizes, with the usual differentials on small coal. The haul to Philadelphia being entirely within the State of Pennsylvania, these rates could not be revised by the Interstate Commission.

By way of comparison it may be noted that the rate on Lehigh coal for New York is \$1.55 to Perth Amboy and \$1.60 to Jersey City. To these figures it is necessary to add the barge rate across the Hudson. The companies will contest the order.

### The Zinc Corporation's Plans

In an editorial not long ago we outlined an important coming change in the zinc-smelting business whereby the Zinc Corporation and other Broken Hill ore-producing companies were to unite with the American Smelting & Refining Co. in the construction of new smelting works for the treatment of the Australian ore. Representatives of the A. S. & R. Co. had gone to London to execute the contracts, when injunction proceedings were inaugurated on the ground that the contracts with certain German houses had not been abrogated as was supposed, and the negotiations were thus interrupted. Further moves are thus chronicled by the *London Financial Times*, of Dec. 8:

In a full Court of Appeal, Dec. 7, the Lord Chief Justice, the Master of the Rolls and Lords Justices Buckley, Kennedy, Phillimore and Pickford, the appeal of the defendants against the decision of Mr. Justice Sargant, given last Friday, in a motion by the Zinc Corporation against Skipworth and others, was heard. The Zinc Corporation has a contract with Aaron Hirsch & Sohn, of Germany, by which the latter are to take the whole of the zinc concentrate output of the corporation at Broken Hill, Australia, up to 1919. The war having intervened, the directors proposed, on the assumption that the contract was abrogated, (1) to enter into a new contract with an American concern or (2) to erect a plant at a cost of over £1,000,000 to treat the concentrates themselves. One of the large shareholders of the company sought an injunction restraining the directors from acting in this way, and Mr. Justice Sargant granted the injunction, holding that the contract was not abrogated by the war.

The Lord Chief Justice said the court was asked to decide this case in a friendly suit. Both the plaintiffs and the defendants wished to have the case decided, and the point as to the third party was not raised in the interlocutory proceedings. They were now faced with this difficulty, whatever decision they gave would be in the absence of one of the parties to the contract. Although it was true that Messrs. Hirsch would not technically be bound by the decision of the House of Lords, their position would have been prejudiced. It appeared to him that such an action did not lie. The court must take care in these times that it did not do an injustice to parties who were not before the court. The appeal ought, therefore, to be allowed and the order for the interlocutory injunction discharged. The other Lords Justices concurred.

The meaning of this involved legal phraseology appears to be that the directors of the Zinc Corporation are released from the injunction and are free to go ahead, but may be subject to a suit for violation of contract by Aron Hirsch & Sohn, which has not been directly a party in the hearings up to this time.

### The Lehigh Valley Decision

The United States Circuit Court has decided in favor of the Lehigh Valley R.R. Co. in the suit brought against it by the Government. The court holds that the arrangements with the Lehigh Valley Coal Co. and the Lehigh Valley Coal Sales Co. do not constitute a violation of the Sherman law.



## PERSONALS

B. B. Thayer has returned from Butte.

C. A. H. de Saulles is back from a month's trip to England.

William H. Hampton, of the firm of Florence & Hampton left New York on Dec. 19 for Alaska.

W. DeL. Benedict has gone to California and may be absent from New York two months or more.

S. K. Dahl has just accepted the position of mill superintendent with the Messina Development Co. of the Transvaal.

C. E. Dickens has been appointed superintendent of the Eldorado copper mine in Montgomery County, N. C., in place of George F. Cant.

Albert M. Daniels, manager of the Lumsden mine, is captain of the volunteer company raised in Cobalt, Ont., for service in the British army.

Cutler B. Whitwell, mining engineer, has returned to Nevada City, Calif., having been engaged during the past three months examining the Gold Bank Mine at Forbestown.

H. H. Knox, who has examined the Ridder and other mines in Siberia, is back in London. He reports considerable interest in London in new mining enterprises in spite of the war.

Theodore Dengler, superintendent of the Wolverine and Mehawk mines in the Lake Superior copper country, was in Chicago during the week of Dec. 14, to attend the road show and convention.

Cecil H. Cropper has given up his position as mining engineer and joined Lord Klitchener's army, taking a commission in the Northumberland Fusiliers, which is composed mostly of Northumberland miners.

Ledyard Heckscher, blast furnace manager of the Alan Weed Iron & Steel Co., has been chosen president of the Eastern Pig Iron Association. W. S. Pilling, of Pilling & Crane, Philadelphia, was re-elected secretary.

Robert M. Catlin, manager of the Franklin mine of the New Jersey Zinc Co., was chairman at the afternoon session, Dec. 16, of the Safety and Sanitation Conference held in New York in connection with America's Second Exposition of Safety and Sanitation under the auspices of the American Museum of Safety.

J. H. Polhemus, who has been manager of mines for the American Zinc, Lead & Smelting Co. during the last five years, in which position he has achieved an enviable record, has resigned that position, and on Jan. 1 will become assistant general manager of mines with the New Jersey Zinc Co., making his headquarters at 55 Wall St., New York. Mr. Polhemus will succeed W. A. Pomeroy.

H. A. Guess, general manager of the Federal Lead Co. and consulting mining engineer for the American Smelting & Refining Co., was the subject of an attempt at blackmail last week by a person who gave Mr. Guess the choice between death and paying \$1740. Mr. Guess reported the matter to police headquarters and the attempting blackmailer, who is supposed to be a discharged employee, was apprehended.

R. T. White, manager of the Caucasus Copper Co., of Dzanseul, Russia, which is near Batum, is reported by the newspapers to have been wounded by the Turks. According to a dispatch by telegraph from Tiflis, the Turks took possession of the property, and in addition to wounding Mr. White took two members of his staff prisoners; one of these, an American, was later released. Our mail from Petrograd, dated Nov. 23, indicates that the troubles in the Caucasus are due not to Turks, but to Kurd brigands, who are taking advantage of the situation.

## OBITUARY

John M. Scrafford died at Republic, Wash., Dec. 11. He had been a miner for many years and was well known all through Washington, Oregon and Idaho.

Henry K. Preston died at his home in Germantown, Philadelphia, Dec. 17, aged 51 years. His death was caused by cyanide poisoning. He had lived in Philadelphia two years, going there from Georgia, where he was interested in coal mining. In Philadelphia he was known as a mining engineer and promoter, interested in Southern coal and gold mines.

John Pym Neville, manager of the white lead department of the Selby Smelting & Lead Co., died in Oakland, Calif., Dec. 8. Death, it was believed, resulted from injuries received some time ago in an automobile accident. He was 60 years old, born in London. He came to America at the age of 21 and found his first employment with the Collier White Lead Co., in St. Louis, and later became president of the company. He resigned that position about nine years ago and took a position with the National Lead Co.; he was then engaged to construct and install the white-lead plant for the Selby, and he became manager of the operating department after the works were completed.

Hon. Robert Jaffray, of Toronto, Ont., a financier connected with many industrial undertakings and a member of the Canadian Senate, died on Dec. 16 in his 83d year. He was born in Scotland and went to Toronto when quite young. He was for many years engaged in the grocery trade, but gave up that business in 1883 to devote his attention to financial affairs in which he achieved great success. He became prominently identified with many industrial and commercial enterprises. Mr. Jaffray at the time of his death was a director of the Nova Scotia Steel & Coal Co., the Canadian General Electric Co., the Canada Foundry and several others. He was also president of the Globe Printing Co. and the Imperial Bank. He took an active part in the organization of the Crows Nest Pass Coal Co., of British Columbia, in 1897, and was vice-president of the company until a few years since. He was appointed a member of the Canadian Senate in 1906. Two sons and two daughters survive him.

## SOCIETIES

**Engineering Society of Queen's University**—The annual dinner was held at Kingston, Ont., Dec. 15, at which G. G. S. Lindsey, president of the Canadian Mining Institute, delivered an address on "The Business Ethics of the Engineer." Other speakers were Dean Adams, of McGill University, J. W. L. Forster, of Toronto, and Dr. Willet G. Miller. Prof. Wm. Nicol, head of the Mineralogy department, was presented by his former students from all parts of the continent with an oil portrait of himself.

## NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

**ROASTING**—Metallurgical Furnace, Utley Wedge, Ardmore, Penn. (U. S. No. 1,115,263; Oct. 27, 1914; and 1,119,483; Dec. 1, 1914.)

**ROASTING-FURNACE SHAFT**, Harry H. Stout, New York, N. Y., assignor to General Chemical Co., New York, N. Y. (U. S. No. 1,119,325; Dec. 1, 1914.)

**SCREEN or Separator**, Thomas Joseph Sturtevant, Wellesley, Mass., assignor to Sturtevant Mill Co. (U. S. No. 1,116,512; Nov. 10, 1914.)

**SEPARATION**—A New or Improved Method of and Means for Separating Metalliferous Materials or Metals from Their Ores or Other Matter Carrying the Same. J. D. Wolf, London, Eng. (Brit. No. 18,351 of 1913.)

**SINTERING**—Mechanism for Oxidizing, Reducing, or Otherwise Treating Ores and Other Materials. Felix von Schlippenbach, Stolberg, Binsfeldhammer, Germany, assignor, by mesne assignments, to Dwight & Lloyd Sintering Co., Inc., New York, N. Y. (U. S. No. 1,119,459; Dec. 1, 1914.)

**SIZING**—Process of and Apparatus for Sizing Comminuted Material. Henry M. Sutton, Walter L. Steele, and Edwin G. Steele, Dallas, Tex. (U. S. No. 1,119,662; Dec. 1, 1914.)

**SLAG**—Apparatus for Granulating Molten Slag. Robert Donaldson, Cleveland, Ohio. (U. S. No. 1,117,644; Nov. 17, 1914.)

**SLAG CEMENT**—Method of Producing Cement from Molten Blast-Furnace Slag. Wilhelm Lessing, Menzenberg, near Honnef, Germany, assignor to Mittelrheinische Cement-Industrie G. M. B. H., Cologne, Germany. (U. S. No. 1,115,321; Oct. 27, 1914.)

**SLIME SEPARATOR**, Charles Allen, El Paso, Tex. (U. S. No. 1,118,614; Nov. 24, 1914.)

**SLUICE BOX**, Henry Wilber Fry, Denny, Calif. (U. S. No. 1,117,828; Nov. 17, 1914.)

**SMELTER GASES**—Bag-Cleaning Apparatus. Willard E. Playter, Collinsville, Ill. (U. S. No. 1,118,044; Nov. 24, 1914.)

**SMELTING**—Process of Generating Heat in Fusion Furnaces. Bradley Stoughton, New York, N. Y. (U. S. No. 1,117,274; Nov. 17, 1914.)

**SMOKE AND FUME FILTER**, Ernest H. Gagnon, Billings, Mont. (U. S. No. 1,116,053; Nov. 3, 1914.)

**STAMP MILL**—Ore Stamp Mill. Peter N. Nissen, Los Angeles, Calif. (U. S. No. 1,119,308; Dec. 1, 1914.)

**TIN**—Improvements in the Treatment of Tin Ores and Slags Containing Tin. Billiton Maatschappij, Hague, Holland. (Brit. No. 18,422 of 1913.)

## Editorial Correspondence

### SAN FRANCISCO—Dec. 16

The **International Hotel** in Virginia City, Nev., was burned to the ground Dec. 12. This marks the end of one of the most famous hotels connected with the mining industry. The International was a massive brick structure, completed in 1876, to replace an old wooden building of the same name burned in 1875. It was six stories high and had 160 rooms. The furnishings were the most elaborate and costly obtainable at the time. The hotel was associated with all the stirring events and the great mining men that made the Comstock famous. Its fortunes followed those of the mines and of late days its deserted and funereal aspect gave slight indication of its exciting past.

The **Potash Deposits of Searles Lake**, it is reported, will again be the cause for an attack upon the American Trona Co. The leader of the men who claim these deposits is Henry Lee, of San Francisco. It is stated that he has already started for Searles Lake with men for the purpose of doing the annual assessment work before Jan. 1. The American Trona Co. is reported to have the land well guarded. A year ago similar effort was made and it was reported that a battle with guns had taken place on the desert between Randsburg and Trona. It is likely that the daily newspapers will again take advantage of the opportunity to publish sensational stories, all of which in a way is an advertisement of the existence of potash in California, although it is not a desirable mode of advertising.

The **Alta Silver Mining Co.** has removed its head office to the headquarters of the Yellow Jacket, Belcher and Crown, in the Mills Building, San Francisco. Thus the four corporations controlled by the Sturges interests in the Gold Hill section of the Comstock have been brought together. The change was effected at the annual meeting of the Alta stockholders, Dec. 10; 68,829 shares out of 82,183 shares of outstanding stock were represented; 25,817 shares are in the treasury of the company. The retiring officers and directors were reelected as follows: George S. Sturges, Edward B. Sturges, Edward S. Spring, William Bannan and J. B. Shaw. George S. Sturges will continue to act as agent for the company in Nevada. Immediately following the reelection, William Bannan and J. B. Shaw tendered their resignations as directors and R. B. Worthington and Charles H. Sooy were elected to fill the vacancies. J. B. Shaw resigned as secretary and Edward S. Spring was elected to that position. The changes made in both the office headquarters and in the official board indicate that interesting work is in contemplation in the Alta property. The shaft and machinery and other equipment are in good condition and ready for almost immediate resumption of operations down to the 1050-ft. level. Since Feb. 1, 1912, a total of only 8c. per share assessments has been levied. In that period repairs have been kept up and connection has been made with the south lateral branch of the Sutro tunnel, and after all expenses have been paid there is a balance of \$1700 in the treasury.

A **Preliminary Injunction** against the Butte Creek Consolidated Gold Dredging Co., operating on Butte Creek, has been granted by the superior court at Chico. The application was made by the trustees of Stanford University. The applicants contend that property owned by the university, situated down stream, will be damaged by tailings carried down stream and deposited on the land. The company affirms that the dredge is being moved and is not operating within 50 ft. of the present channel of the stream. The injunction applies not only to the present channel but to the flood channel, and all dredging operation is ordered stopped until a hearing is had on the application for permanent injunction. A bond of \$3000 was required of the university trustees to indemnify the dredging company. Dredging has been carried on along Butte Creek, east of Chico, for several years. The Butte Creek Consolidated was the first company to operate there and was followed by John Ross Wade, and within the present year by Guggenheim interests, making three dredges in all that have operated in this district. The Butte Creek Consolidated in its early operations installed and operated a bucket-elevator dredge of 11-cu.ft. capacity, and equipped with tail sluices which distributed the tailings in such manner as to leave the ground in approximately the same condition, if not better condition, than before the gravel was turned

over. When John Ross Wade began operations about three years ago he operated with a 4-cu.ft. bucket-elevator dredge equipped with a belt conveyor and stacked the tailings along the creek banks in such manner as to serve as retaining walls to prevent overflow of the creek upon the adjacent agricultural lands. About two years ago the Butte Creek Consolidated remodeled its dredge, installed a new bucket line of smaller capacity and equipped the dredge with a conveyor belt stacker. It should be possible to dredge any ground along this creek and prevent the tailings from doing damage to adjacent or nearby agricultural lands.

This subject of depositing sand and gravel on the agricultural lands in the vicinity of dredges, stamp mills and hydraulic mines has long been a bone of contention between the miners and the farmers. The hydraulic mines have been regulated by cooperation of the state with the Federal Government. The hydraulic miners complained a good deal in the early period of the enforcement of the rules of the Government commission; but now they are endeavoring to conduct hydraulic operations by such methods as will provide for taking care of the tailings without damage to agriculturists. In the last session of the state legislature a strong effort was made to interfere with dredge operations in the state because it was claimed by the proponents of the measure that valuable agricultural land was being destroyed by the dredges. That bill was not allowed passage but the disposition is still prevalent to interfere with dredging by an act in the next legislature. This is a matter that should be taken under consideration by the California Metal Producers' Association. The interests of the dredge operators could be protected by a concerted action of this representative body of mine owners and managers and representatives in the legislature interested in the mining industry. There is no doubt that in some instances the agricultural lands have been damaged by the operation of dredges just as they have been damaged by the operation of stamp mills and formerly by the hydraulic mines. But there is no good reason why the whole matter should not be satisfactorily arranged and proper legal provision made for protection of the dredging companies as well as for the protection of the farmers. The trouble in the past has resulted from the lack of concerted action on the part of the mining men, but that can no longer be an excuse since the producers of metal have organized into one of the solidest associations in the state.

### BUTTE—Dec. 17

**Of Anaconda's Plans** for future activity renewed announcements are made. John D. Ryan and B. B. Thayer state that improvements costing from \$6,000,000 to \$7,000,000 will be carried out at Great Falls and Anaconda in the near future. Decision was reached after a conference with the heads of departments with whom they have been consulting since their arrival in the state recently. At the Great Falls plant an electrolytic refinery with a capacity of 10,000,000 lb. per month, together with a complete new furnace refinery will be installed. All concentrating of ore will be done at Anaconda, and concentrates sufficient for the operations of Great Falls will be shipped there for smelting. At Anaconda the changes decided upon will enable the company to mine at a profit ore of a lower grade than is possible under present methods, thereby increasing the available tonnage and extending the life of the mines. In this program of reconstruction at the reduction works, the company will take care of some of the employees who were thrown out of work at the time of curtailment.

**Labor Unions**—In a petition addressed by Butte Miners' Union No. 1 to all other locals of the Western Federation, scathing charges are made against Charles H. Moyer, John C. Lowney and Guy E. Miller, heads of the Federation; the locals are asked to demand the removal from office of these officials. It is stated that in its 36 years of existence, the local union expended over \$2,000,000 on behalf of its members, aided every struggling union in the country and answered every appeal for assistance; that between Jan. 1 and June 13, 1914, the union transmitted to the officers of the W. F. of M. more than \$160,000 for the Michigan strike funds; that the irregularities in handling these funds caused general dissatisfaction among the Butte miners, leading up to the riots,



the destruction of the union hall and the formation of an independent union; that upon return of normal conditions, Moyer sent Lowney and Miller to Butte for the sole purpose of further disrupting the organization of the petitioners and confiscating funds and other property; that Moyer, Lowney and Miller are so thoroughly hated and despised by all persons and especially by the Butte miners, that the petitioners feel that it will be impossible ever to build up the organization so long as the men named are directing the affairs of the Federation; that by their conduct Moyer, Lowney and Miller are traitors and are a curse to organized labor. Miller replied in a letter denouncing the charges as false and making countercharges against the officers of the Butte local. According to statements made at union headquarters, local officers are still in possession of the union's property and are resolved to keep it in spite of the attempts of Miller to wrest it from the union. An organization was to be formed Dec. 19, consisting of one delegate from each union represented in the Silver Bow Trades & Labor Council, to inquire into the factional troubles of the miners of the Butte district, and to consider ways to heal the breach. William Winchester, one of the men arrested for kidnapping and deporting Richard O'Brien, a miner, during the labor disturbances last June, was tried, convicted and sentenced to two years' hard labor in the state penitentiary. There are a number of other men still in jail awaiting trial for the same offense.

#### SALT LAKE CITY—Dec. 17

The State Land Board through the attorney general, A. R. Barnes, has protested to the Department of the Interior against the taking over of school lands in Utah by the Government on the ground that they contain coal deposits. Utah acquired title to the lands under the enabling act. It contends that should the lands be reserved on account of possible mineral deposits, metalliferous deposits only should be considered, and not coal deposits. The question as to whether the department has jurisdiction in passing upon the character of school lands and reserving any such because of mineral deposits was argued recently before the First Assistant Secretary of the Interior, the Commissioner of the General Land Office, and a special board of three members, in Washington. Under section 6 of the enabling act state school lands granted by the Government in Utah comprise sections 2, 16, 32 and 36 in each township. It is argued that the title to the land reverted to the state and that the department, therefore, has no right or jurisdiction over them, and cannot withdraw them. Utah further contends that if there is any question as to the right of the state to such lands, it should properly be determined by the Federal courts and not by the department. Efforts will be made to bring the case before the United States Supreme Court as soon as possible. New Mexico will take similar action. The idea is to have a test case to determine the following points: "Are mineral lands in the school grants reserved by the Federal Government, and if they are, does the term 'mineral lands' include lands containing coal deposits'?"

#### SEATTLE—Dec. 16

The Ore Wharf burned at Skagway, Alaska, Dec. 12. The Moore wharf with all its warehouse buildings, ore bunkers and chutes was completely destroyed and the loss is estimated at \$210,000, of which \$150,000 was represented by ore and the contents of the warehouse. The wharf handled all the shipping at Skagway, including freight destined for the interior over the White Pass road and the Yukon River.

#### WALLACE—Dec. 17

The Montana Power Co. has 75 men at work on the construction of electric transmission lines from its new power plant at Thompson Falls, Mont., to Burke and Mullan. It is reported that contracts have been made by this company to supply power to the Hercules, Tamarack-Custer and Federal mining companies. The entrance of this company into the Coeur d'Alene district in competition with the Washington Water Power Co., which now supplies all of the electric power used, will cause a reduction of rates. At the expiration of existing contracts other mines will be supplied with power by the Montana company.

#### ORACLE, ARIZ.—Dec. 10

In the Mammoth district there are at present no properties operating. The Calumet & Copper Creek suspended operations last summer on account of a shortage of capital. Efforts are being made to reorganize and secure additional funds. The Calumet & Arizona did several thousand feet of drilling during the year on the company's holdings in the Copper Creek region in an attempt to develop the orebodies further, but no results have been given out. The E. J.

Longyear Co. did this drilling. At Schultz, Young Bros., of Clinton, Iowa, have been developing the old Mammoth mine, but suspended operations in September awaiting more favorable financial conditions. Not enough has been done to prove the merits of the property. Robert Boykin and associates have taken a lease on the tailings produced by former operations on this property by the old English company and are shipping a small amount of wulfenite.

#### JEROME, ARIZ.—Dec. 16

The Jerome District is feeling the effect of the recent strike in the United Verde Extension. During the year the Edith shaft of the Extension was completed to the 1200-ft. level, and crosscutting was started toward the bottom of the old Fisher winze. This winze had been sunk from the 800-ft. level of the old Daisy shaft. Before the crosscut reached the winze, and in fact while several hundred feet from it, it encountered and passed through a 20-ft. formation consisting of mixed oxides, iron-stained slate carrying native copper and some sulphides. A drift to the east along this deposit opened up several feet of sulphide ore in place, some of it chalcopryrite and some chalcocite. This orebody was proved continuous on the 1200-ft. level for several hundred feet and was also found at one point on the 800-ft. level. The crosscut was continued through this ore toward the winze, but before reaching it another body of ore was encountered carrying a commercial content of gold, silver and copper. When this ore was proved on the 1200-ft. level the company sank the main Edith shaft again to the 1400-ft. level and began crosscutting towards the same orebody below. New pumps are now being installed and preparations are under way for a large amount of development work.

The United Verde's new smelting plant at Clarkdale should be ready to blow in about the first of the year. It will take care of about 2000 tons of United Verde ore, and about 1500 tons of custom ore. It is expected to be of considerable help in developing smaller mines in the district, inasmuch as it will make a market for siliceous ores heretofore hard to dispose of.

Among Other Properties, the Pittsburgh Jerome continues development with a small force and the Calumet & Jerome recently cut some low-grade copper, which has proved an encouragement for further development. The Copper Chief continues to operate under the same management, although rumors of a sale are frequent; it employs about 5 to 7 men; developments below the 300-ft. level recently discovered a body of enriched sulphides which ought to put the mine on a producing basis. It is only 10 miles by wagon road from the new Clarkdale smelting plant, so that haulage will not be prohibitive as in the past. The Arkansas & Arizona continued its main shaft to the 1650-ft. level this year, but after a little drifting on that level closed down. The Haines Copper Co. reached the 1200-ft. level early in 1914, cut a small station and a short drift and started diamond drilling. Two horizontal holes and one vertical, ranging in depth from 200 to 300 ft., all encountered excessive flows of water under high head; the company deemed it best to abandon the holes and was afterwards forced to pull the pumps and close down the property.

#### HOUGHTON—Dec. 19

Fairness in Taxation in the Michigan copper district was brought out during a hearing conducted by the state tax commission in Houghton County. It is well known that the mines pay the great proportion of the taxes of this county. In Calumet, for instance, the Calumet & Hecla company pays actually seven-eighths of the total state, county and township tax. In other townships where mines exist personal property escapes with a comparatively small assessment and property other than mining is not heavily assessed. Fixing valuation is a difficult thing because mining values are unstable and all other property values are directly or indirectly dependent upon mining prosperity or the lack of it. Following a thorough investigation of the methods and of the valuations fixed, the state commission expressed the opinion that the mining companies were if anything paying more than their share and that mining superintendents who acted as supervisors in their townships had shown a commendable inclination to see that their properties stood a just proportion of the cost of the maintenance of the government. This fine tribute to the spirit of community interest which actuates mining men is especially important because it came from a disinterested outside body of taxation experts.

Unemployed Workingmen in the Copper Country are not so numerous as in other sections of the country so far as reports indicate. While general industrial conditions are no better than elsewhere, the energy shown by people generally

in looking out for the needy, and the well organized efforts that have been made to secure employment for the men let out when curtailment became necessary, have combined to limit the number of cases of actual want to a smaller total than was feared at first. Those seeking to provide ways and means to care for the unemployed are surprised to find that the strike had one unfortunate result in that it made drones of a considerable number of men who formerly were good workers. These men lived on strike benefits for a long period; they loafed until they became accustomed to it. Their limited intellectual capacity figured out that the necessary food and clothing came to them and their families from some source or other and when the strike was over they were content to sit by and let the public look after them and their families. The Associated Charities has found a surprisingly large number of cases where the men of this class refuse work when it is secured for them. These are the same men who were told of the speeches by Secretary Wilson and of his reports advocating government ownership, and who spent their time figuring out which superintendent's job they would accept when the Government took over the mines. Local charity organizations have no objection to looking after their families but would do it with better grace if the men showed some desire to work.

#### ISHPEMING—Dec. 19

The Michigan Equal Tax Association is the name of an organization which had its birth at Marquette, Dec. 15. The organizers are business men of Upper Michigan whose object is to fight attempts to impose a tonnage-tax. Representatives were in attendance from 12 of the 15 counties of the Peninsula and there was not a man present directly connected with the mining industry. The officers are Thomas Conlin, Crystal Falls, president; W. E. Smith, Mohawk, vice-president; L. T. Sterling, Iron Mountain, secretary-treasurer. The following will act as directors: F. H. Vanderboom, Marquette; Homer A. Guck, Houghton; R. A. Douglas, Ironwood; August Wallin, Ontonagon; J. O. Maxey, L'Anse; W. H. Reade, Escanaba and Chase S. Osborn, Sault Ste. Marie. The press committee, which has been instructed to prepare literature that will let the people of the state know what hardships will be caused if additional taxes are placed against the mining operators, is made up of Geo. A. Newett, Ishpeming; Frank J. Russell, Marquette; Robert Douglas, Ironwood; Tom A. Hanna, Iron Mountain, and Homer Guck, Houghton.

