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# The Engineering and Mining Journal

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No. 5

## Spelter Statistics

The report of the U. S. Geological Survey shows a production of 166,496 tons of spelter during the first semester of 1912 against 146,330 in the second and 140,196 in the first of 1911. The deliveries are estimated at 159,046, against 145,157 and 134,902. At first glance the marvellous increases both in production and in consumption that are indicated by these figures are likely to be viewed with amazement, but before seeking for an explanation it is useful to examine the statistics of other metals in order to discover whether the spelter statistics are in or out of tune with them.

Assuming that the rate of consumption during the second half of 1912 is going to continue at the same rate as in the first half and comparing with the consumption during the 12 months of 1911, it appears that iron increased to 1.12 times the rate of 1911, copper to 1.11 and spelter to 1.13½. These figures are sufficiently in harmony to lull any suspicions of manipulation or abnormality, however we may marvel at the extraordinary percentage of increase, which will be even greater if industry continues to wax during the remainder of 1912.

How then is the difference in the behavior of the markets to be accounted for? As between iron and spelter this is simple. In the iron business there was, and still is, a surplus of producing capacity, which has been utilized as required. Consequently, the advance in the iron market has been orderly and moderate. In the spelter business, on the other hand, there was no surplus to speak of and new capacity has had to be provided. This has put the producers under a severe strain and the market naturally has advanced to a high level and has been feverish.

With respect to copper the case is not so simple. An adequate explanation of the delay in smelting and refining the excess production of 75,000,000 lb. is necessary before any broad deduction may safely be drawn as to the market

for this metal. It may be said, however, that the domestic deliveries of the refined metal probably measure the actual consumption in this country.

## The Park City Report

The Park City report is one of the publications of the U. S. Geological Survey of major character, such as have done most to establish the reputation of the Survey. Its author, Mr. Boutwell, is a distinguished mining geologist (who is no longer a member of the Survey) and his reputation insures excellence in his work. We shall review it from the geologic standpoint in a subsequent issue.

It is highly unfortunate that the publication of the Park City report has been so long delayed. This has previously been the subject of criticism in the JOURNAL and elsewhere. The field work was begun in 1902. The full report is issued after the lapse of 10 years.

Mr. Boutwell, in his preface, offers an apology for the tardiness, saying, "Delay in digesting this large mass of facts and in preparing the final report, which is regretted by none more deeply than by the writer, has been caused mainly by the interference of other work. This includes the completion of previous work, occupying two office seasons after the Park City field work was started; the organization of statistical work on the production of lead, zinc and quicksilver, both in field and office, and two outside examinations undertaken with the consent of the proper Survey officers. Fortunately the resulting loss has not been as serious as it would have been in most districts, owing to a lull in mining operations in this camp which leaves the examination practically up to date."

This apology is in reality a serious indictment of the former administration of the U. S. Geological Survey. No elaborate argument is necessary to demonstrate that one important piece of work of this kind ought not to be inaugurated

before previous work had been completed, that members of the Survey ought not to be given leave of absence in order to conduct outside examinations, and that distinguished geologists ought not to have been detailed to mere statistical investigations. We have criticized the administration of the Survey for such errors of judgment during a long time. We have reason to believe that some of these faults will not be permitted to continue under the present direction.

### The World's Production of Pig Iron and Steel

The pig-iron production of the world in 1911 showed a small decrease from 1910, the total loss being 1,609,043 tons, or 2.4%. This decline was entirely due to the smaller production of the United States, nearly all the European iron-making countries having enlarged their production. The three leading countries are the United States, Germany and Great Britain, which produced in 1911, respectively 37.4, 23.8 and 15.4%—in all 76.6% of the total make, against 23.4% by all other countries. The accompanying table shows the production in 1910 and 1911, all being reduced to metric tons for purposes of comparison:

PIG IRON PRODUCTION OF THE WORLD		
	1910	1911
United States.....	27,636,687	24,027,733
Germany.....	14,794,029	15,280,527
Great Britain.....	10,380,212	9,894,136
Total.....	52,810,948	49,182,396
All other countries....	13,049,312	15,068,821
Total.....	65,860,260	64,251,217

While there was a small loss in production, there was probably no decrease in consumption, as both the United States and Great Britain carried over heavy stocks from 1910, and these were practically used up last year.

Unlike pig iron steel showed an increase in 1911, though the gain was

STEEL PRODUCTION OF THE WORLD		
	1910	1911
United States.....	26,512,437	24,054,309
Germany.....	13,698,638	15,019,333
Great Britain.....	6,106,856	6,564,998
Total.....	46,371,921	45,638,640
Other countries.....	11,934,426	12,748,281
Total.....	58,252,347	58,386,921

small, being only 134,574 tons, or 0.2%. In most countries the proportion of steel to pig iron showed an increase; and this was the case even in Great Britain, which has always been comparatively a small steel producer, and has continued the use

of wrought or puddled iron more than any other country, except Belgium. The second table shows the steel production, in metric tons, for the last two years.

Of the steel in 1911 the United States, Germany and Great Britain together made 78.2%, the proportions of the three countries being 41.2, 25.7 and 11.3%, respectively. No other country approaches any one of these three in its production of iron and steel. The leaders among the other countries are France, Austria-Hungary, Belgium and Russia.

In the 10 years from 1902 to 1912 the world has shown increases in production of 19,908,648 tons, or 44.9%, in pig iron, and of 26,936,779 tons, or 85.6%, in steel. The very much greater proportional growth of the steel is substantial evidence of the general adoption of the various steel-making processes. Much of this growth is due to the openhearth and basic converter methods, making available a wide range of raw material formerly thought unfitted for the manufacture of steel.

### Pig Copper

The official report of the Nevada Consolidated Copper Co. for the quarter ended June 30, 1912, throws some light upon the much discussed discrepancy in the copper statistics. "Labor troubles at refineries delayed the marketing of copper and during the quarter there was also a considerable increase in copper on hand at the Steptoe plant. The quantity and value of copper in transit to the market (with the higher price for copper) has also materially increased. In total we have \$702,611 more values in metals on hand than at the end of the preceding quarter."

Reckoning this copper at 16c. per lb. and allowing for the gold and silver, it appears that Nevada Consolidated was carrying at the mid-year something like 4,000,000 lb. of copper more than it was on March 31, 1912. Consequently here is one bit of official evidence respecting the stock of pig copper at the smelteries and in transit. Perhaps some of the other smelters find themselves similarly situated. It may be mentioned also that some of the refiners are no longer quite so positive about the absence of pig copper in their yards as they were a little while ago.

### Tonopah Milling Practice

When a knowledge of the present trend in the cyanidation of silver ores is desired one naturally turns to the practice in Mexico and Nevada as furnishing the best indicator. The ores of Tonopah are essentially silver ores, for the silver occurs in the approximate ratio of 100:1 of gold by weight. It is of double interest therefore to follow the development of the metallurgical practice in this district, for we obtain an idea of the progress in the cyanidation of silver ores in general, as well as of the advance in Tonopah milling methods in particular.

The first mill to treat Tonopah ores, a 10-stamp, pan-amalgamation mill, was followed by others in which the cyanide process was adapted to treat the characteristic arsenical, antimonial sulphide ores by preliminary concentration, the sand and slime tailing being separately cyanided. The next step was the adoption of all-sliming, which was followed by the use of direct cyaniding in addition to all-sliming at two of the mills, whereby the lower-grade ores were successfully treated.

At the West End Consolidated, an all-sliming, nonconcentrating mill, described in detail in a recent issue, an extraction of 90.85% on \$17 heads is obtained at a cost of \$3.52 per ton. The limit at which direct cyaniding can be profitably adopted is given as \$20, preliminary concentration being essential for ores of higher grade. That direct cyaniding is the more profitable method for the lower-grade ores was demonstrated at the Tonopah Extension, where concentration was abandoned after one year's operations. At the latter mill the ore averages \$13 and a total extraction of 90.85% is obtained at a cost of \$3.19 per ton by direct cyaniding.

A survey of the present practice in the Tonopah district shows that all-sliming is general in the new mills, that the tendency is toward heavier stamps, 1250- to 1500-lb. stamps displacing the 1050-lb., that a combination concentration-cyanidation system is used for high-grade ore and direct cyaniding for lower grade, that both zinc-shavings and zinc-dust precipitation are used, that heating of solutions is common and that lead acetate is the reagent generally used to prevent the precipitation of silver as the sulphide.

## By the Way

The *Boston News Bureau* recalls the 25th anniversary of its first publication by reprinting a stock exchange sheet of June 1, 1888. Only five mining stocks are quoted and they are Boston & Montana, \$47; Calumet & Hecla, \$245; Franklin, \$15; Osceola, \$20; Quincy, \$69.25 per share.

A "Cousin Jack" story, which has been going the rounds of the Michigan iron ranges, has to do with the directions given a Cornish mining captain by a young mine engineer concerning the starting of a crosscut from the main drift. Upon returning several days later the engineer found that nothing had been done. He questioned the captain and was asked with much dignity: "'Ow th' bluddy 'ell couldde turn a right angle to the left!'"

A dispatch states that gold, silver and other metals to the value of \$62,000 have been cleaned up in the last 13 months, from the old smeltery dump at Argentine, Kan. The site is now occupied by a structural-steel company, which is reported to have paid \$45,000 for the property. The officials of the steel company expect to recover about \$25,000 more and consider that they made a good bargain in the purchase of this property. The smelter suspended operations about fifteen years ago.

Like Banquo's ghost the spectre of "hidden stocks" of copper rises every now and then to disturb the 17c. copper feast of the American producers, says the *Wall Street Journal*. The phantom will not down, although each producer in turn rises to roll up his sleeves, turn his pockets inside out to show he has none of the elusive metal hidden about his person, and laying his hand upon his heart solemnly avows that the only hidden stocks he knows about are those concealed in the bosom of mother earth.

The long fight of the labor unions against improved machinery and processes in the Government Printing Office is fittingly supplemented by Senator Poin-dexter's bill abolishing all scientific shop-management systems in Government establishments says the *Evening Post*. The bill has been favorably reported. It is said for it that it would end the stopwatch and all other devices for "speeding up" workmen. The great principle that one man must not be allowed to do what can be divided between two or more is obviously violated by the scientific management idea.

Colonel Goethals, engineer in charge of construction of the Panama Canal, in a recent report, states that over \$15,000,000 worth of machinery has already been purchased in connection with the work. Some of the principal items are: Steam shovels, 102; cars, 4181; locomotives, 189; rock drills, 725; cranes, 79;

dredges, 14; barges, 44. After the canal is placed in operation, many of the locomotives and cars will be continued in use, but the remainder of the equipment, together with a vast amount of scrap material, will probably be put up for sale. Secretary of the Interior Fisher has suggested that much of the Panama Canal machinery be transferred to Alaska for use in constructing a government railroad to the interior of that territory. The execution of this plan, of course, depends on the action of Congress.

One curious and unexpected result of the Standard Oil dissolution has been an accumulation of Standard Oil securities in the hands of Wall Street speculators, says the *Evening Post*. Old Standard Oil of New Jersey was, perhaps, better distributed among small investors than any other industrial security. Transactions in it were made on the Curb, and 40 or 50 shares in a day would cause it to be called active. After the dissolution, many small holders were unable to abide the confusion and annoyance of sorting, keeping, and understanding fractional shares. It was harder on the small stockholder than on the others. True, he could put all of his fractions into one envelope and be sure that he had the same property as he owned before, but then came the dividend checks, one for 1c., another for 6c., and so on. He found that there was a market for the stuff in Wall Street. Speculators were willing to take his fragments and piece them together or swap them around into full shares, and, rather than to be bothered, he often sold. The speculators had tips, first on one stock and then on another, and the tips were good, and their willingness to collect and integrate the fractions accordingly increased. The result is that speculators have a larger interest in Standard Oil securities today than was ever the case before. It is worthy of note that Standard Oil Co. of New Jersey recently sold on the Curb at \$1000 per share, a record price for this stock:

Few but editors appreciate the difficulty of obtaining and holding good correspondents. Like the tropics, the desert also has a peculiar effect on the nerves of certain men and an otherwise good correspondent will suddenly violate all the ethics and start to "syndicating his stuff." Editors like doctors and other professional men have to stand together and one of the Salt Lake dailies has forwarded to us the latest attempt of a desert Agamemnon G. Jones, to catch the editors going and coming. Of course, we cannot print correspondence that has been syndicated in this way, but by changing names and giving the writer and hero the Henry Wallace Phillips' sobriquet, no confidence will be violated, and any advertising will be impartially bestowed. Elko County is booming, and the only thing that can retard it is the

loss to the state through the theft of Mr. Jones' most modern scientific instruments. This great loss is fully depicted in Mr. Jones' letter below:

\_\_\_\_\_, Nev.

July 22, 1912.

Mining Editor. S. L. Tribune. Being a Specl Corespondent, Engineering & Mining Journal of N. Y. City, I send you also an Item. On \_\_\_\_\_, Nevada. Elko County is Booming—aspecially the Linn District Bullion District In Fact The whole County, of Elko. Nearly Evry Train Brings in Bonders and Prospective Purchasers of Mining Properties. The True Fissure Mining Co. Headed By The Well Know operator Mr. Jones. Is on the ground. There is Reported a Great Gold Strike about a mile From Linn Camp. These new Finds are no Fake Prospects. as you will note By the Prominent visitors to the many Camps, Surrounding \_\_\_\_\_ in Bothe and all Directions. There is also as usual an Epidemic of Thieves that Infest these Rich Mining Camps. In Broad Day light yesterday they Celebrated the Sabath. By wholesale Burgleries Robing 2 Rooming Houses and made a Fine Clean up on the Mining Men and a Resturant Keeper Taking His Days Receipts as Part of the loot. They also appropriated, one of the Most Modern Scientific Mining Engineers outfits of Great Value and a Gift Given To Mr. Agememnon G. Jones, M. E., By Alaska Friends valued at a large sum of Appreciation. For Reports on Copper River Properties From valdese to Many Miles up the River. They also stole Many valuable Federal Corespondents and Divested His Room of all Wearing apparel. The Federal People and local officers Have all Been sent Notice. But as yet no Clew Has Been Sighted. But there is little Doubt But they will offer this Magnificent outfit of Scientific Instruments to Some Engineers. It Consisted of Range Taking. Instrument. Baromaters. Compasses angle measurement Instrument, and at least 6 other Devises of Instruments used By Metelurgical Men such as Mr. Jones. In Evry Branch and line of Reports on Mines and Ther ore Measurments. Being So Modern it is not only a loss to Mr. Jones But to the Whole State of Nevada, Jones Being one of the Mining Men who was Educated In virginia City a Graduate of Conrad Wegans Class Chief assayer In the Con virginia and a Report From Him Goes in the Greatest Mining Journals in the World—Engineering & Mining Journal, 505 Pearl Street N. Y. Now Mr. Editor C. C. Goodwin Knows Me well. ask Him, Send Me Copy of the Paper With this Report. I will also send it to The New York office of the Engineering Journal. loose no time attend'ng to it.

AGEMEMNON G. JONES, M. E.

P. S.—I am Doing Business With Standard Oil Co.

## Mining Bills

WASHINGTON CORRESPONDENCE

The Alaska placer-mining bill the main features of which were published in the JOURNAL of Jan. 27, 1912, has passed both houses of Congress and requires only the President's signature to become a law. Briefly, the features of the law are the following:

No association placer-mining claim shall exceed forty acres, and on each 20 acres or fraction, \$100 worth of labor must be performed each year including the year of location, until a patent has been issued. No person may locate any placer-mining claim in Alaska as attorney for another unless he holds power of attorney in writing acknowledged and recorded in any recorder's office in the judicial division where the location is made. Such authorized person may locate claims for not more than two individuals or one association, and no agent may locate more than two claims for any one principal or association during any calendar month. No placer-mining claim may be patented in Alaska which is longer than three times its greatest width.

The Senate has passed a bill for the establishment of a mining experiment station in the State of Wyoming. This bill is the same that was offered by Senator Warren some time ago.

## U. S. Petroleum Production

Petroleum production in the United States in 1911 surpassed its own record made in 1910 by an increase of nearly 11,000,000 bbl., according to the U. S. Geological Survey. In 1910 the output was 209,557,248 bbl. The total production of the world also surpassed all previous records, amounting to over 345,000,000 bbl., and of this the United States produced more than 63%. The value of this enormous output of oil in the United States for 1911 was \$134,044,752, the

### U. S. PETROLEUM PRODUCTION

	Bbl.
1901 .....	69,389,194
1903 .....	100,461,337
1905 .....	134,717,580
1907 .....	166,095,335
1909 .....	183,170,874
1911 .....	220,449,391

average price being 60.8c. per barrel. The increase for the year was caused principally by the gain in California, which was by far the largest producer, its output being over 81,000,000 bbl. Another factor in the increase was the discovery of oil at Vinton, La., and the comparatively new Caddo field in Louisiana also grew in importance. A find of high-grade oil at Electra, in northern Texas, was another noteworthy event of the year.

Oklahoma, with a production of more than 56,000,000 bbl., extended its field well into Osage and Pawnee Counties, and oil was discovered still farther west,

in Kay County, considerably increasing the Mid-continent yield. All these gains in the Mid-continent field, however, were offset by the declines in Illinois and states farther east; in short, all fuel oils increased and refinery oils declined. Another feature, the influence of which is being felt in 1912, was the increase in transporting and refining capacity, which in spite of the general increased yield of the country led to a drain on stocks in the Mid-continent field and the result has been a general increase in the price of crude oils for refining.

In the production for 1911 California led with 81,134,391 bbl.; Oklahoma took second place, with 56,069,637 bbl.; Illinois was third, with 31,317,038 bbl.; and Louisiana was fourth, with 10,720,420 bbl. The greatest increase in production in 1911 were in California, 8,123,831 bbl.; in Oklahoma, 4,040,919 bbl.; and in Louisiana, 3,879,025 bbl. The principal decreases were in Illinois, 1,826,324 bbl.; and in Ohio, 1,099,258 bbl.

## Important Iron Lease Decision

NEGAUNEE CORRESPONDENCE

An important mining decision has been handed down in the Michigan iron region in the suit of Andrew Young, of Stambaugh, Mich., against the Verona Mining Co., to cancel the lease which the company holds on his homestead. Young was dissatisfied with the manner in which development was being carried on. Judge Flannigan decided that the company is in the right and the case was dismissed.

Young is the owner of an 80-acre homestead at Palatka, Iron County, and gave the Verona Mining Co., a subsidiary of Pickands, Mather & Co., an option to explore and conduct mining operations in case ore was discovered. Several options were given, the last one in 1901; the lease attached was to run for 50 years and the royalty to be paid was 10c. per ton on all ore mined with a minimum royalty or ground rental of \$1000 per year.

An exploratory shaft was attempted in 1901-2 and was sunk to a depth of 200 ft., of which 80 ft. was surface and 120 ft. was "paint rock" and black slate, and about 125 ft. of drifting was also done, at a total cost of \$15,000, without finding any definite orebody. This form of exploration proved so expensive that permission was obtained from Young to drill from the underground workings of the adjacent Baltic mine of the company, which was granted, upon payment of \$50 per month, until July 1, 1903. A drill hole was driven a distance of 520 ft. from a point 150 ft. underground in the Baltic mine, and cost about \$1700, without disclosing ore.

After the execution of the lease, which the mining company finally accepted, its

activities were confined to developments in the adjacent Baltic and Fogarty mines. In 1909, the company bored two drill holes horizontally on the complainant's land from the underground workings of the Fogarty at a depth of 330 ft. One hole was barren of results, but the other cut 100 ft. of ore, although the other dimensions of the ore lense are not known. This was the first discovery of commercial ore on the property. The cores indicated that the drill had proceeded with the formation, and it was not possible at that time to point a drill hole from the Fogarty that would crosscut the formation, nor was the find considered sufficiently valuable to sink a shaft to it. The most feasible manner of exploring the find was to drive a drift from the Fogarty along the drill hole and then crosscut; permission was asked of the complainant to do this, which was refused, and shortly afterward the complainant started suit. Judge Flannigan says:

The discovery made by the drill was so far beneath the surface and so small as not to warrant sinking a shaft thereon from the surface. No sufficient reason was presented by the complainant for such refusal. Here was an effort on the part of the defendant which offered the only real chance for the discovery of a workable deposit of ore and to permit the plaintiff to complain of the lack of development of the property when he stood directly in the way of development would not be equity.

During the years that the Verona company has held the lease it has paid \$1000 per year minimum royalty. Since the time the lease was granted, there has been a great development of lands on all sides of the property, whereas at that time the Baltic was the only mine in the locality. The leases made since then have, as a rule, carried higher royalty than the figure on the Young's tract.

Judge Flannigan's conclusion says in part:

He (Young) testified that the form of lease did not suit him, nevertheless, after careful consideration of the whole subject, he accepted it, as, no doubt, being the best he felt he could do with his property, in view of its doubtful prospects and under iron-ore conditions existing at that time. It appears he made practically the same contract a number of his neighbors made. Recent mining events in the Iron River district may serve to show his and his neighbors' foresight was at fault. If his and his neighbors' contracts were being written today, no doubt they would be different, but, if they were being written today under the circumstances and conditions of their respective dates, there is no reason to apprehend they would be substantially different.

If the decision had been in favor of Young, it is certain that other similar suits would have been commenced, as there are a number of persons who are dissatisfied with the leases they now have with mining companies. The case will probably be carried to the Supreme Court.

# Correspondence and Discussion

Views, Suggestions and Experiences of Readers

## The Ton

On account of absence from the city I did not until today observe the communication in the JOURNAL of July 6 signed "American," who takes exception to the use in the Geological Survey publications of the long ton. "American" certainly has not traveled far beyond the boundary lines of Cook County or he would know that the long ton is the accepted unit in many branches of the mining industry. Iron ore and pig iron are invariably sold by the long ton. In the anthracite industry of Pennsylvania the long ton is practically the only unit. The use of the long ton in Maryland is fixed by statute, and all of the bituminous coal shipped to the Atlantic Seaboard north of and including the Chesapeake Bay is measured by the long ton. When the measurement gets beyond pounds in the copper industry the long ton or long cwt. is used.

The officials of the Geological Survey prefer the use of the short ton, but as long as there is a double unit used in the industry the Survey reports are made to conform thereto. The "Mineral Resources of the United States" is not a publication intended primarily for European consumption, and consequently no attempt has been made to adopt the use of the metric ton, which, if divided into pounds would be more fractional than the long ton. The customs officials invariably report the imports and exports in long tons where the weight is the basis of measurement. In many instances in the reports of the Geological Survey these are converted into short tons for convenience in the making of comparisons.

E. W. PARKER,  
Statistician in charge,  
Division of Mineral Resources,  
Washington, D. C., July 23, 1912.

## Underground Positions for Engineering Graduates

At the Tiro General mine of the Cia. Metalurgica Nacional, in the state of San Luis Potosi, Mex., it has recently been decided to put into practice the plan of starting recent graduates from schools of mines at work in the mines as carmen, shovelers, miners, etc., and at periods of about six months to advance them through the positions of level boss, assayer, assistant in the engineering office, night-shift boss, day-shift boss, foreman and chief engineer.

If this plan has already been tried by other companies and definite results were obtained, it would be of interest and value to many readers to learn how successfully it worked for both employer and the young engineer.

S. F. SHAW.

Charcas, San Luis Potosi, Mex., July 16, 1912.

L. E. I.

## Supplies for Mining Camps

In the accompanying table is given a list of groceries and provisions consumed at Iron Mountain, Idaho, by 20 men (average) including cooks, during four winter months in 1909 and 1910. In addition to the list, lard was tried out of the two hogs listed as fresh pork. There were not enough fresh vegetables to last through the period and owing to the winter season and snow-blocked roads, the camp was snowbound practically all of the period, no more could be obtained and their place was taken by canned goods. Double the amount of cabbage, turnips, parsnips, and one-half more onions and carrots should have been provided. In addition to the list were used sundry small amounts of spices.

### FOUR MONTHS' SUPPLIES FOR 20 MEN

Fresh beef.....	2383 lb.	Canned pears.....	1 case.
Fresh pork.....	581 lb.	Canned pumpkin	1 case.
Fresh mutton.....	167 lb.	Canned oysters..	1 case.
Fresh fish.....	100 lb.	Maple syrup.....	3 cases.
Fresh chickens...	112 lb.	Crackers.....	4 cases.
Fresh eggs.....	69 doz.	Macaroni.....	3 cases.
Case eggs.....	6 cases.	Cheese.....	77 lb.
Ham.....	472 lb.	Sugar.....	9 sacks.
Bacon.....	258 lb.	Oatmeal.....	3 sacks.
Butter.....	330 lb.	Beans.....	1½ sacks.
Flour.....	29 sacks.	Molasses.....	2 gal.
Graham flour....	50 lb.	Jelly.....	3 buckets.
Corn meal.....	2½ sacks.	Vinegar.....	6 gal.
Coffee.....	322 lb.	Baking powder...	8 (large) cans.
Potatoes.....	40 sacks.	Pickles.....	1 keg.
Carrots.....	200 lb.	Lard.....	25 lb.
Turnips.....	100 lb.	Catsup.....	1 gal.
Cabbage.....	200 lb.	Tea.....	30 lb.
Onions.....	248 lb.	Chocolate.....	5 lb.
Parsnips.....	100 lb.	Cocoanut.....	6 lb.
Apples.....	600 lb.	Soda.....	2 lb.
Salt.....	105 lb.	Yeast foam.....	10 pkg.
Dried peaches....	30 lb.	Cornstarch.....	6 pkg.
Dried apples....	65 lb.	Chowchow.....	8 qt.
Dried apricots...	50 lb.	Pepper sauce....	2 bot.
Dried prunes....	100 lb.	Currants.....	9 pkg.
Raisins.....	150 lb.	Hominy.....	20 lb.
Condensed milk..	23 cases.	Matches.....	1 case.
Canned corn....	3 cases.	G.S. soap.....	1 case.
Canned tomatoes	5 cases.	Tar soap.....	1 case.
Canned peas....	5 cases.	Ivory soap.....	1 case.
Canned peaches.	1 case.		

The isolation of the camp made the cost of these supplies high and the 30-mile wagon haul was expensive. The total payroll deductions for board were \$2318 (\$1 per man per day) and just about equaled the cost of running the boarding house, paying for all supplies and the cook's wages.

PERCY E. BARBOUR.

Candor, N. C., July 13, 1912.

## Mine Hoisting Systems Compared

In the article entitled "Mine Hoisting Systems Compared," published in the JOURNAL of May 25, 1912, B. V. Nordberg quotes from a paper that I read before the American Institute of Mining Engineers, in March, 1910, making several misstatements which show careless reading. As stated in my paper, the Winona hoists were installed "to centralize power plants and secure central-station economies," and not with the idea that the Ilgner hoist would show any great theoretical heat efficiency. I have even advanced this opinion personally to Mr. Nordberg.

Although Mr. Nordberg makes several statements to which I must take exception, I hasten to agree with him on the proposition that each hoisting problem has its own solution which may differ radically from that for another mine. Where steam is the necessary power and the hoisting can be made regular enough to get a good load factor, there is ample room for discussion as to the advisability of generating electricity or compressing air for driving a hoisting drum with the hope of making a fuel saving. The steam engine, as in the case of the Copper Queen, is quite likely to be the proper solution.

Fuel economy, as figured by Mr. Nordberg in his paper, frequently has but little bearing on the problem of saving dollars and cents by change in a hoisting system. Successive months' operation at Winona No. 4 shaft and at King Philip No. 1 shaft, by steam and by electricity, respectively, have brought out this fact clearly.

When using steam, the coal actually burned at Winona No. 4 shaft, was 54 tons per month, which is at the rate of 108 tons for two hoists, each operated by a separate steam plant. The following month, using electricity for both hoists, the kilowatt-hours used totaled 46,590. If we assume the convenient ratio of four pounds of coal per kilowatt-hour, these figures would indicate a theoretical coal consumption of about 93 tons, or not much less than the coal consumption when using steam on each of the two hoists. The quantity of coal, however, that was actually burned at the central plant was only four tons greater when the hoists were electrically driven than when they were operated by separate steam plants, or an actual saving to the mine of 104 tons for the month when using the

electric hoists. In addition, the wages of four firemen and the cost of delivering the coal were saved. The additional expense chargeable to the electric hoist was two oilers at \$1 per day each. Oil and repair expense was greater on the steam hoist than on the electric hoist.

ADDITIONAL EXPENSE	
Electric Hoists	
52 days oilers @ \$1.....	\$52.00
Steam Hoists	
104 days firemen @ \$2.20.....	\$228.80
100 tons coal @ 3.30.....	330.00
16 days teaming @ 7.00.....	112.00
	<hr/>
	\$670.80
Less Oilers.....	52.00
	<hr/>
Net Saving for month by using the electric Hoist.....	\$618.00

This statement will perhaps satisfy Mr. Nordberg, who wonders what the object was to apply electric motors to these hoists. The 25% saving of fuel, which he quotes from my paper, refers to a certain class of steam engines, as can be seen by reference to the paper. The apparent fuel saving of the electric over the steam method deduced from the rock to coal ratios given (124:1 for the Winona steam hoist and 279:1 for the electric hoist) is over 50%. The steam hoist replaced by electric hoists at Winona may be, as Mr. Nordberg intimates, "of an uneconomical type, designed for preliminary operations in opening a mine," nevertheless, they are the steam hoists recommended and sold by Mr. Nordberg and other manufacturers for the purpose for which they are now in use. Some of the drums have a capacity of 1500 ft. of rope; the next drum purchased will have a capacity of at least 3000 ft. of rope. These drums will have to hoist all the rock left above the 1600-ft. level at that time, even if they are not built for the shallower depth. This is what happened when the Nordberg 3000-ft. hoist was installed at the D shaft of the Champion mine. The larger hoist had to be purchased for the greater depth, but had to work for some years hoisting from an average depth of from 600 to 1200 ft. The little hoist which is replaced would show a much better coal-to-rock ratio.

I am unable to check Mr. Nordberg's figures for the D shaft of Atlantic mine in April, 1903. He does not give the total coal burned. This hoist actually hoisted 18,180 tons of rock from an average depth of 2492 ft. on an average dip of 52°. The coal burned was 238½ tons. The rock-to-coal ratio is 76.2:1. At 600 ft. depth this is equivalent to a ratio of 316.46:1. Multiplying by 0.788 to reduce to vertical gives a ratio of 249.4:1. At this same hoist in March, 1906, a banner month, the product was 20,638 tons from an average depth of 2830 ft. The coal burned was 342 tons; the rock-to-coal ratio was 60.34:1, equivalent to 284.62 at 600 ft. depth; referred to vertical, it is 224.26:1. The B hoist at the Atlantic mine with a skip load of 1.536

tons, in February, 1906, hoisted 9448 tons of rock from an average depth of 2234 ft. The coal burned was 198 tons; rock-to-coal ratio, 47.72:1, at 600 ft., 156.04:1; referred to vertical, 140.2:1. This hoist has a separate boiler plant, while the D plant also serves a compressor and the rockhouse engine.

The comparable rock-to-coal ratio in my paper would be  $279 \times 0.94 = 262$ . Mr. Nordberg has used, to his apparent advantage, my conservative figures of four pounds coal per kilowatt-hour. It might be well to state that three pounds is not an uncommon figure. The Houghton County Electric Light Co., at its Houghton plant, gets monthly figure of 2.5 lb. coal per kilowatt-hour on the switchboard. The output will probably average about 1000 hp., with a high lighting peak. The Winona figure of 262 becomes 350 at 3 lb. per kilowatt-hour.

Mr. Nordberg appears to be inconsistent in his use of the word "efficiency." Efficiency is output divided by input. He charges for the full input, but gives no credit on the output side for windage in the hoisting shaft, handling of men and timber, for friction of skips, etc., or for the fact that King Philip No. 1 shaft was hoisting unbalanced. Using 1.54 kilowatt-hours per net ton from 600 ft. depth, which is the only figure he gives indicating results on the Butte hoists, we get, in a similar manner, an efficiency of  $\frac{1.79}{1.54} = \frac{27.6}{23.7}$ , 27.6% for the Butte hoists and, from his manner of statement, I would assume that the cost of reheating was still to be added. Does he mean that at Butte the result is the same as if we had a hoisting engine, the friction of which was 72.4%, with the cost of the reheating still to be added? If the Anaconda Copper Mining Co. would allow some of its officials to publish actual results from the Butte air hoists, the contribution would be of great value to operators everywhere. Mr. Nordberg gives no description of the Butte hoists and no figures of actual results obtained.

R. R. SEEBER.

Winona, Mich., July 17, 1912.

### Sampling of Ore

The first section of the article under the above title in the JOURNAL of July 27, 1912, p. 159, does not seem to prove much. Reduced to lowest terms it seems to be a bald statement that carefully taken hand samples showed about 20% higher than the "actual contents" of the ore. How were the "actual contents" determined, by resampling or by recoveries? If the latter, might not the metallurgical losses in the process have been greater than suspected, or might not some of the employees been holding a private clean up?

That hand sampling can be made to give fairly reliable results was pretty well shown in C. T. Rice's article, "Grab Sampling in Stopes," (ENG. AND MIN. JOURN., Oct. 14, 1911).

It is one of the commonest of metallurgical practices to blame any differences between samples and recovery on the sampling. In the first place it saves any mental work on the part of the superintendent, and in the second it lets him out of any responsibility, leaving him free to talk of the economies of his administration.

SAMPLER.

Perth Amboy, N. J., July 29, 1912

### Crystals and Optical Activity

I think that H. C. Jones, in his article on "Solution and its Importance," (ENG. AND MIN. JOURN., Apr. 6, 1912, p. 698), has made a few mistakes in his crystallography. He states that sodium-ammonium racemate forms two kinds of crystals, of which some contained only right-handed and others only left-handed faces. As a matter of fact most of the faces present are identical in both forms. The only one showing the enantiomorphous symmetry being a comparatively small and insignificant form (hkl) thus showing very few faces on the crystals.

Again he states, "From his work as a whole, Pasteur was able to see not only that asymmetry in crystalline structure was necessary for optical activity, but —" etc. Not having a reference library here I cannot say whether Pasteur made this statement, though I do not remember seeing it when reading his works. Asymmetry in crystalline structure is not necessary for optical activity—take Mr. Jones' own instance dextro- and laevo-tartaric acids (not laevo-racemic—such a thing does not exist) when mixed in equal amounts and crystallized at the ordinary temperature, they come out as racemic acid in only one form showing no enantiomorphous faces. Pasteur himself investigated this, and finding it to be so, and therefore being unable to separate and dextro- and laevo-tartaric acids as such, transformed them into their sodium-ammonium salts, which do show the enantiomorphous symmetry referred to. Instances of bodies showing optical activity in solution and no enantiomorphous forms in their crystals might be multiplied indefinitely. There are also many bodies showing these forms which yet possess symmetry in the molecule—any crystal without a center or a plane of symmetry may do so. Two common instances are cuprite CuO and quartz SiO<sub>2</sub>—both of which have fairly symmetrical molecules. Of course there is no known exception to the law that optical activity implies the existence of enantiomorphous form in the molecule.

D. F. SANDYS WUNSCH.

Naraguta, Northern Nigeria, May 21.

# The Importance of Observation

By Rensselaer H. Toll\*

One of the most important qualifications of the successful engineer and one which the young members of the profession should strive assiduously to develop is the habit of close observation. It is the framework to which we apply the covering of technical knowledge by the nails of logical deduction. If the frame or the fasteners are weak or carelessly placed the result will be a faulty structure.

The prime requisites of a mining engineer are: (1) the ability to see things as they exist, (2) to understand what he sees; (3) to make profitable use of what he sees and understands. Other things being equal, his usefulness will be measured by his power of seeing, understanding and making practical application of the results of his observation; and of two men of about equal education and ingenuity the one who possesses the greater powers of observation will be much the more efficient.

## A FACULTY ACQUIRED BY HABIT

The faculty of close observation is acquired by habit, rather than "bred in the bone." It results unconsciously from long familiarity with a subject, but one who has acquired the habit will be a close observer under all conditions. Among laymen a great difference in this regard is to be expected, but it is surprising how great a difference exists among engineers, in whom the faculty should be developed to a high degree. How many important factors are overlooked through lack of close attention to details!

The miner who breaks the most ground is not necessarily the quickest or the one who can strike the hardest blow. Such may be greatly outclassed by the slowly-moving plodder who carefully studies his working place and takes advantage of the lines of weakness or other characteristics of the rock, pointing his holes so as to obtain the maximum results with the minimum expenditure of powder and effort.

Likewise, the best engineer is not always he who makes a mine examination in the least possible time and bases decision upon the absolute value of ore in sight; for he may be found wanting by another, who, by closer observation and judicious application of his knowledge of geology or metallurgy, makes capital of details which the other fellow overlooked.

The appraisal of a mine is not entirely a matter of sampling and assaying combined with the use of simple arithmetical formulas—especially the appraisal of prospects or partly-developed mines, with which we have principally to deal. Each fault, slip and fracture should be studied as carefully as if the value of

Attention to details and the cultivation of the faculty of close observation are essential to the success of the mining engineer for in his, far more than in other engineering professions, results often depend upon his ability to interpret nature's language, an ability acquired only by persistent study of the significance of all natural phenomena.

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the property depended upon its relation to the ore occurrence; for, in mining geology, "every little movement has a meaning all its own,"—a meaning which all too often is overlooked.

## THE SIGNIFICANCE OF SURFACE INDICATIONS

Surface indications are of great importance, and a careful study of the surrounding surface may save much time in the underground work, often affording important clues to the situation of ore-bodies and the possibilities of extension. In the present incomplete stage of our knowledge of ore formation it is not advisable to place too much reliance upon surface indications; but, nevertheless, they sometimes offer hints which are of great value.

It is quite amazing, when one stops to consider it, how much information regarding the character and position of the underlying rocks may be obtained by observing the character of the vegetation. Many trees and small plants have strong preference for certain kinds of soil and indicate by their presence or absence some of the constituents of the rocks which, by their decomposition, formed the soil sustaining the plant life.

In desert regions, where vegetation is sparse, this selective action of plants is most marked, but in almost any mining region a close observation of the flora will disclose the nature of some of the rocks beneath.

Often when the vegetation does not seem to indicate the chief constituents of the soil it may show quite plainly the possibilities for mineralization. For instance, a heavy growth of aspens or other trees or plants requiring much moisture may denote a fissured area, which would favor mineralization; while an even growth of vegetable matter requiring but little moisture may indicate a

barren area. This condition exists in many districts.

## FISSURE VEINS SOMETIMES INDICATED BY VEGETATION

Fissure veins may often be traced by the character, color, absence or profusion of vegetable growth. If the vein filling is harder than the enclosing rock it will stand out above the latter, often devoid of vegetation; but when softer, and wet, the outcrop will often be plainly marked by the luxuriance of the vegetation, and sometimes by a plant which does not flourish in the soil at either side of the vein.

In the deserts of the Southwest the changes in the formation are apparent to even to a casual observer by the difference in the character of the plant life; and the line of division of two dissimilar rocks may often be seen for miles, though the rocks may be covered by several feet of soil or debris. Such plants as the yucca, cactus, cedar, piñon, ocotilla and many varieties popularly known as sage brush will be found to select certain lines or areas for their growth, indicating whether the soil is chiefly limey, siliceous, or clayey. Many plants show even the presence of certain metals which are favorable to their growth.

The important point of this discussion, however, is the examination of the rocks themselves, which is often carelessly done. It was close observation that led to the discovery of a peculiar piece of rock on the Gertrude dump which gave Thomas F. Walsh and Camp Bird, Ltd., their millions from this famous mine; and the discovery of most mines is the result of continuous application of the powers of sight and thought.

Discoveries of many of the rich mines have been called "accidents," but they were accidents only in that some man happened upon the ground with his eyes open. Prospectors have the faculty of observation developed to a high degree and, being always on the lookout for indications of ore, failure to notice those indications is really more of an accident than is an occasional discovery, as may readily be seen from a casual examination of any district which has been prospected to any extent.

## THE RESULTS OF TAKING THINGS AS THEY APPEAR

In this regard it seems that the average prospector is more careful than many mine managers and engineers, for there are numberless instances of workings being carried forward for years alongside bodies of good ore; an especially striking instance is the recent discovery of

calamine of good grade in a number of the old mines at Leadville, large bodies of this ore having been exposed to view for several decades, unrecognized, though the mines had been visited time and again by engineers and metallurgists of international reputation. This only shows how easy it is to accept things for what they appear, without proper investigation, and how prone we are to overlook things which seem to have but little value.

When the fever of speculation was at its height in Cripple Creek an ambitious Kentuckian came west to mine and sold a good farm which his father had left him, to invest in the booming stocks. Fortune has not yet smiled upon him, though he has not given up hope of some day regaining the farm. It seems that life on the farm was made doubly unattractive by the presence of extremely heavy boulders which cropped up at every plowing and had to be carted off and piled up out of the way; and the land itself was not prolific.

A few years after the sale of the farm zinc was discovered in the vicinity in commercial quantities and the purchaser of the farm soon found that his boulders were high-grade zinc ore, and what he has realized from the metallic products from his land have compensated many times over for the lack of fertility of the soil and the difficulty of cultivating it.

#### WHAT SURFACE FEATURES MAY INDICATE

Some time ago I was called upon to examine an old mine which was being reopened, and before visiting the workings was informed by the superintendent that the country was entirely volcanic, the ore-bodies being in fissures in the "porphyry." However, a cursory examination on arrival at the mine proved that the vein was a fault-fissure following the contact of eruptives and sedimentaries. The difference in the character of the rocks was not easily distinguishable by candle light, but the identification of the foot wall as a mass of porphyry was indisputable, while any doubt as to the sedimentary character of the hanging was dispelled by the discovery of a considerable exposure on the surface, made by a recent cave-in, where the stratification of the rocks could be seen from a long distance.