#### VANCOUVER—Dec. 9

Tonopah-Belmont interests have organized the Belmont Canadian Mines, Ltd., for the purpose of carrying on mining and exploration in British Columbia. The directors are Clyde A. Heller, president; K. Kitto, secretary-treasurer; C. S. Verrill, mining engineer, resident director in Vancouver. Some account of the Surf Inlet property of Tonopah-Belmont was given in the "Journal" of Nov. 14. Operations there are in charge of F. W. Holler, mining engineer, one of the permanent Tonopah-Belmont staff. It is reported that the company expects to spend about \$150,000 on development before July 1, 1915, when the option expires. If the bond is then taken up the company is to proceed at once with the construction of a plant capable of treating 500 tons of ore a day. With the installation of hydro-electric power for operating the plant, together with cost of mill and development, a sum of nearly \$1,000,000 will be involved. The company acquired its option on the property in April, 1914. Work has been carried on with a force of about 50 men. A wagon road has been constructed into the mine, a power plant for development has been installed consisting of two 50-hp. boilers and 10-hp. compressor plant, with a complete set of buildings consisting of bunk houses, cook house, office and several cottages, with a capacity for 60 men. About July 1 the company began operating machine drills, since which time about 1000 ft. of tunnel and drifting has been accomplished. Up to the time of giving the option, the property had been developed by the Surf Inlet Gold Mining Co., owned and controlled by Vancouver business men under the management of Fred M. Wells. Several hundred feet of tunnels and crosscuts were driven, resulting in proving an orebody to a depth of over 500 ft. The ore on the property is a gold quartz containing iron sulphides, assays about \$8 a ton, and is readily treated by cyanide. It is estimated that over 200,000 tons of ore is already developed. The nature of the ground is such that the orebody can be opened by tunnels to a great depth. The tunnel, which will be about 2000 ft. in length and will tap the orebody 400 ft. below the present 500-ft. level, is now advanced about 700 feet.

#### TORONTO—Dec. 19

McKinley-Darragh's decision to allow its option on the Jupiter property in Porcupine to lapse, has occasioned a good deal of surprise. McKinley-Darragh took the option last

spring and agreed to spend \$30,000 in development before October; then if the company was satisfied with the property it was to pay off the outstanding bonds and provide \$40,000 additional for working capital and for this it was to receive 51% of the stock. When the time came to take up the bonds McKinley-Darragh asked for an extension to permit further development at greater depth. This was granted and the time was extended till Dec. 17. All reports from the property were favorable, and it was fully expected that the option would be exercised. It is understood that P. A. Robbins, of the Hollinger, formerly manager of McKinley-Darragh, who examined the property for that company, advised that the option be exercised, while R. B. Watson, consulting engineer for the purchasers, was averse to taking up the property under the terms of the option. An alternative proposal was made to the Jupiter directors, but was not acceptable. Other people have since made an offer for the property along the same lines as the McKinley-Darragh option, but no decision has as yet been reached.

#### NOGALES—Dec. 8

In Sonora there have been relatively few shutdowns on account of the war. The Cerro de Plata mine, operated by Holt Bros., 40 miles south of Nogales, has in operation a 30-ton cyanide plant and is preparing to enlarge it to an all-slitting plant of 60 tons capacity. The mine has blocked out a good body of milling ore, and, during the last three years, produced about 600,000 oz. of silver. Minas Prietas, the largest mine now operating in Sonora, has been steadily turning out gold and silver bullion this year. The old gold-silver mining camp at El Plomo, once a good producer, has been bonded to Harold Wheaton, who has in operation an amalgamating and concentrating mill and has been making good during the year. The property lies about 40 miles north of Altar. At La Valedora, D. A. Moreno, of Santa Ana, is cyaniding some old dumps and has made several shipments of silver-gold precipitates. W. C. Laughlin has been operating the San Xavier gold and silver mines in the Yaqui River country. He made regular shipments until about the middle of September, when revolutionary conditions forced him to shut down. Howard Squires took an option on the Candelaria, which belongs to Mr. Geck. He has developed a good tonnage of high-grade milling ore and is now installing a test mill preparatory to making more extensive developments. This property lies about 40 miles south of Caborca. Holt Bros. & Glover shipped some rich gold ore from their prospects about 55 miles southeast of Magdalena. Further development work is planned. John Henderson has been making regular shipments of copper ore from his Caborca mine, although he has a long freight haul to Santa Ana and is handicapped in other ways. In the Altar placer field, Doctor Roberts, John Doan, Reagan Bros., Cal Wright, Ira Bowles, Ben Brey, and others, are operating mines in placer ground in the neighborhood of Boludo and Cienega. There have been installed by them, during the past year, several Quenner machines. Although it is difficult to get in and out of this district, operations are in general successful, and there has been no molestation by Yaquis or revolutionists.

#### MEXICO CITY—Dec. 10

Mining in this part of the republic is suffering seriously from the effects of the revolution. Pachuca properties are running only three days a week, due to shortage of supplies. El Oro and the Hostotipaquillo district of Jalisco have been cut off from rail communications for three weeks. Guanajuato mines are running in only a half-hearted way in order to make their supply of cyanide and dynamite last as long as possible. More than one company have carload lots of the precious cyanide tied up somewhere between Vera Cruz and Mexico City with no hope of getting it for months. The dynamite factory near Torreón has started work again and is supplying the demand from its own or imported makes as fast as rail communications permit shipment. Optimism exists as to the outcome of the political trouble. Undoubtedly, social, political and economic reforms have been needed and needed badly, and a great many believe that Villa and Zapata will be strong enough and patriotic enough to put their combined platform into effect.

#### CERRO DE PASCO—Nov. 12

In Cerro there are only two mines operating, to wit, the Cerro de Pasco and La Docena. There are a number of prospects but all are closed, and there are also small rich mines worked without machinery, owned by that peculiar class of individuals who prefer to mine just enough ore to pay them \$150 a month, and who see no use in employing machinery. The ore is transported on backs of Indians instead of using hoists, and similar primitive methods are used. Those familiar with Mexico will recall the existence of this class of unenterprising mine owners—natives, of course.



# The Mining News

JACOB B. ROSS, of Denver, was sued by Samuel Watson, of New York, who charged misrepresentation in the sale of the Esmeralda mine. In the "Journal" of Dec. 5, 1914, it was reported that damages had been awarded Watson in the Federal Court in Denver. This was incorrect. Watson failed to make a case and the jury, which was out only a few minutes, decided in favor of Ross. The decision was erroneously reported by a Denver daily paper and the "Journal" repeated the error, which it regrets.

## ALASKA

POORMAN DISTRICT output for season past placed at \$125,000. District responding to development in most satisfactory manner; pay streaks being extended.

ROSE CLAIM (Valdez)—From 2200 lb. of ore, \$475 taken. Claim on Mineral Creek near Crawford stamp mill. Dr. C. A. Minans and H. L. Jaynes, owners, well satisfied with returns; ore was secured from outcrops; they will open property in spring.

## ARIZONA

### Gila County

NEW KEYSTONE (Miami)—Stockholders' meeting called for Jan. 6, at 61 Broadway, N. Y., to take action in regard to sale to Inspiration Consolidated of all assets but cash. Sale recommended by J. Parke Channing, vice-president; basis nine shares of Keystone for one of Inspiration.

## CALIFORNIA

### San Bernardino County

GOLD BRONZE (Barnwell)—Messrs. Porter and Lower, of Los Angeles, have lease on this mine and St. George. Are at present treating Gold Bronze tailings in 50-ton cyanide plant, using L. C. Trent machinery.

FURSMAN VS. PACK—U. S. District Court issued temporary injunction enjoining defendants from asserting any claim or title to property embracing 175 placer claims in what is known as the Searles Lake Borax entry. Temporary injunction will hold until case is heard on its merits. Three other suits involving placer-mining claims in Searles Lake region filed Dec. 12, complainant being Cecil C. Carter, defendant Thomas W. Pack and others. These three suits involve total of 221 claims.

### Shasta County

BINDER VS. STOWELL (Redding)—Suit for \$500,000 in U. S. district court in San Francisco involving dredging operation of what was known as "Huron Submarine" mine. Dredge constructed and equipped with Du Bois suction pump. Various reports that it made money and that it made nothing. Etta Stowell, of Sacramento, is administratrix of Du Bois estate. Binder is son of one of stockholders in enterprise.

### Siskiyou County

HEAVY SNOW in all Salmon Mountain region promises plenty of water for mining in western side of county. Hydraulic miners and mill men confident coming season will be a good one for gravel and quartz mining.

### Trinity County

LA GRANGE (Weaverville)—Reported number of men reduced and general retrenchment begun. Probably only temporary, pending improvements being made.

## IDAHO

TERRIBLE-EDITH (Murray)—Raise started from No. 5 tunnel level to No. 4.

NABOB (Kellogg)—Discovery reported of lead ore 5 ft. in width, 2½ ft. averaging about 50% lead.

NEW INDEPENDENCE (Wallace)—New company organized, has bought property of Independence Mining Co., adjoining Morning mine of the Federal.

HERCULES (Burke)—Haulage capacity of mine increased 50% by installation of new equipment, including two eight-ton General Electric motors. Required temporary shutdown to widen gage to 30 in. in No. 5 tunnel level.

FEDERAL (Wallace)—New features of Frisco mill open for trial run are Callow flotation plant and magnetic separation of zinc from lead concentrate after roasting. Callow flotation plants have also been installed at Morning and Green Hill-Cleveland mills.

MARSH (Burke)—Three-compartment winze now down to 800 level. New station cut with bin capacity of 1000 tons; 300-hp. Nordberg electric hoist being installed to raise 2½ tons at 800 ft. per min. from depth of 2700 ft. maximum. Preparing to sink 275 ft. deeper. Operations to be confined to development until lead price improves.

## MICHIGAN

### Copper

WHITE PINE (Ontonagon)—Heating plant for stamp mill completed; crushing plant practically so.

CALUMET & HECLA (Calumet)—Understood to have made substantial sales of metal in Germany; copper shipped there before war opened.

NAUMKEAG (Houghton)—Explorations continue to develop occasional evidences of commercial copper. Treasury well able to continue explorations, having \$200,000 balance on hand.

VICTORIA (Victoria)—Opened 250 ft. rich ground on 24th level, averaging 40 ft. wide, often 70 ft. Sinking to 28th level

under way and lateral openings on 27th under way in fair ground, not up to 24th, however.

KEWEENAW (Calumet)—Management pleased with continuation of good showing in lode in shaft. Sinking continues to 1000 ft. Shaft now below 6th level (900 ft.). Stockpile accumulating better than average commercial rock, including much barrel.

PORCUPINE (Rockland)—Exploration on S. L. Smith property, ten miles south of White Pine, subsidiary of Calumet & Hecla, continues to show good results. Shaft opening None-such formation, same as White Pine has about ready to mill. Commercial copper opening fairly well.

NEW ARCADIAN (Houghton)—Stamp-mill shipments of 2000 tons of mass, barrel and stamp rock accumulated on stockpile to be made within month. Railroad switch to main line completed. Unknown formation opened at 900, 250, 600 and 750 levels shows promising commercial rock. Stopping limited to date. Promising prospect.

QUINCY (Hancock)—Maintenance of dividend record of 54 years without missing did not necessitate cutting into treasury surplus. Mine maintaining regular rock shipments today on two-thirds former working force. Openings ahead keep pace with stopes underground. No. 2 now down to 73d level. No. 6 to 71st and No. 8 to 59th. Sinking continues in all three. Recurrence of mass copper and good mineralization in Alouez conglomerate cut in crosscut from 59th level north of No. 6, two most important physical developments. Latter particularly important in connection with work at Franklin (old Boston) mine, next adjoining on north. Shaft bottoms all better than average.

## Iron

CAMBRIA (Negaunee)—About 900 tons of ore being shipped per week to furnaces of Algoma Steel Co., Sault Ste. Marie, Ont.

REPUBLIC (Republic)—Mine shipping 2000 tons per week to Newberry furnace of Lake Superior Iron & Chemical Co. This only charcoal furnace in district in operation but plant at Ashland due to start up shortly.

BALKAN (Alpha)—Shaft sunk to new level to permit installing 150-ton storage bin. Bin will be one of largest in Lake Superior district. Only two mines having larger ones are on Marquette range. Much of ore will be milled; thought better results can be obtained by having large bin, to cause no delay in hoisting.

NEWPORT (Ironwood)—Plans now well under way for new shaft which Newport Mining Co. will sink near present shaft. Latter badly in need of repair; thought advisable to have new outlet and repair old one when new one is ready. New shaft will be as large as old one, now largest in district. Sinking will be started at surface, and raising begun at several levels in mine. Shaft now being used is over 2200 ft. deep, has five compartments and has handled over a million tons of ore in single year. At present only 350 men at work underground; normal force over 1000.

## MINNESOTA

### Mesabi Range

GRANT (Buhl)—Closed down to permit repairs; will open again middle of January when 60 men will be given employment.

HUDSON (Aurora)—Sinking of new shaft started from bottom of pit. Mine worked as openpit for several years, but considerable ore at depth can be mined only by underground methods.

HIGGINS (Virginia)—Check drilling started at Higgins No. 2 by Oliver company. Further development work to be undertaken. Part of mine worked as openpit and it will soon be determined whether it will pay to sink shaft to get ores at depth.

## MISSOURI-KANSAS-OKLAHOMA

PORTIA MINING CO. (Galena, Kan.)—Company recently struck one of best mines brought in for some time, on 32-acre tract south of Galena. First turn-in, two cars zinc ore sold at top price paid in district. A 250-ton mill installed with modern equipment; 25 men employed; more will be given employment as soon as mine is opened up. S. R. Ping superintendent.

## MONTANA

### Silver Bow County

BUTTE & SUPERIOR (Butte)—After two-months' shutdown, company resumed operations Dec. 15, at Black Rock property, starting with 500 miners, force to be increased in few days to 1200 by addition of surface and mill men.

BUTTE-ALEX SCOTT (Butte)—Manager C. J. Stone left for Duluth, Dec. 11, to consult with officials of company in regard to resuming work. Understood many directors favor resumption at once, since present price of copper will permit mining at profit. Development work below 2000-ft. level showed some promising bodies of ore running better than that from higher levels. Starting of operations will mean adding between 100 and 200 men to payroll at beginning of new year.

BUTTE-DULUTH (Butte)—Capt. A. B. Wolvin, principal owner, announces option given to Anaconda Copper Mining Co. During period covered by option, Anaconda will make thor-

ough examination of property and plant, on results of which will depend whether or not option is exercised. Force of men will be put to work at once with diamond drills to prospect at depth. Company owns about 80 acres of mineral ground in southeastern part of Butte district which contains large tonnage of ore running about 2% copper, extracted by leaching and electrolytic precipitation. Present plant has capacity of 1000 tons per day.

#### NEVADA

##### Esmeralda County

**GREAT BEND (Goldfield)**—Operations will be started soon and capacity of mill increased. Large tonnage of milling-grade ore developed.

**ATLANTA (Goldfield)**—Three-foot sulphide ore, assaying \$40 to \$60, opened on 1750-ft. level. Ore carries gold chiefly, some silver and 10% copper. Deepest oreshoot opened in southern Nevada.

**MILLTOWN MINING CO. (Goldfield)**—Reported George Wingfield sold control to Tonopah and Reno men. Property three patented claims adjoining Golconda claim of Goldfield Consolidated on south.

##### Humboldt County

**NEVADA SHORT LINE** completed as far as new Rochester Mines Co. mill in Rochester Cañon and will be extended to upper Rochester. Shay locomotive added to equipment. Expected new mill will be ready to operate in January.

##### Mineral County

**LUCKY BOY CONSOLIDATED (Hawthorne)**—Crosscut tunnel now in 5100 ft. First vein cut at 4000 ft.; drifting under way on this and several oreshoots opened. Much water encountered; will be used in milling. Tunnel will be driven 600 ft. further to point under Hubbard shaft.

##### Nye County

**RESCUE-EULA (Tonopah)**—Shaft will be sunk 200 ft. deeper.

**TONOPAH-BELMONT (Tonopah)**—New oreshoot struck in raise from 1000-ft. level.

**TONOPAH EXTENSION (Tonopah)**—Mill additions and improvements completed; 40 stamps now crushing 250 tons per day. Stated good-grade oreshoot, 7 ft. wide, opened in development work.

**MANHATTAN CONSOLIDATED (Manhattan)**—Repairs needed in Associated mill due to sudden and severe freeze-up all completed; heating system installed, consisting of three big stoves, and mill once more running steadily.

**BIG PINE (Manhattan)**—New mill about ready to start. Classifier almost installed. At mine, installation of waste-rock stacker will serve to cut down costs. Mushett & Wittenberg operations are going to compete soon with Round Mountain mill and mine costs. When running to capacity, claimed profit will be made on ore averaging not over \$1 per ton. Within month new mill will be crushing ore at rate of 200 tons per day.

**WHITE CAPS (Manhattan)**—Company will soon be in entire charge of Manhattan Milling & Ore Co. 10-stamp mill, sampler and cyanide plant. Mushett & Wittenberg, owners of mill, are vacating it fast as possible, as their tube mill is now ready to turn over on Big Pine. When mill runs entirely on White Caps ores, daily tonnage of over 60 will be handled, with milling cost not over \$2.25 per ton, including overhead. Mine now producing ore at total cost of \$1.35 per ton; hauling charges 90c.; mill showing average extraction under supervision of Pat Quinn of 90%. This indicates substantial profit on ore in quantity averaging only \$6 per ton. Of this grade of ore, there is probably 6000 tons still in upper levels of mine, oxidized material, not considered an asset heretofore, being low-grade.

##### Ormsby County

**ARTICLES OF INCORPORATION** of three Goldfield companies filed at office of secretary of state, viz., Goldfield Spearhead Mining & Leasing Co., Goldfield Columbia Co. and Booth Extension Mining Co., each with capitalization of \$1,000,000, shares \$1 par.

##### Storey County

**COMSTOCK PUMPING ASSOCIATION (Virginia City)**—Examination of conditions on deep levels of northern mines made by William E. Sharon, Thomas F. McCormick and Whitman Symmes and report submitted favoring lowering of water from 2500- to 2700-ft. level. Recommended pumps be installed in joint Mexican-Ophir winze. Necessary pumps and other material on hand. Estimated cost, \$22,000; time, three months.

#### NEW MEXICO

##### Grant County

**CHINO COPPER**, according to 1914 tax rolls just received by state traveling auditor, pays nearly one-fifth of total taxes of Grant county. Total taxes due \$244,388; Chino's share \$43,409. Total assessed valuation \$20,660,067; of this Chino holdings represent \$4,062,252. One-third assessed valuation subject to taxation. Company pays taxes on 12,694 acres of land, principally mineral, valued at \$147,770; on improvements valued at \$3,479,716; and on "other personal property" valued at \$434,766. Property of Santa Rita Store Co., Chino enterprise, included in company's assessment. In 1913 county assessed Chino on \$1,000,000 worth of "net products" of mines; protest against this assessment was made to State Board of Equalization, company contending assessment of mine products as well as mineral land was double taxation, and that under state constitution no authority for such assessment existed. County contended authority for assessment and taxation of mine products was given by territorial enactments, and that as these did not conflict with any provisions of state constitution they were not affected by its adoption. On showing that approximately \$700,000 of returns from mines had been invested in improvements, Board of Equalization reduced assessment to \$476,904. However, company refused to pay taxes on this, and assistant district attorney, acting for county

commissioners, is now preparing to bring suit. It will be test of state's right to tax mine products.

#### NORTH CAROLINA

**IOLA (Candor)**—No. 1 shaft being retimbered to 255 ft., where ground is solid. When finished development will be undertaken below present deep levels of mine. Some ore of good grade now being developed and mined in new shaft that struck Iola oreshoot at 90 ft. depth. Owing to caving stopes this ore left when work was carried on in this part of mine 10 or 12 years ago.

**SADBURY**—Hammer and Hooper, of High Point will begin work at this property near Onvil west of Candor. Will erect five-stamp mill to be operated by kerosene engine. Prospect discovered about seven years ago. Number of exceedingly narrow quartz stringers carry high values in gold. An 80-ft. shaft sunk and dump accumulated. Present plan to mill dump.

**UWARRA (Candor)**—During past few months substantial changes made in methods and equipment of mill described in "Journal," Oct. 31. First change is that of cutting out second pair of 10x24-in. rolls and passing feed direct from first set to tube mill. Ore being delivered to mill with considerably less of country schist than formerly; found that clean ore is far more easily crushed than mixture, and that mill capacity is not decreased by cutting out second set of rolls, while coal bills are. Steam no longer used for heating pulp while being agitated, and two of agitating tanks discarded. Third stripped of all mechanical agitating devices and used as simple air-lift agitator; from this, pulp is run into pulp-storage tank, and there further agitated by compressed air. Precipitates not melted on ground now, but sent to A. S. & R. Co. at Maurer, N. J. Changes have increased profits of mill by economies in consumption of power and of materials.

#### SOUTH DAKOTA

**ANACONDA (Roubaix)**—Removal of hoisting plant to site on Box Elder Creek side of property completed and sinking in progress. Shaft now 50 ft. deep.

**ECHO (Maitland)**—Machinery for mining plant, consisting of 25-hp. Vulcan hoist and 8x8-in. Bury compressor, delivered. Both electric-driven machines. Western hammer drills also received.

**GOLDEN REWARD (Deadwood)**—Mill employees will be paid weekly; heretofore paid on 16th of month following. Move in response to request of Deadwood merchants who are endeavoring to place business on cash basis.

**HOMESTAKE (Lead)**—Electric pumps will replace steam pumps at Hanna, where large portion of water supply is pumped from Spearfish Creek over 332-ft. divide. Power transmission line completed; pumps ordered and expected soon. Commodious new hospital will be erected next year on East Main St., Lead, at cost of about \$25,000. At meeting of trustees of Grier memorial fund, voted to receive subscriptions in any amount, from societies and individuals. Dollar contributions from employees now amount to over \$1800. Homestake Veterans' Association subscribed \$100; other fraternal organizations contributing. Site and design not decided upon; matters will be postponed until all sculptors invited have submitted designs.

#### UTAH

##### Salt Lake County

**MONTANA-BINGHAM (Bingham)**—Statement to stockholders shows No. 3 or transportation tunnel to be in 3460 ft., with 700 ft. more to go to reach Congor vein, immediate destination. During past two years work paid for by monthly contributions from chief stockholders. Two largest stockholders in Bingham Congor Copper Co. for 10 months previous to outbreak of war advanced \$1000 monthly; these offer \$3000 more and others an additional \$2000, provided funds to complete tunnel to Congor vein are provided by Montana-Bingham. With this in view assessment of 1c. has been levied. When Congor vein is reached, contract with Bingham Amalgamated will be complete and Montana-Bingham will receive 125,000 shares of Amalgamated stock, and 10% of net proceeds from that property.

#### WASHINGTON

**LUCKY KNOCK (Tonasket)**—Stated that new furnace will be installed at this antimony mine, near Whitestone Mountain. With increased price mine may be worked with profit. Said to be large antimony deposit. Situated near railroad and can be worked at minimum cost. Several efforts made in the past to produce and treat ore were without success.

#### CANADA

##### Ontario

**BEAVER (Cobalt)**—Stockholders notified company is holding silver for better prices, has 99,125 oz. bullion in New York, 23,159 oz. at smelting plants, and 100,000 oz. at mine. In driving on 460-ft. level toward rich shoot, found on 530-ft. level, struck 3-in. vein, Nov. 26, running about 2000 oz. Drill started toward it on 400-ft. level; no work done below 530-ft. level to ascertain depth of deposit.

**ALGOMA CENTRAL & HUDSON BAY RY.** announces 2000 square miles of lands held in reserve during construction of road now open for public prospecting. No license required; staking, recording and assessment work practically as on government lands. Perpetual mining rights obtainable under renewable leases on easy royalty. Lands in alternate blocks with government areas also open for prospecting. Lands lie along northeast shore of Lake Superior south of Michipicoten iron district.

#### SOUTH AMERICA

##### Chile

**CHILE COPPER CO.** has arranged for shipment of last of machinery contracted in Germany; construction at Chuquimata having been going on without any material delay, expected regular operations will begin before middle of 1915 or about on schedule time as laid out by engineers.



# The Market Report

## Metal Markets

Copper, lead, zinc and tin were all reactionary during the last week, but business was small in volume.

### Copper, Tin, Lead and Zinc

**Copper**—High-water mark was touched about Dec. 15. Purchases by consumers had been on a diminishing scale with the rise in the market, and at the beginning of our last week of record came to a full stop. The principal producers were quite unconcerned about this, having previously sold freely and having expected a lull in buying as a natural development. Consequently they, for the most part, maintained their prices of 13 $\frac{3}{4}$ @13 $\frac{1}{2}$ c., regular terms, previously asked, but certain of the first hands appear to have done some fishing to find a market. The latter was chiefly an affair of the second hands and dealers. By virtue of the operations of interests who want to sell all the time and offer copper in an unwilling market, prices declined rather rapidly. However, the volume of business was so small that quotations were rather nominal. During the last two days copper was offered at below 13c., regular terms.

The alleged bids of 35c. for copper in Germany, talked about last week, are not regarded seriously, but it is believed to be a fact that copper is now worth about 28c. per lb. there. Reports about the tearing down of trolley wires, etc., are simply moonshine, but it is believed that the Mansfeld mines are being worked very strenuously.

Copper sheets, base price is now 18 $\frac{1}{2}$ c. per lb. for hot rolled and 19 $\frac{1}{2}$ c. for cold rolled. Usual extras charged and higher prices for small quantities.

Exports from New York, week ended Dec. 12, as reported by Department of Commerce: To France, 4,771,000 lb.; Sweden, 1,994,000; Great Britain, 1,069,000; Canada, 112,000; Cuba, 1000; total, 7,947,000 lb., or 3548 long tons.

Exports of copper from Baltimore for the week ended Nov. 17, were 906 long tons.

**Tin**—On the decline in London, the market here became dull. Consumers have been buying sparingly for future deliveries, but their buying has now stopped. Spot tin is scarce and at a premium.

The output of Federated Malay States in November was 3788 long tons. For the 11 months ended Nov 30, the total was 45,513 tons in 1913, and 44,110 tons in 1914; decrease, 1403 tons.

H. A. Watson & Co. report arrivals of tin concentrates at Liverpool in November as follows: Bolivia, 789 tons, equal to 473 tons tin; Nigeria, 519 tons, 363 tons tin; South Africa, 192 tons, or 134 tons tin; total, 1500 tons concentrates carrying 970 tons metallic tin.

Arrivals of tin at Pacific Coast ports in October were 139 tons; for the 10 months ended Oct. 31, they were 1438 tons, being 123 tons less than last year.

**Lead**—This market has been stronger, especially at St. Louis. In the New York market no business below 3.80c. was reported. Some further large sales for export were made.

**Spelter**—Business amounting to a few hundred tons daily was done both for export and for home consumption, but from neither quarter was the demand satisfactory, and there was a general tendency among sellers to shade prices in order to consummate business. At the close spelter was offered at 5.40c., St. Louis.

The railroad rates on spelter from St. Louis or East St. Louis to New York were advanced on Dec. 16 from 15 $\frac{1}{2}$ c. to 17c. per 100 lb. The same advance applies also to pig lead.

Exports from Baltimore for the past week included 504,001 lb. spelter to Glasgow.

Reports from correspondents in Kansas indicate that the stock of spelter at works in Kansas and Oklahoma on Dec. 1 was only about one-sixth the amount on hand on July 1. Important export shipments have been made to Europe by way of Montreal. A lot of 500 tons recently went to Japan.

## Other Metals

**Aluminum** continues dull and there is little change in conditions. Quotations are 18 $\frac{3}{4}$ @19c. per lb. for No. 1 ingots, New York.—**Antimony** has continued quiet, with no special feature. Ordinary brands are fairly steady at 12 $\frac{1}{2}$ @13 $\frac{1}{2}$ c. per lb. Cookson's is easier, 15@15 $\frac{1}{2}$ c. being asked.—**Quick-silver** has been in moderate demand only and is a little easier at \$50 per flask of 75 lb., New York. The foreign market is strong; London price is £11 10s. per flask.—**Nickel**—Ordinary forms—shot, blocks or plaquettes—are 40@45c. per lb., according to size and terms of order. Electrolytic metal is 5c. per lb. higher.