Whether these physical features are any more favorable than if all the rock were porphyry is immaterial. The point is that, had the superintendent been more observing he might have recognized the different characters of the rocks and when he found a good-sized but low-grade vein on the contact he would probably have drifted on it and opened the rich ore-body which lay within a few feet, instead of driving 150 ft. in the barren porphyry, at a loss of two months' time and \$1500 of the company's money.

Another case to the point which was re-

cently observed was a drift of several hundred feet on a portion of a vein which was highly impregnated with sulphides of iron and copper, and hence spectacular, though of unprofitable grade. The really valuable portion of the vein was unattractive to the eye and its worth was unsuspected until it was suggested to the manager that he break into it and sample it at different places, when it was found to be of profitable grade.

Another instance is of a promising prospect which was recently turned down by a mining man through lack of careful examination. A vein of good width and grade crosses a tunnel at what appeared to be about a right angle, and a drift was started in the foot wall and driven along the supposed strike of the vein. The latter, however, instead of being at right angles to the tunnel, really makes an angle of 50 or 60 deg., and the drift soon crossed the vein and was well into the hanging before the error was discovered. A bend was then made toward the vein, but before the breast had reached the ore, the contractor quit work and the drift was left in that condition, with the pay streak showing only where the drift crossed.

Mud and powder smoke obscured the identity of the vein and country rock, giving everything much the same appearance, and instead of making fresh exposures to determine the character of the rocks all along, the aforesaid expert took it for granted that the ore in sight where the vein was crossed was merely a "bunch," and that the vein lacked continuity,—an opinion which was deepened to conviction by the assay results from two samples of country rock which had been taken at the breast.

#### THE CASE OF A CRIPPLE CREEK LEASE

A few years ago a group of miners in the Cripple Creek district obtained a lease on a block of ground which had little to recommend it excepting its situation. However, they were confident that the area contained ore somewhere within its limits and they commenced development on a vein which in places was so obscure that the trail was lost a number of times, and but for the trained eye of one of the party which is characterized by the miners as a "nose for ore," they would scarcely have been able to follow the streak at all.

Several times their funds became exhausted and they were obliged to work elsewhere for wages until the necessary "grubstake" was at hand, when they would resume operations. After three or four disappointing resumptions they decided to sell the lease, but could find no buyers. Finally succeeding in unloading a three-fourths interest on a wealthy speculator who did not need the small sum with which he parted or the large one which he acquired, they advanced

their drift a few feet and were rewarded by the glitter of sylvanite in an ore-body which, during the last eleven months of their lease, produced nearly a million dollars.

The last case may be classed by some as of pure luck; but, no matter what part that indefinable element may have played in the final result, its accomplishment was due to dogged perseverance and the application of a well-trained faculty of observation. To carelessness or carelessness in the use of this faculty many failures and successes may be traced; and it probably is of greater importance in the business of mining than in any other line of endeavor.

## U. S. 1911 Coal Production

The United States has become a half-billion ton coal country. During the last two years the total production has averaged just a trifle short of the 500,000,000 mark, exceeding that figure in 1910 and

COAL PRODUCTION IN UNITED STATES IN 1910 AND 1911

State or Territory	1910 Tons	1911 Tons
Alabama	16,111,462	15,021,421
Arkansas	1,905,958	2,106,789
California and Alaska	12,164	11,647
Colorado	11,973,736	10,157,383
Georgia	177,245	165,330
Idaho	4,448	1,821
Illinois	45,900,246	53,679,118
Indiana	18,389,815	14,201,355
Iowa	7,928,120	7,331,648
Kansas	4,921,451	6,254,228
Kentucky	14,623,319	13,706,839
Maryland	5,217,125	4,685,795
Michigan	1,534,967	1,476,074
Missouri	2,982,433	3,760,607
Montana	2,920,970	2,976,358
New Mexico	3,508,321	3,148,158
North Dakota	399,041	502,628
Ohio	34,209,668	30,759,986
Oklahoma	2,646,226	3,074,242
Oregon	67,533	46,661
Pennsylvania bituminous	150,521,526	144,721,303
Tennessee	7,121,380	6,433,156
Texas	1,892,176	1,974,593
Utah	2,517,809	2,513,175
Virginia	6,507,997	6,864,667
Washington	3,911,899	3,572,815
West Virginia	61,671,019	59,831,580
Wyoming	7,533,088	6,744,864
Total bituminous	417,111,142	405,724,241
Pennsylvania anthracite	84,485,236	90,464,067
Grand total	501,596,378	496,188,308

almost reaching it in 1911. The final figures compiled by Edward W. Parker, of the U. S. Geological Survey, show a total production in 1911 of 496,188,308 tons, valued at the mines at \$625,910,113. Of this production Pennsylvania anthracite amounted to 90,464,067 tons, valued at \$174,952,415, and bituminous coal and lignite to 405,724,241 tons valued at \$450,957,608.

The decrease in production in 1911 was 5,408,070 tons, or a little over 1%. The decrease is attributed by Mr. Parker wholly to the depressed condition of the iron and steel trade in 1911, which was reflected in the decreased production of coke. The three leading coke-producing States alone showed an aggregate decrease of nearly 9,000,000 tons of coal.



The decrease in the production of bituminous coal compared with 1910 was 11,386,901 tons, but this loss was largely made up by the increase in the production of anthracite, which was 5,978,831 tons greater than in 1910.

The average price for bituminous coal was one cent per ton lower in 1911 than in 1910 and that of anthracite was three cents higher. The total number of men employed in the coal mines of the United States in 1911 was 722,322, of which 172,585 worked in the anthracite mines of Pennsylvania. The average number of days worked in the anthracite mines was 246 and in the other mines 211. The average production per man was 3½ tons per day in the bituminous and lignite mines and 2.13 tons per day in the anthracite. The time lost by strikes in 1911 was insignificant.

The production of coal by States in 1910 and 1911 is shown in the accompanying table.

### Pig Iron Production

The production of pig iron in the United States in the first half of 1912 as collected and reported by the American Iron & Steel Association reached a total of 14,072,274 long tons. This is an increase of 2,405,278 tons, or 20.6%, as compared with the first half of 1911, and of 2,089,723 tons, or 17.4%, in the second half. This production has been exceeded in two previous years, in the second half of 1909, when the total was 14,773,125 tons, and in the first half of 1910, when it was 14,978,738 tons.

The production for the half-year, classified according to the kind of iron made, is given below; comparison being made with the first half of 1911:

	1911		1912	
	Tons	%	Tons	%
Foundry & forge	2,788,355	23.9	2,835,016	20.1
Bessemer	4,704,424	40.3	5,572,355	39.6
Basic	3,935,487	33.7	5,405,376	38.4
Charcoal	161,135	1.4	166,366	1.2
Spiegeleisen	43,429	0.4	36,145	0.3
Ferromanganese	34,166	0.3	57,016	0.4
Total	11,666,996	100.0	14,072,274	100.0

The bessemer production this year includes 124,162 tons of special low-phosphorus iron. Charcoal iron includes a few tons of pig iron and of ferro-alloys made in the electric furnace. The largest increase was in basic iron which gained 1,469,889 tons, or 37.3%; while there was an increase of 867,931 tons, or 18.5%, in bessemer.

### PRODUCTION BY FUELS USED

The classification by fuels used is as follows:

	1911	1912	Changes
Coke and bit...	11,356,634	13,840,251	I. 2,483,617
Anthracite	149,227	65,657	D. 83,570
Charcoal	161,135	166,366	I. 5,231
Total	11,666,998	14,072,274	I. 2,405,278

The small quantity made with electricity is included under coke. Only two

or three furnaces use raw bituminous coal, and nearly all the anthracite furnaces use some proportion of coke mixed with the coal, so that practically 97% of the iron is made with coke as fuel.

### PRODUCTION BY STATES

The production by States was as follows, in long tons, in the first half of 1912:

	Furnaces in Blast	Tons made	%
Mass. & Conn.	4	8,793	0.1
New York	17	880,581	6.3
New Jersey	1	2,773	...
Pennsylvania	108	6,035,773	42.8
Maryland	2	107,027	0.8
Virginia	6	120,127	0.9
Alabama	19	887,512	6.3
West Va.	2	129,155	0.9
Kentucky	1	24,017	0.2
Tennessee	9	145,076	1.0
Ohio	49	3,285,752	23.3
Illinois	20	1,304,227	9.3
Indiana & Mich.	20	788,252	5.6
Wis. & Minn.	4	153,420	1.1
West of Mo. River	5	199,789	1.4
Total	267	14,072,274	100.0

Producing furnaces west of the Missouri are found in Missouri, Colorado, Oregon and Washington, with one electric furnace in California. No furnaces were in blast in Oregon and Washington this year. The number of furnaces given in the table is that in blast at the close of the half-year.

### CONDITION OF FURNACES

The whole number of furnaces in blast on June 30, 1912, was 267, against 231 on Dec. 31, 1911, and 212 on June 30, 1911. The number of furnaces idle, including furnaces being rebuilt, on June 30, 1912, was 200, against 235 on Dec. 31, 1911, and 201 on June 30, 1911. During the first six months of 1912 the number of furnaces actually in blast during a part or the whole of the time was 302, against 275 in the last half of 1911 and 297 in the first half of that year.

On June 30, 1912, there were seven new furnaces under construction, of which six will use coke and one charcoal; five furnaces were being rebuilt. During the half-year eight new furnaces were completed and seven were abandoned. The yearly capacity of the new stacks was 1,039,500 tons; that of the abandoned stacks was 215,000 tons, so that there was a net gain of 824,500 tons in capacity.

### Stripping Hill Mines

#### DULUTH CORRESPONDENCE

Since the announcement several weeks ago of the letting of the contract for stripping the Adams mine of the Hill interests at Chisholm, Minn., it is reported that the contracts for stripping two other holdings of the same company will also be let. One tract is situated three miles northeast of Buhl, consisting of four forties in Sec. 15, 58-19; the other consists of one forty immediately west of the Mahoning mine at Hibbing in Sec. 2,

57-21. It is estimated that thirty million cubic yards will be removed from the former, and five hundred thousand from the latter. Neither of these properties has been given a name as yet, but it is expected that the Adams mine at Chisholm will be renamed "St. Louis" from the county in which it is situated; the fact that there is another Adams mine at Eveleth, also on the Mesabi range, necessitated a change.

It is planned that the Hill properties will be in shape to ship ore in 1915. The lands which have already been released by the Steel Corporation comprise all those on which no developments had been started, and it is understood that by releasing these now, instead of in 1915 when the balance will be given up, the corporation gained certain concessions from the Hill interests.

### Swansea Consolidated

#### SPECIAL CORRESPONDENCE

The Swansea Consolidated Gold and Copper Mining Company has been organized to succeed the old Clara Consolidated Gold and Copper Mining Co., of Swansea, Yuma Co., Ariz. The new company has been organized by strong financial houses of France and Holland, and is entirely separate and distinct from the old company which formerly operated the property. The new board of directors represents the European interests and it proposes to develop and exploit the property in a businesslike way.

Camille Clerc a well known French engineer, has been placed in charge of the work as general manager. L. C. Mott is in charge of the smeltery and H. T. Hughes directs the underground operations.

During the last two months, under the new management, the condition of the mine has been much improved, and it is now producing 200 tons daily of 3% copper ore. The ore runs high in iron and from 6% to 12% SiO<sub>2</sub>. The smeltery has just been blown in and is expected, in the near future, to handle 400 tons of mine run as well as 200 tons of outside ore. There are now about 225 employees on the property.

### Asphalt in Utah

#### SALT LAKE CORRESPONDENCE

Among the little developed resources of Utah, that are beginning to attract attention, are the rock-asphalt deposits near Sunnyside, in Carbon County. The asphalt occurs as an impregnation of certain beds of sandstone, of which there are four principal ones. The largest is 200 ft. thick, and the three others average about 100 ft. each. The total tonnage available has been estimated at many million tons. The impregnation is said

to be uniform, the deposit carrying between 10 and 12% pure bitumen. It is interesting to note that, when broken, the material is especially suitable for paving in its present condition; it is practically ready for use, without artificial mixing, after being crushed and heated. It has been tried in Salt Lake City with good results. The initial cost of installation is relatively low, and material which has been in use since 1893 is still in good condition. The cost of upkeep compared to that of other streets paved with California asphalt is relatively small. The deposit is in Whitmore Cañon five miles from Sunnyside, and is owned in part by the Pittsburgh-Salt Lake Oil Co., which holds 480 acres of ground, in which the deposits occur. The rock asphalt so far taken out, has been mined by open-cut.

## The Steel Committee Report

WASHINGTON CORRESPONDENCE

After months of unexpected delay the Stanley Steel Investigating Committee has finally made public its report concerning the work which has been in progress for a good deal more than a year past. The Stanley report besides going over the alleged facts which were ascertained in the investigation, also makes recommendations for legislation. This had not been expected, as it was supposed that the Stanley Committee was merely an investigating body and would, if it recommended anything whatever, confine its attention to the steel industry as such. Instead of that it has now branched out and made suggestions, putting them, moreover, in the form of regular bills, that would have reference not only to the steel industry but to every other. It in fact undertakes to recommend a general anti-trust program.

The Stanley report contains much old material practically accepting the work of the Bureau of Corporations in regard to many of the subjects connected with the steel industry which were studied by the Bureau. In particular it goes over the details concerning the organization of the different steel companies, with much minuteness.

The principal distinguishing characteristic of the report is the stress that is placed upon the possession by the Steel Corporation of a very large power over ore reserves as well as over coal and other mineral materials that are needed in the manufacture of steel and iron. All this had been treated by Commissioner Smith in his report on the steel industry, but Mr. Smith had assigned considerably less importance to the subject than the Stanley Committee is inclined to do. Mr. Stanley and his associates moreover, seek to make out a case against the Steel Corporation for a general hostility to the public that was not detected by the Com-

missioner of Corporations. Particular stress is placed upon the absorption of the Tennessee Coal, Iron & R.R. Co. and the stock market deals connected with that episode.

Mr. Stanley's remedies for the evils he has pointed out in connection with the steel industry include a good many of the general "anti-trust" variety, but they are all tolerably familiar. It would seem that the recommendation which the Stanley group is disposed to push most strenuously is that which bears upon so-called "interlocking directorates." These directorates are regarded as chiefly conclusive to close control of industry and their abolition is recommended. It would appear that the Stanley suggestions are not likely to receive attention at this session of Congress and in all probability will not be considered next winter either. This will throw the question over to a new Congress, which may take a different view.

## Zinc Production in 1912

The United States Geological Survey has issued a bulletin, prepared by C. E. Siebenthal, giving the production and approximate consumption of zinc in the United States for the half-year ended June 30, comparisons being made with the first half and the second half of 1911. The figures for consumption are as follows, in short tons:

	1911		1912
	1st half	2nd half	1st half
Stocks on hand.....	23,232	17,788	9,081
Production.....	140,196	146,330	166,496
Imports.....	146	463	3,053
Total supply.....	163,574	164,581	178,630
Exports.....	10,884	10,343	13,170
Stocks at close.....	17,788	9,081	6,414
Total deductions.....	28,672	19,424	19,584
Apparent consumption	134,902	145,157	159,046

Of the exports this year 7331 tons are classed as "foreign exports" and 5839 tons as "domestic exports," presumably meaning zinc smelted from foreign and domestic ores. For the second half of 1911 the division was 6452 tons foreign and 3891 tons domestic; for the first half, 7903 and 2981 tons, respectively.

The production statement for the half year is as follows, in short tons:

	1911		1912
	1st half	2nd half	1st half
Made in			
Illinois.....	41,255	41,875	44,224
Kansas.....	50,574	47,839	52,485
Oklahoma.....	19,997	26,318	36,010
All other states.....	28,370	30,298	33,777
Total.....	140,196	146,330	166,496
From domestic ores.....	135,061	136,360	159,952
From foreign ores.....	5,135	9,970	6,544
Total.....	140,196	146,330	166,496

The production for the first half of 1912 shows an increase of 26,300 tons, or 18.8%, over the first half of 1911; and of 20,166 tons, or 13.8%, over the second half.

The statement of foreign ores and of ore exports is as follows:

	1911		1912
	1st half	2nd half	1st half
Zinc ore imported.....	27,885	38,097	27,049
Zinc contents.....	15,028	17,112	12,228
Zinc ore exported.....	9,625	8,656	13,709

Of the imports of zinc ore in 1912 about 95% came from Mexico, and 5% from British Columbia and other countries. These figures do not include some lead ores from South America containing less than 13% zinc.

## Nevada Consolidated Copper Co.

The Nevada Consolidated Copper Co. produced 18,092,439 lb. of copper in the quarter ended June 30, 1912, divided as follows: April, 6,115,095 lb.; May, 6,063,462; June, 5,913,882 lb. There were milled during the quarter, 813,141 tons of Nevada Consolidated ore, averaging 1.66% Cu, of which 731,299 tons were from the pits, and 81,842 tons from the Veteran mine. In June the Steptoe plant milled 26,924 tons of Giroux Consolidated ore, the copper production from this ore not being included in the copper-production figures above. In the quarter previous, 17,578,450 lb. of copper were produced.

The metals on hand and in transit have increased by \$702,611, and now amount to \$3,936,680. Earnings were \$1,628,850, from which dividends of \$749,784 were paid, leaving net surplus for the quarter, \$879,075. From this were allowed \$141,161 for depreciation on the Steptoe plant and \$134,603 for ore extinguishment, giving a net credit to undivided profits of \$603,311. Expenditures for stripping amounted to \$302,253, of which \$131,294 was charged to operating, the balance to deferred charges, which now stand at \$2,499,016.

In August and September it is proposed to determine the possibility of ore in depth at the Eureka pit. By that time the work will have been carried further westward, and will give a larger area for drilling below the bottom of the development holes.

## Eastern States Copper in 1911

The Eastern States produced 19,605,386 lb. of copper in 1911, of which 18,850,276 lb. came from Tennessee, where the Tennessee and Ducktown companies operate; 665,110 lb. from Maryland and Pennsylvania, and 90,000 lb. from Virginia. The deepest shaft of the Tennessee company was 797 ft. in 1911, according to the U. S. Geological Survey, and the deepest of the Ducktown shafts, 900 ft. About one quarter of the Tennessee copper is shipped to Europe without refining, the remainder is refined in the United States.

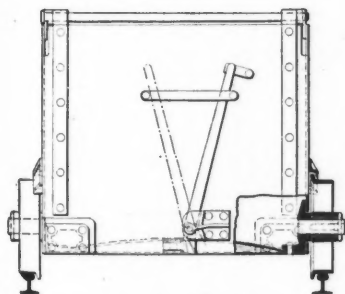
# Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

## The Red Jacket Car

The car shown in the accompanying drawings is used at the Red Jacket shaft of the Calumet & Hecla company. The most interesting feature of the car is the manner of reinforcing the bottom. Two plates are used, bolted together to form a beam, with a filling of wood to give stiffness. The top plate is  $\frac{3}{8}$  in. thick while the bottom plate is  $\frac{1}{4}$  in. thick, with wood filling two inches thick at the center. The gage of the track is 48 in. and the car has a capacity of  $2\frac{1}{2}$  tons of conglomerate ore.

This car, owing to the construction of the bottom, carries the load without strain, although the wheels are carried by hubs fastened to the sides of the car instead of by axles extending clear under the body. This is partly because of the limits put on the size of the car by the size of the cages on which they are lowered in the Red Jacket shaft, and partly because the body of the car had to be kept as low as possible, owing to its use with rope haulage. Consequently,



CAR USED AT RED JACKET SHAFT OF CALUMET & HECLA COMPANY

axles could not be used, for it was desired to make the capacity of the cars  $2\frac{1}{2}$  tons.

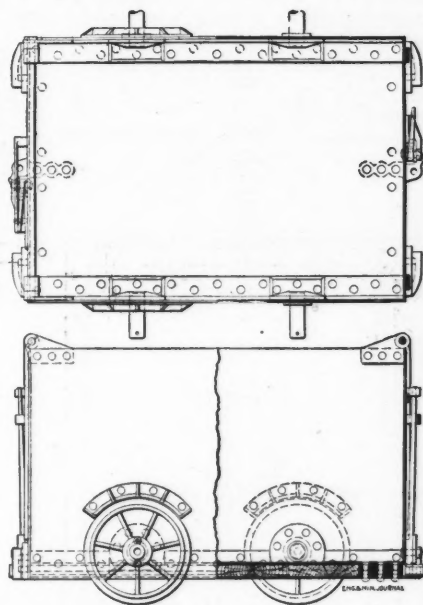
The car is fitted with doors at each end to aid in loading boulders from the floors of the drifts when cutting-out stoping is being done, although most of the ore after stoping proper begins is loaded from slide chutes. As the car is used on the rope haulage levels, buffers are provided at the corners. The car is dumped by a chain coming down from an air cylinder over the measuring pockets at the shaft. The axles are greased by screwing a grease cup on the end of the hollow axle.

These cars stand up to the work well and no trouble comes from bowing of the bottom under the strain. The same design of bottom is used in the  $7\frac{1}{2}$ -ton

cars used to serve the underground bins at Osceola No. 13 shaft, where the track on which the car runs has a gage of 5 ft. 9 in. to enable the car to be kept low and short for dumping.