**Minor Metals**—Current sales of **Bismuth** have been at \$2.75 per lb., New York. **Selenium**—Quotations are \$2@3 per lb. for larger quantities; \$4.50@5 per lb. for smaller lots.

DAILY PRICES OF METALS IN NEW YORK

Dec.	Sterling Exchange	Silver, Cts. per Oz.	Copper	Tin	Lead		Zinc	
			Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.
			*13.00			3.60	5.67 $\frac{1}{2}$	5.50
17	4.9713	49 $\frac{1}{2}$	@13.10	34 $\frac{1}{2}$	3.80	@3.70	@5.70	@5.52 $\frac{1}{2}$
			*12.90			3.60		5.45
18	4.8700	48 $\frac{1}{2}$	@13.00	34 $\frac{1}{2}$	3.80	@3.65	5.65	@5.50
			*12.90			3.60		5.45
19	4.8675	48 $\frac{1}{2}$	@13.00	34	3.80	@3.65	5.65	@5.50
			*12.85			3.60		5.45
21	4.8563	49 $\frac{1}{2}$	@12.95	33 $\frac{1}{2}$	3.80	@3.65	5.65	@5.50
			*12.75			3.60		5.40
22	4.8525	48 $\frac{1}{2}$	@12.85	33 $\frac{1}{2}$	3.80	@3.65	5.60	@5.45
			*12.75			3.60	5.55	
23	4.8525	48 $\frac{1}{2}$	@12.85	33 $\frac{1}{2}$	3.80	@3.65	@5.60	5.40

\*Nominal.

The quotations herein are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.17c. apart.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold at prices including delivery to the consumer, and is subject to discounts, etc. The difference between the price delivered and the New York cash equivalent is at present 0.15 to 0.20c. on domestic business and 0.25 to 0.37 $\frac{1}{2}$ c. on European. The price of electrolytic cathodes is 0.05 to 0.10c. below that of electrolytic. Quotations for lead represent wholesale transactions in the open market for good ordinary brands. Quotations for spelter are for ordinary Western brands. Silver quotations are in cents per troy ounce of fine silver.

Some current freight rates on metals per 100 lb. are: St. Louis-New York, 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1c.

## LONDON

Dec.	Silver	Copper				Tin		Lead		Zinc	
		Spot		3 Mos	Best Sel'td	Spot	3 Mos	£ per Ton	Cts. per Lb.	£ per Ton	Cts. per Lb.
		£ per Ton	Cts. per Lb.								
17	22 $\frac{1}{2}$	57 $\frac{1}{2}$	12.55	58	*	148	146 $\frac{1}{2}$	19	4.13	27 $\frac{1}{2}$	6.00
18	22 $\frac{1}{2}$	57 $\frac{1}{2}$	12.49	57 $\frac{1}{2}$	*	147	145 $\frac{1}{2}$	19	4.13	27 $\frac{1}{2}$	5.97
19	22 $\frac{1}{2}$	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
21	23	57 $\frac{1}{2}$	12.46	57 $\frac{1}{2}$	*	145 $\frac{1}{2}$	144	19 $\frac{1}{2}$	4.16	27 $\frac{1}{2}$	5.95
22	22 $\frac{1}{2}$	57	12.38	57 $\frac{1}{2}$	*	144	142 $\frac{1}{2}$	19 $\frac{1}{2}$	4.18	27 $\frac{1}{2}$	5.89
23	22 $\frac{1}{2}$	57	12.38	57 $\frac{1}{2}$	*	144 $\frac{1}{2}$	142 $\frac{1}{2}$	19 $\frac{1}{2}$	4.18	27	5.87

\*No quotations.

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17 $\frac{1}{2}$ c.; £15 = 3.26 $\frac{1}{2}$ c.; £20 = 4.35c.; £30 = 6.52c.; £60 = 13.05c. Variations, £1 = 0.21 $\frac{1}{2}$ c.

**Gold, Silver and Platinum**

Gold imports in Great Britain, 11 months ended Nov. 30, were £50,067,108; exports, £30,071,352; excess of imports, £19,995,756, against £10,544,364 last year.

Gold and Silver Movement in the United States, 11 months ended Nov. 30, as reported by the Division of Statistics of the Department of Commerce:

	Gold		Silver	
	1913	1914	1913	1914
Exports.....	\$81,226,017	\$222,485,232	\$58,319,092	\$46,291,181
Imports.....	58,631,475	53,278,678	33,057,451	23,219,995
Excess, exports...	\$22,594,542	\$169,206,554	25,261,641	\$23,071,186

Exports of merchandise for the 11 months are valued at \$1,867,879,583; imports, \$1,674,619,401; excess of exports, \$193,260,182. Adding excess of exports of gold and silver gives \$385,537,922 as the total export balance.

Iridium—This metal is scarce and in demand. Prices are rather irregular, sales being a matter of negotiation.

Platinum—The market is rather dull, and demand is small. Sales are reported at \$41@42 per oz. for refined platinum. Hard metal is \$46@50, according to grade.

Our Russian correspondent writes that the position of the market is essentially without change. In Petrograd there have been no sales and no prices can be given. At Ekaterinburg no large sales have taken place, but some small lots have been sold at 7.30 rubles per zolotnik—\$27.45 per oz.—for crude metal, 83% platinum.

Silver—The market shows a slight declining tendency owing to the approach of the holiday season. The apathy of former years at this time is accentuated by the unfavorable trade conditions that continue to exist between London and the East.

Exports of silver from London to the East, Jan. 1 to Dec. 10, values, as reported by Messrs. Pixley and Abell:

	1913	1914	Changes
India.....	£9,606,000	£5,219,500	D. £4,386,500
China.....	755,000	42,000	D. 713,000
Total.....	£10,361,000	£5,261,500	D. £5,099,500

Imports of silver into Great Britain, 11 months ended Nov. 30, were valued at £10,831,251; exports, £10,343,094; excess of imports, £488,157, which compares with an excess of exports of £1,243,358 last year.

**Zinc and Lead Ore Markets  
PLATTEVILLE, WIS.—Dec. 19**

The base price paid this week for 60% zinc ore was \$47@50 per ton. The base price paid for 80% lead ore was \$45@46 per ton.

**SHIPMENTS WEEK ENDED DEC. 19**

	Zinc Ore, Lb.	Lead Ore, Lb.	Sulphur Ore, Lb.
Week .....	3,563,430	.....	174,200
Year .....	163,771,770	4,998,890	31,421,850

Shipped during week to separating plants, 4,435,280 lb. zinc ore.

**JOPLIN, MO.—Dec. 19**

Blende, high price, \$53; assay base, \$48@52; metal base, \$47.50@48.50; calamine base, 40% zinc, \$23.50@27.50; average all grades of zinc, \$47.32 per ton.

Lead, high price, \$48.50; base, \$47@48 per ton, 80% metal content; average, all grades of lead, \$46.92 per ton.

Beginning last Sunday with offerings of \$49@50 assay base on the best ores, it required effort to prevent a wild impulse from seizing the market, but prices were generally kept down to \$48@51, except two sales for next week's delivery, made at \$52. Three blizzards this week, beginning late last Saturday night, another Wednesday and one Friday night, put the calamine and lead producers with handjigs out of business the entire week.

**SHIPMENTS, WEEK ENDED DEC. 19**

	Blende	Calamine	Lead	Values
Totals this week..	9,212,940	325,000	1,268,590	\$255,480
Totals this year..	501,815,750	37,589,070	86,696,400	12,583,680

Blende value, the week, \$221,370; 51 weeks, \$10,117,590.

Calamine value, the week, \$4300; 51 weeks, \$443,530.

Lead value, the week, \$29,750; 51 weeks, \$2,022,110.

**Iron Trade Review**

**NEW YORK—Dec. 24**

The better feeling in the iron and steel trades is beginning to be justified by some increase in orders, notwithstanding the close approach of the holiday season.

The movement is more active in plates, bars and shapes.

Structural steel is rather slow, few heavy building contracts being reported. Sheets and tinplates are fairly active.

Export business is reported on the increase, some considerable contracts having been closed, while others are pending. Most of this business is for early delivery.

There is considerable talk of a general reduction in wages. Nothing has been actually done about it, but the matter is reported to be under discussion by the larger steel companies. With regard to wages, President Gary, on Dec. 22, issued the following statement: "After giving careful consideration to the subject, it has been decided to make no general reduction in the wages of the employees of the United States Steel companies at this time. There will probably be some readjustments in the amounts paid for skilled labor or piece work, depending upon special conditions."

Pig iron continued to show fair buying, especially of foundry and basic iron. The better prospect has stimulated coke and some large contracts for 1915 are reported.

**PITTSBURGH—Dec. 23**

Trade prospects continue to improve and there is actually a betterment in most directions. The improvement in sentiment begun, as has been noted, nearly a month ago; actual increase in buying did not show until later, but it is now in evidence. There is no doubt that the turn in the market has come; the question is now how long the improvement will last and how far it will go. Under present conditions nobody looks for a boom, but a steady market with better prices is rather confidently expected.

There has been no change in prices, but present quotations are rather more firmly held than they were:

Pig Iron—Nothing big is noted but there has been quite a fair demand for foundry and basic. Quotations are about the same: Bessemer, \$13.75; basic, \$12.50; No. 2 foundry, \$12.75@13; malleable, \$12.75@13; gray forge, \$12.50@12.75, at Valley furnaces, 95c. higher delivered Pittsburgh.

Ferromanganese—The ferromanganese market remains quiet. We quote prompt and contract at \$68, Baltimore.

Steel—Negotiations are still forward on contracts for billets and sheet bars for next year's delivery. For early deliveries we quote billets at \$18.50 and sheet bars at \$19, at maker's mill, Pittsburgh or Youngstown. Rods are \$24.50@25, Pittsburgh.

United States Foreign Trade in Iron and Steel, 10 months ended Oct. 31, is valued as below by the Department of Commerce:

	1912	1913	1914
Exports.....	\$238,971,131	\$251,676,318	\$169,232,670
Imports.....	23,885,776	28,292,118	24,947,236
Excess, exports.....	\$214,085,355	\$233,384,200	\$144,285,434

As compared with 1913 there are in 1914 decreases of \$82,443,648, or 32.8%, in exports; and of \$3,344,882, or 11.8% in imports.

**IRON ORE**

The total water shipments of iron ore from the Lake Superior region for the season of 1914, as corrected, were 32,021,897 long tons, against 49,070,488 in 1913. Of these shipments 25,402,655 tons were delivered to Lake Erie ports. Shipments to furnaces from Lake Erie docks were 21,976,941 tons, against 35,747,800 in 1913; stocks on docks Dec. 1, were 9,345,871 tons, being greater than on Dec. 1, 1913, by 83,995 tons.

**COKE**

Connellsville—The contracting movement is about over for the present, with about 250,000 tons a month placed under contract, all within five or six weeks, at about \$1.75. Prompt furnace coke is quiet at \$1.60, prompt foundry remaining at \$2@2.20 for miscellaneous brands while contract foundry, for best brands, is nominal at \$2.35@2.50 at ovens.

**Chemicals**

**NEW YORK—Dec. 24**

All indications are that the year will close on a dull market. It is, moreover, still rather disorganized by the war, and the difficulty of obtaining some products from abroad.

Arsenic—The market is extremely dull with sales few. Supplies are more than sufficient for present demand. Quotations are \$3.75@4 per 100 lb. for both spot and futures.

Copper Sulphate—On a moderate business prices are unchanged. Quotations are \$4.35 per 100 lb. for carload lots and \$4.60 per 100 lb. for smaller parcels.

Nitrate of Soda—Business is quiet, as usual at this season. Quotations are steady at 1.85c. per lb. for all positions. Supplies are good.





Assessments

Table with columns: Company, Delinq., Sale, Amt. Lists various companies and their assessment details.

Stock Quotations

Table with columns: Name of Comp., Bid., Name of Comp., Bid. Lists stock prices for COLO. SPRINGS, SALT LAKE, TORONTO, and SAN FRANCISCO.

N. Y. EXCH. Dec. 21

Table with columns: Name of Comp., Clg. Lists various companies and their exchange details.

N. Y. CURB Dec. 21

Table with columns: Name of Comp., Clg. Lists various companies and their curb exchange details.

LONDON Dec. 21

Table with columns: Name of Comp., Clg. Lists various companies and their London exchange details.

BOSTON EXCH Dec. 21

Table with columns: Name of Comp., Clg. Lists various companies and their Boston exchange details.

BYSTON CURB Dec. 21

Table with columns: Name of Comp., Bid. Lists various companies and their Byston curb exchange details.

Last Quotations.

COPPER

Table with columns: Month, New York, London. Lists copper prices for various months.

TIN

Table with columns: Month, New York, London. Lists tin prices for various months.

LEAD

Table with columns: Month, New York, St. Louis, London. Lists lead prices for various months.

SPELTER

Table with columns: Month, New York, St. Louis, London. Lists spelter prices for various months.

PIG IRON IN PITTSBURGH

Table with columns: Month, Bessemer, Basic, No. 2 Foundry. Lists pig iron prices for various months.

Monthly Average Prices of Metals

SILVER

Table with columns: Month, New York, London. Lists monthly average silver prices.

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

New York and St. Louis quotations, cents per pound, London, pounds sterling per long ton. \* Not reported. † London Exchange closed.



# The Engineering and Mining Journal

Volume 98, No. 26  
 Issued Every Saturday  
 Hill Publishing Company

NEW YORK, DECEMBER 26, 1914

Price, 15 Cents  
 Contents, First Page  
 Advertising Index, Last Page

## The American **TUNNELING RECORD**

AGAIN BROKEN

BY **LEYNER-INGERSOLL** DRILLS

817 feet of 7"-6" x 10"-0" Tunnel in 30 Days,  
 Driven from a Single Heading

Name of Tunnel . . . . . Rogers Pass (West End Pioneer Heading)  
 Location . . . . . Glacier, British Columbia  
 Contractors . . . . . Foley Bros., Welch & Stewart  
 Character of Ground . . . . . Slate with small quartzite bands  
 Drills . . . . . 3 Leyner-Ingersoll Water Drills on 9'-6" Cross Bar.

### CREW

Drill Runners . . . . . 3	Trackman . . . . . 1
Drill Helpers . . . . . 2	Pumpman . . . . . 1
Muckers . . . . . 8	Walking Foreman . . . . . 1

Haulage was done by mules.

### PERFORMANCE

Average Advance per day . . . . .	27.84 feet
Best Day's Work (Nov. 27) . . . . .	37 feet
Best Week's Work (Nov. 23 to 29) . . . . .	220 feet
Total No. of Blasts . . . . .	140
Rock Removed . . . . .	2270 cubic yards

### COMMENTS

The Superintendent, Mr. A. C. Dennis, characterized the ground as follows—  
 "Driven down grade through rock that could not be broken over six feet per round."

The Assistant Superintendent, Mr. J. Fowler, comments as follows—  
 "Pump had to be placed in face before dropping bar to drill lifters. After the machine men had finished drilling the top holes of heading and while waiting for the muck to be cleared away they would oil the machines and have the hose lines connected, so that when bar was dropped and fixed the machines would be running in one and a half minutes. Have a very high opinion of your machines."

BULLETIN No. 4020 DESCRIBES THE LEYNER-INGERSOLL DRILL.

# INGERSOLL-RAND CO.

New York

London



# The S-A Journal



Published Weekly in the Interests of S-A Conveying Engineering

## What would be Your Judgment?

### The Problem

Ore is dug by steam shovels and hauled in 100,000 pound steel hopper cars to the crushing plant. It ranges in size up to 18-inch lumps. How to store this in bins and arrange to deliver from the bins to the crushers at the rate of 16,000 tons per day was a problem confronting one of the well-known mining companies. They had already found an extensive system of cars and electric locomotives to be inadequate.

### The Solution

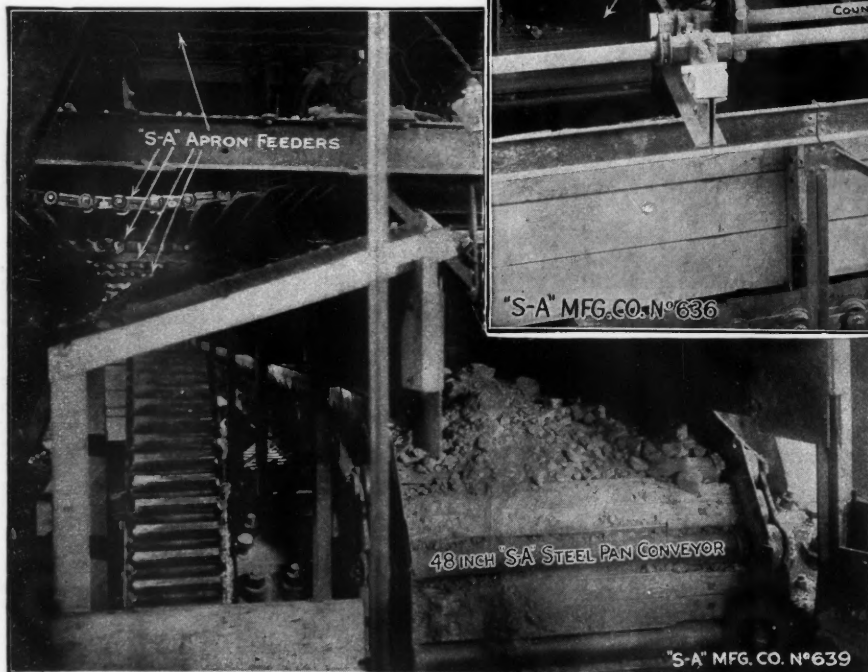
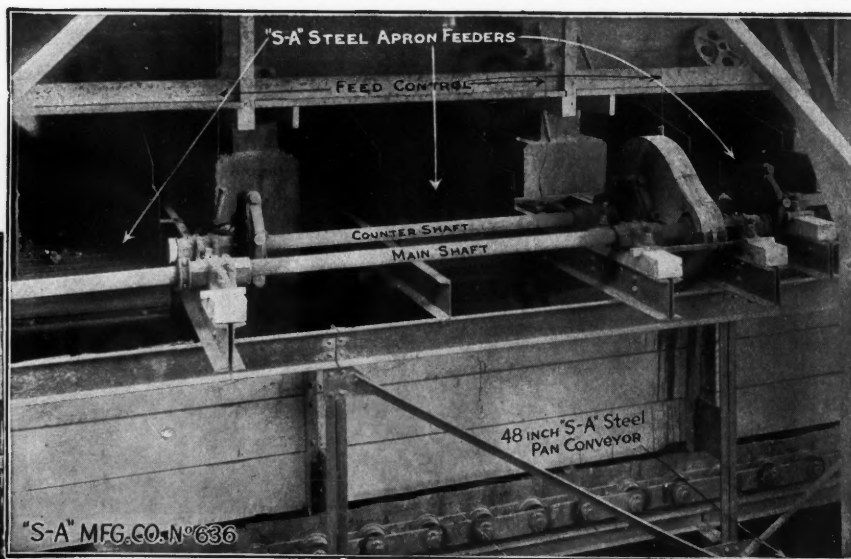
In constructing this new plant, a very comprehensive system of feeders and conveyors was installed, which has proven highly satisfactory. A battery of over 100 "S-A" Steel Apron Feeders withdraws the ore from the bins. Four 48-inch "S-A" Steel Pan Conveyors, aggregating 462 feet in length, handle the lump ore, and 3,000 feet of 30, 36, and 42-inch "S-A" Belt Conveyors handle the fine ore. The methods of control, the general arrangement, and various refinements in design are most interesting. We have described this immense plant in our "Labor Saver" No. 63, which we will be glad to mail on request.

Experience in hundreds of problems, similar to the above, is at your service gratis. The "S-A" Engineering Board is ready to consult with you on any conveying problem.

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# The Engineering and Mining Journal

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VOLUME 98

DECEMBER 26, 1914

NUMBER 26

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| <p><b>*DAWSON TO NOME:</b> <span style="float: right;"><i>Page 1121</i></span></p> <p>Experiences of a tenderfoot in traveling from Dawson, Yukon, to Nome, Alaska, and in visiting mining districts at Ruby, Fairbanks and Nome; transportation is unsatisfactory. By H. E. Chako. <i>ENG. AND MIN. JOURN.</i>, Dec. 26, 1914.</p>                                                                                                                                                                                                                        | <p><b>DETAILS OF PRACTICAL MINING:</b> <span style="float: right;"><i>Page 1136</i></span></p> <p>*Safety Boards for Tram Car—Record Tunnel Driving—Resolving Dredged Areas in Victoria—*Shaft-Concreting Bucket—Repair Jobs with Iron Cement—*Myers-Whaley Machines on the Rand.</p>                                                                                                                                                                                                                                                                                                    |
| <p><b>COMBINED CYANIDE AND OTHER PROCESSES—II:</b> <span style="float: right;"><i>Page 1127</i></span></p> <p>Costs of the usual concentration processes are given for comparison. Water crushing and oxidation treatments may be considered additional processes. Ammonia dissolution of copper is sometimes employed. Amalgamation is one of the oldest collaborators of cyanide, but is becoming of less use. By Herbert A. Megraw. <i>ENG. AND MIN. JOURN.</i>, Dec. 26, 1914.</p>                                                                     | <p><b>DETAILS OF MILLING AND SMELTING:</b> <span style="float: right;"><i>Page 1139</i></span></p> <p>*Settling-Pond Sludge Box—Leaching Experiments on the Ajo Ores—*The Thibault Amalgamator—Briquetting of Iron-Furnace Dust—A New Flue-Gas Scrubber.</p>                                                                                                                                                                                                                                                                                                                             |
| <p><b>*MEN AND MACHINERY OF THE COMSTOCK—PIONEER HOISTING WORKS:</b> <span style="float: right;"><i>Page 1130</i></span></p> <p>The details of the hoisting engines described give some idea of the huge mechanical problems solved more than a generation ago by the engineers of the Comstock. Hoists with flat steel ropes, which weighed over 25 tons and lifted 1800 tons a distance of 1700 ft. every 24 hours, are particularly interesting. G. W. Dickie. <i>ENG. AND MIN. JOURN.</i>, Dec. 26, 1914.</p>                                          | <p><b>THE ASSAYER AND CHEMIST:</b> <span style="float: right;"><i>Page 1141</i></span></p> <p>*A Rapid Method for Washing Gold Beads—Substitute for the Blast Lamp—Volumetric Method for Lead in Ores—The Pearce Assay for Tin.</p>                                                                                                                                                                                                                                                                                                                                                      |
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## THE READER'S PAGE

“Advertising,” said a speaker at a great business men’s dinner, “is merchandising by wireless — suggesting comforts and necessities before the need is born—creating new markets—building new factories—selling the surplus.”

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And, incidentally, advertising makes the advertiser a bigger, broader man; likewise, the reader of advertising.



# PUMPING MACHINERY

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## Service

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## Cost of Labor

alone will be more than the saving made by an efficiency 5% higher than that given by a pump not requiring any shut-down for repairs.

## For Mine Service

it is especially important to select equipment that will

## Work Continuously

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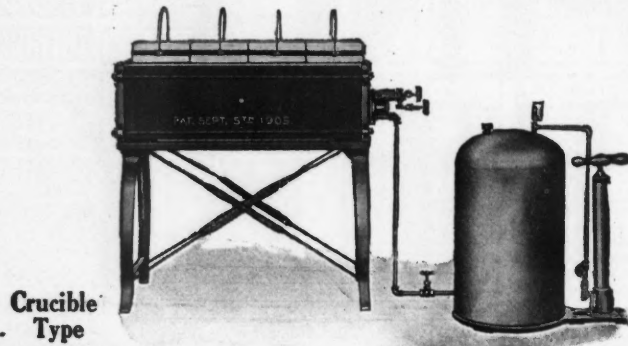
## Total Operating Cost

is of more importance than high efficiency.

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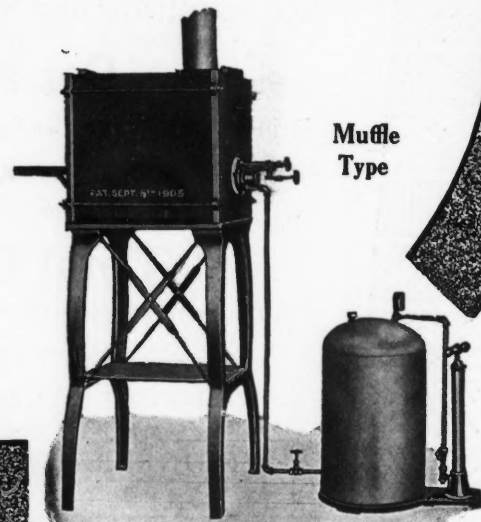
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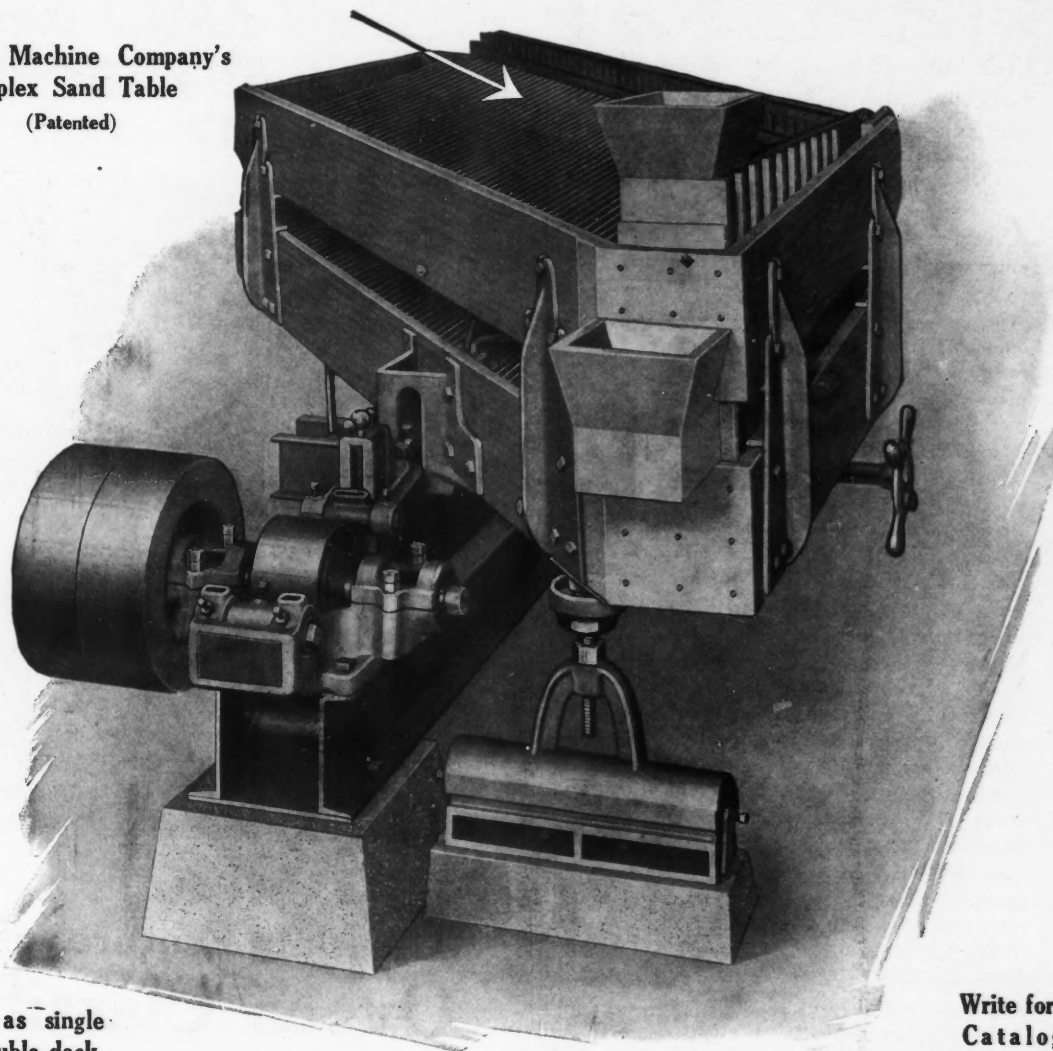
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# The Sorting Column

We do not know whether in 1550 when Agricola wrote his famous work on mining, they were in the habit of juggling stock or not—certainly they knew what mine shares were. Listen:

"Some owners prefer to buy shares in mines abounding in metals, rather than to be troubled themselves in search of veins—. They should not buy only high priced shares in those mines producing metals, nor should they buy too many in neighboring mines where metal has not yet been found, lest, should fortune not respond, they may be exhausted by their losses and have nothing with which they may meet their expenses or buy other shares which may replace their losses. This calamity overtakes those who wish to grow suddenly rich from mines, and instead, they become very much poorer than before. So then, in the buying of shares, as in other matters, there should be a certain limit of expenditure which miners should set themselves, lest blinded by the desire for excessive wealth, they throw all their money away. Moreover, a prudent owner, before he buys shares, ought to go to the mine and carefully examine the nature of the vein, for it is very important that he should be on his guard lest fraudulent sellers of shares should deceive him."