## Joplin Method of Dumping Buckets

The following method of dumping buckets is practiced in the Joplin district when tramping the ore at surface to a bin near-by, as when the ore is being hand jigged, or for dumping buckets of waste as in shaft sinking. The shaft is straddled



by the tub-truck tracks which are laid at a wide enough gage so that the bucket will come up between the rails without any likelihood of its hitting. Consequently the truck has a wider deck than the underground bucket cars, which run on a 14- or 16-in. track. On the truck is nailed a 2-in. cleat against which the front side of the bucket rests when it is landed on the car, while at the back end is a 4x6-in. timber also nailed to the deck. On top of this back piece the rear end of the bucket rests in a tilted-forward position.

The track when tramping to a near-by mill generally has a considerable grade so that the trammer can ride the truck out to the dump. He gets up considerable speed to the load so that when it strikes the cribbing of the dump the momentum

causes the bucket to tilt forward. During this tilting the bucket is generally guided by the man, while at the same time he gives the bucket a slight push forward just as it strikes the dump so as to aid in unsetting in case the momentum of the load is not enough. The buckets on which these dumps are worked generally are not larger than about 22x30 in. A tall can, of course, works better than one with breadth equal to height, as in dumping such a can the center of gravity has to be raised relatively higher than in dumping by momentum.

The dump is a crib built up on the bin or the tracks to approximately the height of the top of the bucket car, which is about 15 in. This crib is securely tied in place so that the shock of the constant bumping will not move it and the crib timbers are securely spiked together so as to stand the work. This crib is made about the same width as the track, or several inches wider than the bucket, so that provision is made for side swing during the tipping of the bucket. In depth, speaking of the direction in which the bucket dumps, the crib is somewhat greater than the width of the bucket, yet considerably less than the diagonal of the longitudinal section of the bucket. Consequently, in dumping the top of the rim of the bucket strikes on the far side of the crib while the lower part of the side of the bucket is resting upon the near side of the crib. This throws the bucket into an inclined position so that the rock or ore slides out aided by its momentum. Owing to the roughness of the crib walls it is impossible for the bucket to go down through, although the section of the dump crib is greater than the bottom section of the bucket.

In some instances these dumps are rigged so as to allow side dumping of the car. The cribbing is then built alongside the track, with a bumping block fixed across the track to stop the car even with the dump crib. But in this form no aid comes from the momentum of the load and the blocks on the top part of the car truck have to be made so as to throw the bucket into practically a balanced position with the top pointing to the side on which the can is to be dumped; then with a slight push the trammer can dump the bucket.

The back block gives the pitch to the bucket necessary to put it in an unstable position, while the front cleat prevents sliding forward on the deck when the dumping impulse is given.

This dumping system is surprisingly simple and effective. Flying dumps are generally made as that is easiest on the man, and seldom, if ever, does the bucket fail to take the dump properly. In getting the bucket back on the car, all that is necessary is to tip the bucket straight back the way it came over and slide it back a few inches so that its front side is behind the forward cleat. The tilted position on the truck makes it possible to run the truck back up the track to the shaft without danger of the empty bucket slipping on the car.

### A Drop Bottom Cage

In the accompanying drawing are shown the details of the drop-bottom cages used at the mines of the St. Louis Smelting & Refining Co., in southeastern Missouri. The notable feature of the cage is that the car is locked in position on the deck by dropping the central part of the deck track. This track is carried on a framework that rests upon the bottom deck of the cage and under which are cross-beams that come down far enough so that the car and the central portion of the track are raised up level with the outer rails before the crossbars of the deck of the cage come in contact with the landing chairs. These outer fixed rails are given a slight slant toward the center of the car so that, if the car has not been put on properly, the jar of lifting the cage off the chairs will cause it to run to the center of the cage and drop down into the recess in the rails formed by the dropping of the central portion of the deck. Only its weight holds this movable portion of the deck in position so that in case of repairs the central portion can be easily lifted out to work on it.

Pans marked *P* in the drawing are riveted to the bottom of the deck so as to come up alongside the rails and keep anyone riding on the cage from getting his toe under the rails of the drop portion. In this way possibility of injury from that source during the hoisting of a deck load of men is prevented. Until these pans were put on, some trouble was experienced from a man getting his toes caught under the drop bottom when the cage was lifted off the chairs.

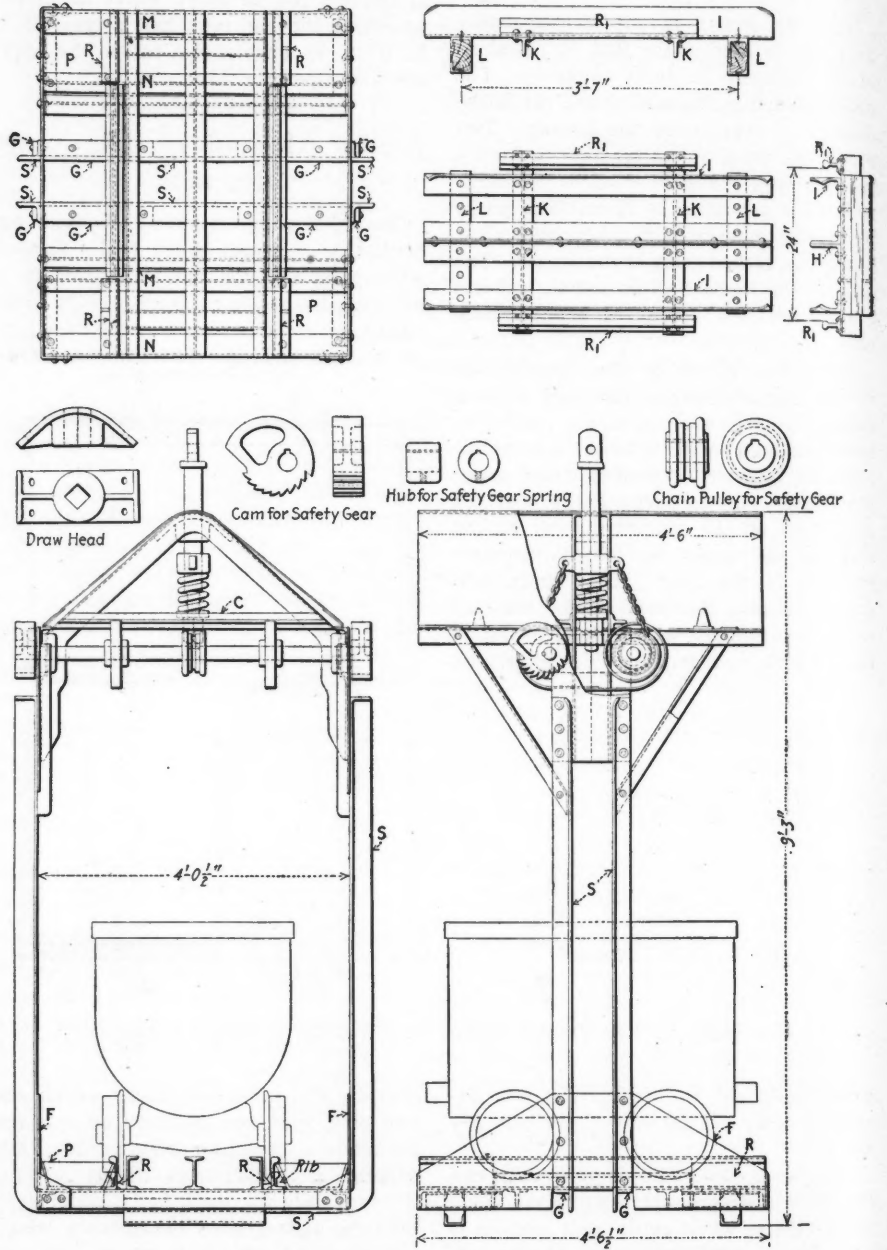
This seems to be a good way of locking the cars on the deck of the cage. It is quick and certain in its action, and forgetfulness of the men is guarded against. The lifting of a locking bail and dropping it again to lock the car in position on the cage, both at surface and at the different levels, are avoided, and so the men are able to cage quickly. The main advantage is that the possibility of a car getting loose in the shaft and causing a wreck is almost completely eliminated. A disadvantage is that the use of chairs in the shaft is entailed. In some districts, as at Butte, Mont., it is preferred not to use chairs, for the cars can

be caged more rapidly without them and there is less danger from accident.

The bail is a 1x6-in. wrought-iron plate bent up into a short curve at the point and punched to allow the drawbar to go through. Plates are put in between the bail and the side plates to reinforce them and distribute the shear of the rivets used in fastening the bail over a larger area of the side plates.

bottom where the angles are bent around to take the weight of the bottom, reinforcing plates *G* are riveted.

The deck of the cage is made up of the outer angle cross-braces *M*, the inner center braces *N*, and the shoe angles *S* that extend clear across to help form the bottom deck. The braces *M* and *N* are far enough apart so that the cross-braces *K* of the drop bottom can come down be-



DROP-BOTTOM CAGE USED IN SOUTHEASTERN MISSOURI

The cage is equipped with the ordinary type of cam safety catches operated by coil springs and chains from a collar on the drawbar of the cage. The side plate is punched to receive these dog shafts, while it also extends down the side of the cage to take the guide shoes *S*, which are angle irons riveted to the side plates. These shoe angles extend clear down under the deck of the cage so as to tie the deck securely to the sides. Also to the

tween them. These cross-braces *K* are timbers shod at top and bottom with channels. To the cross angles *M* and *N* of the main deck are bolted the rail castings *R*, which serve as rails to carry the car over to the drop bottom. These castings do not extend clear over the inner braces, but a ledge is left for the rails *R*, of the drop bottom to come down on so as to justify at the proper height with the rails *R*.

The drop-bottom frame is made up of the cross-braces *K*, the angle irons *I*, the longitudinal angles *H* bolted together, back to back, so as to stiffen the drop bottom, and the cross-braces *K* which carry the rails *R*, of the drop bottom.

In landing the cage the chair shoes come out and catch the cross-braces *L* of the drop bottom and raise the drop bottom even with the rest of the deck. By that time the shoes of the chairs have engaged with the outer angle braces *M* of the cage proper. It is by these cross-braces *M* that the weight of the cage is carried.

### Joplin Type of Horse Whim

From the nature of the ore occurrence in the Joplin district, where many of the deposits are mined at shallow depths, the mining must be done by individuals rather than by companies, and this has led to the development of many excellent types of prospecting machinery, of which the horse whim is an example. It is

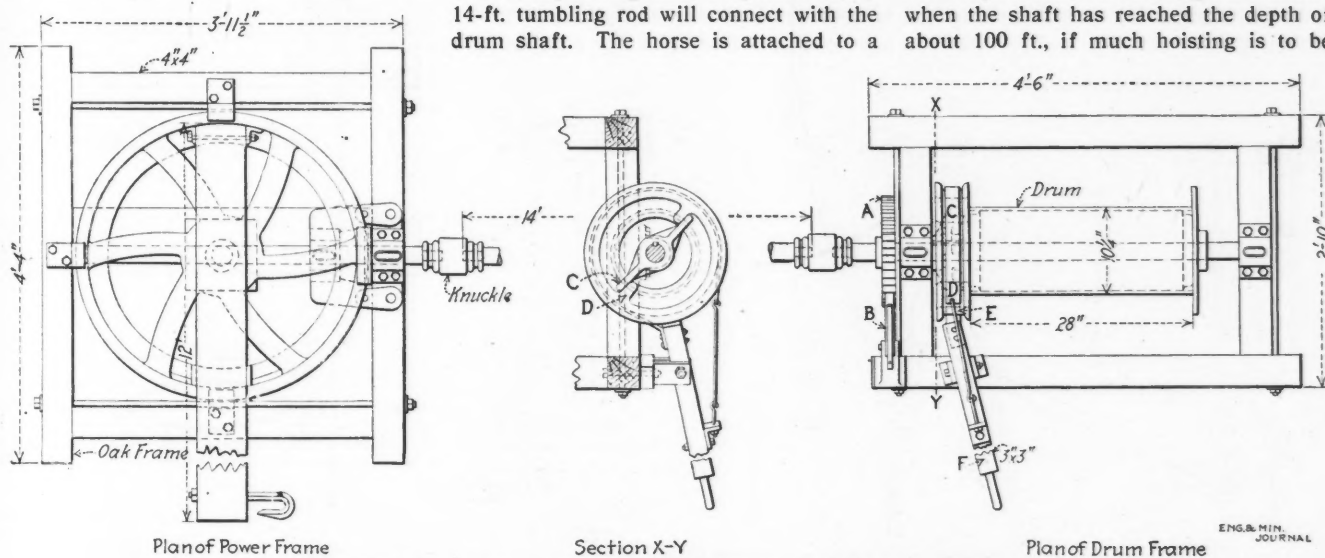
The headframe used with these hoists is of the derrick type, made chiefly of 2x6-in. planks. This headframe is made high so that where the ground is flat an upper floor may be built, which is necessary in order to get dumping room. On that account the brake lever, which is a piece of 3x3-in. timber, is made long enough for the driver to control the hoist from the upper floor while landing the bucket.

The bucket used in hoisting with these whims is made by cutting a 50-gal. oil barrel in half and binding and tying it together with suitable irons. This bucket will hold about 350 lb. of ore or rock. Small buckets are used in order that hoisting may be fairly constant; while one bucket is being filled the second is raised to the surface, dumped, and lowered so as to arrive at the bottom of the shaft just as the filling of the first bucket is completed.

The design of this Joplin horse whim is shown in the accompanying drawing. The horsepower gear is so placed that a 14-ft. tumbling rod will connect with the drum shaft. The horse is attached to a

shaft, while keyed to the driving shaft is a double-arm dog *C*, that engages with the two plugs marked *D*, which form part of the end casting of the drum. An outer groove is made in this casting for the brake strap *E*, which is lined with leather as wood is too bulky for brake lining on such a hoist. Pieces of old belt are used for this lining; it lasts well, and gives a good grip on the drum. The brake lever is fulcrumed either from the top cross brace of the drum frame or else from a 2x6-in. cross piece nailed to the headframe about 18 in. from its lower end. This is a loose fastening permitting side swing to the lever, as it is by the side throw of the brake lever that the drum is thrown into or out of clutch with the dogs on the driving shaft.

These hoists can be obtained at any time for about \$50, f.o.b. Joplin, Mo., or may be made cheaply at any local foundry. Their great advantage is that the driver is stationed at the shaft where he can watch the bucket as it comes up. The horse hoist is usually abandoned when the shaft has reached the depth of about 100 ft., if much hoisting is to be



HORSE WHIM AND HOISTING DRUM USED IN THE JOPLIN DISTRICT

probably the best type of horse whim in use today, being much better than the type of whim used in Western camps in which the drive is of the capstan instead of the geared type. In the Western type of horse whim the topman is stationed at the drive, as that is where the drum and brakes are placed. This is done with the idea of having the driver near the fractious western mustang. Missouri horse whims are built on the saner idea of placing the drum and brakes at the collar of the shaft, leaving the control of the better-trained Missouri horse to word of mouth and transmitting the power by a tumbling rod to the drum. This entails no danger from the horse or mule becoming unmanageable, as the driving shaft can be thrown easily out of gear with the drum and the bucket be held in the shaft by the brake lever, which lever is the same one that is used in throwing the drum out of gear.

sweep, 12 to 14 ft. long, and as there are 77 teeth on the driving gear and 12 on the pinion, and as the drum is a little more than 10 in. diameter, the bucket is raised about 17 ft. to one journey of the horse around the ring. A knuckle is used to connect the tumbling rod to the shaft of the power pinion as well as to the shaft of the hoisting drum.

The drum is carried on a 4x4-in. oak frame as is also the driving gear. The frame is securely fastened to the frame of the derrick in an upright position. The rope, which is generally an old 5/8-in. rope that has been used until too worn to be safe on one of the steam hoists with its larger loads, reels directly on the drum from the top sheave. To prevent the bucket from running back when the drum is in clutch, a ratchet and dog are provided. These are shown in the illustration and are marked *A* and *B*. The drum is loosely mounted on the drum

done, and a steam hoist is substituted as horse hoisting is too slow to be economical at greater depths.

Concrete stringers for supporting the skip rails in inclined shafts were first used in the Lake Superior copper country by the Ahmeek Mining Co., and later by the Mohawk Mining Co. The rigidly constructed skip running at high speed on a rigidly supported track resulted in doubling the cost of skip repairs, because the skip axles rapidly became "crystallized" and the rivets worked loose. The repair bill was reduced to normal by molding 2-in. pine strips into the stringers at 3-ft. intervals in such a way that the strips projected 1/2 in. above the stringer. The rails were then relaid upon these strips. The strips were treated with a wood preservative before using and after four years' service are still in good condition, none having been replaced.

## Exploring the Sudbury Orebodies

BY HAMILTON MAXWELL

Under the conditions of ore occurrence in the Sudbury nickel-copper district in Ontario, exploration for the ore and "proving" the tonnage and grade of the ore when found can be satisfactorily done by diamond drilling. The drilling is done usually by contract at about \$3.50 per foot.

The location of the holes and general direction of the work is usually under the charge of the company's own engineer, who lays out a general program based on a consideration of the geology and any available data from previous explorations.

The engineer should be in close touch with the work to correlate the new holes with the results obtained in holes already drilled. A "corechopper" checks the cores and prepares them for

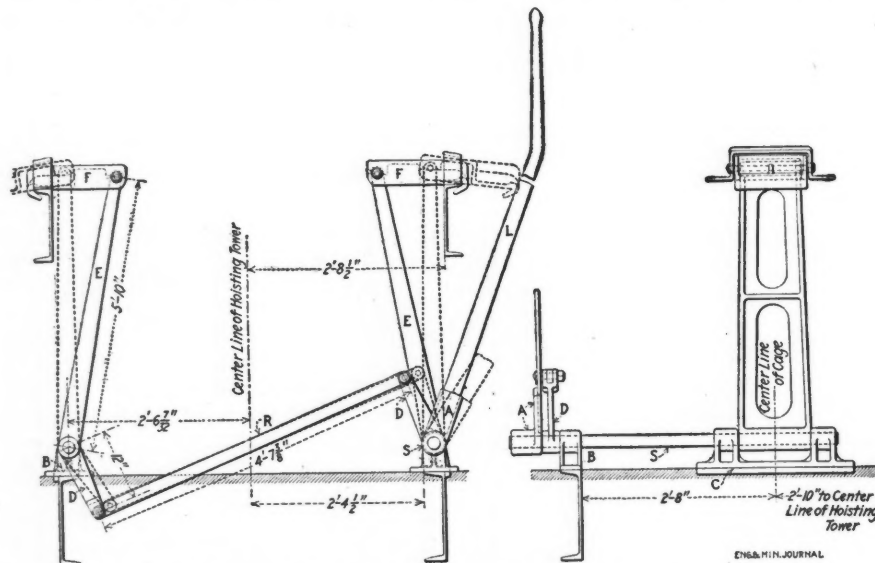
tion of the smaller figure. In any case the expense should be charged against the cost of the ore as the drilling is an aid to the economical extraction of the ore.

In exceptional cases, exploration by shaft is desirable but this is more expensive than drilling and slower. A drill hole advances from 10 to 25 ft. daily in this district and several drills are often used.

## Chairs for Drop Bottom Cages

The details of construction of the chairs for the drop-bottom cages that are used at the shafts of the St. Louis Smelting & Refining Company in the lead district of southeastern Missouri, are shown in the accompanying drawing.

The chairs are made to come out and catch the cage under the center of each

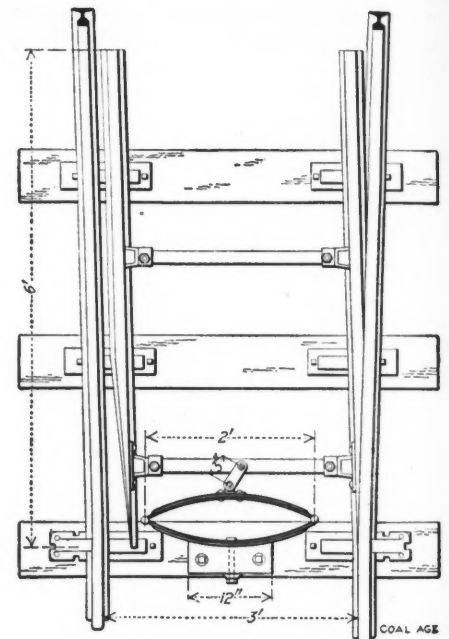


DETAILS OF CHAIRS FOR DROP-BOTTOM CAGES

## Locking Switch for Inclined Plane

Every mine superintendent who has operated or is operating a mine where the ore is lowered by gravity, will probably be glad to hear of any scheme that will automatically lock the switch points on an incline with three rails above and two below the parting.

It often happens that the parting point cannot be seen by the man at the drum, and he must trust almost entirely to good luck to properly land his trip. To know that he has a device that will positively lock the switch points relieves the drum man of unnecessary worry, and makes his position more secure. It has been my lot, states A. W. Evans, in *Coal Age*, for the last 18 years to be in charge



SWITCH-LOCKING DEVICE

sampling. Usually it is advisable to have surface, topographic and magnetic surveys made prior to the drilling.