Agricola evidently thought the average miner needed some good advice, too. Next week in this space he gives the Prospective Miner something to think about.

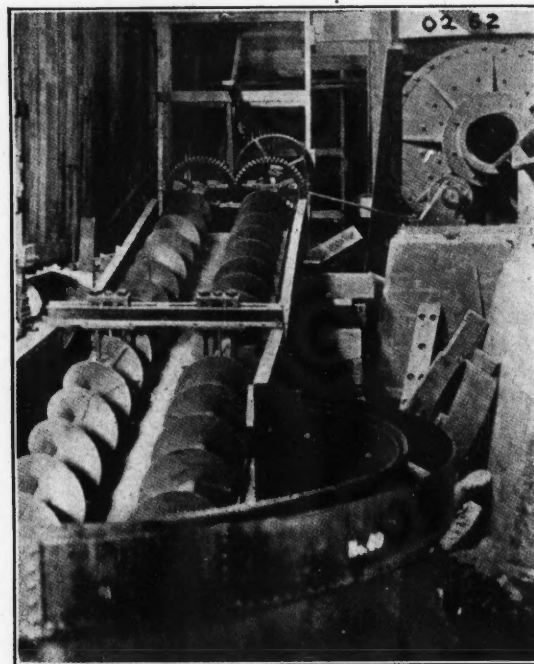


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An enlarged settling chamber to permit fine sand to subside.  
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An inclined unwatering trough, with:  
Conduits to convey the water

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One or more spiral conveyors extending through the settling and unwatering portions.  
A sand bed under the spiral conveyor forming the bottom of the trough—

Show why it is so successful in separating instantly slimes from sand.

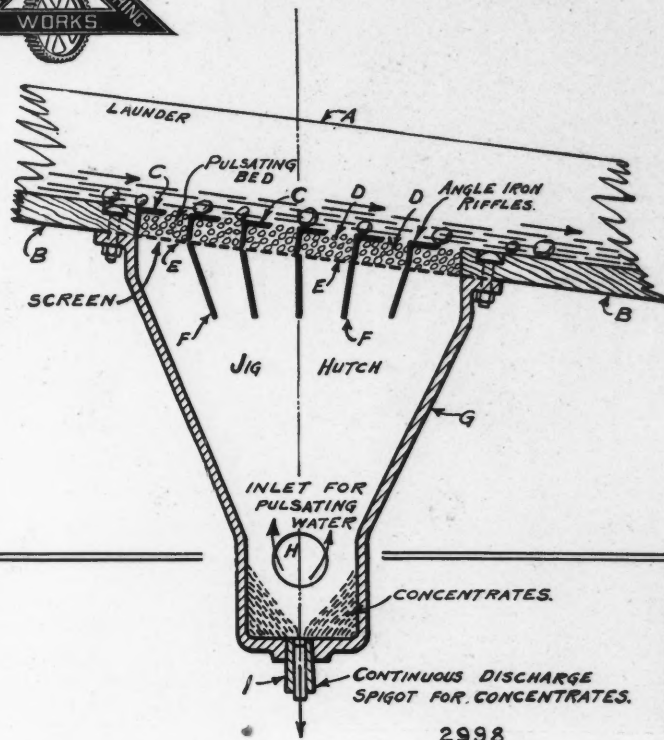
The Ovoca gives a clean, continuous separation of float concentrate from solution. It will give a continuous weir overflow of clear solution—will give a continuous discharge of concentrate carrying about 30% moisture, even when 60% of the concentrate will pass 200-mesh.

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The Richards Riffle consists of the Hungarian riffle with an intermittent pulsating current of water applied. Its saving qualities are as fine as those of the Hungarian riffle, yet—

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uous discharge—it will separate magnetite from black sand particles which carry no gold values—it cannot pack—it requires no clean-up.

Economical of operation, too. Water pressure, 7 lbs.—quantity required 40 gal. per min. per sq.ft. of riffled surface.

You will find it saves in space, weight and time.

Booklet No. 1069 on request.



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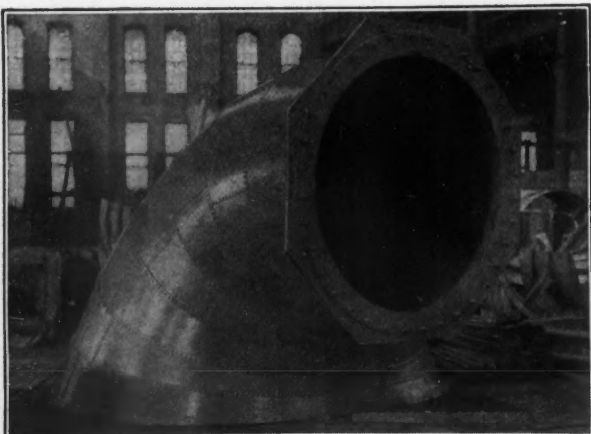
Send us your inquiries with specifications or blueprints for prompt attention.

**Allis-Chalmers Manufacturing Co.,** Mining Machinery Department **Milwaukee, Wisconsin**

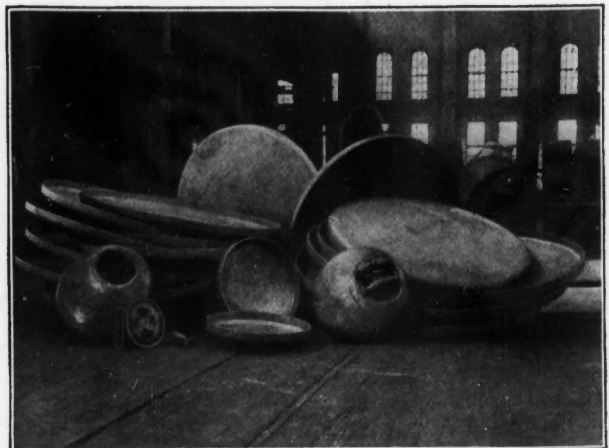
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Hydraulic Turbine Draft Tube



Pressed Steel Work





# At Last, a Carbide Lamp Burner That Won't Stop Up!!

As usual it was up to us to find a means of overcoming the trouble caused by the burners stopping up.

Well, we've perfected a burner that won't stop up. This only proves once again that we are constantly on the job, that we are giving the mining industry our very best efforts and that the really good things, the important improvements, are always found first on the

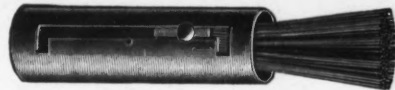
**Non-Cloggable Burner**

**BALDWIN**  
THE MINER'S LIGHTING BUG

**R**igid Removable Reflector



### Brush Burner Cleaner



Case is made of brass and contains a sliding base into which are solidly set sixty non-rusting wires. The knob allows the brush to be locked into position.

This cleaner can be used on any burner, using a single wire as you would an ordinary needle. When used on our new burner it should be used as a brush to remove any deposit on face of burner or from the slots.



This burner is made of a solid piece of brass, slotted on the face. These slots serve two purposes.

1st. They permit of air reaching the base of the flame, this air mixing with the gas lifts the luminous part of the flame away from the burner. The flame at the burner is blue and will not carbonize (make soot) only when the flame gets very low; even then the soot deposits on the face of the burner, it does not get down into the gasway and clog it.

2nd. The slots serve the same purpose as the slot in the head of the screw, and the burner is put on and taken off, just as you would an ordinary screw.

The shape of the burner, makes the sparker lighter more effective, as the burner rides close to the reflector and as the face of the burner is flat the spark from the lighter can get to the gasway. It works every time, there's never a miss.

The reflector is attached to the lamp as securely and rigidly as if soldered—still removable. This is a decided improvement on the permanently fixed reflector for several reasons.

1st. Should the reflector become damaged it can be replaced with a new one.

2nd. Different kinds of work require different kinds of light. For some, concentrated light is best, for others, partial diffusion of light is most desirable and still others, general illumination is needed.

The only practical way to obtain these variations is to use different shaped reflectors—hence the need of a removable reflector.

Note please, the brass reinforcing shell, back of the reflector. This more than doubles the strength of the reflector. You cannot bend or twist the reflector when unscrewing the carbide container and it will take more than an ordinary bump against the roof or wall of the mine to seriously injure it.

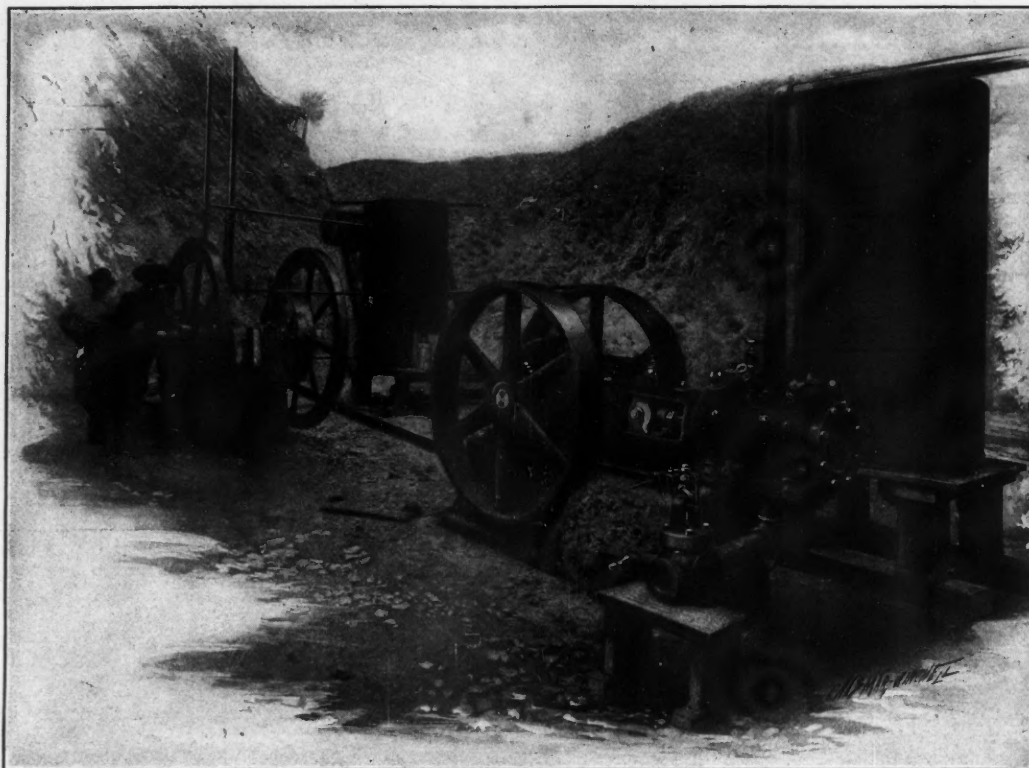
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If you need a small, steady, reliable supply of air power, for sinking a shaft, driving an exploratory tunnel or any temporary or regular, independent service, select a

### Sullivan Small Air Compressor

These compact, single stage units are built in capacities from 40 to 250 cu. ft., for standard or special pressures, and are operated by steam, belt or direct motor drive.

The “WG3,” belted compressor, shown above, embodies splash lubrication, radial poppet inlet and outlet valves, water jackets on cylinders and heads, total closure unloading device, bearing surfaces of liberal area and high standards in materials and construction—elements that mean **quality air service for you.**

When you need a new compressor, “*Get a Sullivan.*” Booklet 2112.

Hammer Drills

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# The Wedge Mechanical Furnace

Patented

## Dead or Sweet Roasting Gold Ores

A uniform dead or sweet roast of gold ores for cyaniding can be secured in Wedge Furnaces.

Furnaces are constructed to use whatever fuel may be available. You can use oil, gas, coal, coke, charcoal or wood.

On account of the detailed construction of the Wedge Roaster, designed for sweet roasting, you can secure a more uniform calcine than has been secured in previous practice with a different style of rabbling.

Wedge Furnaces are in commercial use, dead roasting gold ores, also in commercial use, dead roasting iron ores, where it is necessary to practically eliminate all the sulphur contents.

Write us stating analysis of ore, concentrates, mixture or material to be roasted, characteristics and physical condition of same, number of tons to be treated per 24 hours, and results desired in the calcine.

**Wedge Mechanical Furnace Company**

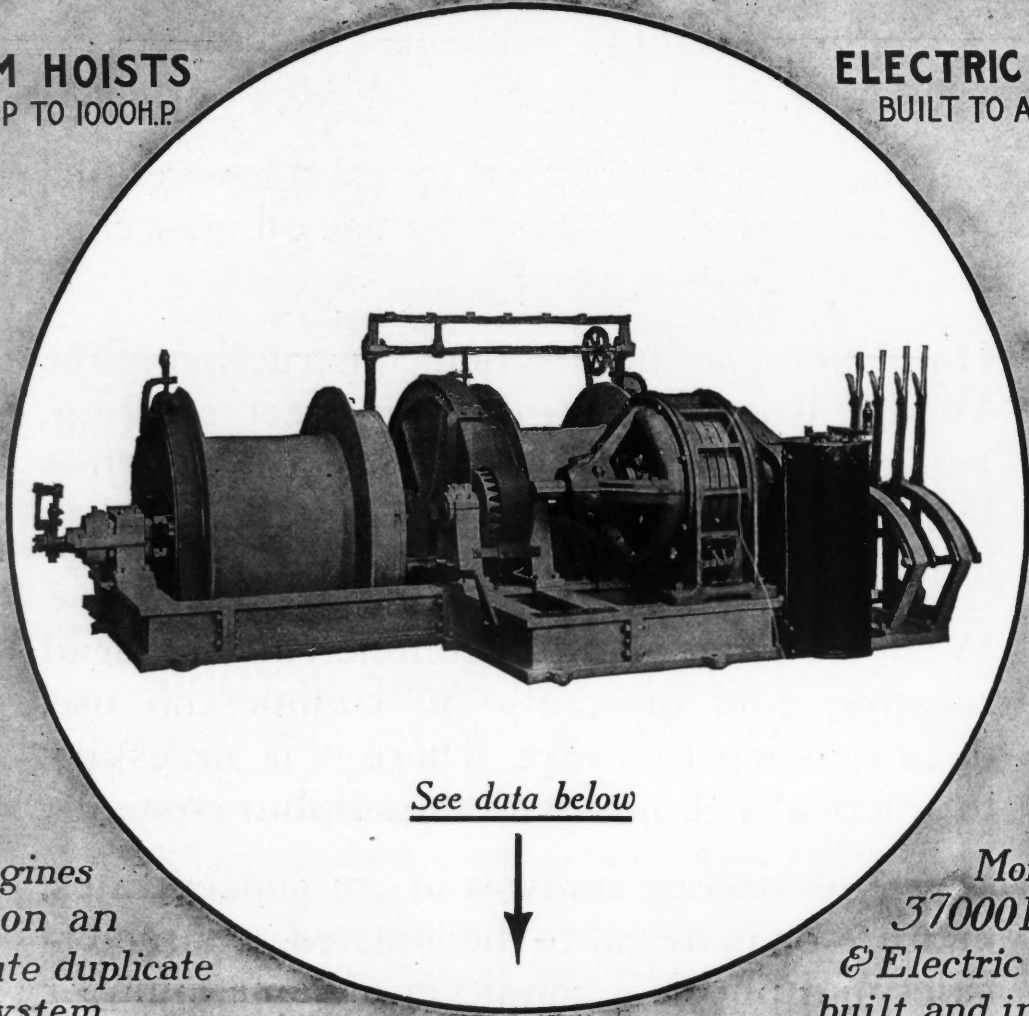
115 Chestnut St., Philadelphia

# Lidgerwood Hoists

*The product of the largest works in the world devoted exclusively to the building of Steam and Electric Hoists.*

**STEAM HOISTS**  
BUILT UP TO 1000H.P.

**ELECTRIC HOISTS**  
BUILT TO ANY SIZE



See data below

*All Engines  
built on an  
absolute duplicate  
part system.*

*More than  
37000 Engines  
& Electric Hoists  
built and in use.*

## A Hoist That Displaces Mules and Increases Output

Takes loaded cars from various headings to the main haulage line. Has tail rope drum to return empties where required by the grade. Tail rope drum and bed removable when not required. Haulage drum holds 3,000 ft. 7/8" rope. Tail rope drum holds 5,000 ft. of 5/8" rope.

### DATA

Two Friction Drums 42" diameter 33" face. Main Drum grooved. Tail rope Drum smooth. Duty 8550 lbs. 500 FPM. All cut gearing. Motor 150 H.P., wound for 3 phase, 60 cycles, 440 volts current.

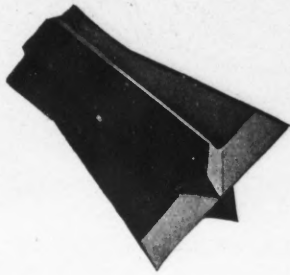
**LIDGERWOOD MFG. CO.**  
Chicago Pittsburgh

**96 Liberty St., NEW YORK**  
Seattle London



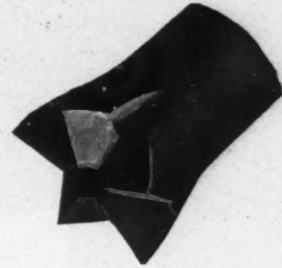


# Leyner Drill Sharpener



Makes

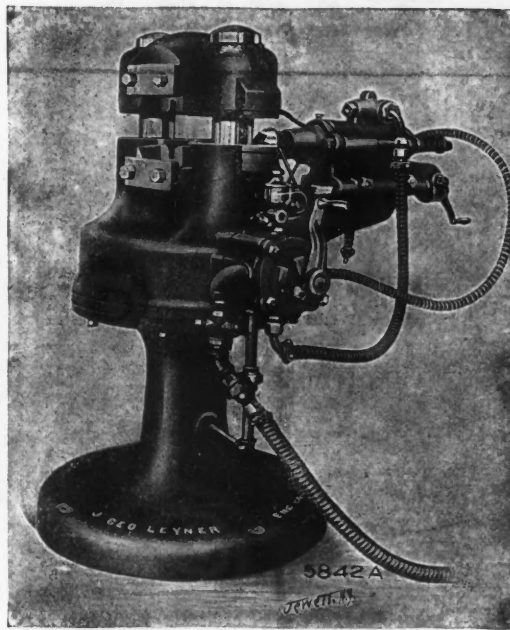
And Sharpens Any Kind of Bit,  
Shanks Hammer and Piston Steel,  
Does Special Forging Work.



Compact,  
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Occupies  
Very Little  
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is Low.

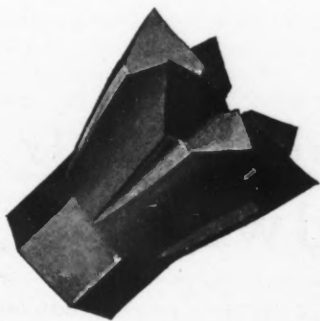


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Cost for sharpening is lower  
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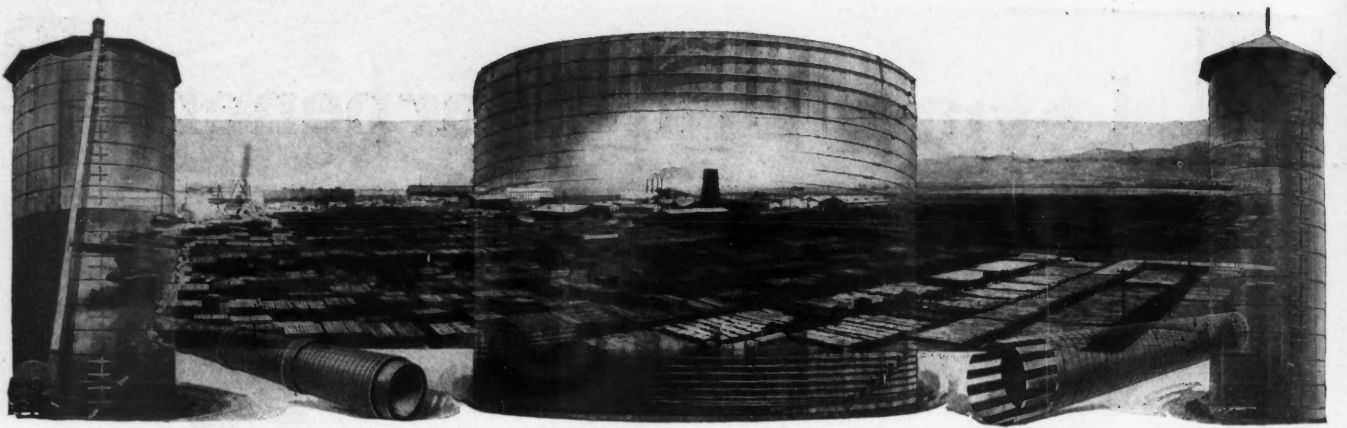
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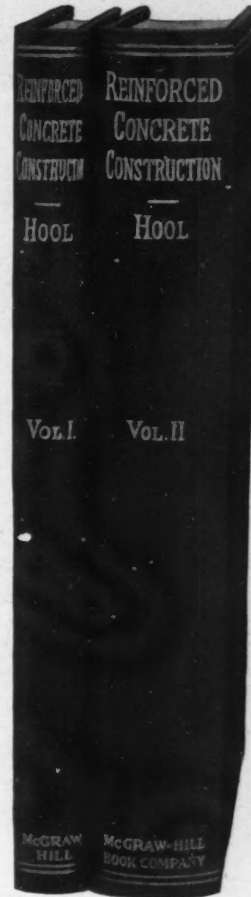
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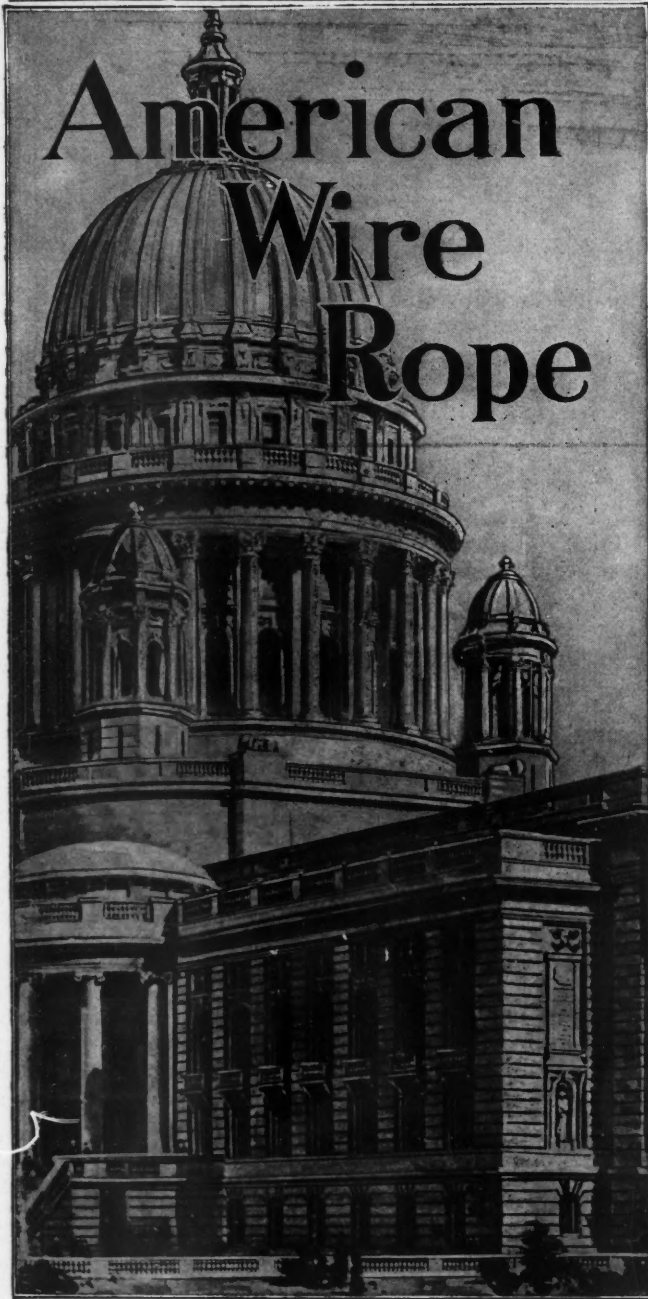
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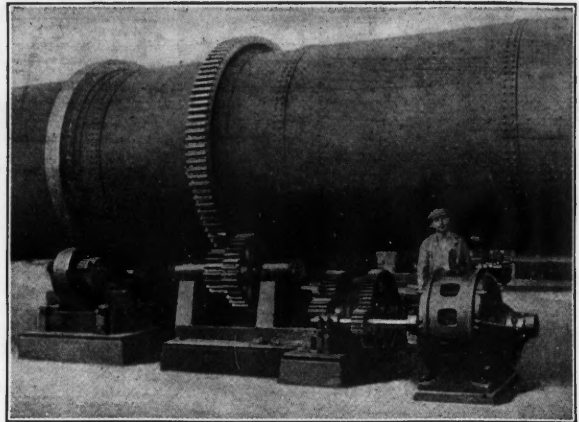
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are now in use drying ores and concentrates and are in successful operation where dryers of less rugged construction have failed. They are also in use in locations where fuel is so expensive that no other dryer could be profitably used.

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*An Automatic  
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For the Laboratory*

**Eliminates the Personal Equation  
Assures Accuracy and Impartiality**



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Two buckets revolve in opposite directions. Each bucket is divided into four parts. In the upper bucket the sample is quartered, two of the diametrically opposite quarters going into the discard and two into the lower bucket, where the operation is repeated, allowing one-quarter of the original sample to fall into the hopper while three-quarters passes through the discard chute.

Our new catalog No. 50 now ready.  
Tell us your needs—we will do the rest.