The first drill holes are necessarily tentative. These "scout" holes ordinarily need not be very deep. Other holes are placed to "prove" the orebody. Holes are drilled usually at right angles to the plane of the contact but vertical and "fan" holes are sometimes advisable.

The core is sampled in 3-ft. sections or according to the changes noted. It is broken up and the whole material assayed. The barren core is of value only in interpreting the geology and is usually not saved after inspection by the responsible engineer.

Obviously the costs of proving ore by drilling vary greatly. They may range from 5c. to 20c. per ton on an extensive drilling campaign. If a large orebody is encountered without much preliminary drilling they may be only a frac-

side so as to lift the drop part of the cage deck on which the car is resting, level with the outer rails of the deck before the weight of the whole cage comes on this chair.

The bearings B and C are carried from a member of the headframe to which they are securely bolted. In these bearings are carried the chair shafts S to which are keyed three arms: the lever arm A to which the lever is bolted; the link arms D and the chair arms E. A rod R connects the link arms of the two chair shafts together. The chair arm is a heavy steel casting about four feet long. To the upper end of the chair arms are bolted the chair shoes F that are moved out over channels riveted to the headframe at the proper height for landing the cages. On the inside end of the chair shoe is a hook that engages with the channel on which it slides and limits the inward throw of the chairs.

of mining operations where gravity planes were used, and in the history of each plane, where the arrangement of three rails above the parting and two below was used, a number of wrecks occurred at the switch points.

In the accompanying illustration, a device for locking a switch on an inclined plane, is shown. It is simple in construction and positive in its action. The device consists essentially of an elliptical spring—usually an old buggy spring—bolted to a block of wood and then made secure to a track tie, as shown, with its upper side fastened to the switch bar. Its action is to hold the switch point close to the rail, no matter which way the switch may be set. Each down-coming car automatically sets the switch for its own track and the spring practically locks the points in position, insuring a safe delivery of this car over the proper track to the head of the incline.

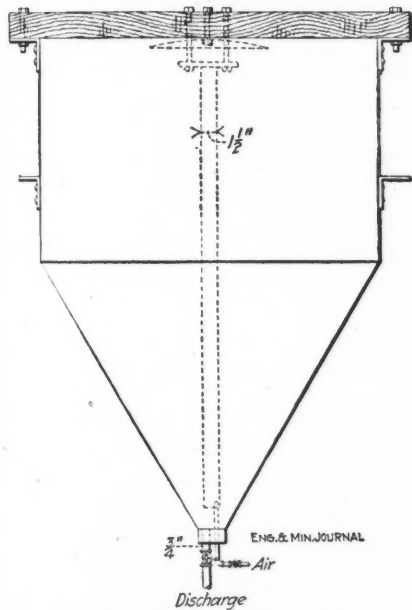
# Details of Metallurgical Practice

Records of Experience in Ore Dressing, Cyaniding and Smelting

## Laboratory Pulp Agitator

By EVANS W. BUSKETT\*

The accompanying engraving shows a cheap and convenient agitator for cyanide experiments. There being no heavy sheet iron in camp the agitator was made from the heaviest galvanized iron obtainable. It was riveted and soldered on the outside, no solder being put on the inside. The machinist made an iron plug with provision for an air inlet and tailings discharge. The plug was soldered into the bottom of the cone, which may sound queer to some, as it did to the tinner who made the agitator, but clean iron can be



soldered with common solder almost as easily as tin. The tailing discharge was fitted with a 3/4-in. pipe and stopcock. Brackets were riveted to the sides to support the tank and at the top for anchoring the wooden bar which supports the umbrella.

The material being galvanized, it was, of course, necessary to remove the zinc to prevent the precipitation of the gold and silver. This was done by swabbing the interior with commercial hydrochloric acid and washing thoroughly with water. When dry, it was painted with asphalt paint, which was poured on.

The umbrella was supported by a bolt in the center, while the pipe was supported by two bolts passing loosely through the umbrella. The central pipe

\*Metallurgical engineer, Joplin, Mo.

was 1 1/2 in., with an ordinary 1 1/2-in. flange coupling at the upper end. By these supporting bolts the umbrella or the pipe could be raised or lowered independently or the whole arrangement could be lifted out by raising the wooden bar supporting it.

The agitator was 18 in. in diameter and 30 in. high overall, and was used in

## Canvas Tables of the Combination Mill

Canvas tables were more in vogue in this country before the perfection of the cyanide process and before the early types of bumping tables came into favor. Still at several gold mills in the United States, canvas tables are now used. More

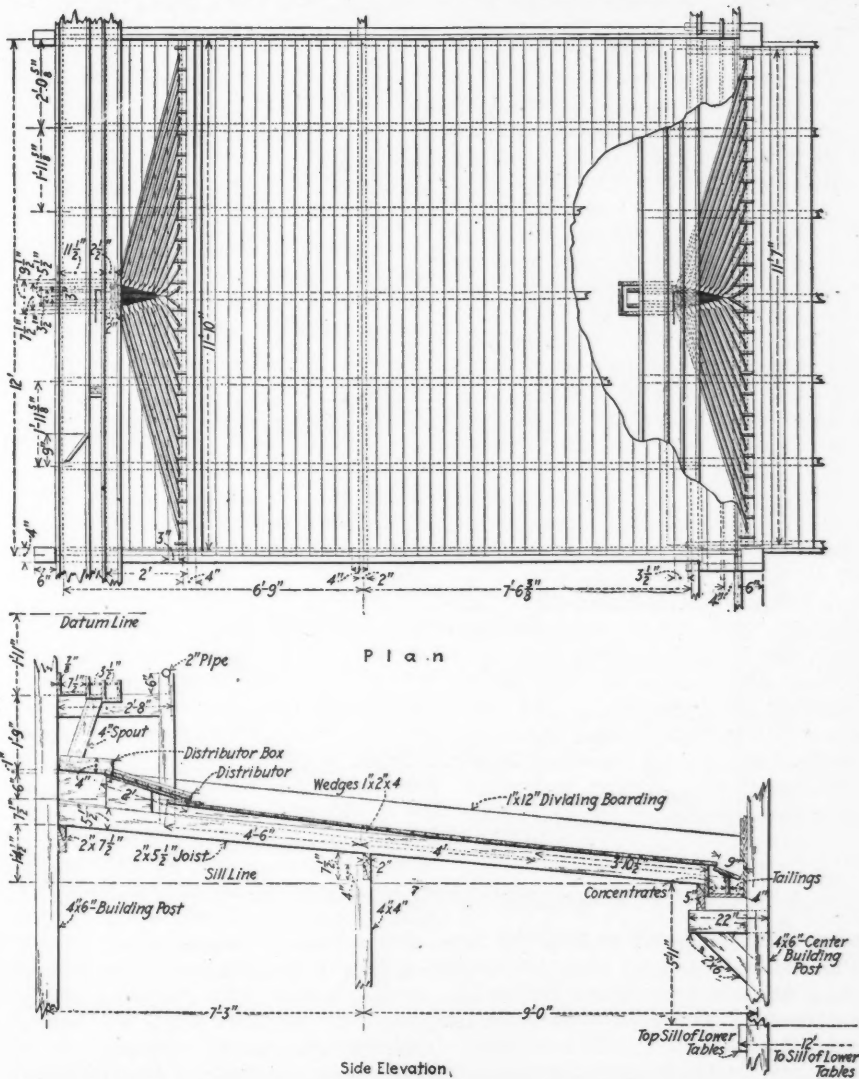


FIG. 1. DETAILS OF CANVAS TABLES USED IN OLD COMBINATION MILL, AT GOLDFIELD, NEV.

the cyanidation of silver tailings, a 25-lb. sample being used in each test, although the tank has a capacity of 50 pounds.

A Taylor automatic stoker is to be tried in connection with one of the reverberatory furnaces of the Michigan Smelting Co., at Houghton.

extensive use of canvas tables was made in the earliest days of stamp milling in Australia. There it was the custom at the mills to stamp custom ore in small lots, carefully cleaning up amalgamation and canvas tables upon completing the stamping of a lot of ore supplied by one man, before starting a lot supplied by another. It was then customary for

the owner of the ore being stamped to attend to and clean up the canvas tables. Bullock's skins were often used instead of canvas—the particles of gold becoming entangled in the hair.

A canvas table is an extremely simple device to construct. It is simply necessary to build a substantial support for the canvas covering. The slope or grade of the table and the amount of water required must be determined by experiments upon the crushed ore that is to be treated. Sticky ores, those containing much clay, and ores containing heavy minerals, must be treated on a table, the grade of which is steep, compared with the grade of a table treating granular ores or those containing few heavy minerals.

The greatest ingenuity required in the building of a canvas table is in the man-

tables were arranged in the Combination mill, as is shown in one of the sketches. The tailings from the lower end of the first table were sent to the feed trough of a second set of tables placed below and extending out from the tail end of the first series. Later the tailings from the first set of tables were sent to Gates vanners, and tailings from the vanners were then caused to flow over the second set of canvas tables. Still later the second set of canvas tables was abandoned.

After a canvas table has been in use for some time, especially where, as in the case of the Combination mill, lime was fed to the dry ore in the bins before crushing, the canvas covering soon becomes coated and the interstices of the threads filled with a deposit of lime salts. At the Combination mill it was the cus-

concentrate in a tube mill or grinding pan, or in a Berdan pan, mercury being added and this fine or dirty gold being amalgamated. In other plants, the concentrate is cyanided, in others reconcentrated and shipped; depending on local conditions and the nature of the concentrate itself.

The amount of water that must be used to transport the finely crushed ore over the canvas surface, depends largely on the nature of the ore and grade at which the table is set. The amount of water used in cleaning is entirely dependent on the skill of the operators; some men will use three or four times the quantity of water that will be amply sufficient for another. At the Combination mill, 54% of the total ore milled, or an average of 1400 tons of slime per month, was treated in the canvas plant. The percentage of the total recovery made by concentration on vanners and canvas tables ranged from 17 to 28%; by the canvas tables alone, 7 to 13%. The average weight of concentrate recovered per month after passing over Gates vanners was 21.4 tons. The sizing test of the feed is shown in Table I. The costs of operation were as fol-

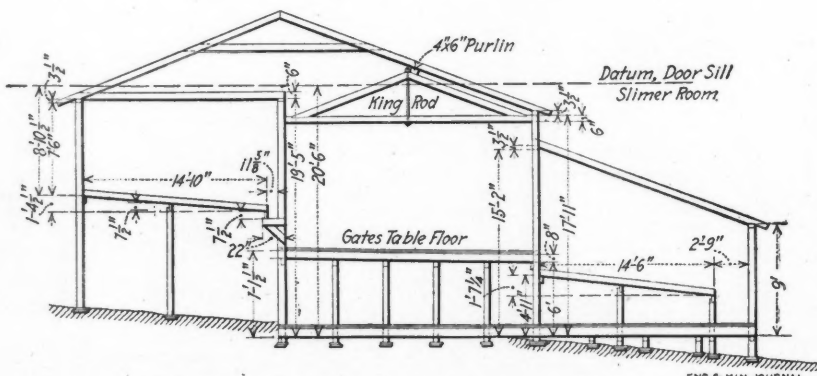
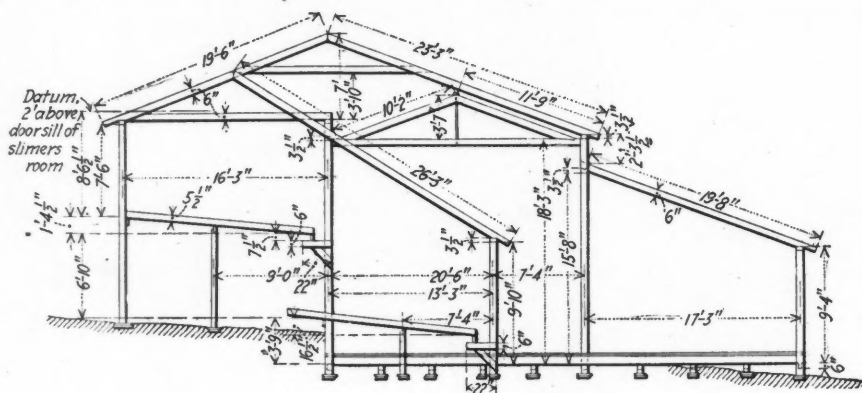
TABLE I. SIZING ANALYSIS OF CANVAS TABLE FEED

Mesh	Heads Percentage Held	Tails Percentage Held	Extraction
+100	1.5	1.3	0.300
+150	12.2	9.8	0.600
+200	0.07	0.7	0.792
-200	13.3	9.6	
-200(slimes)	72.5	78.4	11.310
	100.2	99.8	13.002

lows: Labor, 18.5c.; repairs, 3.0c.; power for vanners, pumps and lights, 3.0c.; acid, 0.5c.; sundry supplies, 5.0c.; total, 30.0c., per ton of pulp treated, not including superintendence and general expense.

## An Adjustable Drafting Board

In the article published under the above caption in the JOURNAL of June 8, 1912, there are several typographic errors that make the description of the drafting board somewhat obscure. They are as follows: The first sentence of the third paragraph should read: "The legs *H*, were also made of  $\frac{3}{4}$ -in. pipe, 2 ft. 8 in. long"—not "2 to 8 in. long." The last sentence in the first column should read: "The rest of these hinges are merely two short pieces of light strap iron." The last word in the paragraph at the top of the second or middle column should be "rod," not "iron." The second sentence of the last paragraph should be—"Setscrews are put in the coupling *L* and *L*"—not "Such screws, etc." and the "of," the third word from the last in the article should be omitted. In the illustration one side of the endless cord should be shown as passing in front of *A A'* the supports.



No. 2. CROSS SECTION OF CANVAS-TABLE PLANT

ner of distributing the pulp at the head end, and in arranging some device by which the concentrate caught by the canvas cover, can be readily removed at frequent intervals.

In the accompanying illustration is shown the canvas table, designed by A. G. Kirby, and used at the old Combination mill, at Goldfield, Nev. The notable features of this table are the distributing trough at the head end and the manner of deflecting the concentrate into a collecting launder at the end of the table when the supply of feed is shut off and the concentrate is to be gathered. The manner of collecting the concentrate and distributing the feed, is clearly shown in the accompanying drawings. The canvas

tom to remove this lime deposit from time to time by treating the canvas with dilute acid. In some mills where the gold is in an exceedingly fine state, this deposition of lime salts on the surface of the canvases might not prove a disadvantage, for it often is the case that the fine flakes of gold will adhere strongly to a very smooth surface; an example being the cement tables now used in some of the Mexican gold mills. This fine gold is often efficaciously recovered by the canvas table after the pulp has passed over amalgamation tables of the usual type.

Where the amount of material caught is small, and consists largely of fine, clean, or even dirty gold, it is the practice in some mills to treat the canvas-table



# The Cost of Doing Things

Data from Mining and Metallurgical Practice

## Crosscutting in Caved Ground

In running a 600-ft. crosscut through soft porphyry and partly through a caved area in a Nevada mine, the last 179 ft. of the crosscut cost \$13.13 per ft. Included in this cost were 7341 B. ft. of sawed and 14 ft. of round timber; 265 1/2 eight-hour shifts of labor was required to break the ground, tram the rock and put this amount of timber in place. The timber consumption was equal to about 41 b. ft. per ft. of crosscut and labor for mining, mucking, tramping and timbering was equivalent to 1.48 eight-hour shifts per ft. A total of 419 holes was drilled; 880 lb. of dynamite and 2414 ft. of fuse were consumed, equivalent to a little less than 5 lb. of dynamite per foot of crosscut and about 5.76 ft. of fuse per hole drilled. The candle consumption amounted to 1063 candles or a little over four per man per shift. The accompanying table gives the totals that make up the \$13.13 per foot.

### CROSSCUTTING COSTS IN A NEVADA MINE

Miners, muckers, trammers and timbermen	\$1052.94
Dynamite	120.87
Caps	3.26
Fuse	10.86
Candles	24.80
Timber	285.86
Superintendence, shift bosses and surveying	170.62
Hoisting	215.82
Air and tools	139.72
General expenses	296.13
Assaying	38.70
Total for 179 ft.	\$2359.58

The cost of driving 171 ft. of crosscut before reaching the caved area was only \$8.90 per ft., indicating that it costs about 47.4% more to drive through caved ground than it does through virgin territory. Labor was figured at \$4 per shift for miners, \$3.75 for muckers, \$4.50 for timbermen and \$4 for timbermen helpers.

## Concentration Costs, Bluebell Mine

The following costs were incurred at the Bluebell mine, Riondel, B. C., in concentrating an ore consisting of 35% quartz, 35% pyrrhotite, 20% marmatite, and 10% galena. The object was to recover the galena, of which 85% probably was found in sizes of from two to 10 mm., usually associated with the pyrrhotite. The greatest difficulty was found in the presence of a large amount of lead-bearing pyrrhotite middling, which requires recrushing, reports S. S. Fowler,

in the *Bulletin of the Canadian Mining Institute*, February, 1912.

There were three shifts, each consisting of boss, jigman and tableman, while on the day shift were three more men, used in dumping, weighing and crushing. Water power is supplied by five 24-in. impulse wheels. No amortization charges are included in the power costs.

### BLUEBELL CONCENTRATION COSTS

	Per Ton
Bosses, jigmen and tablemen	\$0.186
Weighre, crusher, miscell.	0.057
Heat, light, and power	0.022
Repairs, labor	0.085
Supplies for breaking and rolling	0.031
Supplies, conveying, pumps, launders	0.042
Supplies, sizing, jigging, tabling	0.026
Miscellaneous supplies	0.036
Loading concentrates	0.013
Total	\$0.498

In the time covered by these costs, there were 43,069 tons milled in 5494 hours of running; 994 hours were lost on repairs, and 88 by holidays.

## Costs in the Iron River District, Michigan

The Iron River district is situated in Iron County, Michigan, in the vicinity of the towns of Ironwood and Stambaugh on the Chicago & Northwestern R.R. Dr. C. K. Leith describes the district as follows: "The ores are in closely folded, upper Huronian slates. The iron-formation lenses are uniformly steep dipping. In a large way they have a distinct linear trend, but almost every property shows major and minor buckles and considerable narrowing or widening of the formation. The walls of the orebody may be all slate, all jasper or any combination of the two. The larger orebodies occur in places where formation has been thickened by folding. The axes of these folds are favorable places for the concentration of ore. They have steep pitches and should have great persistence in depth. The underground developments are yet shallow, the deepest mine being 690 ft. deep and the average about 450 ft. Drilling, however, has shown the ore down to a depth of 1712 feet."

The important mines of the district are expected, in the future, to produce about 2,000,000 tons of iron ore per year. The Caspian mine is the largest in the district, having a probable ore reserve of 10,000,000 tons, which is one of the largest orebodies in the Lake Superior region. Its bottom level is about 290 ft. deep with a cross section of 377,000

sq.ft. and drill holes have shown ore on the north at more than 1300 ft. in depth. It is operated by the Verona Mining Co., which also operates the Baltic, Fogarty, and the Houlihan, a new property. The Osana is probably the next in importance to the Houlihan and is owned by the Mineral Mining Co., together with the Wauseca and the Nanaimo. Other mines in the district are: The Chatham of the Brule Mining Co., the Hiawatha and Chicagon of the Munro Iron Co., Tully and Baker belonging to the Corrigan, McKinney & Co., and other small properties and explorations, operated by the Oliver Iron Mining Co., Davidson Ore Co., Niagara Iron Mining Co., and the Huron Iron Co.

A summary of a 5-year period, 1906-1910, shows that the average cost of the ore produced during that period was 103.75%, with the average value of the ore based at 100%. This is partly accounted for by the large amount of exploration and development work during the period mentioned. The items that make up the total cost as stated show the following ratio to the value of the ore: Mining, 39%; exploration and development, 19%; construction, shafts, machinery, etc., 7.5%; general expenses, including administration, 2.6%; royalties, 6.3%; taxes, 0.55%; rail freights, 11.5%; lake freights, 15.3%, and commissions, 2%. While this means that the expenditures have averaged 3.75% more than the value of the ore, if construction, exploration and development are figured at the average for all other districts in the state the profit should eventually be about 19% of the average value of the ore.

## Meyer & Charlton Costs

As stated in the 1911 annual report of the Meyer & Charlton Gold Mining Co., Transvaal, South Africa, 123,043 tons of ore were mined from which 6289 tons or 5.11% of waste were discarded by hand sorting, 1190 tons being sorted out underground and the remainder after hoisting the ore to the surface. The mill crushed 117,154 tons in 247.7 days with an average of 75 stamps which is equal to a stamp duty of 6.30 tons per day. The cyanide department treated 113,727 tons of sand and slime consisting of 83,541 tons of sand and 30,186 tons of slime which was equal to 71.3 and 25.7% respectively of the mill pulp. The plant for treating accumulated slime treated

36,369 tons averaging 2.649 dwt. gold per ton and made a theoretical extraction of 82.95%. The total cost of production was \$4.61 per ton made up of \$2.01 for mining, 15c. for sorting, crushing and transportation; 56c. for milling; 84c. for cyaniding; 46c. for general mine expenses; 30c. for mine development and 29c. for head office expenses. The average value of the yield per ton was \$8.55 which indicates a profit of \$3.94 per ton of ore including recovery from accumulated slimes.