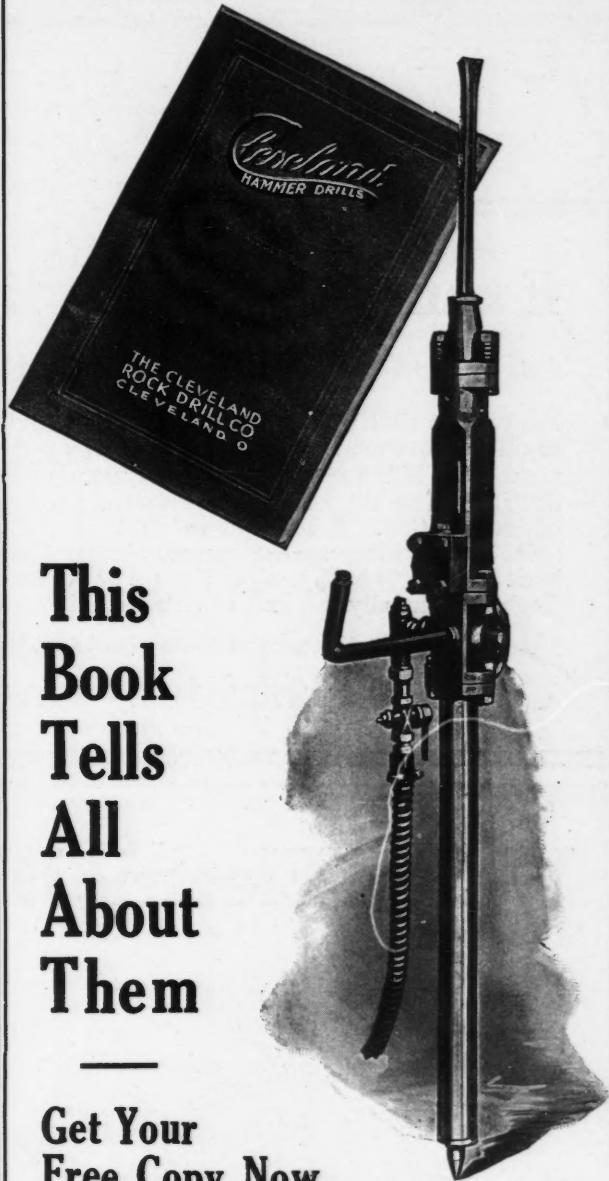


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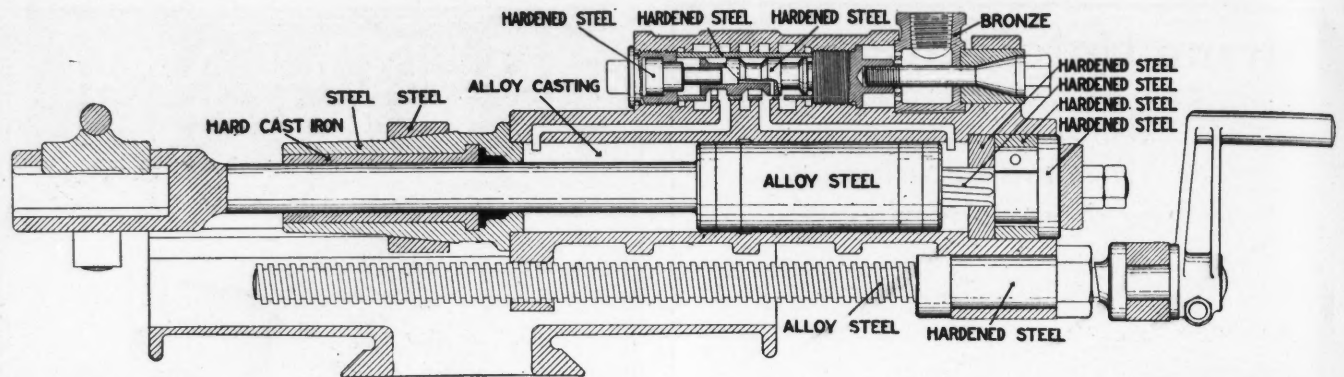
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Canadian Trade supplied by Cleveland Pneumatic Tool Co.  
of Canada, Limited, 80 Duchess Street, Toronto, Canada.



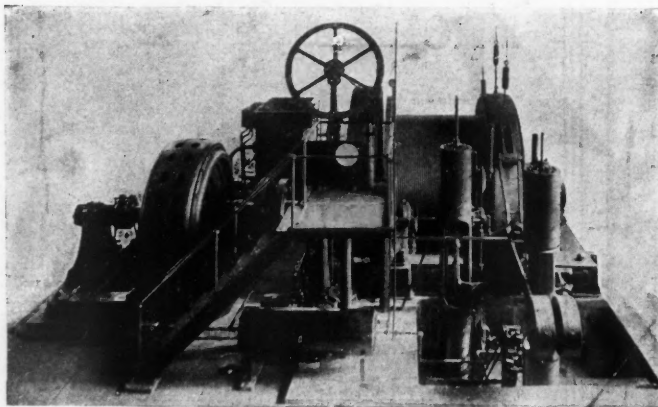
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Rock drills that proved satisfactory a few years ago are now practically out of date because of the rapid improvement taking place. ¶ Competition in doing development work makes it necessary to make close bids to secure contracts, money and time cannot be wasted by using inferior and obsolete drills. ¶ Note the valve construction of the Cochise Rock Drill. Note its simplicity and the materials of construction. ¶ Its light weight makes it a one-man machine that can be easily handled by one man. The drilling capacity exceeds others of similar cylinder dimensions. ¶ The air consumption is at least from 25 to 50% less per minute or per footage of hole drilled than the next best machine. ¶ The Cochise is equally efficient in either drilling, sinking or raising.

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New York, 50 Church Street

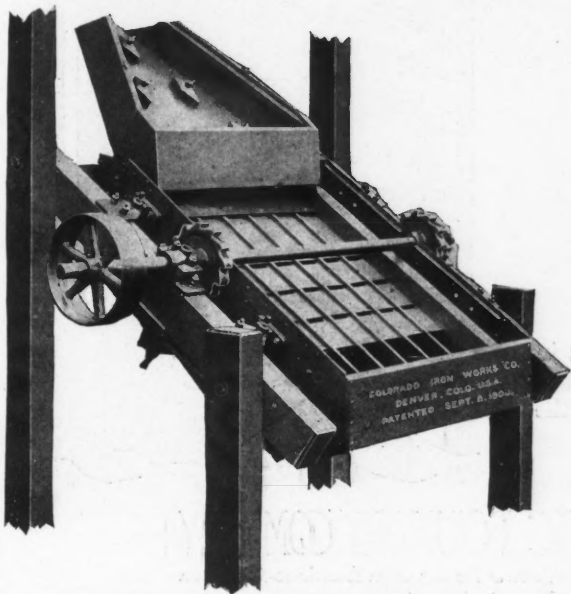
**The Wellman-Seaver-Morgan Company**  
Cleveland, Ohio, U. S. A.



Denver, 611 Ideal Bldg.



	<h2 style="margin: 0;">COLORADO IRON WORKS COMPANY</h2>	
<p><b>ORE SMELTING EQUIPMENTS</b></p>		<p><b>ORE MILLING MACHINERY</b></p>



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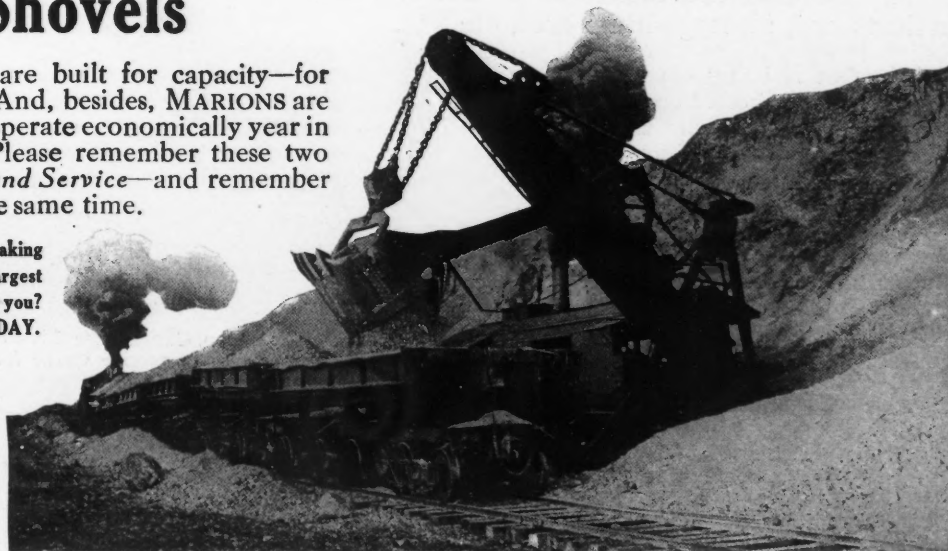
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STEAM SHOVEL  
COMPANY** Established 1884

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Atlanta Chicago New York  
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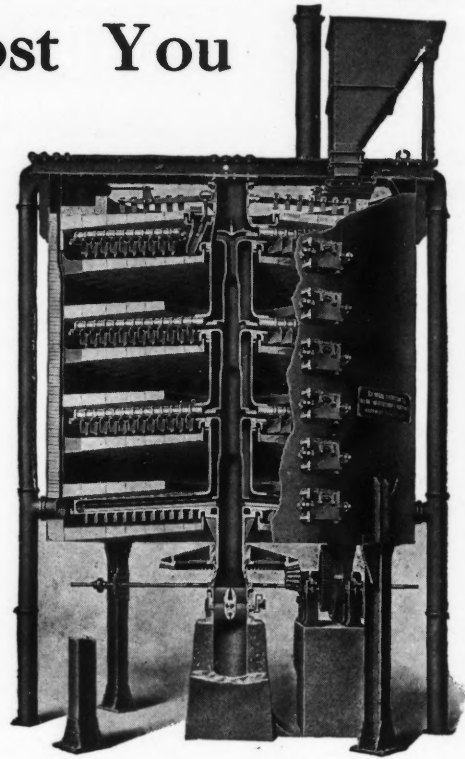
## How Much Does It Cost You to Roast Ores?

The cheapest furnace for you to buy for metallurgical-chemical use is not the one having the lowest selling price. It is the furnace that utilizes all waste heat—gives 40% greater capacity—eliminates fusion—consumes little power.

The furnace with these and other economical features is

### The New Herreshoff Temperature Controlled and Air-Cooled Furnace for Roasting Ores

Large batteries of these furnaces were used for several years in the various works of this company. We know its economical use *now*. In the meantime, send for our catalog describing the furnace.



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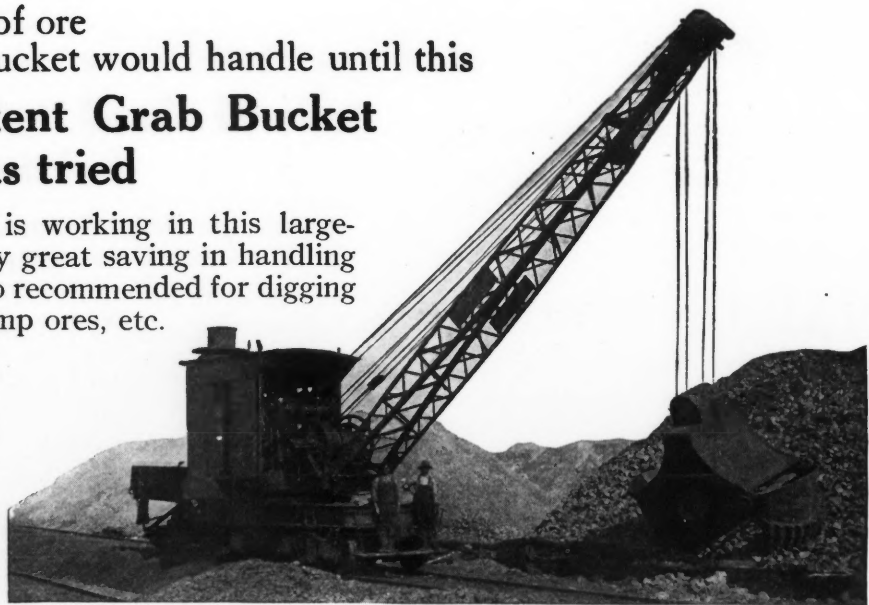
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## HERE is one kind of ore that no bucket would handle until this Brownhoist Patent Grab Bucket was tried

And today this bucket is working in this large-lump nickel ore at a very great saving in handling costs. The bucket is also recommended for digging in limestone, all large-lump ores, etc.

This bucket is being operated on a Brownhoist Locomotive Crane which is noted all over the world for its fine grab bucket operation

We have spent 33 years studying the different ore handling problems. And our engineers will gladly help you solve your problems.



The Mond Nickel Co., Ltd., of Conniston, Canada, use this 40 cu. ft. Brownhoist Special Grab Bucket on a 15-ton Brownhoist Locomotive Crane for handling the nickel ore.

Write for *Catalog E on Brownhoist Grab Buckets*  
*Catalog L on Brownhoist Locomotive Cranes*

**THE BROWN HOISTING MACHINERY CO., Cleveland, Ohio**

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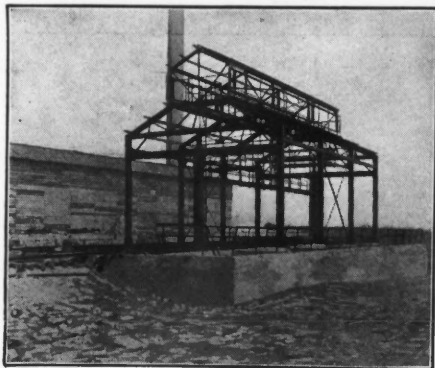
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*Manufacturers of Steel Structures of all classes particularly* **BRIDGES AND BUILDINGS**



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*The Slogan of the Cameron—"Character: The Grandest Thing"*

**LONG LIFE IS THE BIG FEATURE OF**

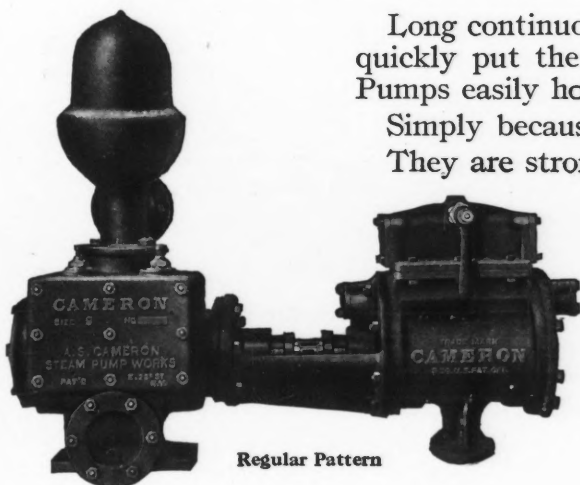
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Long continuous service under working conditions that would quickly put the average pump out of business finds Cameron Pumps easily holding their own.

Simply because Cameron Pumps are **made for hard work.**

They are strong, sturdily constructed pumps, have few parts and no working parts exposed.

Their upkeep cost is consequently very low—in fact, considered from the standpoint of service, operating cost, or repair cost, they are the ideal pumps for the exacting service encountered in mine work.



Regular Pattern

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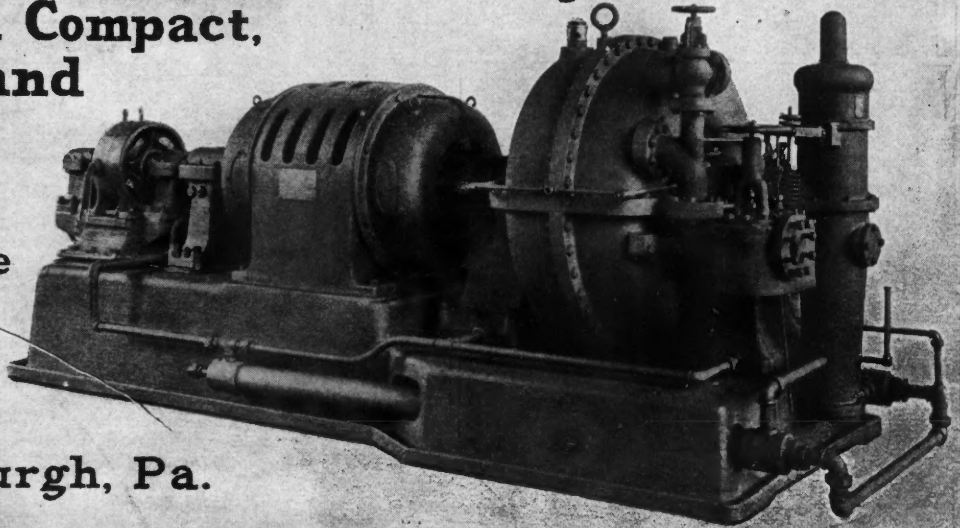
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**For A.C. and D.C. Work,  
Condensing or Non-condensing;  
Light and Compact,  
Reliable and  
Efficient.**

**The  
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and Auxiliaries**

**East Pittsburgh, Pa.**



**Do You Know What Real** DOUBLE CRIMPED **“Perfect”** WIRE CLOTH **Is?** CAN'T SLIP

Fifty years of success in its manufacture have caused many imitations to appear in the field, so we ask you to

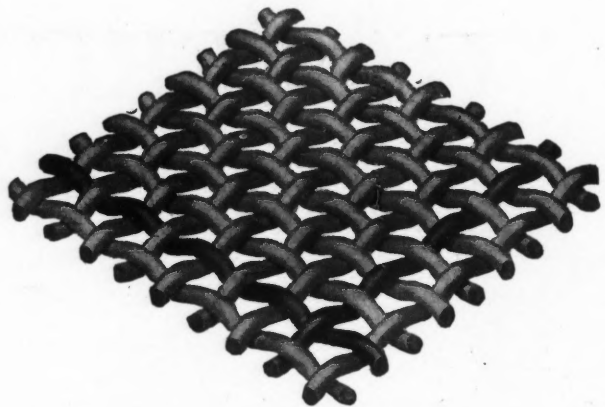
## Look

carefully at the two blackened wires.

Note how evenly they are crimped, not bent, over the warp and shoot wires—no rough corners or sharp angles but each wire curved gradually and gracefully over and under the intersecting wires.

This gives an absolutely permanent and rigid mesh, eliminating all slip and guaranteeing a uniform, even product throughout the life of the screen. Think of the more efficient operation this feature makes possible.

Remember, the Double Crimp and the name “Perfect” when ordering your next screens.

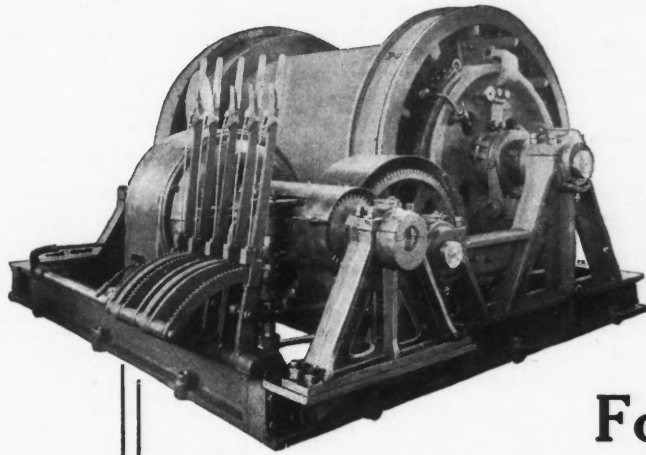


**Made in every size of wire and mesh. Immense stock on hand always to fill rush orders. Write or wire.**

**Write for “The Wire Cloth Book”—a valuable addition to your files.**

**The Ludlow-Saylor Wire Co., St. Louis, Mo.**





## For What Do You Look in a Hoist?

First, you want capacity to haul your load at the most economical speed. Then you want sufficient overload capacity to enable you to haul at higher than general speeds, or heavier loads at the usual speed. The gear ratios must be such as to reduce current consumption to the lowest figure. The proportions of the hoist must be such as to withstand the severe grind of continued operation at full load. Parts should not wear quickly, nor should bearings run hot; and the manufacturer must be reputable, must be one that you *know* can build hoists and stay in business. You want EFFICIENCY!

## Vulcan Hoists

are known throughout the mining world to give just what you, and every other mining man, are looking for. The thousands that have been successes on the most difficult hoisting jobs in the world are your guarantee of the service you can expect from any VULCAN Hoist, providing we have had a chance to look thoroughly into your conditions. You are free to utilize our engineering department whether you buy or not.

### Vulcan Iron Works

1733 Main St.,

Wilkes-Barre, Pa.

New York

Chicago



# Classified Advertising

**Positions Wanted**, 3 cents a word, minimum charge 50 cents an insertion, payable in advance.

**Positions Open**, (Civil Service Examinations), **Employment Agencies** (Labor Bureaus), **Business Opportunities**, **Wanted** (Agents and Salesmen—Contract Work), **Miscellaneous** (Educational—Books), **For Sale**, 5 cents a word, minimum charge \$1.00 an insertion.

Count five words for keyed address care of New York; six for Chicago. Abbreviated words or symbols count as full words.

Copy should reach us not later than Saturday noon for ensuing week's issue. Answers addressed to our care, Tenth Avenue at Thirty-sixth Street, New York or 1144 Monadnock Block, Chicago will be forwarded (excepting circulars or similar literature).

No information given by us regarding keyed advertiser's name or address.

Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents. Send copies.

**Advertisements calling for bids**, \$3.60 an inch per insertion. **J**

## POSITIONS OPEN

**WANTED**—Technical graduate with practical experience in making Lithopone, to erect and operate a plant in southern Missouri. Correspondence confidential. Give full particulars as to experience, etc. P. 825, Engineering and Mining Journal, Chicago.

## POSITIONS WANTED

**MASTER MECHANIC**, experienced in mine, mill and smelter, wishes position with good company. P. W. 817, Engineering and Mining Journal.

**MINING ENGINEER**, 12 years' experience, desires position as superintendent or engineer; construction and development work a specialty. P. W. 790, Engineering and Mining Journal, Chicago.

**SUPERINTENDENT** desires position; 20 years' experience in gold mines; first class executive and practical millman; technical graduate. P. W. 638, Engineering and Mining Journal.

**MINING ENGINEER** desires position of any description; experienced miner, millman and smelter chemist; speaks Spanish; first-class references. P. W. 809, Engineering and Mining Journal.

**MINE SUPERINTENDENT**, technical graduate; aged 35, married, desires position; specialty, efficiency and cost reduction; 10 years' experience. P. W. 822, Engineering and Mining Journal.

A **MINING ENGINEER** with experience in Missouri, Colorado and Butte, desires position as superintendent or engineer; good at handling men. P. W. 811, Engineering and Mining Journal, Chicago.

**MINING SUPERINTENDENT**—Young man, married, desires position as superintendent of iron ore mine; will start for moderate salary; references furnished. P. W. 820, Engineering and Mining Journal.

**ANY KIND MINING POSITION**—Prospecting, developing, superintending, surveying, assaying, construction, office; go anywhere at once; experienced graduate; 27. P. W. 819, Engineering and Mining Journal.

**SURVEYOR AND ASSAYER** desires position with small or new mining company; 29 years old; single; 6 years' practical experience; best references; will go anywhere. P. W. 823, Engineering and Mining Journal, Chicago.

**IN MINE OFFICE**; have had 10 years' experience; understand costs, payrolls, supplies; stenographer; can handle men; best references; family; go anywhere; any job to start; employed now. P. W. 821, Engineering and Mining Journal, Chicago.

**METALLURGIST** with many years' experience as assayer, chemist, assistant superintendent and superintendent with large smelting and refining companies desires position; technical graduate; good references. P. W. 804, Engineering and Mining Journal.

**ELECTRICAL MACHINIST AND STEAM ENGINEER** wishes position with mining company; thoroughly competent to handle the electrical and mechanical end of mining plants; conversant with mining methods, milling and gold dredging; 14 years' experience; initiative ability; age 35; will go anywhere. P. W. 818, Engineering and Mining Journal.

**SUPERINTENDENT OF PROPERTY** closed as result of war desires position; Ontario preferred; had just finished heavy development campaign and installation of an extensive mining plant; can produce results; refer you to present employers; free any time. P. W. 813, Engineering and Mining Journal.

**MINE MANAGER OR SUPERINTENDENT** desires change; technically educated; 14 years' experience; specialty, difficult ore treatment, also construction; highest testimonials; fluent Spanish; at present manager of silver-gold property. P. W. 800, Engineering and Mining Journal, Chicago.

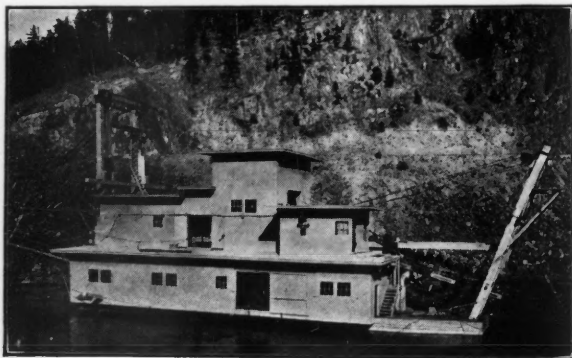
**OPEN FOR ENGAGEMENT**, mining engineer and metallurgist; graduate Michigan College of Mines, '98; a good executive; Mexican experience. P. W. 799, Engineering and Mining Journal, Chicago.

## WANTED

**JOHN TORDIFF**, please furnish me with your present address. W. W. Douglass, 420 South St. Patrick St., New Orleans, La.

**WAR** CONDITIONS PRODUCE AN EXCEPTIONAL OPPORTUNITY for **DIAMOND DRILLERS** and **MINING COMPANIES** doing **DIAMOND-DRILL EXPLORATION WORK**:—We have some high-grade **CARBONS** (Black Diamonds) and **BORTZ** to dispose of.

Full particulars will be sent to responsible concerns on request. Address **OPPORTUNITY**, 13 Engineering and Mining Journal.



**FOR SALE**—Complete 5-foot Modern Dredge with Close Connected Buckets. Apply to **THE STEARNS-ROGER MFG. CO., DENVER, COLO.**

EIGHT YEARS FURNISHING TECHNICAL MEN

**NEED A SUPERINTENDENT?**  
— ASSAYER, ENGINEER, MASTER MECHANIC, ELECTRICIAN —  
WIRE OR WRITE  
**BUSINESS MEN'S CLEARING HOUSE, DENVER, COLO.**

**JOSEPH RALPH, Assoc. Inst. M. M. (London)**  
(Attorney-in-Fact for the Liquidator: The Glasgow & Western Exploration Co., Ltd.) 416 Walker Bank Bldg., Salt Lake City, Utah.  
Can accept commissions in the Western States in the interests of Bond and Debenture Holders relating to mining involvements; undertake investigations into working methods, cost, operative and administrative data; the relative of economic resources to financial obligations; assume technical and commercial overseership for particularized financial interests, etc. Credentials relating to past and existing connections.



**Special Shovels**

Conneaut Special shovels or scientific management in the making and use of shovels, was first advocated by this Company in 1905. Drop us a card and let us tell you what it has done for others and what it will do for you.

**The Conneaut Shovel Co., Shovel Specialists**  
Conneaut, Ohio.



# Classified List

## Second Hand Machinery, Material and Equipment For Sale—Exchange—Rent—Wanted

Items not otherwise marked list equipment for sale.

Rates: Less than 4 insertions 55 cents per line—4 to 11 insertions 50 cents per line—12 or more insertions 45 cents per line.

**NOTE**—Most items are signed with only part of the advertiser's name. Complete names and addresses in alphabetical order will be found under the heading "Addresses."

### ADDRESSES

McMASTER, D. J., 1112 Folsom St., San Francisco, Cal.  
NEW RIVER Co., The, MacDonald, W. Va.  
YANKEE Consolidated Mining Co., 1120 Newhouse Bldg., Salt Lake City, Utah.

### AIR COMPRESSORS

3 Laidlaw-Dunn-Gordon steam driven, duplex, 2 stage and 5 Norwalk tandem, 2 stage; excellent condition.—NEW RIVER.  
1—18"x30"26"x16"x24" Class K.G.C. cross compound Meyer steam gear, 2-stage Laidlaw-Dunn-Gordon, first-class condition.—YANKEE.

### AIR RECEIVER

1—54"x12' horizontal, complete with safety valve water glass and gauge reg. fitted; first-class condition.—YANKEE.

### BOILERS

125 H. P. B. & W. 150 lbs., and a 150 H. P. B. & W. 160 lbs. McMASTER.

### DRILLS

Keystone traction No. 3 with placer equipment located at Prescott, Ariz.—L. J. HOHL, 525 Market St., San Francisco, Calif.

### ELECTRIC LIGHTS

For sale at less than half cost. Sixty 300 C.P. D.C. 220 V. Nernst arc lamps, moon globes. In perfect running condition. Can be seen in use in our offices; \$4 each. (Regular price, \$9.50). Price includes drop lighting switch. Must sell, as our voltage is 110 in new office. HILL PUBLISHING CO., 10th Ave. at 36th St., New York.

### ENGINES, STEAM

14"x36" Atlas Corliss, and 12"x30" Bates Corliss.—McMASTER.

### GENERATING UNITS

22 sets, direct current, 250 V. and 550 V. D.C. and belted, capacities up to 250 K.W.—NEW RIVER.

### HOISTING ENGINES

15 H. P. Fairbanks-Morse Gasoline Hoist.—McMASTER.

### MILLS

5 Stamp Mill 1000 lb. drop.—McMASTER.  
5 ft. Huntington, overhead drive.—McMASTER.

### MINE HOISTS


12 hoists from 14"x20" to 24"x48" in excellent condition and practically as good as new.—NEW RIVER.

### PUMPS

High head, general service and boiler feed.—NEW RIVER.

### ROCK CRUSHERS

No. 3 Gates and an 8"x12" Blake.—McMASTER.




**YOU CAN'T LOOK INTO THE EARTH**  
but we can get you a large clean core of all strata under your land to be examined in broad daylight, No guess work.

**THE J. A. BRENNAN DRILLING CO.**  
Home Office—Scranton, Pa. Field Office—30 Carson St., Pittsburgh, Pa.  
Contractors for Diamond Drilling.

**JAMES L. NORRIS** : : *Established 1869*  
*Member Patent Law Association. Counsellor in Patent Causes.*

**Solicitor of American and Foreign PATENTS**  
*Information sent free on request.*

Norris Building Washington, D. C.



**Gilbert Wood Split Pulleys**  
Represent the product of 25 years' experience and detail improvement.  
*Manufactured by*  
**Saginaw Manufacturing Company,**  
Saginaw, Mich. U. S. A.  
New York Branch, 88 Warren St; Chicago Branch, 105-109 N. Canal St. Sales Agencies in all Principal Cities.

*That MONARCH-ROCKWELL DOUBLE CHAMBER MELTING FURNACE reduces costs, prevents oxidation, assures rapid, continuous melting. Better look into it.*

**The Monarch Engineering & Mfg. Co.**  
Specialists in Mining, Mill and Plant Equipment  
1206 American Bldg., Baltimore, Md., U.S.A. (Works, Curtis Bay, Md.)  
We are specialists in Mill Equipment. Mfrs. of the Monarch-Rockwell Double Chamber, the Monarch Steele-Harvey Crucible Tilting, and the Monarch Crucible Tilting Metal Furnace—all patented.

# RUBBERGLASS<sup>F</sup>OR SKYLIGHTS

AND WINDOWS

Weatherproof—Durable—Unbreakable. Recommended and used for mine buildings by H. Kenyon Burch, Mechanical and Metallurgical Engineer. Cheaper and better than ordinary glass from start to finish. Full information, samples and prices on request.

Sole Manufacturers: **ANGIER MILLS,** Angier Road, Ashland, Mass.

# LUNKENHEIMER

## Injectors and Ejectors

Efficient and durable.  
Interchangeable with  
all standard makes.



Besides the above, the Lunkenheim line of high grade engineering specialties includes **Bronze and Iron Body Bronze Mounted Globe, Angle, Cross, Check, Lever, Gate, Non-return Boiler Stop, Throttle, Pop Safety, Relief, Blow-off, Screw Down Check Valves, etc.;** "Puddled" **Semi-steel and Cast Steel Valves** of all types; **Water Columns, Gauges and other Boiler Mountings; Whistles and Ground Key Work** of all descriptions; **Lubricators and Lubricating Devices; Oil Pumps, Oil and Grease Cups; Gasoline Engine Specialties, etc.**

Your local dealer can furnish them; if not, write us.

A complete description of the entire line can be had by referring to *Lunkenheim Catalogue No. 50*. If you haven't a copy, write for one.

**THE LUNKENHEIMER CO.**  
"QUALITY"

Latest Manufacturers of High-Grade Engineering Specialties in the World  
**CINCINNATI, OHIO**

New York — Chicago — Boston — London 19-20c

# SMOOTH-ON

TRADE MARK—REG. U. S. PAT. OFF.

## Iron Cements

Permanently stop all leaks of  
steam—water—fire or oil.

Easy to apply.

Send for free 104-page illustrated  
instruction book.

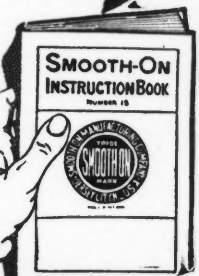
It will save time and money.

**Smooth-On Mfg. Co.**  
Jersey City, N. J., U. S. A.

221 N. Jefferson St., Chicago, Ill.

34 Sacramento St.,  
San Francisco, California

White St., Moorfields,  
London, E. C.



## The Moore Vacuum Filtration Process

Fully protected by patents

Will Enable You to Save All Values Reduced to  
Solution and Recover the Solvent at Minimum Cost.  
We are pioneers in the field—we developed the only  
really successful process, and we are still the **Leaders**  
in **Filter Design**. Send Your Specifications or  
Submit Your Problem to the

### MOORE FILTER COMPANY

115 Broadway

New York City, U. S. A.

Cable:  
"Morefilter" New York

Bedford-McNeill or  
any Standard Code

## For All Filtering Requirements

### The Kelly Filter Press

*especially adapted for drying  
oil flotation concentrates and  
for acid leaching.*

### The Kelly Filter Press Company

207 Felt Building

Salt Lake City, Utah

E. E. Lungwitz, 80 Maiden Lane, New York

## T. SHRIVER & CO. FILTER PRESSES

826 Hamilton Street,  
HARRISON, NEW JERSEY

## SLIME FILTERS

For slime filtration and clarification  
**Sweetland Self-Dumping Filters** are  
a revolutionary improvement in filtra-  
tion machinery. Every engineer will be  
keenly interested in our Catalog No. 10.  
Send for your copy today.

**The Sweetland Filter Press Co.**  
1317 Singer Bldg. NEW YORK

## Harbison-Walker Refractories Company

MANUFACTURERS OF

High Grade Silica, Chrome,  
Magnesia and Fire Clay Brick.

IMPORTERS OF

Chrome Ore and Spaeter Dead-Burned Magnesite.

PITTSBURGH, PA.

## Elevating, Conveying and Power Transmission Machinery

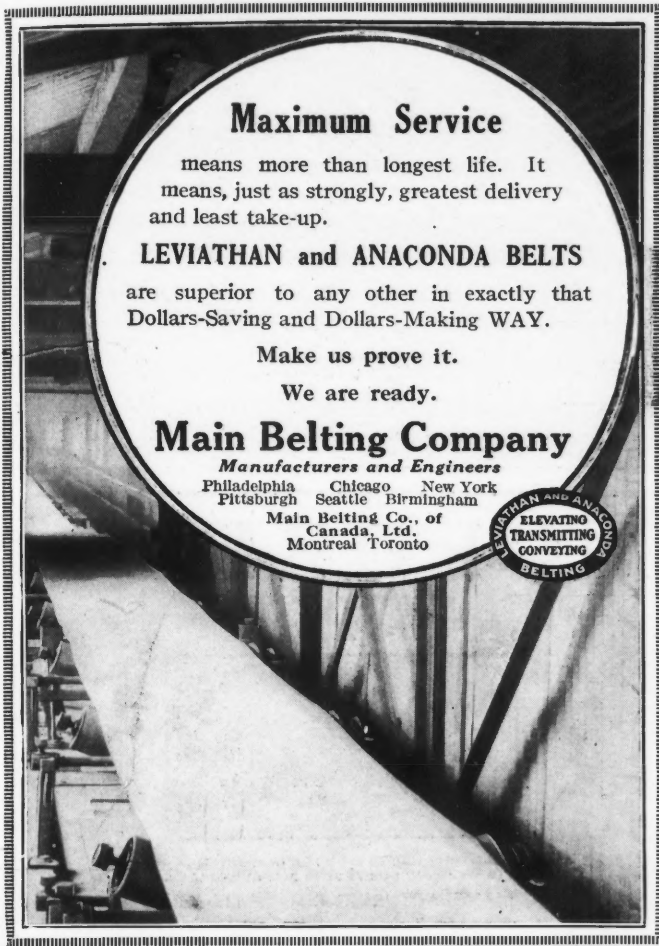
Submit us your requirements and we will furnish plans, with  
estimates of cost. *Our engineering service always at your disposal.*

**The Webster M'g Company,**

Chicago  
New York

Tiffin, O.





**Maximum Service**  
means more than longest life. It means, just as strongly, greatest delivery and least take-up.


**LEVIATHAN and ANACONDA BELTS**  
are superior to any other in exactly that Dollars-Saving and Dollars-Making WAY.

Make us prove it.  
We are ready.

**Main Belting Company**  
*Manufacturers and Engineers*  
Philadelphia Chicago New York  
Pittsburgh Seattle Birmingham  
Main Belting Co., of  
Canada, Ltd.  
Montreal Toronto

**LEVIATHAN AND ANACONDA BELTING**  
ELEVATING TRANSMITTING CONVEYING

## Robins Conveying Machinery



**T**HE Robins Conveying Belt Company has designed and erected stocking and reclaiming bridges and unloading towers in many parts of the country. We are prepared at all times to undertake the design and manufacture of any sort of conveying equipment. Write for our Bulletins.

**ROBINS CONVEYING BELT COMPANY**  
ENGINEERS - FOUNDERS - MACHINISTS

**15 Park Row, New York**      Chicago: Old Colony Bldg.  
San Francisco, Spokane, Toronto,  
The Griffin Co. United Iron Works. Gutta Percha & Rubber, Ltd.  
New Glasgow, London, E. C.  
Eastern Steel Co., Ltd. Fraser & Chalmers, Ltd.

## Copy Must Interpret— Not Blare

The old idea of advertising copy was simply to yell the firm name in black type—yell the name and nothing else.

That day is fleeting. Advertisers now recognize that their copy must interpret their product to the particular class of reader to whom it goes.

The Engineering & Mining Journal has a Department whose sole business it is to write interpretive copy for its advertisers.


Every Journal advertiser can have the services of this Department free of charge. Its name is

**The Make-It-Pay Dept.**

Consult it if you wish  
that your advertising pay

**The Engineering & Mining Journal**  
New York

## Beware of the Excited Salesman. He is apt to exaggerate.



The sales force of the Chas. A. Schieren Co. are instructed to stick carefully to facts, because the actual truth about Duxbak Waterproof Leather Belting gives our strongest selling points.

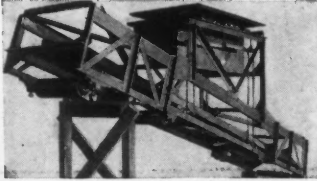
Try one small Duxbak Belt and see how belting has improved.

**Charles A. Schieren Company**  
39 Ferry Street      New York City

## Ball Bearing Belt Conveyors

Trump Measuring and Mixing Machines.  
Merrick Conveying Weighers for Belt Conveyors.

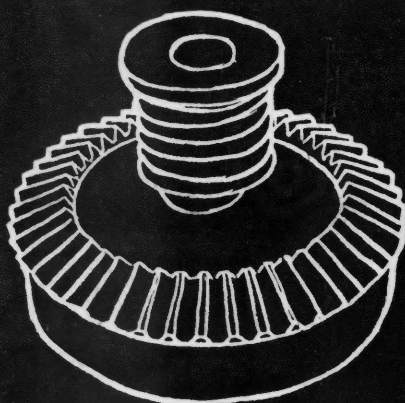
The Conveying Weigher Co.      90 West St., N. Y.



## Conveyor Scales

For weighing COAL, ORE and other materials while being transported.

**Electric Weighing Company**  
182 Thirteenth Ave., N. Y. City



*We have six floors  
of equipment waiting  
for your gear order—  
Write us*

**PHILADELPHIA GEAR WORKS**  
Geo. B. Grant, M.E. Philadelphia  
1120 Vine Street.

**Flory Hoists** Steam and Electrical

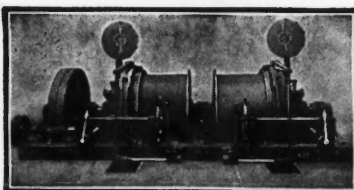
Take the lead and are dependable for mines and general hoisting. Made in all sizes, steam and electrical. Satisfaction guaranteed.



Write for Catalog.

**S. Flory Mfg. Co., Bangor, Pa.**

**NORDBERG HOISTS**



FOR ELECTRIC HOISTS SEND FOR OUR BULLETIN 24.  
FOR STEAM AND AIR HOISTS SEND FOR OUR BULLETIN 23.

**NORDBERG MANUFACTURING CO., Milwaukee, Wisconsin**  
NEW YORK: 42 Broadway    Globe, Arizona    Butte: Electric Bldg    CHICAGO: 1504 Fisher Bldg.



Whether cut-tooth or cast-tooth gears are the more economical and practicable is a matter of conditions. We make both 1-inch to 6-inch pitch and larger, of cast-iron, steel, or high grade semi-steel. Our neutral position and wide experience enables us to determine fairly what kind of gears to use for a given set of conditions, and we shall be glad to confer with you.

SEND US YOUR LISTS FOR PRICES

**H. W. CALDWELL & SON CO.**  
CHICAGO—17th St. and Western Avenue.  
NEW YORK—Fulton Building, Hudson Terminal, 50 Church Street.

**Wuest Herringbone Gears**  
Make 20 to 1 Reductions Possible  
Herringbone Construction and the Wuest Patent make wonderful single reductions possible. Let us tell you all about it in our descriptive matter.  
Write

**The Falk Company, Milwaukee, Wisconsin**

**ALBERGER MINE PUMPS**



With Centrifugal Pumps, whether of the Turbine or Volute Type, the name of Alberger is a guarantee of maximum service and minimum operating expense.

Write for Bulletins.

**Alberger Pump & Condenser Company, 40 Cedar St., New York**  
Atlanta Boston Chicago St. Louis Pittsburgh San Francisco New Orleans

**Pumps and Pumping Engines  
Oil Engines and Gas Engines**

**National Transit Co., Oil City, Pa.**

**“JACKSON MADE” PUMPS**  
A Better Make Not Made

They cost less to buy—less to run and less in repairs. Write for Catalog No. 20.

**BYRON-JACKSON IRON WORKS, Inc.**  
357-361 Market St., San Francisco, Cal. 212 N. Los Angeles St., Los Angeles, Cal. Works—West Berkeley, Cal.

**Hydraulic Turbines**

To meet all requirements for heads from 5 to 600 feet. High efficiency maintained at all loads. Builders of the “Smith,” “McCormick” and “Francis” Turbines. Water power accessories.

Write for Catalog J.

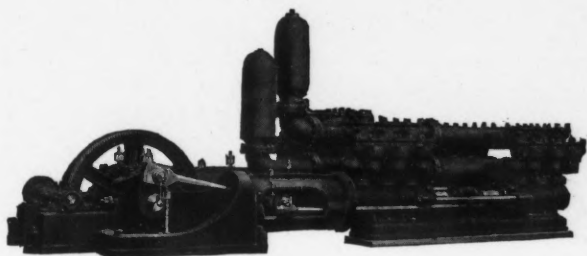
**S. Morgan Smith Co. - - York, Pa.**  
Branch Offices 644 American Trust Bldg., Chicago, Ill.  
176 Federal St., Boston, Mass.

**BLOWERS FOR SMELTER WORK**

**The Connersville Blower Co.**  
Connersville, Indiana, U.S.A.



## Prescott Mine Pumps



Should be carefully considered before you install your mine station pumps.

They are of the highest type of development in pumping machinery and can be depended upon to carry you through emergencies where a breakdown would be disastrous.

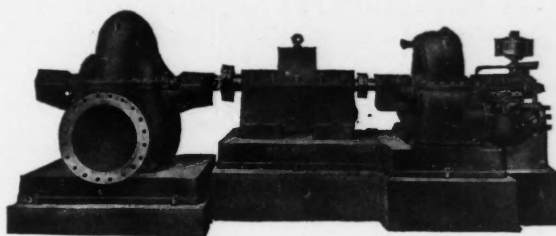
PRESCOTT Pumps have no "weak" parts to fail in such emergencies. Years of satisfactory service under the most trying circumstances to be found are their recommendation to you for any conditions in mine service.

Write for Catalogue P-22-16.

### Fred. M. Prescott Steam Pump Co.

115 Broadway, New York Works: Milwaukee, Wis.  
BRANCH OFFICES IN ALL PRINCIPAL CITIES.

P178.2



## For Handling Large Volumes of Water Against Low Head

As in surface and barometric condenser service, the pump, to be efficient and reliable must run at comparatively slow speed.

Efforts to adapt pumps to this service by operating several small high speed impellers in parallel upon a single shaft have proved unsatisfactory because of hydraulic and mechanical unbalancing, pitting, corrosion, etc.

A much simpler solution of the problem of combining the proper speed for the turbine with the proper speed for the pump is to employ a De Laval Speed Reducing Gear. Not only is higher efficiency obtained but also greater sturdiness and reliability.

For the latest developments in Steam Turbine and Pump practice, ask for Catalog "C" 49.

## DE LAVAL Steam Turbine Co.

Trenton,

122

New Jersey

## SAMSON TURBINES



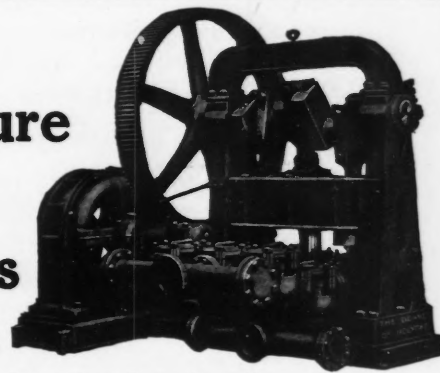
Great Strength — Close Regulation—Low Operating Cost—Quick Speed  
*Write*

### JAMES LEFFEL & CO.

306 Lagonda Street

Springfield, Ohio, U. S. A.

## High Pressure Mine Pumps



Write for  
Bulletin D218-16

### International Steam Pump Co. Deane Steam Pump Plant

115 Broadway, New York

D280.1

Works: Holyoke, Mass.

## R. D. WOOD & CO., 400 CHESTNUT ST., PHILADELPHIA, PA.

**CENTRIFUGAL PUMPS**  
For Mines and Sinking Purposes  
**GRAVEL AND WATER PUMP**  
For Placer Mining a Specialty  
**CIRCULATING PUMP**

Cast Iron Pipe, Tanks, Gas Producers and Iron Casting

## FRENIER'S SPIRAL PUMP

The most durable pump for elevating  
TAILINGS, SLIMES, BATTERY SANDS, etc.  
No Valves No Buckets

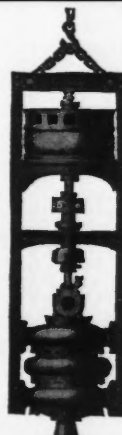
FRENIER & SON, Rutland, Vt.  
AGENTS—Allis-Chalmers Co., Chicago, Ill. Stearns-Roger Mfg. Co., Denver, Col. Harron, Rickard & McCone, San Francisco, Cal. Frank R. Perrot, Perth, Australia.



## Krogh Mine Sinking Pumps

Absolutely  
Reliable  
Durable  
and Efficient

Made in  
Various  
Combinations  
to Suit  
Your  
Conditions



Krogh Pumps are all automatically waterbalanced and of the No End Thrust Type. Your inquiries are invited. Shall we send you our Catalog?

**Krogh Mfg. Co.**  
147-159 Beale St.  
San Francisco, Cal.

The Mine and Smelter  
Supply Co.

Represent us in: Salt Lake City:  
Denver: El Paso: New York City.

## Mr. Dooley Says:—

*“Whot I object to is whin I pay tin or fifteen cents f'r a magazine expectin' to spind me avenin' improvin' me mind with th' latest thoughts in advertisin', to find more thin a quarter of th' whole book devoted to lithrachoor.”*

□

**P**EOPLE read advertising, and usually they read it because they like to. That is why it pays.

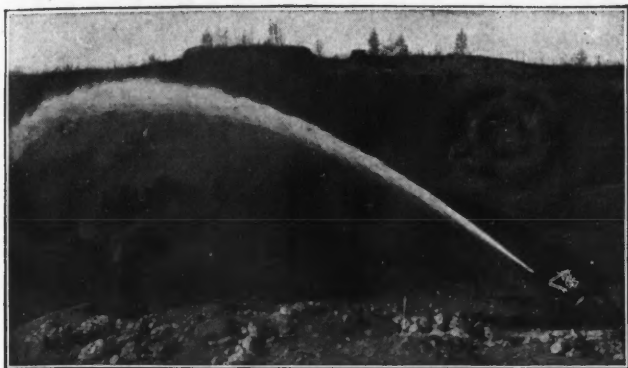
Perhaps we study street car cards to avoid staring at the feet or faces of our fellow passengers. Some other forms of advertising force themselves upon us.

But periodical advertising—including technical journal—we read because it interests us. Many of us scan the advertising pages before we read the articles and news.

We read our JOURNAL at times when no more pressing matters are upon us, in moments that might otherwise be idle, in slippers and ease in the evening. We have paid for the privilege of reading it; it always has something to say worth listening to and we intend to get full value.

Reading advertising in good periodicals, is, in short, a *national habit*. If it were not, \$700,000,000 would not be invested every year in this country in printed advertising.





### Hydraulic Mining—Yukon Gold Co.

Water supplied through TAYLOR SPIRAL RIVETED PIPE

New York, Jan, 16, 1911.

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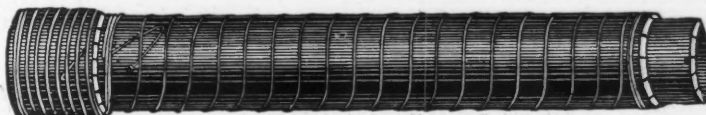
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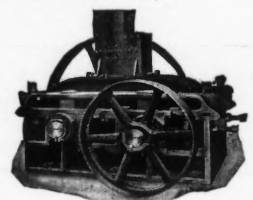
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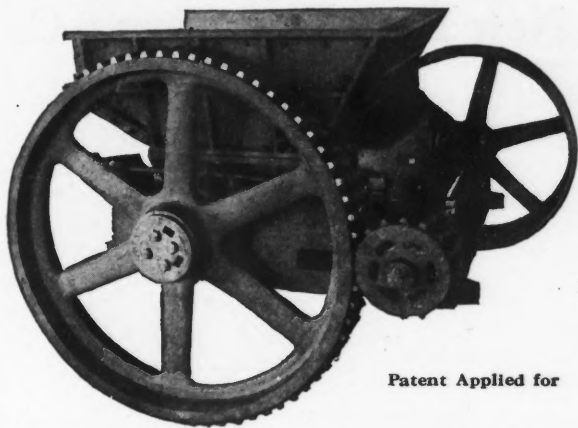
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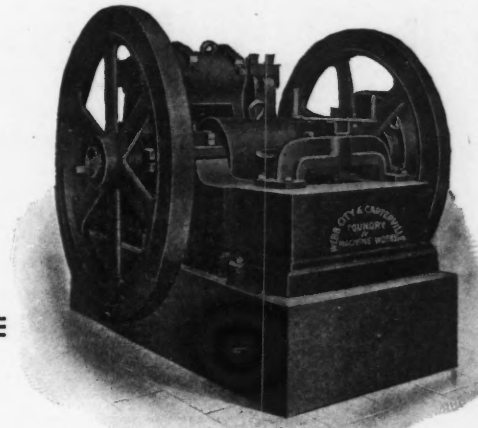
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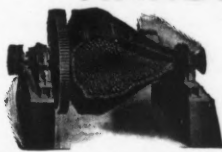
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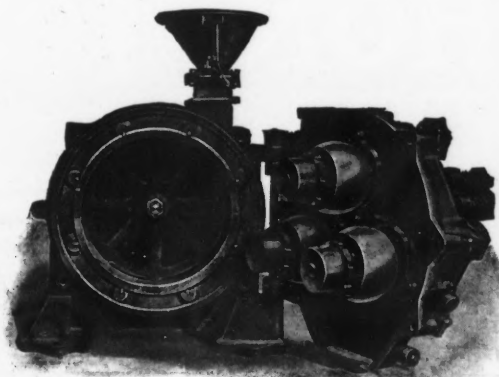
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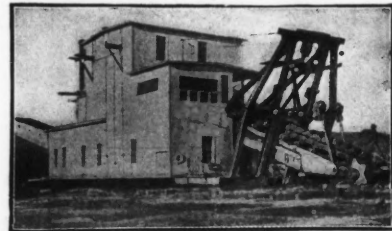
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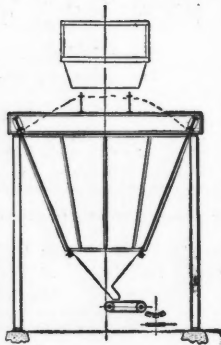
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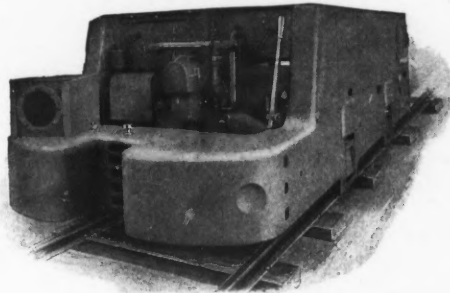
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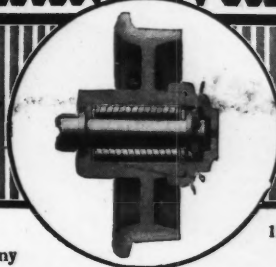


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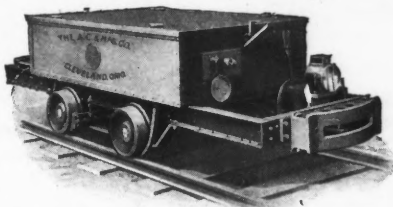
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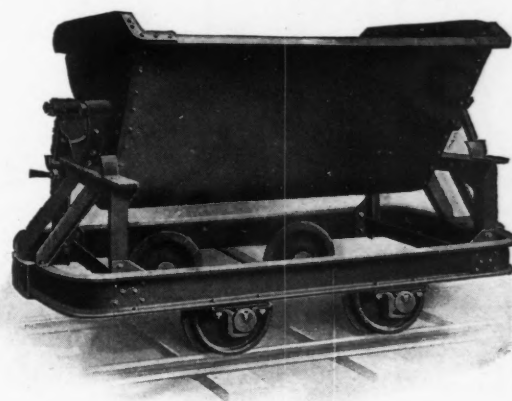
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**Bardwell, A. F.** (Successor to Bettles & Bardwell), Custom Assayer and Chemist. 158 South West Temple St., Salt Lake City, Utah  
**Barke, A. C.**, Mining Engineer, United States Smelting Refining and Mining Exploration Company. 908 W. P. Story Building, Los Angeles, Calif.  
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**Beatty, A. Chester**, Consulting Mining Engineer. 71 Broadway, New York; N. Y. No. 1 London Wall Building, London E. C. Cable: "Granitic." Code: Bedford-McNeill.  
**Beaudette, A. J.**, Mining Engineer. 825 Birks Bldg., Vancouver, B. C.  
**Bell, Charles N.**, Mining Engineer, Smuggler-Union Mining Co., Telluride, Colo., 945 Equitable Bldg., Denver, Colo.  
**Bell, William L.**, Mining Engineer and Metallurgist, Bradford, Pa.  
**Bellingier, H. C.**, Metallurgical Engineer. Spokane, Wash.  
**Benedict, William de L.**, Mining Engineer. 19 Cedar St., New York.  
**Bird-Cowan Co.**, Charles S. Cowan, Manager. Custom Assayers and Chemists, 160 S. W. Temple, Salt Lake, Utah.  
**Blaisdell Co.**, Engineers. Vat Excavating. Los Angeles, Calif.  
**Blood, George D.**, Mining Engineer, 1021 Kearns Bldg., Salt Lake City, Utah.  
**Bond, Josiah**, Examinations and Supervision of development in Arizona and Sonora; Alto, Arizona.