### Tons per Man

Several articles published under this heading have given the tons of ore secured per man per year as figured from data obtained from annual reports. So far figures thus given have shown a wide range according to the class of men employed, indicating that where intelligent white men are employed the tonnage rate per man is higher. It is interesting to note what H. C. Hoover says in his book "Principles of Mining."

After stating that the actual outlay for labor represents from 60 to 70% of the total underground expenses and a general discussion on the relation of efficiency to general results, he says: "Much observation and experience in working Asiatics and negroes as well as Americans and Australians in mines, leads the writer to the conclusion that, averaging the actual results, one white man equals from two to three of the colored races, even in the simplest forms of mine work, such as shoveling and tramming." In reasoning this out Mr. Hoover attributes this fact, among other things, to the necessity of a greater amount of direction, waste of supplies, more accidents, more ground to keep open for increased numbers, and increased expense in handling men in and out of mine.

These opinions have only been arrived at after a careful study of the whole situation as indicated by the data given in his book which is substantially quoted herewith.

Four groups of gold mines were taken from India, West Australia, South Africa and Western America, all of which were working in depth and using every labor-saving device available. The conditions at all the mines were practically the same, stoping width from four to five feet, except that at those working white men conditions were less favorable owing to heavy supports required in stoping.

At four Kolar (India) mines where the average wages were about 20c. per day for native labor, 963,950 tons were secured with 13,611 colored men, and 302 white men engaged wholly in super-

intendence, 69.3 tons were secured per man per annum at a cost of \$3.85 per ton. Six Australian mines paying about \$3 per day for white labor and employing 1534 men produced 1,027,718 tons or 669.9 tons per year per man at an average cost of \$2.47 per ton.

At three South African mines in Witwatersrand, where two-fifths of the colored men employed were negroes and three-fifths Chinamen; 2,962,640 tons were mined with 13,560 colored men and 1595 white men at the rate of 195.5 tons per man per annum and at a cost of \$2.68 per ton. The negroes receive about 60c. per day and the Chinamen 40c. including board. The white men were almost wholly engaged in superintendence of some form.

At the five American mines selected to compare with these properties 1,089,500 tons were mined with 1524 white men at the rate of 713 tons per annum, and at a cost of \$1.92 per ton. The average wage was approximately \$3.50 per day. Attention is called to these facts to refute the statement so often heard about the advantage of cheap labor. Mr. Hoover is of the opinion that "no engineer or investor in valuing mines is justified in anticipating lower costs in regions where cheap labor exists."

### Alaska Mining and Milling Notes

During 1911, at the Alaska-Mexican mill, one pound of chrome steel in the shoes crushed 2.61 tons of ore and one pound of iron in the dies, made at the Treadwell foundry crushed 5.71 tons of ore at a total cost of 2.61c. per ton of ore crushed for iron and steel consumed. Stamp duty was 5.27 tons per day.

The cyanide plant, operated jointly by the Alaska-Treadwell, Alaska-Mexican, and Alaska United companies treated 17,751 tons of concentrates from May 15 to Dec. 31, 1911, at an estimated extraction of 96.5% on an average grade of \$60.43 per ton.

The cost of concentrate treatment was \$2.8115 per ton of which \$1.1349 was for labor, 10.76c. for electric power, 30.90c. for pebbles, 47.25c. for cyanide, 6.69c. for lime, 21.47c. for zinc dust, and 50.59c. for sundry supplies. Some of the unit costs per ton were: 20.36 lb. of pebbles in grinding, 2.28 lb. of cyanide and 7.37 lb. of lime in cyaniding, 2.79 lb. of zinc dust in precipitation, and 27.98 kilowatt-hours of electric power, per ton of concentrates treated.

At the mine a record from 1909 to 1911, inclusive, as given in the annual reports shows that in mining 667,017 tons of ore and performing 13,925 ft. of development work, the average consumption of dynamite was about 1.1 lb. per ton of ore produced; candle consumption equals 0.258 lb. and drill steel approximately 0.258 lb. per ton of ore. The dynamite as used is reported at about 18% of No. 1 and 82% of No. 2 grade. The development work during this period was equal to one foot for every 48 tons of ore produced.

At the 240-stamp Alaska-Treadwell mill one pound of iron and steel in the dies crushed 4.22 tons of ore and chrome steel in the shoes, 2.87 tons of ore. The dies were part chrome steel dies and part dies cast in the Treadwell foundry. An average of 4.71 tons was crushed per stamp in 24 hr. The 300-stamp mill crushed an average of 5.50 tons per stamp in 24 hr. and consumed one pound of iron and steel in the dies in crushing 4.16 tons of ore against 2.59 tons per lb. of chrome steel in the shoes. All dies used in the 300-stamp mill were made in the Treadwell foundry.

A summary of two years' operations at the mine indicates that, including development work at the ratio of one foot for every 75.5 tons of ore, the dynamite consumption was about 1.73 lb. per ton of ore, candles approximately 0.74 lb. and drill steel 0.107 lb. per ton of ore.

At the Ready Bullion mill of the Alaska United Company, one pound of chrome steel in the shoes crushed 2.58 tons of ore and one pound of iron in the dies, which were cast in the Treadwell foundry, crushed 4.28 tons of ore at a total cost of 2.86c. per ton of iron and steel consumed. The average crushing rate per stamp was 5.13 tons per day. At the 700-ft. Claim mill one pound of chrome steel in the shoes crushed 2.62 tons of ore against one pound iron in the Treadwell-foundry dies to 5.83 tons of ore. The total cost of iron and steel consumed was 2.58c. per ton of ore crushed.

A three-year record on the Ready Bullion shows that the consumption of dynamite is approximately one pound per ton of ore; candles, 0.113 lb. and drill steel, 0.095 lb. per ton of ore. This includes about one foot of development work for every 59.8 tons of ore produced. The dynamite used consisted of 30% of No. 1 and 70% of No. 2 grade. On the 700-ft. claim the ratio of development during the same period was approximately one foot for every 50.7 tons of ore and the consumption of dynamite 1.15 lb. per ton of ore; candles 0.12 lb.; and drill steel, 0.148 lb. per ton of ore. About 23% of the dynamite used was No. 1 and the remainder No. 2 grade.

Based upon one-half year's operations at the Broken Hill Proprietary Block 10 Co., New South Wales, 224 annual tons are secured per man employed in the mine and mill, and 442 tons per man employed underground.

# Buffalo Mine and Mill, Cobalt

By W. J. Dobbins\*  
and H. G. S. Anderson †

The silver occurs in Huronian conglomerate and slate. Drifts are run to the end of a vein before stoping. After preliminary crushing, the milling process includes trommeling, jigging, regrinding in rolls and chilean mill, hydraulic classification, separate concentration of sand and slime and cyanidation of the slime tailing. Vacuum filtration precedes and follows agitation in Pachuca tanks.

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†Mill superintendent, Buffalo Mines, Ltd., Cobalt, Ont.

The Buffalo mine being one of the earliest to begin operations in the Cobalt camp and the first to start concentration of its low-grade ore was, on account of the peculiar form of the ore deposits and the nature of the ore itself, obliged to work out a system of mining and treatment under new conditions. It was early seen by the management that in the low-grade ore lay one of the chief assets of the property, so that operations were planned with the view of mining the milling rock at a reasonable cost rather than forcing the production of high-grade ore first and then going back after the milling rock at advanced cost.

The property comprises 40 acres lying in Coleman Township, and is one of the mines along what is known as the "Western Ridge" of the Cobalt producing area. Much prospecting has been done and some is still going on west of this property, but so far no producing mines have been developed in that direction.

## SILVER OCCURS IN HURONIAN FORMATION

The rock formation is about equally divided between Keewatin and Huronian; the contact crosses the property in a northeast-southwest direction at about the center. So far no silver has been found in the Keewatin, which covers the western half of the property, and this fact places all the workings on the eastern half, which is made up of Huronian conglomerate and slate.

Outside of the veins themselves, which are more regular in the conglomerate, the silver content is much higher in the slate, which is much broken up and well shot with native silver along the cracks and faces. The Keewatin dips to the east at an angle of about 15°, reaching a depth along the eastern boundary of 300 ft. While this is the general dip, a vein developed near the southern boundary has shown the existence of a trough in the Keewatin which allows the extension of the conglomerate, and hence the ore, much farther west than was expected from early development.

The veins which have a general strike of southeast are all narrow and high grade, ranging in width from one to six inches with an exceptional place being as wide as 12 in. With the exception of minor faults they hold close to vertical. As stated above the veins in the conglomerate are more regular, while in the slate they are badly broken up, sometimes decreasing to a mere slip, but as the silver is well scattered through the slate it makes good milling rock.

It has been the experience here that as the veins pass the contact and enter the

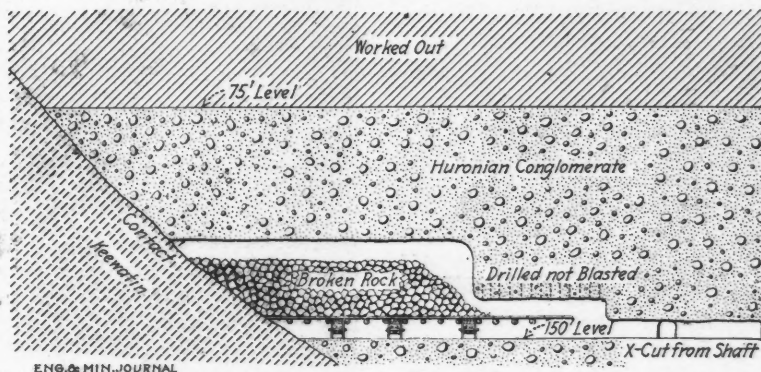
Keewatin they, in most cases, pinch out, or where in one or two cases they hold their width and mineralization, the silver disappears and the vein is made up of

ore of steady average grade by permitting hoisting from the various stopes at the same time.

The ore extends from 3 to 6 ft. on each side of the vein and as this determines the width of the stopes it makes the timbering problem easy. In opening a vein the drifts are driven 6 ft. wide and 7 ft. high. Before any stoping is done the drift is carried the full length of the vein which means either to the contact or the property line. After this is completed two rounds are taken out of the back and the third one drilled, the muck meanwhile remaining in the drift to set up on. This makes the back from 13 to 15 ft. high with an additional 5 ft. above drilled but not blasted as shown in Fig. 1. The muck is now cleaned out and the stope is ready for timbering.

## SIMPLE TIMBERING USED

Stulls are placed across the stope at an angle of about 15° from the horizontal and 6 ft. apart. These are covered



METHOD OF MINING AT BUFFALO MINE, COBALT, ONT.

barren smaltite. Very recently silver has been found in the Keewatin at other mines along the Western Ridge, but here drifts driven 50 ft. beyond the contact have shown no silver.

What is considered as proof of a constant deposition of silver from the mine water at present has been noted at this mine. Where the mine water seeps through the cracks in the rock a thin scale forms on the face of the rock. This scale has the appearance of argenticite and assays high. This may be interesting in determining the genesis of the ore and will be more specifically proven as time goes on.

## AIM TO HAVE RESERVE OF MILLING ORE

In determining the system of mining the main object was to have at all times a good reserve of broken mill rock. This not only insures a constant supply to the mill but allows the producing of an

with 4-in. lagging. On the lower side of the timbers at intervals of 20 ft. chutes are placed. These consist of 6-in. posts with plank sides and bottom and with removable plank in the front and are not cribbed up in the stope. The only timbering used in the stopes is cribbed manways one at each end which are carried up with the working and are used for raising and lowering steel and high-grade ore sorted in the stope, also as exits for the men.

When the timber has been placed the round already drilled is shot and stoping proceeds in the same way until the level above is reached, each round raising it about 4 ft. About one-third of the rock broken is drawn off during the stoping. This allows keeping the broken rock within 6 ft. of the back and makes it easy for setting up as compared with staging for from 10 to 40 ft. In stoping, the rock on one side of the vein is shot

out; one or two light holes are then put in to break down the vein rock which is sorted and bagged. Only a rough sorting is made in the mines as the ore goes over a picking belt before entering the mill.

#### PISTON DRILLS EXCLUSIVELY

At this mine piston machines are used exclusively. The rock in most cases is exceedingly hard and although many hammer drills are used in the camp it has been found here that, everything considered, the piston drill has the advantage. Hydraulic-compressed air is used. When this air was first introduced some trouble was experienced, as candles would not burn in close stopes where it was used. By driving a raise in these close places the trouble was overcome and now candles are used except in one or two especially long drifts where carbide lamps are necessary. While the lack of oxygen in this air caused trouble with the candles no ill effects are noticed by the miners nor have any of them suffered any effects since its introduction over two years ago.

#### PRIVATE INSPECTOR EMPLOYED

Safety in preference to speed has always been the policy of the management. An inspector who comes on duty at the change of each shift is employed. He has an office convenient to the main exit shaft for the men. To him are reported missed holes, needed repairs, and anything of interest to the opposite shift. Each man coming off or going on shift must pass through this office whether he has anything to report or not. This not only protects the miners against accident but saves the time of sending up for materials for repairs after the men are down which the outgoing shift failed to get.

Many an accident might be prevented if the miner's partner on the opposite shift had not failed to see him. By having the men pass through the office regardless of whether they have anything to report minimizes the chance of forgetting anything that should be reported and insures that the one coming on will be seen. A dry and change house with shower bath, wash room, individual lockers, etc., is provided for both mill and underground men.

#### CONGLOMERATE HARD TO CRUSH

The concentrating plant consists of the coarse-crushing plant, concentrator proper, and the cyanide plant. The coarse-crushing plant has a capacity of 30 tons per hour and sufficient rock is crushed in six hours actual running time to carry the mill through 24 hours. The mill has a capacity of 175 tons per 24 hours and the cyanide plant has a

capacity of 100 tons, but has never been worked to full capacity as it is merely an auxiliary to the mill and treats whatever slime is produced by the mill in the process of crushing.

The mill rock is chiefly the typical Huronian conglomerate of the Cobalt district. It is extremely hard and causes excessive wear to all parts of the mill machinery used in the course of reduction. From the nature of the rock it has not developed lines of fracture, and the varying degree of hardness and the rounded shape of the cemented pebbles cause extraordinary jars to the crushing rolls.

This is most manifest on the medium rolls which crush a well sized product averaging an inch in size and which does

nides, antimonides, and sulphides are easily slimed it has been found that stage crushing, preventing excessive abrasion, gives the best results.

The massive condition in which the native silver occurs in the conglomerate prevents the ore as a whole being economically reduced by abrasive action to the necessary degree of fineness for profitable cyanidation, hence concentration with cyanidation of the slime made in crushing is the practice adhered to at this plant.

Direct amalgamation was tried experimentally but proved a failure due to the fact that the arsenides, antimonides and sulphides fouled, hardened and granulated the amalgam.



BUFFALO MINE, COBALT, SHOWING VEIN CUT OFF BY KEEWATIN FORMATION

not contain any fine material to form a cushion. Rapid wear of babbitted bearings, of roll shells which often break off in pieces around the edges, and an occasional broken frame bear testimony to heavy duty imposed. The slate is, of course, not as hard and the mill will put through from 15 to 20 tons more per 24 hours with a marked degree less wear on the rolls. The increased tonnage is easily taken care of by the concentrating machinery with the same efficiency as the lesser tonnage.

From tests it has been determined that 97% of the silver occurs as native silver, the remaining 3% being made up of arsenides, antimonides, and sulphides, such as dyscrasite, argentite, and ruby silver. From the fact that these arse-

The Buffalo mill differs materially from the rest of the mills in the Cobalt camp in the use of rolls in the grinding of the ore. The fact that the amount of slime resultant from the use of rolls is much less than in the case of stamps doing the same work was the determining factor in adopting this kind of a flow sheet.

The amount of slime made in the Buffalo mill averages 18% which includes the mine slime and the slime made in a 6-ft. Evans-Waddell Chilean mill. The mine slime is practically negligible amounting to less than 1% of the total ore milled. The rolls make about 12% slime while the Chilean mill will make a variable amount depending upon the degree of hardness of the ore and the

amount of middling taken from the concentrating tables.

The accompanying screen analyses, an average of a number taken at different times, will give a fair idea of the amount made in the Chilean mill.

#### SCREEN ANALYSES AT BUFFALO MILL.

Chilean Mill Feed Mesh	%	Chilean Mill Product Mesh	%
+8	27.4	+16	19.8
+12	30.1	+20	10.6
+16	16.2	+30	21.0
+20	3.2	+40	5.6
+30	6.4	+60	10.1
+60	6.0	+80	10.1
+80	4.0	+100	8.2
+100	2.0	+150	8.0
+150	2.1	+200	2.3
-150	2.1	-200	4.2
	99.5		99.9

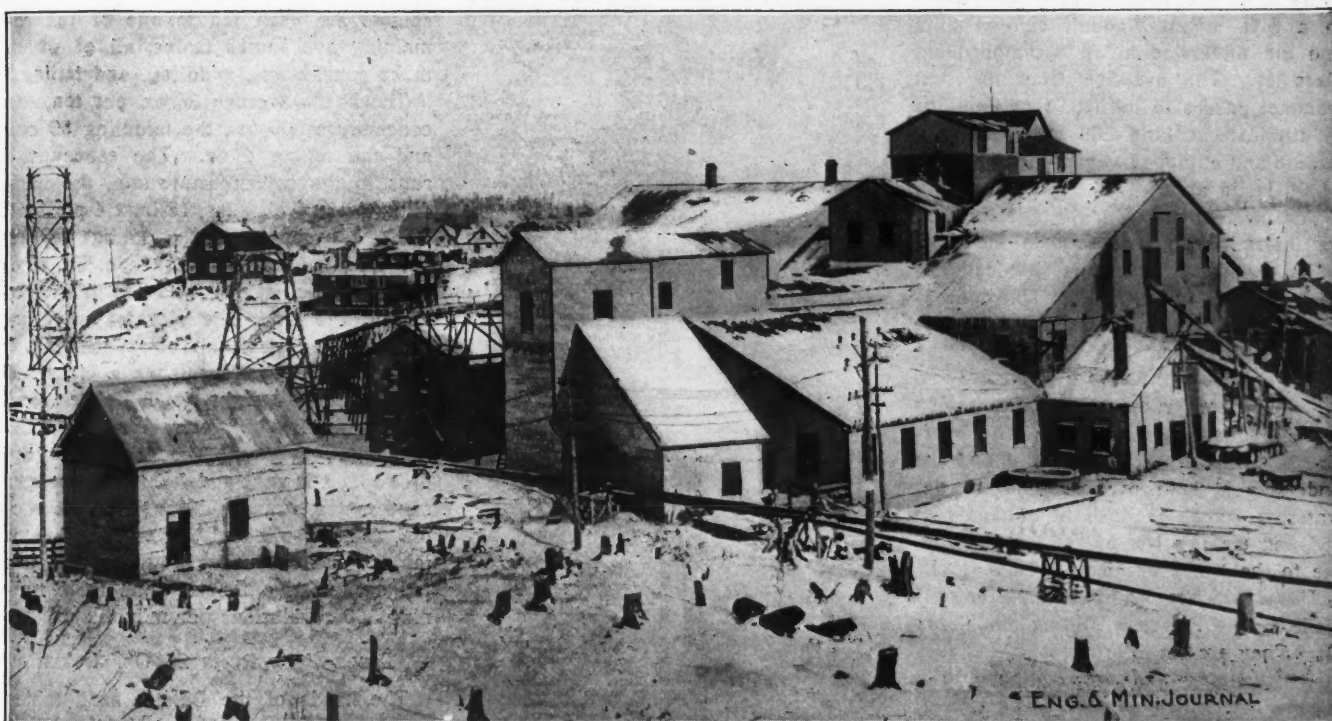
From these results it will be seen that the distribution of slime made throughout the process of grinding and concentration

a Fairbanks-Morse track scales. It is then dumped into a bin of 300 tons capacity. The ore is discharged from the bin by a feeder of the "wall" type worked by a worm and hand wheel. The feeder is of sufficient size to pass boulders of from 350 to 400 lb. The crusher, a No. 5 McCully, rests on a concrete foundation which extends down to bed-rock, a distance of 20 ft. The product of the McCully crusher will pass a 2½-in. ring. The crusher is driven by an Allis-Chalmers 50-hp. alternating current motor running 850 revolutions per minute.

The ore passes from the McCully crusher to a Robins conveying belt 30 in. wide, 38-ft. centers, traveling 40 ft. per minute, with 15° slope; it is also used as

carried forward enough to give it a 1:1 slope to the 14-in. conveying belt beneath the secondary crusher.