**Bonhron & Company**, Mining Engineers. Bank of Hamilton Bldg., Vancouver, B. C. Canada.  
**Botsford, C. W.**, Mining Engineer and Geologist. Springville, N. Y.  
**Botsford, Robert S.**, Mining Engineer. Nicolaev Pavdinsk Estate, Vyia Station, Bogoslovsk, R T., Province of Perm, Russia.  
**Boutwell, John M.**, Mining Geologist. Howard Canfield Bldg., Santa Barbara, Calif.  
**Bowman, Frank A.**, Mining Engineer. Gilbert, Minn  
**Bradley, D. H., Jr.**, Consulting Mechanical Eng. Specialty: Design of Mining and Milling Plants. Equipment Reports. 1700 Rampart St., El Paso, Texas  
**Bradley, Fred W.**, Mining Engineer. Crocker Building, San Francisco. Cable Address: "Basalt," San Francisco. Code: Bedford-McNeill  
**Bradley, R. J. H.**, Consulting Mining Engineer. 115 Broadway, New York City. Cable Address: "Investigate." Code: Bedford-McNeill.  
**Bretherton, S. E.**, Consulting Mining Engineer, 27 years' experience, Metallurgist and Mine Manager. Specialty: Complex Zinc Ores. Mills Bldg., San Francisco, Calif.  
**Bridger, Geo. F.**, Metallurgist, Specialty Milling and cyaniding gold and silver ores, address 3448 Second Ave., Los Angeles, Calif.  
**Brinsmade, R. B.**, (E. M., Lehigh '95), Con. Engineer; Specialties: Mining, Ore-Dressing, Petroleum; Code "ABC", 1 a Pensador Mex. 1. Puebla, Pue., Mex.  
**Brockunier, S. H.**, Mining Engineer. Nevada City, Calif  
**Brodie, Walter N.**, Mining Engineer and Metallurgist. In care Batopilas Mining Co., 50 Broad Street, New York.  
**Brodrick, C. T.**, 62 London Wall, London E. C. Cable: Care Argeby, Usual Codes.  
**Buck, Stuart M.**, Mining Engineer. Bramwell, W. Va.  
**Burbidge, Frederick**, Mining Engineer. 1119 Paulsen Building, Spokane, Wash.  
**Burch, Caetani & Hershey**, Albert Burch, Gelasio Caetani, Oscar H. Hershey. Mining, Metallurgy, and Mining Geology. Crocker Bldg., San Francisco, Calif. Cable Address: "Burch" or "Caetani," San Francisco. Codes: Bedford-McNeill, Moreing & Neal.  
**Burch, H. Kenyon**, Mechanical and Metallurgical Engineer. Care Inspiration Consolidated Copper Co., Miami, Gila County, Arizona.  
**Burdick, Charles A.**, Mining Engineer. 74 Broadway, New York. Phone Rector 8328.  
**Burlingame & Co., E. E.**, Est, 1866, Assayers and Chemists. Bullion Dealers, Ore Shippers agent, Ore Testing. 1736 Lawrence St., Denver, Colo.  
**Burrall, Fred'k P.**, Mining Engineer. 264 Riverside Drive, New York.  
**Burt, Edwin**, Metallurgical and Cyanide Engineer. Mills and Cyanide Plants Examined, Designed and Started. Specialty: Treatment of Ores, Fine Grinding and Slime Filtering. Patentee—Burt Slime Filters. El Paso, Texas.  
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**Carpenter, Alvin B.**, Mining Engineer. Examinations, Consultation. Supervision of Mines. 1015 California Bldg., Los Angeles, Calif.  
**Carpenter, E. E.**, Mining and Metallurgical Engineer. Wonder, Nevada.  
**Carpenter, L. B.**, Mining Engineer, Examination and Consultation. 810 Flatiron Bldg., San Francisco, Calif.  
**Case, Benjamin H.**, Mining and Civil Engineer. Examination of Southern mines, mineral and water-power properties. 5 Edgehill Ave., Asheville, N. C.  
**Case, Walter H.**, Mining Engineer. P. O. Box 832. 512 Trust Building, El Paso, Texas.  
**Cazin, Franz**, Mechanical Engineer. Design and Construction of Metallurgical Plants. McPhee Building, Denver, Colo.  
**Chance, H. M. & Co.**, Coal and Iron. Consulting Engineers, Drexel Building, Philadelphia, Penn.  
**Channing, J. Parke**, Consulting Engineer. 61 Broadway, New York.  
**Chase, Charles A.**, Mining Engineer. 734 First National Bank Bldg., Denver, Colo. Liberty Bell G. M. Co., Telluride, Colo.  
**Chase, Edwin E.**, Mining Engineer. 1450 Williams Str., Denver, Colo.  
**Chede & Davidson**, Consulting Mining Engineers. Examinations and Reports. Representation of Foreign Mining Companies. Cable: "Chedavi-Cali", Colombia. Codes: Bedford-McNeill, Liebers, A. B. C. 5th.  
**Chedsey, Wm. R.**, Mining Engineer. Examination and Equipment of Mines, Colorado School of Mines, Golden, Colo.  
**Church, John A.**, Mining Engineer. 15 William St., New York. Cable: "Seotist."  
**Church, John L.**, Mining Engineer. Apart. 125, Chihuahua, Mexico.  
**Clark, Bayltes, C.**, Mining and Mechanical Engineer. Sutter Creek, Calif. Cable Address: "Baclark." Code: Bedford-McNeill.  
**Clark, C. Dawes**, Mining and Efficiency Engineer. Mining and Industrial Economy. With W. Rowland Cox and Staff. 165 Broadway, New York.

- Clapp, F. G.**, Chief Geologist, Associated Geological Engineers. Reports on Oil, Gas and Mineral Properties. 331-4th Ave., Pittsburg, Pa.
- Clapp, L. R.**, Mining and Metallurgical Engineer. Silverton, Colo
- Clapp, Rolla E.**, Consulting Engineer. 1511 Marquette Bldg., Chicago. 401 Dooley Bldg., Salt Lake City, Utah.
- Clements, J. Morgan**, Mining Engineer and Geologist. 20 Broad Street, New York. Code: Bedford-McNeill.
- Clennell, J. A.**, Mining Engineer, Elizabethville, Congo Belge, Africa. Code: McNeill, 1908.
- Clevenger, G. Howell**, Metallurgical Engineer. 381 Hawthorne Ave., Palo Alto, Calif. Code: Bedford-McNeill.
- Clifford, James O.**, Consulting Mining Engineer. Mills Bldg., El Paso, Texas. Codes: Bedford-McNeill, Western Union.
- Cobb, Wm. Lewis**, Mining Engineer. Sausalito, Calif.
- Cohen, Louis**, Mining and Metallurgical Engineer. 229 First National Bank Building, Denver, Colo.
- Cohen, Samuel W.**, Consulting Mining Engineer. Dominion Express Bldg., Montreal, General Manager, Crown Reserve Mining Co., Ltd., Cobalt, Can.
- Cole, David**, Specialist in Ore Concentration. Mining Mechanism and Property Management. Morenci, Arizona. Code: Bedford-McNeill.
- Coe, Ira Judson**, Consulting Engineer. 762 Mills Bldg., San Francisco, Calif.
- Colbath, J. S.**, Mining and Cyanide Engineer. Late Gen. Manager, El Rayo Mines. Examination, Development, Equipment and Operation of Mines Adapted to the Cyanide Process. 526 Gramercy Place, Los Angeles, Calif.
- Cole, F. L.**, Mining Engineer. Examinations in Eastern Asia, Shanghai, China. Cable Address: "Hanco."
- Collins, Edgar A.**, Mining Engineer, General Superintendent. Commonwealth M. & M. Co., Pearce, Ariz.
- Collins, Edwin James**, Mining Engineer and Mining Geologist. Examinations and Management. Torrey Bldg. Duluth, Minn.
- Collins, George E.**, Mining Engineer. Mine Examinations and Management. 420 Boston Building, Denver, Colo. Cable Address: "Colcamac," Denver.
- Colvocoresses, George M.**, Mining Engineer. General Manager Consolidated Arizona Smelting Co., Humboldt, Ariz.
- Comings, Geo. R.**, Mining Engineer. Apartado 126. Oaxaca, Oax., Mexico.
- Conklin, H. R.**, Mining and Electrical Engineer, Manager Lluvia de Oro Gold Mining Co., 1232 Alvarado St., Los Angeles, Cal.
- Conner, Eli T.**, 1315 Stephen Girard Bldg., Philadelphia, Penn.
- Constant Co., C. L.**, Mining, Metallurgical and Chemical Engineers, 42 New St., New York, N. Y.
- Cook, Fred'k S.**, Mining Engineer, Consultation, Examination and Management. 1001 Northwestern Bank Bldg., Portland, Ore.
- Cooper, J. H.**, Mining Engineer, Manager The Skidoo Mines Co., Skidoo, Calif.
- Copeland, Durward**, Metallurgical Engineer. Missouri School of Mines, Rolla, Mo., and Llallagua, Bolivia, So. Am.
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- Cox, G. H.**, Mining—Geology. Missouri and Wisconsin Lead and Zinc fields a Specialty. Missouri School of Mines and Metallurgy. Rolla, Mo.
- Cox, W. Rowland, and Staff**, Consulting Specialists. Management, Operation and Examination of Mines and Mills. 165 Broadway, New York, N. Y.
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- Cranston, Robert E.**, Mining Engineer. 437 Holbrook Bldg., San Francisco 11 Pine St., New York. Cable Address "Recrans." Code: McNeill's 1908.
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- Crosby, W. O.**, Consulting Geologist. Mining properties, Engineering works, water supplies, etc. 491 Boylston St., Boston, Mass.
- Crowell & Brennon**, Cliff Crowell, John C. Brennon. Mining Engineers. Calle Artega, 170, Monterrey, N. L., Mexico. 110 South Street, West Lafayette, Ind.
- Cunningham, George**, Mining Engineer. 136 So. Oxford St., Los Angeles, Calif. Specialty—Alaska Examinations.

## D

- Darlington, Wayne**, 50 North 23rd St., Philadelphia, Pa. Consulting Mining Engineer and Metallurgist.
- Davies, Ellsworth T.** 116 Adam Ave., Room 7, Scranton, Pa. Consulting Mining Engineer, Geologist; Examination and reporting coal lands a specialty.
- Davis, Geo. C.** 39 So. 10th Street, Philadelphia, Penn. Metallurgical Chemist, Specializing on Coal, Iron and alloys.
- Del Mar, Algernon**, Mining and Milling Engineer. 1424 Alpha St., Sierra Vista, Los Angeles, Calif.
- Demming, Henry C.**, Mining Engineer. Geologist, Mineralogist and Chemist. Offices and Laboratory 15-17 N. Third St., Harrisburg, Penn., U. S. A.
- Dennis, Clifford G.** Mining Engineer. Crocker Bldg., San Francisco, Calif. Cable: "Sinned", Code: Bedford-McNeill.
- de Sallier, René**, Mining Engineer. Basin, Mont.
- Dickman, R. N.**, Mining Engineer. Dickman & Mackenzie. 1010 Mallers Building, 5 South Wabash Ave., Chicago, Ill. "Deegold" Bedford-McNeill Code, also care Robert W. Hunt & Co.
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- Dresser, John A.**, Mining Geologist. Manager, Lands Dept., A. C. & H. B. Ry., Sault Ste. Marie, Canada.
- Drew, C. V., E. M.**, with Cerro de Pasco and Morococha Mining Companies. Room 4—5th floor, 15 Broad St., N. Y.
- Drucker, A. E.** Metallurgical Engineer. Ore Dressing, Cyaniding and Copper leaching. Testing, designing and construction. 62 London Wall, London.
- DuBois, Mixer & Armas**, Consulting Mining Engineers, 302 Harrison Bldg., Philadelphia, Penn. Salt Lake City and Paris, France.

- Dufourcq, Edw. L.**, Mining Engineer, Room D-15, Produce Exchange Bldg. New York. Cable Address: Dufourcq, New York. Bedford-McNeill Code.
- Duncan, Lindsay**, Mechanical Engineer. Nevada Consolidated Copper Co., McGill, Nev.
- Dunning, Charles H.**, Mining Engineer. Prescott, Arizona.
- Dunster, Carl B.**, E. M. Manager Mines Department Breitung & Co Ltd. McNeill's Codes. 11 Pine St. New York and Marquett e, Mich.
- Dutton, Chas. E.**, Mining Engineer. P. O. Box 104. Goldfield, Nevada.
- Dwight, Arthur S.**, Mining Engineer and Metallurgist. 29 Broadway, New York. Cable address: Sinterer, New York. Bedford-McNeill Code.

## E

- Easley, Geo. A., M. E.**, Mgr. Olla de Oro Gold Mining Co., La Paz, Bolivia, South America. Cable Address: "Easley," La Paz.
- Easton, H. D.**, Mining Engineer and Geologist, Specialties, Oil, Coal and Clay, Lexington, Ky.
- Easton, Stanly A.**, Mining Engineer, Manager Bunker Hill & Sullivan Mining and Concentrating Company, Kellogg, Idaho.
- Eaton, E. R., Jr.**, Mining Engineer. Manatawny, Pa.
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- Emmens, Newton W.**, Mining Engineer. Examinations and reports. Cable address "SANSPEUR." 415 Rogers Building, Vancouver, B. C.
- Emmons, N. H.**, 2nd, Mining Engineer. "Knollwood" Dover, Mass.
- Estes, Frank M.** Mining Engineer. Manager Creston-Colorado Co., Torres, Sonora, Mexico.
- Eurich & Knapp**, Ernst F. Eurich, John A. Knapp. Metallurgical Engineers, 15 William St., New York.
- Evans, M. B.**, Mining Engineer, with F. A. Pellas & Co. Address La Libertad Chontales, Nicaragua, C. A.
- Eveland, A. J.**, Mining Engineer. Compania de Santa Gertrudis, Pachuca, Hidalgo, Mexico.
- Everest, H. A.**, Mining Engineer. Engineer and Geologist; Coalgate, Oklahoma and 511 E 10, Oklahoma City, Okla.
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## F

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- Farish, John B.**, Mining Engineer, 25 Broad St., New York and 315 Colorado Bldg., Denver, Colo. Cable Address: "Farish."
- Farrell, J. H., E. M.**, Practical Geologist. Development work, Examination of Prospects. 714 Beverly Drive, Beverly Hills, Calif.
- Fearn, Percy L.**, Consulting Mining Engineer, 17 Battery Place, New York
- Ferrier, W. F.**, Consulting Mining Engineer and Geologist, 204 Lumsden Building, Toronto, Ont.
- Fields, John D.**, Mining Engineer. Designing and Constructing Copper Leaching Plants a specialty. Maxville, Mont.
- Finch, John Wellington**, Geologist and Engineer of Mines. 71 Broadway, New York, N. Y. 730 Symes Bldg., Denver, Colo.
- Finlay, J. R.**, Mining Engineer. Room 802, 52 William Street, New York.
- Fishback, Martin**, Mining Engineer. Eseedido, Calif. Cable: "Fishback." Codes: Western Union and Bedford-McNeill.
- Florance & Hampton, J. Esdaile Florance, E. M.**, Wm. Huntley Hampton, C.E., E.M., Mining and Consulting Engineers. Power, Electric Furnaces. 17 Battery Place, New York. Cable address: Florhamp, New York.
- Fohs & Gardner**, Consulting Oil Geologists. 212-213 Cinton Bldg. Tulsa, Okla.
- Folsom, D. M.**, Mining Engineer. Stanford University, Calif.
- Forbes, D. L. H.**, Chief Construction Engineer, Chile Exploration Co., Chuquicamata, (via Antofagasta) Chile, South America.
- Fowler, Samuel S.**, Mining Engineer and Metallurgist. Nelson, British Columbia.
- Fox, John M.**, Mining Engineer, Tonopah, Nevada.
- France, T. H.** 42 Broadway, New York. Mining Engineer, Usual Codes.
- Frank, Alfred**, Mining Engineer. 807 Newhouse Bldg., Salt Lake City, Utah.
- Free, E. E.**, Geologist and Chemical Engineer. Specialist in potash and other salines. 1105 Madison Avenue, Baltimore, Md.
- Frost, Oscar J.**, Assayer, 511 18th St., Denver, Colo.
- Fuller, John T.**, Mining Engineer. Consulting Engineer State Department of Mines. P. O. Box 393, Little Rock, Ark.
- Fulton, Chester A.**, Mining Engineer. Care of Mina Lo Increible, El Callao, Yuruari, Venezuela, Via Trinidad.

## G

- Garrey, George H.**, Consulting Mining Geologist and Engineer. Appraisal of the Possibilities of Mines, Outlining of Development Work for Mines Detailed, Surface and Underground Geologic Mine Maps. Cable address—Garrey. Code: Bedford-McNeill. 115 Broadway, New York. Telephone Rector 3222.
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- Godfrey, W. H.**, Mining, Irrigation, and Railway Engineering, Sheridan, Madison County, Montana.
- Goodloe, Meade**, Mining and Metallurgical Engineer. 831 San Fernando Building, Los Angeles, Calif.
- Graham, Stanley N.**, Mining Engineer. Nova Scotia Technical College, Halifax, N. S., Canada.
- Grant, Wilbur H.**, Geologic Engineer. Applies the Geologic Knowledge of Metalliferous Deposits for Commercial Purposes. Code: Bedford McNeill. 445 Holbrook Bldg., San Francisco, Calif.
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**Grugan, Justice**, Mining Engineer. Manager Northern Ore Co. Edwards, St. Lawrence Co., New York. Philadelphia Office, 607 Chestnut St.  
**Grunsky, Jr., C. E.**, Mining Engineer. American Engineering Corporation. 57 Post St., San Francisco, Calif.  
**Guess & Haultain**, Mining and Metallurgical Engineers. 174 College St., Toronto, Ont. Specialize on Ore Dressing and Pyritic Smelting, working tests.

## H

**Hager, E. T.**, Mining Engineer, 517 S. St. Andrews Place, Los Angeles, California.  
**Hamilton, E. M.**, Metallurgist. Specialty: Cyaniding Gold and Silver Ores. Room 1883, 50 Church St., New York.  
**Hamilton & Hansell**, J. W. H. Hamilton. N. V. Hansell. Mining Engineers. 50 Church St., New York. Cable: "Minemel," New York.  
**Hammond, John Hays**, Consulting Engineer. 71 Broadway, New York. Code: Bedford-McNeill.  
**Hanks, Abbot A.**, Control and Sample Assays, Ore Shippers' Agent, Analyses of Ores, Minerals, Etc. 630 Sacramento St., San Francisco, Calif.  
**Hardy, J. Gordon**, Mining Engineer. 312 City National Bank Bldg., El Paso, Texas.  
**Hartley, Carney, M. E.**, Placer Mining. Examination and Equipment Specialty—fine gold and black sand. 316 Colorado Bldg., Denver, Colo.  
**Harvey, F. H.**, Mining and Consulting Engineer. Galt, Calif.  
**Hassan, A. A.**, Mining Geologist and Consulting Engineer. Examination, Management and Operation of Mines. 61 Waldorf Court, Brooklyn, N. Y. Any Code. Cable "Asghar."  
**Hatcher & Carpenter**, (M.M.) Mining Engineers. Assayers U. S. Mineral Surveyors. Opp. Santa Rita Hotel, Tucson, Ariz.

**Hawkins, Edwin N.**, Metallurgical and Mining Engineer, Boston Bldg., Denver, Colo.  
**Hawhurst, Robt., Jr.**, Mining Engineer, care of International Banking Corporation, 60 Wall St., New York.  
**Haynes, Justin H.**, Metallurgical Co. 319 Boston Bldg., Denver, Colo.  
**Henderson, H. P.**, Mining Engineer. 66 Broadway, New York.  
**Hendrickson, Wm. H.**, Mining Engineer, Manager, Horn Silver Mining Co., Frisco, Utah.  
**Hendryx, Wilbur A.**, Metallurgist V. P. and Gen. Mgr. Hendryx Cyanide Machy. Co., 107-109 William St., New York. Cable: Henelecy.  
**Hills & Willis**, Victor G. Hills. Frank G. Willis. Mining Engineers. Denver, Colo., and Cripple Creek, Colo. Cable Address: "Hillwill."  
**Hodges, A. B. W.**, Mining and Metallurgical Engineer. 109 South Kingsley Drive, Los Angeles, Calif.  
**Hoffmann, Ross B.**, Mining Engineer. 228 Perry Street, Oakland, Calif. Cable Address: Rosshof.  
**Hofstrand, O. B.**, Mining Metallurgist. Versed in flotation and hydro-metallurgy. Development of ore treatments. Mill designing, construction and operation. Examinations and reports. Wallace, Idaho.  
**Hohl, L. J.**, Consulting Engineer Hydraulic and Dredge Mining, 525 Market St., San Francisco, Calif.

**Holden, Edwin C.**, Consulting Mining Engineer. Madison, Wis. Code: Bedford-McNeill.  
**Holden, R. J.**, Mining Geologist. Virginia Polytechnic Institute, Blacksburg, Virginia.

**Holland, Chas. H.**, Metallurgist. Analytical Chemist. Examinations and Superintendence of Properties. P. O. Box 415, Auckland, New Zealand. Cable Address: "Reduction," Auckland. Usual Codes.

**Holland, L. F. S.**, Mining Engineer and Metallurgist. Examinations and Reports. 601 I. W. Hellman Bldg., Los Angeles, Calif. Cable: Verify.

**Hollis, H. L.**, Mining Engineer and Metallurgist. 1417 First National Bank Bldg., Chicago, Ill.

**Hooper, G. H.**, Graphite mining and refining a specialty. Somerville, N. J.  
**Hoover, Theodore J.**, Mining Engineer. 1 London Wall Bldg., London, E. C. "Mildaloo."

**Houck, Arthur W.**, Assayer and Chemist. Umpire and Control Work a Specialty. P. O. Box 885, 403 N. Oregon St., El Paso, Texas.

**Hunt, Robert W. & Co., Engineers.** Bureau of Inspection, Tests and Consultation. Investigations and Reports on Mining Properties and Processes. Chemical Analyses. 2200 Insurance Exchange Building, Chicago; 90 West St., New York; Monongahela Bank Bldg., Pittsburgh; 1445 Syndicate Trust Bldg., St. Louis; Norfolk House, Lawrence Pountney Hill, E. C., London; 905 McGill Bldg., Montreal; 251 Kearney Street, San Francisco; 1314 Trader's Bank Bldg., Toronto; Cinco de Mayo 6-B, Mexico City; 309 White Bldg., Seattle.

**Huntley, L. G.**, Geologist, Associated Geological Engineers, Reports on Oil Gas and Mineral Properties. 331 Fourth Ave., Pittsburgh, Penn.

**Huntoon, Louis D.**, Mining Engineer. 115 Broadway, New York City.

**Hutchins, J. P.**, Consulting Mining Engineer, 341, Salisbury House, E. C. London. Cable "Getchins."

**Hutchinson, Edw'd. S.**, Consulting, Civil, and Mining Engineer.—Coal. Newtown, Penn.

**Hutton, Gerald H.**, Mechanical and Dredging Engineer. Union Construction Co., Locomobile Power Plant Installations. 604 Mission St., San Francisco.

**Hyde, James M.**, Mining Engineer. Treatment of Difficult Ores. American Agent Murex Process. Cable: "Jamehyde." 610 Mills Bldg., San Francisco, Calif. Codes: Broomhall, Bedford-McNeill.

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## J

**James Co., Geo. A.**, Assayers, Chemists and Cement Testers. 28-32 Belden Place (off Bush, near Kearney), San Francisco, Calif.

**Jarvis, Royal P., Ph. D.**, Mining and Metallurgical Engineer. Reports, Examinations, Consultation. Crested Butte, Colo.

**Jenks, T. H.**, Consulting Mining Engineer. 523 McPhee Bldg., Denver, Colo. Cable address: Jenks Denver. Codes: Bedford-McNeill, Moreing & Neal.

**Jennison, W. F., Ma. Eng.**, Mining Engineer and Economic Geologist. Truro, Nova Scotia, Canada.

**Jennings, E. P.**, Mining Engineer. P. O. Box 841, Salt Lake City, Utah. Cable "Chalcoite" Salt Lake. Code: Bedford-McNeill.

**Johnson, J. E. Jr.**, Consulting Engineer and Metallurgist associated with Sanderson & Porter. 52 William Street, New York, Nevada Bank Bldg. San Francisco, Calif.; Drake Block, Victoria, B. C.

**Johnson, Maurice M.**, Mining Engineer, 1008 Newhouse Bldg., Salt Lake City, Utah.

**Johnson, R. D. O.**, Mining Engineer. Address: Medellin, Apartado 110, Republic of Colombia, S. A. Cable: Rejon, Medellin. Code: Western Union (Univ. Ed.)

**Jones, C. Colcock**, Mining Engineer. 605 I. N. Van Nuys Bldg., Los Angeles, Calif. Code: Bedford-McNeill.

**Joralemon, Ira B.**, Mining Geologist. Calumet and Arizona Mining Co., Warren, Ariz.

## K

**Kedzie, G. E.**, Mining Engineer. 12 years Engineer and Manager of Mexican Mines and Mills in Durango and Coahuila. Danbury, Texas.

**Keffer, Frederic**, Mining Engineer and Geologist with The British Columbia Copper Co., Ltd., Greenwood, B. C.

**Kennedy, J. C.**, Scout Mining Engineer. field Geologist and Metallurgist Manhattan, Nevada.

**Kennedy, Julian**, Engineer. The Bessemer Building, Sixth Street and Duquesne Way, Pittsburgh, Penn. Cable Address: "Engineer," Pittsburgh.

**Kenney, H. S.**, Metallurgy of Gold, Silver and Copper. Box 3541, Johannesburg, So. Africa. Code: Bedford-McNeill.

**King, Frederick Gilberts**, Consulting Mining and Operating Engineer. 205 Sharon Bldg., San Francisco, Calif.

**Kinnon, Wm. H.**, Mining Engineer and Metallurgist. 307 San Francisco St., El Paso, Texas.

**Kinzie, Robert A.**, Mining Engineer. 1st National Bank Bldg., San Francisco, Calif.

**Kirby, A. G.**, Metallurgist. Manager Dominion Reduction Co., Ltd., Cobalt, Ont.

**Kirby, Edmund B.**, Mining and Metallurgical Engineer. 918 Security Building, St. Louis, Mo.

**Kirk & Leavelle**, Consulting Engineers. Examination, management and operation of mines. Design of mine and mill equipment. Newhouse Building, Salt Lake City, Utah.

**Klepetchko, Frank**, Mining and Metallurgical Engineer, 80 Maiden Lane, New York; and Apartado 708, Lima, Peru.

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**Krumb, Henry**, Mining Engineer. Felt Building, Salt Lake City, Utah.

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## L

**Labarthe, Jules**, Metallurgical Engineer, General Manager, Mason Valley Mines Co., Thompson, Nevada.

**Lachmund, Oscar**, Mining Engineer and Metallurgist, General Manager British Columbia Copper Co., Ltd., Greenwood B.C.

**Ladd, David H.**, Mining and Metallurgical Engineer. Houghton, Mich. Cable—"DAHLADD," Houghton. Code Bedford-McNeill and McNeill's 1908.

**Laird, George A.**, Consulting Mining Engineer. Lawson House, 49 Clarence Street, Sydney, N. S. W. Australia. Cable address Drialag, Sydney. Code: Bedford-McNeill.

**Lakenan, C. B.**, Mining Engineer, McGill, Nevada.

**Lamb, Mark R.**, Equipper. Manager, Allis-Chalmers Co., Santiago, Chile.

**Lamb, R. B.**, Mining Engineer. Traders Bank Building, Toronto, Canada. Cable, "Boblam"—Code: McNeill (Both Eds.)

**Larsh, Paul A.**, Consulting Mining Engineer and Mine Manager. Practice limited to New Mexico. Offices: Albuquerque, N. M. Silver City, N. M.

**Laster, Frederick G.**, Mining Engineer, P. O. Birmingham, Michigan.

**Latham, E. B.**, Mining Geologist and Engineer. Petroleum Exploration and Development. Con. Geologist A. T. & S. F. Ry. Co., P. O. Box 53, Taft, Calif.

**Lawton, Nathan O.**, Mining Engineer. Mine Examinations and Management. 23 years mining Iron, Copper, Pyrites, Vein and disseminated ore deposits. Code: Bedford-McNeill. Address Lawton, Michigan.

**Lavagnino, G. M. E.**, Box 1248, Salt Lake City, Utah. 593 East Calif. St., Pasadena, Calif.

**Ledoux, Albert R.**, Expert in Mining, Engineering, Metallurgy and Chemistry. 99 John Street, New York.

**LeFevre, S.**, Consulting Mining Engineer. Magnetic Iron Ore, Witherbee Sherman & Co., Testing Laboratory available for ores. Mineville, Essex Co., N. Y.

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**Lewisohn, Julius A.**, Mining Engineer, 42 Broadway, New York.

**Lindberg, Carl O.**, Mining Engineer (with W. Rowland Cox), Mines Examined and Reported upon. 527 Union League Bldg., Los Angeles, Calif.

**Lindsley, Halstead**, Mining Engineer, 60 Broadway, New York.

**Lindsley, Thayer**, Mining Engineer. 82 Beaver St., New York.

**Linton, Robert**, Mining Engineer. Trust and Savings Bldg., Los Angeles, Calif. 525 Penn Ave., Pittsburgh, Pa. Code: Bedford-McNeill.

**Lloyd, R. L.**, Metallurgical Engineer. Specialty: Pyrometallurgy of copper and associated metals. 29 Broadway, New York. Cable address: Ricloy-New York. Codes: Bedford-McNeill and Miners' & Smelters'.

**Lonergan, Jay**, Mining Engineer. Peking, China. Cable address "Lonergan, Peking." Code, Moreing-Neal.

**Longyear Co., E. J.**, Exploring Engineers and Geologists. Diamond Drill Contractors. Manufacturers of Diamond Drills and Supplies. General Office, 710-722 Security Bank Bldg., Minneapolis, Minn. Cable Address: "Longco," Minneapolis. Code: Bedford-McNeill.

**Loring, Frank C.**, Mining Engineer. Toronto, Ontario.

## M

**MacBoyle, Errol**, Mining Engineer and Geologist. 1022 Crocker Building, San Francisco. Cable Address: MacBoyle, San Francisco. Usual Codes.

**MacDonald, Jesse Juan**, Ore Dressing Expert. Consulting Engineer. Sierra Madre Club, Los Angeles, Calif.

**MacDonald, B.**, Mining and Metallurgical Engineer. Specialty: Design and Construction Cyanide Plants. 533-4 I. W. Hellman Bldg., Los Angeles, Calif.

**MacVichie, D.**, Mining Engineer. 507 Newhouse Bldg., Salt Lake City, Utah.

- McAllister, J. E.**, Consulting Engineer. 60 Wall St., New York. 15 King Street West, Toronto, Canada.
- McCaskell, J. A.**, Mining Engineer. 209 Felt Bldg., Salt Lake City, Utah.
- McCulloms Co., The**, Assayers, Mining Chemists and Engineers. M. R. McCulloms, examination of mines and prospects. Box 847, Reno, Nev.
- McCune, Raymond**, Mining Engineer, New York; Whitehall Building. Lima, Peru, South America; Cable: "Raycune." Code: Western Union.
- McDaniel, A. K.**, Consulting Mining Engineer. 1218 Foster Bldg., Denver, Colo.
- McIntyre, Alexander J.**, Mining and Metallurgical Engineer. Consulting Engineer for Butte and Vipond Gold Mining and Milling Co., Dewey, Mont.
- McKinlay, William B.**, Mining Engineer, Rooms 1214-1215, 27 William St., New York. Code: Bedford-McNeill.
- Mackey, R. W.** Mining Engineer. Llallagua, Bolivia, S. A. Cable: Bobmac. Codes: Bedford-McNeill, Liebers.
- Macnutt, C. H.**, Mining Engineer, Resident Manager, Burma Mines, Ltd. Nantua, Northern Shan States, Burma, India.
- Magnus, Benj.**, Consulting Engineer. General Manager, Mt. Morgan Gold Mine, Sydney, Australia. Cable, Eratype, Sydney.
- Mann, William Seward**, Mining and Metallurgical Engineer. Technical Manager Viking Mining Association, Ltd., Cisco, Placer Co., Cal.
- Marsters, V. F.**, Mining Geologist; Substation, 84, N. Y. C., and San Juacito, Honduras, C.A., Ten years' professional experience in South & Central America.
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- Meade, Richard K.**, Chemical Engineer, specialty pulverized fuel and nodulizing ores. 202 No. Calvert St., Baltimore, Md.
- Melzer, Emil**, Consulting Mining Engineer and Metallurgist. Baker, Oregon. Bedford-McNeill Code.
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- Merrill, Charles W.**, Metallurgist. 121 Second St., San Francisco. Cable: "Lurco." Codes: Bedford-McNeill and Moreing & Neal.
- Merrill Metallurgical Co., Engineers**. 121 Second St., San Francisco. Cable Lureo. Usual Codes.
- Merry F. Chas.**, Mining Engineer. Ferguson, British Columbia.
- Millar, Howard A.**, Consulting Mining Engineer. Third National Bank Bldg., St. Louis, Mo.
- Miller, Hugo W.**, Mining Engineer and Assayer, Mine Examinations, Ores and Bullion bought. Nogales, Ariz.
- Miller, W. Clayton**, Mining Engineer. Consulting and Operating. "The Westminster" Spokane, Washington.
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- Milliken, William B.**, Mining Engineer and Metallurgist. 418 McPhee Building, Denver, Colorado.
- Minard, Frederick H.**, Mining Engineer. Trinity Bldg., 111 Broadway, New York. Cable: "Frednard," New York. Code: Bedford-McNeill.
- Mines Management Co.**, Consulting Mining Engineers and Mine Managers. 60 Broadway, New York City. Branches: London, England, 28 and 29 St. Swithins Lane. Mexico, D. F. Avenida 16 de Septiembre, Num. 48. Cable Address: "Minmanco." Code: Bedford-McNeill.
- Moore, Charles**, Mining and Consulting Engineer. Special attention given to the examination of Mines and Prospects. Box 741, Park City, Utah.
- Morris, F. L.**, Mining Engineer, 1037 Monadnock Bldg., San Francisco, Calif. Cable: Fredmor. Code: Bedford-McNeill.
- Motter, W. D. B., Jr.**, Mining Engineer, Manager Benson Mines Company, Benson Mines, N. Y.
- Mudd, Seeley W.**, Mining Engineer. 1208 W. I. Hollingsworth Bldg., Los Angeles, Calif. Code: Bedford-McNeill.
- Munro, C. H.**, Mining Engineer. Monadnock Bldg., San Francisco. Cable: Ornum. Code: Bedford-McNeill.
- Munroe, H. S.**, Mining Engineer. Concrete, Colo.
- Myers, Desaix B.**, Mining Engineer. 321 Story Bldg., Los Angeles, Calif.
- N
- Nahl, Arthur C.**, Consulting Engineer. Care of Roeholl Ruffo & Co., La Paz, Baja California, Mexico.
- Neel, Carr B.**, Consulting Engineer. 14 Wall St., New York.
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- O'Brien, William D.**, Mining Engineer. Monadnock Building, San Francisco, Cable address "Marath" San Francisco.
- Offerhaus, C.** Dipl. Ing.; Ph.D., Siemens Copper Co., post Artwin, Kaukasus, Russia and Humboldt Engineering Works, Coln-Kalk, Germany.
- Officer & Co., R. H.**, Assayers and Chemists. 169 South West Temple St, Salt Lake City, Utah.
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- Overpeck, Arell C.**, Mining Engineer. Examinations, Reports and Management of Mining Properties. Rapid City, South Dakota.
- P
- Packard, George A.**, Metallurgist and Mining Engineer. 50 Congress St., Boston, Mass.
- Parker, Richard A.**, Consulting Mining Engineer. 802 Equitable Bldg. Denver, Colo. Cable address-Richpark-Bedford McNeill.
- Parker and Parker**, Consulting and Mining Engineers, El Paso, Texas.
- Payne, C. O.**, Mining Engineer. 82 Beaver St., New York.
- Payne, James H.**, Chemical and Metallurgical Engineer. Nodulizing as at Chrome and Braden. Yorktown, Va.
- Pembroke, Earl R.**, Mining Engineer, Examinations, Management. Continental Bldg., Salt Lake City, Utah.
- Pentland, W. J.**, Mining Engineer. Care Dorr Cyanide Machinery Co., Denver, Colo.
- Perry, O. B.**, Mining Engineer. 165 Broadway, New York.
- Peter, Jesse, Jr.**, Mining Engineer. Box 12, Redding, Calif.
- Peters, Edward D.**, Mining Engineer and Metallurgist. Address all letters and Telegrams, 38 Percival St., Dorchester, Mass. Cable "Peters," Boston.
- Phillips, William B.**, Director, Bureau of Economic Geology. Will report on Properties in the Southwest and Mexico. University of Texas, Austin, Texas.
- Pickard, Byron O.**, Engineer of Mines. Examinations and Consultation. Box 762, Phoenix, Ariz.
- Pickings, H. B.**, Mining Engineer. Queen Building, Halifax, Nova Scotia.
- Pierce, F. E., C. E.**, Consulting Civil and Metallurgical Engineer. 35 Nassau St., New York.
- Plate, H. Robinson**, Mining Engineer. 14 Wall St., New York.
- Plumb, Albert M., E. M.**, Specialty Complex Ores. 1219 Foster Bldg., Denver, Colo.
- Pollon & Poirier**, Howard Poillon. C. H. Poirier. Mining Engineers. 63 Wall Street, New York City.
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- Probert, Frank H.**, Consulting Engineer and Mining Geologist. Central Bldg., Los Angeles, Calif.
- Pugsley, F. W.**, Metallurgical Engineer. Patentee—Pugsley Chlorinating Process. Perth Amboy, N. J.
- R
- Rainsford, Ralph S.**, Mining Engineer. Gen. Mgr. Argonaut Mining Co. Jackson, Amador Co., Calif.
- Rakowsky, Victor**, Mining Engineer. Sellwood Bldg., Duluth, Minn. Code: Boulevard-McNeill.
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- Rogers, Allen Hastings**, Consulting E.M. 201 Devonshire St., Boston, Mass. 71 Broadway, New York. Cable Address: Alhasters, New York.
- Rogers, Alexander P.**, Mining Engineer, 60 Broadway, New York. Cable Address, Aprog, New York.
- Rogers, Edwin M.**, Consulting Mining Engineer. 32 Broadway, New York. N. Y.
- Rohn, Oscar**, Mining Engineer and Geologist. Butte, Mont. care East Putte Copper Min. Co.
- Rolker, Charles M.**, Consulting Mining Engineer. 59 a London Wall, London. E. C.
- Ross, Frank A.**, Consultations and Management; Specialties Milling, Cyaniding and Concentrating plants. P. O. Box 2173, Spokane, Wash.
- Rose, Hugh**, Mining Engineer. Pachuca, Mexico. Cable address: RED-WING. Code: Bedford McNeill.
- Rothschild, C. G.**, Mining Engineer, care of Hayden, Stone & Co., 25 Broad Street, New York.
- Rowand, Lewis G.**, Mechanical, Electrical and Metallurgical Engineer. 55 Wall Street, New York.
- Royce, Stephen, A.B. S.B. M.E.** Mining Engineer and Geologist. General Engineer, Gogebic Range, Piekands, Mather & Co., Hurley, Wis.
- Rutherford, Forest**, Metallurgical Engineer, Care Copper Queen Consolidated Mining Co., Douglas, Ariz.
- Rutledge, J. J.**, Ph. D., Mining Engineer and Geologist. Not open for engagement at present. Care of Bureau of Mines, McAlester, Okla.
- S
- Sakikawa, M.**, Mining and Metallurgical Engineer. 1116 Omachi, Kamakura, Sagami, Japan.
- Sanders, Richard H.**, Mining Engineer. 617 Drexel Bldg., Philadelphia, Penn.
- Scheffler, F. G.**, Mining Engineer. Cie. Minas de Campinas Encruzilhada. Rio Grande do Sul, Brazil.
- Schmidt, Henry C.**, Examination and Management. Apart. 327, Monterrey N. L., Mexico.
- Schroter, Geo. A.**, E.M. Denver, Colo. 111 Broadway, New York. Code: Bedford-McNeill.
- Scobey, Jesse**, Mining Engineer. Assistant to the Managing Director, Compania Minera La Luz y Los Angeles, Box 939, Pittsburgh, Penn.
- Scotland, Peter B.**, Mining Engineer, General Superintendent of Mines. The Arizona Copper Company, Ltd. Morenci, Arizona.



**Seamon Assay Co.,** The, Assayers, Chemists. Agents for Ore Shippers. P. O. Box 97, 404 San Francisco St., El Paso, Texas.

**Searle, Barry,** Chemist and Mining Engineer. Consultation, Examination and Management. Montrose, Penn., U. S. A. Codes: Bedford-McNeill and A.B.C.

**Sears, Stanley C.,** Mining Engineer. Consultation, Examination and Management. 705 Walker Bank Building, Salt Lake City, Utah. Usual Codes.

**Sharpless Stephen P.,** Assayer, Chemist and Mining Engineer. 26 Broad St., Boston, Mass.

**Sharpless, Fred'k F.,** Mining Engineer. 52 Broadway, New York. Cable Address: "Fresharp," N. Y. Bedford-McNeill Code.

**Shaw, S. F.,** Mining Engineer. 136 Liberty St., New York.

**Short, Frank R.,** Mining Engineer. 1057 Monadnock Bldg., San Francisco. Cable address—Muskeg.

**Siebert, Fred J.,** Mining Engineer. Buckhorn Mines Co., Reno, Nevada. Temporarily engaged, Tonapah, Nev.

**Sill & Sill,** Mining & Metallurgical Engineers, Examinations, Management, Geological Surveys. 515 Hollingsworth Bldg., Los Angeles, Calif.

**Simonds, Ernest H.,** Metallurgical Engineer. 1105 Crocker Bldg., San Francisco, Calif.

**Simonds & Burns,** Mining Engineers. 25 Madison Ave., New York.

**Skinner, Edmond N.,** Mining Engineer—Thompson, Towle & Co., Members New York & Boston Stock Exchanges, 14 Wall St., New York.

**Smith, A. Y.,** Mining & Consulting Engineer. 701 Brockman Bldg., Los Angeles, Calif.

**Smith, H. DeWitt,** Mining Engineer. Kennecott Mines Company. Kennecott, Alaska.

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**Snelling, Walter, O.,** Ph. D. Research Chemist and Consulting Engineer. Gas and Oil. 7440 Finance Street, Pittsburgh, Penn.

**Snyder, Blanchard M.,** Mining Engineer and Metallurgist. 918 Washington Bldg., Los Angeles, Calif.

**Southern Minerals Company,** Knoxville, Tennessee. A. A. Blow, Consulting Engineer. George Blow, Mining Engineer.

**Spearman, Chas.,** B. Sc. M. A. Mining Geologist and Engineer. Examinations, etc. Microscopic determinations of ores and rocks. Haileybury, Ont.

**Spicer, H. N.** (with the Dorr Cyanide Machinery Co.) Metallurgical Engineer, Specialist in Cyaniding—50 Church St., New York.

**Spilsbury, E. Gybon,** Consulting, Civil, Mining and Metallurgical Engineer 45 Broadway, New York. Cable Address: "Spilroe," New York.

**Spilsbury, Persifor G.,** Mining and Metallurgical Engineer. San Mateo, Costa Rica, C. A. Cable address: "Lion." Code: Bedford-McNeill.

**Spurr, J. Edward,** Mining Geologist. Bullitt Bldg., Philadelphia. Tonopah Mining Company of Nevada.

**Stadelmann, G.,** Consulting Mining Engineer, Calle Guillermo Prieto 63, Mexico City (P. O. Box 529).

**Stanford, Richard B.,** Mining Engineer and Geologist. Room 206, Metropolitan Bank Bldg., New Orleans, La.

**Starey, E. J.,** Scout Mining Engineer. Field Geologist. Care Nat'l. Bank India, Nairobi B. E., Africa. Code: Bedford-McNeill. Cables STAREY, Nairobi.

**Stebbins, Elwyn W.,** Mining Engineer. 818 Mills Bldg., San Francisco, Calif. Bedford - McNeill code.

**Stevens, Blamey,** Mining Engineer, Temascaltepec, Mex., Mexico, care of Lane-Rincon Mines Inc.

**Stevens, Frank G.,** Mining Engineer. 16 Prince St., Halifax, Canada.

**Strauss, Lester W.,** Engineer of Mines. Casilla 1174, Valparaiso, Chile. Cable Address: "Lestra," Valparaiso. Code: Bedford-McNeill (1906).

**Sussman, Otto, Ph.D.,** Mining Engineer. 61 Broadway, New York; 620-621 Judge Building, Salt Lake City, Utah.

**Swart, W. G.,** Mining and Metallurgical Engineer. 1218 Foster Bldg., Denver, Colo.

**Swartley, Arthur M.,** Mining Engineer. Oregon Bureau of Mines and Geology Corvallis, Oregon.

**Swoyer, Will T.,** Mining Engineer, White Oaks, N. M.

**Symmes, Whitman,** Mining Engineer. Manager Mexican Mine, etc. Virginia City, Nevada.

## T

**Tanner, W. Lee,** Mining Engineer and Chemist. Zanesville, Ohio. Examinations, Reports, Assays, Analyses. English and Spanish. Cincinnati and Chattanooga by appointment.

**Tays, Eugene A. H.,** Mining Engineer. San Blas, Sinaloa, Mexico.

**Thayer, B. B.,** Mining Engineer. 42 Broadway, New York.

**Thayer, Reginald Holden,** Mining Engineer. 12 Windsor Terrace, Yonkers, N. Y.

**Thomas, Kirby,** Mining Engineer. Examination, Valuation and Exploration of Mining Properties. Room 1407, 43 Exchange Place., New York.

**Thomas, Marlon L.,** Mining Engineer, 71 Broadway, New York. Code—Bedford-McNeill. Cable address: "Maltom."

**Thorne, W. E.,** Mining Engineer, 341 Salisbury House, London, E. C. Cable Wethorne. Codes: McNeill both editions.

**Thornhill, E. Bryant,** Metallurgical Engineer, Hydro-Metallurgy of Mercury a specialty. Cobalt, Ontario, Can.

**Thurston, E. Coppee,** Care A. Goers & Co., Pinner's Hall, Austin Friars, London, E. C., England.

**Timmons, Colin,** Mining Engineer. Huntington Park, Calif.

**Tomlinson, E. L.,** Mining & Metallurgical Engineer. Cyanidization of Sulphide Ores and Concentrates. Specialty. Prescott, Ariz.

**Torbert, Jas. B.,** Mining Engineer. 425 James Bldg., Chattanooga, Tenn.

**Trumbull, L. W.,** Mining Engineer and Geologist. State Geologist of Wyo. Capitol Bldg., Cheyenne, Wyo.

**Truschkoff, Nicolas, E. M.** Mgr. Ekibastous Mines & Smelter, Khirgis Mining Co., Ltd., Ravladar Sempalatinsk District, Russia.

**Turner, R. Chester,** Mining Engineer. Vice Pres. and Mgr. Brunswick Con. G. M. Co. 519 California St., San Francisco, Calif.

**Turner, H. W.,** Mining Engineer, Mine examinations, sampling, geological reports. Alaska Commercial Bldg., San Francisco, Calif.

**Turner, J. K.,** Mining Engineer, P. O. Box 763, Goldfield, Nevada. Code: Bedford-McNeill.

**Tyrrell, J. B.,** Mine Valuer and Consulting Mining Engineer. 534 Confederation Life Bldg., Toronto, Canada; Cable "Tyrrell, Toronto."

## U

**Union Assay Office, Inc.,** Assayers and Chemists. Box 1446, Salt Lake City, Utah.

## V

**Van Law, Carlos W.,** Mining Engineer. Care of United States Smelting, Refining & Mining Co., 55 Congress St., Boston, Mass.

**Van Winkle, C. T.,** Mining Engineer. Problems in development, mining and milling. Scott Building, Salt Lake City, Utah.

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**Von Rosenberg, Leo,** Consulting Mining Engineer. 42 Broadway, New York. Cable Porphyry, New York.

## W

**Ward, William F.,** Mining Engineer. Dredging, Placer Testing. 416 Ernest & Cranmer Bldg., Denver, Colo.

**Wartenweiler, Otto & Co.,** Engineers and Contractors, Mining and Metallurgical Plants. Van Nuys Bldg., Los Angeles, Calif.

**Watson, R. B.,** Consulting Mining Engineer. 165 Broadway, New York Gen. Mgr. Nipissing Mining Co., Ltd., Cobalt and La Rose Mines, Ltd., Cobalt

**Watson, William, E.M.M.E.,** Mining Engineer. Address Room 412, 52 Wall Street, New York.

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**Weed, Walter Harvey,** Mining Geologist and Engineer. Examinations. Owner of the Copper Handbook. Houghton, Mich. Cable Minexam.

**Weekes, Frederic R.,** Mining Engineer. 71 Broadway, New York.

**Weld, C. M.,** Consulting Mining Engineer. 66 Broadway, New York, N. Y. Telephone 3979 Rector. Cable address: Mineld, New York.

**Weils, Jas. S. C.,** Consulting, Mining and Metallurgical Engineer. N. 15th St., Canon City, Colorado.

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**Wenstrom, Olof,** Mining Engineer. 53 State St., Boston, Mass. Cable. Olavo. Code: Bedford-McNeill.

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**West, H. E.,** Mining & Metallurgical Engineer. Care of Santa Barbara County National Bank, Santa Barbara, Calif.

**Westervelt, William Young,** Consulting Mining Engineer. 17 Madison Ave., New York. Cable Address: "Casewest," N. Y. McNeill Code.

**Wethered, Roy,** Mining Engineer, Paulsen Building, Spokane, Wash.

**Wheeler, H. A.,** Mining Engineer. Reports on Oil and Mining properties. 510 Pine St., St. Louis, Mo. Cable: "Wah." St. Louis.

**Whiting, Lowe,** Mining Engineer. First National Bank Bldg., Iron River, Mich.

**Wiard, Edward S.,** Mining and Metallurgical Engineer. 422 Boston Building, Denver, Colo.

**Wilding, James, Jr.,** Mine Valuation. Copper and Lead Smelting. Concentration by flotation. 825 Merchants Exchange Bldg., San Francisco.

**Wilfey, Clifford R.,** Mining Engineer. Manager Barstow Mine, Ouray, Colo. Mine & Smelter Supply Co. Building, Denver, Colo.

**Wilkins, H. A. J.,** Mining Engineer. President Mines Management Co., 60 Broadway, New York.

**Wilmot, H. C.,** Mining Engineer. Manager, Syndicate Mining Company, Arroy, Masbate, P.I. Codes: Western Union, Universal, Bedford-McNeill.

**Wilson, Fred L.,** Mining Engineer. Examinations, reports and Management, Eureka, Calif.

**Wilson, George Benton,** Consulting Mining Engineer. With the American Smelting & Refining Co., Salt Lake City, Utah.

**Wilson, W. A.,** Mining Engineer. Examinations, Reports and Management of Properties. 412 Felt Bldg., Salt Lake City, Utah.

**Wise, Sidney L.,** Mining Engineer. 28 East 63rd St., New York. Cable Address: Wiseling, New York.

**Wiseman, Philip,** Mining Engineer. 1210 Hollingsworth Bldg., Los Angeles Calif. Cable: "Filwiseman." Codes: Western Union, Bedford-McNeill.

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**Wrampelmeier, E. L. S.,** Mining Engineer. Superintendent Erie Mine, Gaston, Nevada Co., Calif., 565 Monadnock Bldg., San Francisco.

**Wright, Charles Will,** Mining Engineer. Ingurtozu, Sardinia, Italy. Cable: Wright, Arbus. Code: Bedford-McNeill.

**Wright, Louis A.,** Mining Engineer. Care of General Development Company 61 Broadway, New York.

## Y

**Yeatman, Pope,** Mining Engineer. 165 Broadway, New York. Code: Bedford-McNeill.

**Yung, M. B., M. E.,** Examination of Mines in China, 31 Queens Road Central, Hong Kong, China. Cable Annie, Codes Western Union, Moreing & Neal's

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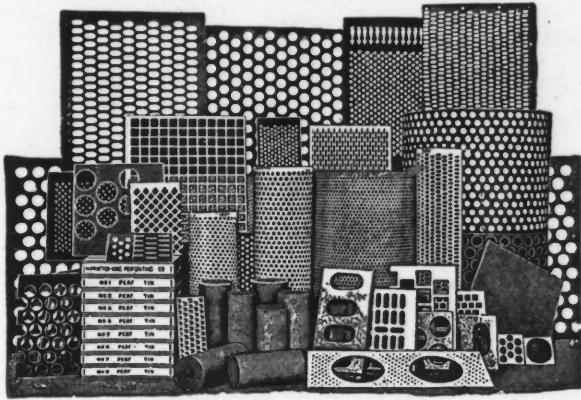
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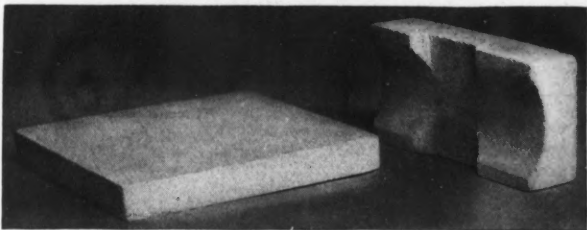
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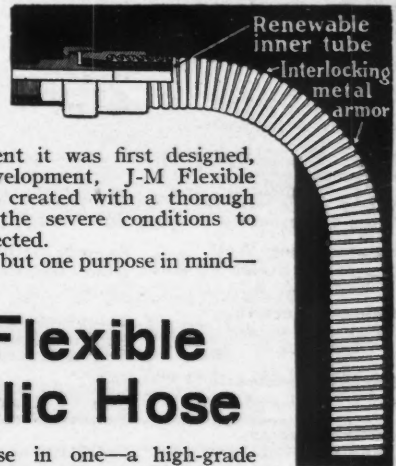
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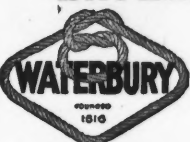
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