The secondary crusher is a 20x6 Blake, operating at 250 r.p.m. and set to crush to 1¼ in. This crusher is also set on a concrete foundation 12 ft. high. The picking belt, trommel and Blake crusher are driven by an Allis-Chalmers 40-hp. alternating current motor, the speed of which is 850 r.p.m. A 14-in. Robins conveying belt runs through an opening in the concrete foundation directly beneath the discharge of the Blake crusher and conveys the crushed rock to the mill storage bin, which has a capacity of 110 tons. The angle of slope of the belt is 19½°, and the speed is 200 ft. per minute. The 14-in. belt is driven by a



BUFFALO CONCENTRATOR AND CYANIDE PLANT, COBALT, ONT.

and which will pass 200 mesh is about 12% due to the rolls and 6% due to the Chilean mill.

The Buffalo mill was the pioneer of the Cobalt camp operating on low-grade ores and as the ore was entirely different from anything before treated, much experimenting was necessary in order to determine the most suitable flow sheet. As it stands today the flow sheet is an evolution from a point where little was known to a satisfactory method of treating the ore. Various changes have been devised by the management and tried out, the results of which have been in some cases disappointing and in other cases most gratifying.

#### MCCULLY AND BLAKE BREAKERS USED

The ore is hoisted from the mine in cars of 1350 lb. capacity and weighed on

a picking belt. The picked high-grade ore is dropped into a number of chutes to locked boxes below, from which it is collected weekly and ground in a Krupp ball mill.

From the picking belt the ore passes into a 40-in. x 8-ft. strutbar pattern revolving screen, with 1¼-in. round holes, running at 16 r.p.m. As the crushing plant was designed after the mill was erected, existing conditions had to be complied with in the construction and it was found that the undersize chute from the trommel would have insufficient fall to carry the rock into the 14-in. conveying belt that carries the rock to the mill storage bin. In order to meet these conditions the first 4 ft. of screen were incased in a hood, which is the same as is furnished for a dust jacket minus the perforations. In this manner the ore is

General Electric 3-hp. alternating current motor, making 1200 revolutions per minute.

The rock in the mill bin is fed through a wall-type feeder driven from a shaft making 90 r.p.m. into the No. 1 coarse rolls set to crush to ¾ in. This set of rolls is an Allis-Chalmers 36-16-in., style B, running 90 r.p.m., equipped with chrome-steel shells, which last on an average of four months. The ore is crushed dry and flushed to No. 1 bucket-belt elevator.

This elevator has a 19-in., 8-ply, double cross-stitched "Maltese Cross" transmission belt, 55 ft. centers, running 435 ft. per min.; the size of buckets used is 18x7x5½ in. and they are spaced 18 in. apart. This kind of belt has been found to be superior and more economical than the regular rubber-faced elevator belt and lasts about 10 months.

The boot pulley runs in guides that are free to move up and down and keep the belt always at the proper tension.

TROMMELS PRECEDE JIGS

The ore passes through three sets of trommels, the first of which is 5 ft. long by 26 in. in diameter, running 26 r.p.m. and having 3/8-in. square perforations; the second is a 6-mesh, slotted steel-wire screen, 10 ft. long by 30 in. in diameter, running 20 r.p.m.; the third is a 12-mesh, steel-wire screen, 10 ft. long by 30-in. diameter, running 20 revolutions per minute.

The undersize of No. 1 trommel passes to the 6-mesh screen, the oversize of which passes to the fine jigs and the undersize to the 12-mesh trommel. The oversize of the 12-mesh trommel passes to a 6-ft. Evans-Waddell chilean mill, and the undersize to an 8-compartment classifier. The oversize from the first trommel passes to the No. 1 or bull jigs in duplicate making 200 pulsations per minute and equipped with 3-mm. screens, 24x36 in. in area.

The concentrate from the bed is taken off intermittently and sent to the drier while the hutch product is sent continuously to the chilean mill. The concentrate from the jigs assays from 2000 to 3000 oz. per ton. The tail from these jigs is sent to a trommel 5 ft. long by 26 in. in diameter, running 18 r.p.m. having 1 1/4-in. square perforations. The oversize is returned to the mill bin and the undersize is sent over a 5x2 1/2-ft. dewatering screen inclined at an angle of 15° and making 160 pulsations per minute to the No. 2 or medium rolls.

These rolls are 36x16-in. Superior rolls made by the Power & Mining Machinery Co. They are set to crush to 3/8-in., running 90 r.p.m. and are equipped with chrome-steel roll shells. The product of these rolls goes to No. 2 elevator, 40 ft. between centers and running 400 ft. per min.; the belt is 10 in. wide by 6 ply, and the buckets are 10x6x5 in., spaced 16 in. apart. This elevator is equipped with a similar takeup for the boot pulley as the No. 1 elevator.

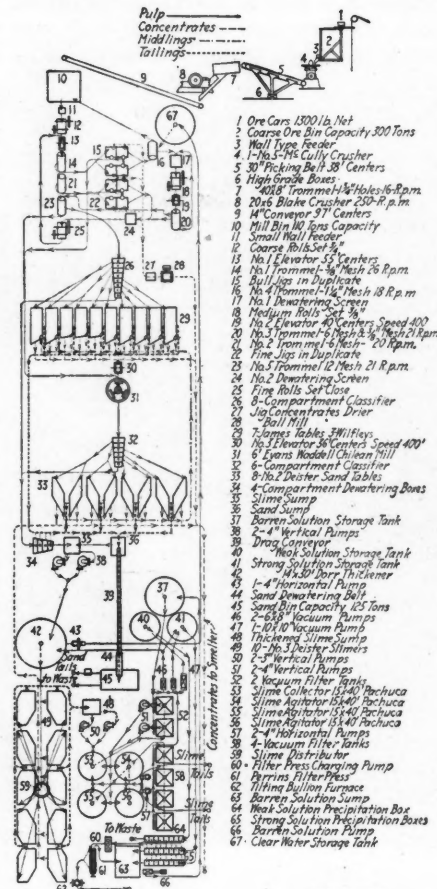
The elevated product goes into a 3-screen trommel. The first screen is 6-mesh, slotted steel wire, the undersize from which goes to the 12-mesh trommel; the second and third screens are 3/8-in. square mesh, the oversize of which is returned to the No. 1 dewatering screen, the undersize going to No. 2 dewatering screen, which in turn discharges to the fine rolls.

TROMMELS DISPLACE IMPACT SCREENS

The screens used on the trommels are made by the W. S. Tyler Co., of Cleveland, Ohio. The slotted ones are of the "ton-cap" variety. The coarse-mesh screens last on an average of six weeks,

the 6-mesh last seven weeks, and the 12-mesh last five weeks. The 12-mesh screen has only recently been installed in place of three Colorado impact screens. The impact screens averaged 55% undersize in their oversize product, making an increased load on the chilean mill and causing unnecessary sliming. The trommel carries about 5% undersize in its oversize product and its maintenance cost is only one-third as great.

The fine jigs are similar to the bull jigs but have a 2-mm. screen on them, the hutch product going to the chilean mill and the bed being taken off intermittently and sent to the concentrate dryer.



FLWSHEET OF BUFFALO MILL, COBALT, ONT.

These jigs make 210 pulsations per minute.

The tail from the fine jigs is dewatered by means of a 4x2 1/2-ft. dewatering screen inclined at an angle of 20° and making 175 pulsations per minute. The tailing passes from the dewatering screen to the No. 3 or fine rolls. These rolls are Allis-Chalmers, style B, 36x10-in., set close and making 90 r.p.m. The product passes to No. 1 elevator and through the first three screens as undersize.

The 6-ft. Evans-Waddell mill is fitted with 12-mesh diagonally slotted screens. The mill runs 38 r.p.m. with two scrapers set to throw the sand to the screens, and a third scraper set to throw the sand

inward and level the bed on the die ring. These die rings last about six months and the tires on the mullers last about eight months. The product from the chilean mill goes to No. 2 classifier similar to the No. 1 classifier but with only 6 spigots.

HYDRAULIC CLASSIFIERS BEFORE TABLES

No. 1 classifier furnishes a classified product for 10 tables, three No. 5 Wilfleys and seven No. 3 James tables. Hydraulic water is used on the first four compartments, the remaining compartments being free settling. The feed from the first spigot is split and fed to two James tables, running 250 r.p.m.; the feed from the second spigot is split and fed to two Wilfley tables, running 250 r.p.m.; the feed from the third spigot to the third Wilfley; the remaining five spigots are each fed to one of the remaining five James tables, all of which make concentrate, middling, and tailing.

The heads average 25 oz. per ton, the concentrate 900 oz., the middling 50 oz., and the tailing 4 oz. The concentrate runs to the concentrate sump, the middling to No. 3 elevator, (8-in. x 4-ply belt, 36-ft. between centers, running 400 ft. per minute, buckets 4x5x8 in. in size, spaced 18 in. apart) and the tailing to the sand sump. The elevated middling goes to the chilean mill for regrinding.

No. 2 classifier furnishes a classified product for the eight No. 2 Deister sand tables. Hydraulic water is used on the first three spigots. The feed from the first spigot is split and fed to two Deister sand tables, running 290 r.p.m.; the second is also split and fed to two Deister tables; the remaining four spigots are fed each to one Deister sand table running 300 revolutions per minute.

TABLE FEED RUNS 25 OZ. SILVER

The heads of the Deister sand tables average 25 oz. per ton as do the heads of the James and Wilfleys. The concentrate averages slightly higher than in the former case, the tailing averaging 3.5 oz. per ton. The concentrate runs to the concentrate sump, where it is dried, barreled, and shipped to the smeltery. The middling runs to the middling elevator and the tailing to the sand sump.

The slime overflow from No. 1 and No. 2 classifiers goes to a 4-spigot dewatering box, where the sand is separated from the slime. The dewatered slime overflows into the slime sump. The overflow from the sand sump also overflows to the slime sump. The sand is drawn out of the sand sump and dewatered by means of a drag conveyor, which consists of 10-in. iron disks cast in halves 1/2 in. thick and bolted in the center of the flights to a 5/8-in. non-twisting cable. These flights are spaced 18 in. apart and the total number on the cable is 110. The angle of inclination of

the drag conveyor is 35°, and the speed 43 ft. per minute.

The sand falls off the flights at the head end of the drag, the flights being washed clean by a spray of water, and drops down a chute 4 ft. long to a 22-in. rubber-faced conveying belt. The speed of the belt is 40 ft. per minute, and the distance from center to center is 25 ft. The belt is inclined upwards 1 in. per foot. The excess water drains off the side and is returned by gravity to the sand sump. The sand drops off at the head pulley and the belt is cleaned by means of a small spray of water. The residual moisture of the sand as it enters the bin is about 22 per cent.

#### SAND TAILING TO WASTE

The sand bin holds 125 tons and the sand is drawn off from below and carried to waste by a 2-bucket oscillating

mers, 25-hp. vertical motor, the speed of which is 850 r.p.m. Lime at the rate of 6 lb. per ton of slime treated is here added to aid the settling of the slime and to provide a protective alkalinity for the cyanide plant. The lime is added in the form of milk of lime from a reservoir holding a sufficient quantity to last 12 hours.

#### DEISTER SLIME TABLES USED

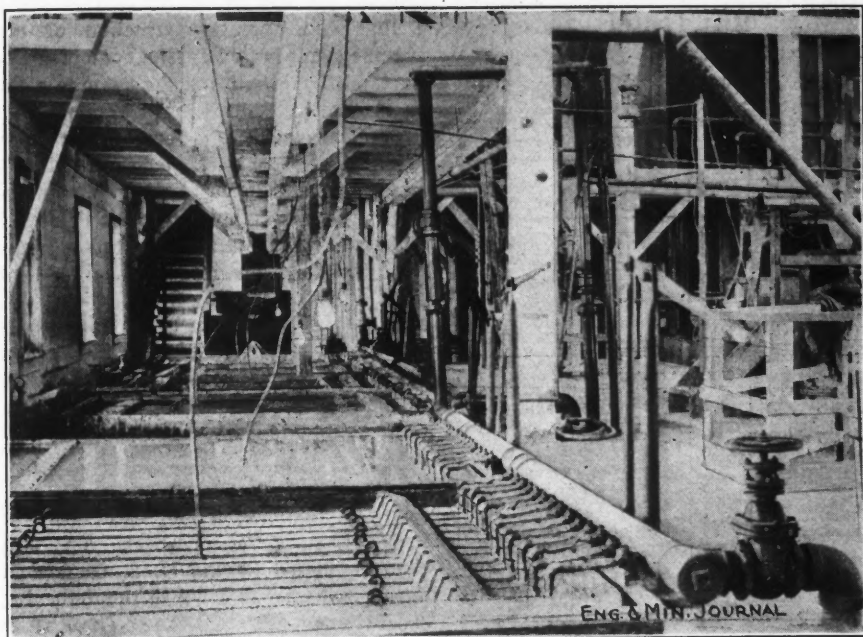
The thickener arms in the Dorr apparatus make one revolution in 3 min. 40 sec. The clear overflow water is returned to the mill by means of a Morris 4-in. horizontal centrifugal slime pump running 1150 r.p.m. and pumping against a 30-ft. head. The thickened slime is drawn off by gravity and run to a circular distributor which feeds 10 No. 3 Deister slimers running 320 r.p.m. These slimers make a concentrate averaging 400 oz. per ton

#### CAPACITY OF MOTORS EXCEEDS NEEDS

In the distribution of motive power in the mill a number of motors are of a horsepower much higher than is actually required. This is due to installations of different kinds of machinery and alterations that have been instituted from time to time.

One 60-hp. motor, running at 850 r.p.m., drives the No. 1 or coarse rolls, the No. 3 or fine rolls, and a wall-type feeder. One 60-hp. motor drives the Chilean mill, one trommel, and one dewatering screen. One 50-hp. motor drives the No. 2 or medium rolls and two James tables. One 40-hp. motor drives 16 sand tables, one 8-in. elevator, a drag conveyor, sand-dewatering belt, a Dorr thickener and a lime feeder. One 40-hp. motor drives a 19-in. elevator, a 10-in. elevator, four trommels, one dewatering screen and two jigs. One 15-hp. motor, running at 1120 r.p.m., drives ten No. 3 Deister slimers. One 30-hp. motor drives a Krupp ball mill. Alternating current transformed from 11,000 volts to 550 volts is used. The remaining motors are used to drive the different machines individually and have been described before. In all, the amount of power actually consumed in the mill and cyanide plant is 220 horsepower.

The mill water is supplied from Lake Sasaganaga by means of a Morris 5-in. two-stage turbine pump direct connected to an Allis-Chalmers 40-hp. motor running at 850 r.p.m. A 20,000-gal. tank situated on a hill at the rear of the mill is used as a storage tank, the water from which is used in the cyanide plant. A valve on the main line is kept partially open all of the time and the leakage from the valve is sufficient to keep the tank full. The mill uses the water directly from the main line.



BUTTERS FILTER PLANT AT BUFALO MILL

tramway furnished by the A. Leschen Rope Co., of St. Louis, Mo. The buckets hold 1600 lb. of sand and travel at the rate of 500 ft. per minute. The tramway is run on day shift and the bin can be emptied in six hours with the mill running. The tramway is 550 ft. long and the sand is elevated 75 ft. at the far end of the dump. There is dump room for three years at the present rate, after which the heap may be spread out by means of a stream of water around its base thereby increasing the dumpage capacity. Power is furnished to drive the tramway by a General Electric 15-hp. alternating current motor, running 1200 revolutions per minute.

The slime in the slime sump is elevated to a 14x30-ft. Dorr thickener by means of a Morris 4-in., vertical slime pump direct connected to an Allis-Chal-

and a tailing assaying from 12 to 16 oz. per ton. The feed to the slimers generally runs 4 oz. higher than the tailing from the same. The ratio of concentration is 65:1. The average extraction by concentration of the sand is 83 per cent.

The tables remove most of the heavy smaltite and other sulphides that act as cyanicides and since their installation a reduced consumption of cyanide has resulted. The tailing from the Deister slimers runs by gravity into a slime sump and is elevated into the cyanide plant by means of a Morris 3-in. vertical centrifugal slime pump direct connected to an Allis-Chalmers 15-hp. vertical A. C. motor, speed 900 r.p.m. One Pachuca tank 15x40 ft. is used as a collector at the top of which is an overflow to carry the clear water back to the Dorr thickener.

#### AGITATION IN PACHUCA TANKS

The cyanide plant was remodeled in the summer of 1911 to suit the conditions of a continuous system of agitation in Pachuca tanks. The results were so unsatisfactory that the former treatment consisting of charging the Pachuca tanks and intermittent agitation was resumed.

The slime, consisting of one part pulp and one part water, flows by gravity from the collector to two vacuum-filter tanks each holding 14 filter leaves 4x7½ ft. These tanks treat "green pulp" and are known as the charging tanks. Upon charging, the vacuum is run up to 25 in. by means of 6x8 Deane vacuum pumps in duplicate until a cake 1 in. thick is formed. The filtered water is pumped into the Dorr thickener.

The vacuum is then dropped to 10 in. in order to hold the cake on the leaves while the surplus pulp is dropped into

the receiving sump beneath and pumped back to the collector by means of Morris 4-in. manganese-lined vertical centrifugal pumps in duplicate, direct connected to an Allis-Chalmers 25-hp. vertical motor, making 850 r.p.m. The filter boxes are then filled by gravity with strong solution of a strength of  $3\frac{1}{2}$  lb. KCN per ton of solution from the barren-solution tank. The cakes are now loosened and dropped into the receiving sump below, the pulp being pumped by the centrifugal pumps above mentioned into one of three 15x40-ft. Pachuca tanks. One tank is filled and agitated before filling another.

#### LEAD ACETATE PRECIPITATES SULPHIDES

At this point, on account of the presence of sulphides of antimony and arsenic which are soluble in caustic alkali in the presence of cyanide, lead acetate is added to the extent of 1 lb. per ton of dry pulp in the charge. Desulphurization of the charge by this means has added materially to the efficiency of the process. The strength of the solution is brought up to 6 lb. per ton in the agitating tanks and agitation is carried on for an average of 100 hr. The pressure of air used is 15 lb., the air being the hydraulic air supplied to the camp.

The tanks are kept at a temperature of 70° or above by means of a steam coil of 2-in. pipe suspended by  $\frac{1}{2}$ -in. rods from the top of the tank to within 8 ft. of the bottom. The steam pipe has an outlet at the bottom of the tanks and is pumped back to the boiler room. The agitation is carried on by means of a jet of air from a  $1\frac{1}{4}$ -in. pipe extending down the center of a 14-in. central column pipe to within 4 ft. of the bottom. Potassium cyanide is added by lowering it in a wire basket hung by a rope.

The agitated pulp is then drawn off by gravity to four vacuum-filter tanks similar to the first and are known as the "discharge tanks." A cake 1 in. thick is formed, the vacuum lowered, and the excess pulp dropped into the receiving sump below, and pumped back to the agitating tanks by means of Morris 4-in. horizontal manganese-lined centrifugal pumps in duplicate, belt driven by Allis-Chalmers 15-hp. motors, making 1120 r.p.m. The filter solution is discharged into the strong-solution storage tank.

Water is now run into the tank and the cakes washed until the filter solution titrates down to 0.3 lb. KCN, the filtered solution being discharged into the weak-solution storage tank. Water is then forced into the leaves and the cakes are dropped into the receiving sump below. The same 4-in. pumps are used to pump the washed pulp to waste, a sample of each discharge being taken automatically as the pulp is discharged.

A sample of a "tank sheet" report, which is made up as soon as results from each agitated charge are obtained, is given herewith.

#### PRECIPITATION BY ZINC SHAVINGS

The filtered strong solution containing the dissolved silver is drawn off by gravity from the strong-solution storage tank and run into two 8-compartment zinc boxes. The second, third and fourth compartments only are filled with zinc shavings, zinc shavings being moved from one compartment to another in inverse order as it is consumed in the precipitation of the silver in solution.

The overflow from the zinc boxes goes by gravity to a concrete storage sump 25 ft. square by 9 ft. deep, coated with P. & B. paint. This solution is pumped in-

through the press to drive out the excess moisture. The filter press is cleaned by hand and the precipitate barreled and sent to the Steele-Harvey tilting furnace. The small amount of short zinc produced is dried and charged into the tilting furnace. The precipitate is fluxed with borax, soda and niter, with an addition of old slag from time to time, and melted in the tilting furnace. The bullion averages 930 fine and is sent to Perth Amboy, N. J., to be refined.

An overhead crawl above the filter tanks permits easy removal of the filter leaves for acid treatment to remove the lime and for repairing. A 5% hydrochloric-acid solution is used for treating the leaves.

Zinc shavings for use in the precipitating tanks are turned at the plant by means of a zinc lathe. The KCN used is 98% pure and the consumption of cyanide per ton of ore treated is about 4 lb. The average extraction of the cyanide plant is 70%. The combined extraction of the mill and the cyanide plant on the ore treated averages 87 per cent.

The assay office is equipped with a double-muffle assay furnace, button balances, pulp balances and other necessary materials. The sampler is equipped with one coffee mill, bell grinder, high-grade grinder, low-grade grinder and an Abbé Engineering Co., 6-jar pebble mill, all of which are driven by an Allis-Chalmers 7-hp. motor, running at 1200 r.p.m. Assays of cyanide solutions, slime heads, washed pulp, mill tailing and concentrate aggregate 30 per day.

#### Loon Creek District, Idaho

The Loon Creek District, Ida., has been examined by the U. S. Geological Survey, which has come to the following conclusions (*Bull.* 530-G.): The district is a poorly prospected area of more than ordinary promise, which is held back primarily by inadequate transportation, the nearest railroad point being 110 miles distant (coke is about \$46 per ton). There are noteworthy gold placers in the area, and the principal gold-copper deposit has been explored to a depth of 1000 ft. Throughout this extent the ore has ranged in value from \$25 to \$90 per ton, and there are still no signs of impoverishment in depth. The dolomitic limestone area near the head of Deer Creek is thought to be a promising field in which to prospect for lead-silver deposits.

Owing to the bold relief of the country, it is possible to obtain a depth of 1000 to 2000 ft. on most of the deposits without resorting to shafts, and there are numerous water-power sites. The gravels of the region are loosely cemented and fall apart when undermined by the giant. There is a small smeltery, completed in 1905.

#### SAMPLE AGITATION RECORD, BUFFALO MILL, COBALT

Charge No. 38. Tank No. 3 Feb. 6, 1912.  
124.5 tons pulp...75.9% moisture...Sp. Gr. 1.17  
Temp. 78° F. Contained...30 tons dry slime...  
94.5 tons solution. 6.2 lb. KCN in solution...0.7 lb.  
protective alkalinity in solution. Filled...17½ hours.  
Agitated...77 hours. Discharged...34 hours.

Sample	Assay oz.	Remarks
Automatic heads	14.2	
Tank heads...	13.6	
8½ hr., washed pulp...	8.0	
12-hr., washed pulp...	7.4	
12-hr., washed pulp...	4.6	Moisture %..... 77.7
12-hr., washed pulp...	4.0	Cyanide lb..... 0.4
12-hr., washed pulp...	3.6	Protective alkalinity lb..... 0.2
12-hr., washed pulp...	3.0	
Before discharge washed pulp.	2.5	
Tailing pulp.	3.8	
Solution.....	0.12	
Washed pulp...	3.5	Percentage extracted. 72.0 Ounces recovered...294.0 Ounces lost.....114.0

J. Willey, Cyanide Superintendent.

termittently, by means of a plunger pump operated with air to the barren-solution storage tank. The weak solution is also drawn off by gravity to one 8-compartment zinc box. The overflow from this box is allowed to flow to waste. Formerly this solution was pumped to storage tanks and used as a weak wash but the accumulation became so great that storage room was inadequate.

#### CLEANUP BY MEANS OF FILTER PRESS AND PUMP

In cleaning the zinc boxes the inflowing solution is cut off, the zinc shavings are washed and the box repacked. Plug valves at the bottom of each compartment are opened and the precipitate is allowed to drain into a sump below. The precipitate is pumped into a Perrins filter press by means of a 3x4 Aldrich triplex pump. After the removal of most of the strong solution, which is returned to the strong-solution sump, air is blown



# Mining Copper at Lake Superior—III

By Claude T. Rice

Before outlining the methods used in handling the broken ore, and describing the drilling practice, it may be well to outline the labor conditions prevailing in the copper country. As a whole they are probably the best in the United States. The companies take a wholesome interest in the welfare of the community and of their employees especially.

## LABOR AND LIVING CONDITIONS

Living conditions are most excellent. Good houses are furnished to the married miners at a low rent, and the companies do everything to encourage settled conditions among their employees. There is a marked absence of saloons compared to mining communities in other parts of the country; there are fairly good theatres and places of amusement; the cost of living is not high, as miners can obtain board and rooms in families at about \$25 per month. It is odd, however, that there has been considerable of an exodus of the Irish, and to a less extent of the Cornish element to Western camps, and as a result there has been a steady increase in the number of foreign employees on the pay rolls of the companies. This condition is hard to account for. Most of the machine men are Cornish, with Irish, Americans, Italians and Finns in the order named, making up the balance of the drillers and timbermen. The trammers are generally Finns and Croatians, but of course there is really no division of the labor according to nationality.

The Cornish miners are no longer in power in this district to the extent that they were formerly, when most of the mine captains were Cornish. The early Cornish influence, however, is still shown in the customs prevailing in regard to contracts and the hours that the mines work, for from Saturday night at 11 o'clock until Monday morning at seven, nothing but repair work is done in the mines. In working hours the machine men are the most favored, as on day shift they work 5½ shifts per week, and only five on night shifts. The trammers, who in these mines do the shoveling, the trackmen, timbermen, stemmers (those who take the places of timbermen, trackmen or drillers when any of the latter are absent), and the underground laborers, or those men who clean the stopes and do other odd jobs underground work, on day shifts five full shifts per week and seven hours on Saturday, coming on at three o'clock; on night shifts all these men except the trammers work only five shifts. The trammers must work from three till eleven o'clock on Saturday nights. The hours on both day and night shifts are from seven to five, with one hour off in the middle for lunch, and the

The width of the ore varies from 10 to 30 ft. One-man drills are replacing the two-man machines. Square cross-bits are generally used but in some mines the Mohawk pilot-bit is in favor. The footage drilled per machine per shift varies from 24 to 55 ft., and the tonnage broken from 900 to 1400 tons per month. Labor and living conditions are bettered by the companies, and contract work is prevalent.

shifts change every week instead of every two weeks, as in the West. The pay on day shift depends on the number of shifts worked, while on night shift the men are paid for six full shifts unless they are off two shifts, when they are not given the extra shift, but are paid according to the number of days that have been worked.

## CONTRACT WORK PREVALENT

Most of the drilling and a large proportion of the shoveling are done on contract. While varying somewhat at the different mines and according to the ability of the individual workmen, the wages for day's-pay work on the different jobs is by the month approximately as follows: Drillers on company account receive about \$63 per month in the amygdaloid mines, and about \$75 in the conglomerate workings; trammers, \$63; underground laborers, \$52 to \$60; bosses on timbering gangs, \$70 to \$90; timbermen, \$60, and roller men \$52 to \$60 per month.

The labor is quite efficient in most respects, and the copper country miner makes up in sobriety and dependability, what he may lack in versatility compared with the Western miner, who generally has run machines and timbered from Leadville to Bisbee, and from Bisbee to Butte, becoming thereby accustomed to many different methods of mining and many kinds of ground. The long rest at the end of the night shift works well in this community, where a good proportion of the employees are married, or if single, are living at home; this would not do at most Western mines on account of the weekly carousals. This shows well the difference between the labor at these mines and in the West. Further, by giving the men a short Saturday on day shift and a five-day-work but six-day-pay week when on night shift, the companies are able to work the men on 9-hr. shifts without objection. This is of considerable benefit to the companies, where the mines are deep, since it takes fully 1¼

hr. to get the men into the deeper conglomerate mines, as no special provision is made for doing this rapidly.

There are no unions among the miners, and there is no desire on the part of the men for them, as the companies treat their employees as well as they possibly can and give them no cause for wanting the union. No small item in the conditions that make it possible to mine and produce copper from these ores at a total cost of about \$1.50 per ton of ore, is the fact that by far the majority of the miners remain in the copper-country mines all their lives, learning the practice of the district thoroughly and the way that the ground works. The contract system decreases the cost of supervision and spurs the men on to the greatest individual effort with a gradual but sure increase in the average ability of the miner of the district.

## MUCKING THE ORE

In doing the shoveling the trammers use a short, D-handled shovel, having an overall length of about 38 in., as is characteristic of Eastern metal mines. In the amygdaloid mines, the ore rolls down to the bottom of the stope and is there loaded into the cars from a plank sollar, the track being carried within about 1½ ft. of the foot wall, making the quarters rather cramped for shoveling. This is not so important, however, as over 60% of the ore is larger than 4-in. size, and most of it is loaded into the car by hand. Indeed, one of the reasons that a machine breaks so great a tonnage in the stopes of the Lake district, is the large size to which the ore can be broken when it is loaded directly into the cars without passing through chutes. Boulders weighing several hundred pounds are rolled into the cars with planks, while those too large for this work are broken either by blockholes or by using "pasters," unless they are thin enough to be sledged. In sledging, the miners use long, narrow-faced hammers, as these boulders have a tendency to cleave. As the faces of the sledges tend to get rounded and the use of a gad often aids greatly in the ease with which the boulders can be broken, tongs with handles about 18 in. long are provided for holding the gad, so that there is no danger of the men getting their hands smashed.

Filling the cars from a sollar and with about half the ore put into the cars by hand, the men in the amygdaloid mines load from 14 to 15½ tons in a 9-hr. shift when tramping an average of about 600 ft. In the conglomerate mines, where most of the ore from the stopes is loaded into the cars from slide chutes, and the cars are taken from the shaft by rope haulage, the trammers average about

three tons more per shift. To insure the safety of the roof in the drift stopes, a special crew of trimmers goes through the amygdaloid mines, barring down any loose rock that may be found along the levels. In the past the drilling in these mines has been done entirely with two-man drills having 3-in. cylinders, later bored out to  $3\frac{1}{8}$  and  $3\frac{1}{2}$  in., and almost universally of Rand make. During the last year extensive tests have been made on the merits of one-man drills in the drifts. While these one-man machines have not drilled as much in a shift as the large machines have, the indications are that much economy will result in the use of one-man drills in the stopes.

#### FOOTAGE DRILLED

The footage drilled in the different lodes varies greatly. In the amygdaloid it is dependent principally upon the amount of alteration that the rock in the lode has undergone. In the Kearsarge lode the large machines, in a 9-hr. shift, drill on an average about 40 ft., although at times the footage rises to 45 ft., and at some of the mines, notably the Allouez, it is much lower, being about 30 ft. The ore in the Osceola lode drills better and the machines average about 47 ft. of hole per shift, the footage rarely dropping below 40 ft. and sometimes rising to 55 ft. Owing to the greater quantity of silica in the conglomerate, and possibly because of the larger proportion of copper in that ore, the machines average only about 24 ft. per shift and rarely is a greater footage than 28 ft. drilled. However, the men are not able to commence drilling as early in the shift, because of the poor condition of the hanging wall in the conglomerate stopes, and also because of the brittleness of the ore that causes it to slab away badly under pressure; the machine men are rarely able to get the back picked down, the breast trimmed and the machine set up inside of two hours, and seldom drill more than one hole before noon.

Both in the amygdaloid and the conglomerate mines, the holes in the stopes are generally drilled 8 ft. deep, and an air pressure of from 65 to 85 lb. is used. Fortunately at the mines where the lower footages are drilled, more burden can be placed on the toe of a hole, so that the tonnage broken by a machine is somewhat evened up. For instance, in the conglomerate stopes it is not uncommon to place 4 ft. of ground on a hole, while the average is about 3 ft. In the Kearsarge lode the burden placed on a hole averages  $2\frac{1}{2}$  ft., or perhaps a little over, while in the Osceola lode, which is the easiest ground in the copper country to drill, only from 24 to 26 in. can be placed on a hole. In fact, in the Osceola lode

two holes must be drilled to break the tonnage that one will break in the conglomerate stopes. The softer the rock for drilling, the less firm is it, owing to alterations, and therefore the less efficiently does it transmit the shock of the explosion, as the cushioning effect is greater. These figures concerning drilling are merely general statements, and conditions differ greatly, so that both in the Kearsarge and the Osceola lodes it is possible sometimes to place as much as  $3\frac{1}{2}$  ft. on the toe of a hole.

#### WIDTH OF ORE

In the northern part of the district the lodes are 12 to 16 ft. wide on the average, although in the Red Jacket workings on the conglomerate, the stopes are 20 ft. wide and in a great portion of the Tamarack stopes a width of 30 ft. prevails. In breaking the ore it is generally sliced out parallel to the level, but in the North Kearsarge the slicing is done up and down the dip. Three holes, one near the foot, the first fired, one in the middle and one near the hanging, are generally sufficient to break the ore from foot to hanging, although in places on the Osceola lode four holes are necessary to break a cut 9 ft. high. When the ore has a greater width than 12 ft., the back is carried with an overhang of ore below the hanging wall, the height to the top of the overhang being about 10 ft. Then either with an upper or a flat roof hole, according to the ease with which the upper can be drilled, the skull of ore that has been left from the last round is skimmed off the hanging.

The ore in most of the mines is inclined to be sticky and dry holes do not drill as fast as water holes. It generally takes half as much longer to drill a dry hole as a wet hole. Consequently the drilling is arranged so that as few dry holes as possible are drilled. Indeed, only in the Mohawk mine are dry holes necessitated by the stoping method used. The ore there is carried as much as possible from foot to hanging, although the lode has a width ranging from 14 to 20 ft., averaging about 18 ft. This is done by carrying a stope about 11 ft. high following along the foot, and by skimming the hanging with a dry hole looking down the stope. In this way a large load can be placed on the dry hole, and as much ore is broken per machine as in the other method. However, there is more likelihood of the hole breaking into the hanging than if a skimming hole is drilled parallel to the roof of the stope and in the direction of the strike, as is the practice in the other methods of drilling in the amygdaloid. In the Mohawk, less trouble is experienced with uppers than in the other mines, either because the ground there is not so damp as in other parts of the Kearsarge and along the

Osceola lodes, or because the Mohawk bit allows dry holes to be drilled with less difficulty than does the square cross-bit that is used in the other mines. For skimming the ore from the hanging, more dry holes are used in the conglomerate stope than in the amygdaloid, because less trouble is had with dry holes in the former than in the latter. While there is not much water in the Lake copper mines, a little comes in along cross seams, so that generally water enough for drilling can be obtained by digging a hole in the muck on the floor of a level. In the Calumet & Hecla mines, as well as some of the subsidiaries, these water holes are kept open by burying a powder box with the bottom out of it, in the muck, so as to keep the hole from caving in.

#### TONNAGES BROKEN

Since ground that necessitates slower drilling generally permits more ore to be placed on the toe of a hole, the amount of ore broken per machine in the different amygdaloid lodes is about the same, while in the conglomerate lodes, although much the hardest ground to drill, the tonnage broken per month is somewhat greater, being about 1400 tons per month of 26 days in the stopes, while in the amygdaloid mines the tonnage is about 1000 tons per machine underground. In the Mohawk mine the machines in the stopes break 1100 tons per month, and in the other mines on the Kearsarge lode from 1000 to 1050 tons, except at the Allouez, where owing to the smaller footage drilled per shift, the machines in the stopes average only about 900 tons. Also in the Osceola workings of the Calumet & Hecla company the average per machine is only about 900 tons per month of 26 days.

The rate of drilling depends largely upon the amount of coarse copper in the lodes, for delays are due almost entirely to that cause. Often two hours are lost on a hole that is in 3 or 4 ft., for frequently if the hole is abandoned a second or third hole will strike the same mass of copper. A piston drill will not cut the copper; yet neither does the copper dull a drill. The only thing to do is to permit the steel to batter its way through the bunch. On the other hand, a Leyner drill, owing to the bit being held against the copper all the time, tends to chip it, but the copper causes trouble with that drill by plugging the hole in the steel. The wear and tear on drill steel is figured at 30 lb. per machine per month in the conglomerate mines, and from 12 to 15 lb. in the amygdaloid mines. In some of the mines the men are charged for all wear, tear and loss above that amount, while in other mines the weight of a drill given to a party of contractors is recorded and

in case any of the drills are lost the original weight of the drill is charged to the miner.

#### DRILLING DONE ON CONTRACT

The drilling in the mines is practically all done on contract, and the drills going to each party of contractors are numbered, to keep them apart and to prevent any scrambling for drills at the station. On surface the drill boys sort out the drills going to each level, and in loading them in the skips they keep the drills for each level separated by piling those for one level bit up, and those for the next level bit down, or else by placing a rope in between the drills for the different levels. At the levels the miners sort out their own drills, the number being cut in deep near the shank end. The drills are made of  $1\frac{1}{8}$ -in. octagonal steel, upset to form the bit, which has a gage of  $2\frac{1}{2}$  in. on the starters and  $1\frac{1}{4}$  in. on the 10-ft. drills. Tests are now being made on cruciform steel and it is likely that this form of steel will in time be adopted, as it has generally been found that better speed in drilling can be obtained; cruciform drills mud a hole better than do octagonal steel drills.

#### SHARPENING THE DRILLS

Two methods of gaging the drills are used, according to the methods of sharpening the steel. With the Word type of sharpener, the one most used in the district, in which a bit is formed by upsetting the edge on itself, a system of step-gaging is used, the gage being reduced  $\frac{1}{4}$  in. for each difference of 2 ft. in the length of the drill. In the Morrison sharpeners, which are used by the Calumet & Hecla company, a system of graduated gaging is used, in which the width of the bit has a definite ratio to the length of the drill, varying for each intermediate length that results as the drills wear down. This is a great advantage in the conglomerate mines, where several drills must be used to a run-out of a machine, but it is not so important at the amygdaloid mines, where one drill will often hold its edge long enough to drill two holes.

The Morrison machines have a large capacity, as two of them sharpen 2900 drills in about seven hours at the Calumet & Hecla mines, where all the drills are sharpened at Calumet No. 2 shaft. The steel is sharpened by passing it from one machine to another by a conveying system that is quite ingenious. At each machine, a portion of the bit is formed and the metal from the center is worked out to the corners, in this way simulating the way that the steel is worked in hand sharpening.

#### ADVANTAGE OF MORRISON MACHINE

The great advantage of the Morrison machine is that the speed of travel of the

steel through the different stages of the sharpening can be regulated so that the bit is finished at the dull red heat.

The working of the metal until it is at this heat, makes the grain of the metal finer than if it were finished with the steel still at a high red, for under the latter condition the metal is lying quiet and the grain can become coarse, resulting in an edge that is not so tough as compared with the other method of sharpening, no matter how well it is tempered. It is probably owing to this working of the metal at the proper temperatures that there was a falling off in the number of drills used in the mine when the Morrison machine replaced hand sharpening. This reduction amounted to about 22%, for with hand sharpening, 3700 drills were dulled per day, while with the machine sharpening only 2900 were required.

In respect to the heat treatment and the graduated gaging of the bit which the Morrison machine affords the drill, it appears that the Morrison machine ought to make a perfect bit; however, in looking at the bit one often finds that there is an offset in the bit edges, so that a hackly edge is obtained and often not enough steel is worked out to form a good corner to the drill. These drills with poor corners pass the inspectors often. It is there that this sharpener is weak. Word machines, or sharpeners of the upsetting type, never turn out drills with weak corners, for the drill is upset in the dolly to the proper width whenever the edge of the bit has assumed the proper shape.

#### BITS USED

A 10 ft. drill is generally the longest that is used, as few holes are drilled over 8 ft. Occasionally a 12-ft. drill is employed in the stopes. Square cross-bits are used in most of the mines, but at the Wolverine and the Mohawk, and also at the Ahmeek to some extent, the Mohawk bit is used, having a small pilot bit ahead of the cross-bit. Some mining men in the district consider that the Mohawk bit is the best for all kinds of hard ground, especially when the ground has a tendency to fitcher, while others think that there is not much benefit coming from it except in ground where there is a tendency for the hole to collar, or rifle as it is more often called. The few tests that have been made in the district seem to indicate that there is real merit in the Mohawk bit but it has not been generally accepted throughout the district, although it has been in use at the Mohawk and Wolverine mines for over eight years. At the mines where the Mohawk bit is used, it is the practice to finish the hole with a chisel bit, as such a bit will drill faster than any other as long as it holds its gage.

In drilling deep holes, considerable trouble is met with sometimes in fitchered holes. In the event that this occurs an attempt is made to straighten it by driving a wooden plug into the bottom of the hole or by placing pieces of copper or iron in it. Such methods generally succeed, but in case that they do not, half a stick of dynamite, or possibly more, is placed in the hole and blasted, after the machine and arm have been turned out of line with the hole. In the Mohawk, North Kearsarge and the conglomerate mines, drill boys bring the steel and the water to the bottom of the stope but at the other mines they merely send the drills up and down the shaft. A drill boy at the conglomerate mines, owing to the large amount of steel dulled by a machine, will generally tend only three or four drills, and at the Kearsarge mines, because of the distance between machines, they rarely can tend more than four machines.

#### DRILLING CONTRACTS

Practically all drilling is done on contract. Only in the cleaning of the foot wall of stopes, are the machine men placed on day's pay and then generally a bonus is offered for all tonnage broken above a certain amount per month. In the amygdaloid mines these contracts are generally let to four men, but in the conglomerate stopes they are generally apportioned to eight men and in some of the heaviest stopes, to twelve, so that three machines can be run each shift in the stope, to hurry the work through. One man on the contract, called the taker, receives and signs for all supplies.

These contracts are let for periods of one, two or three months, and in form are out-and-out contracts in which the miner furnishes all supplies and takes all mining chances. But at most of the mines if the miners meet with harder rock or with ground that contains more than the usual amount of copper, so that they cannot make money at the rate given them, which is generally so much per cubic fathom of lode, or square fathom of lode broken, the company either terminates the contract or gives the miners enough to make up the usual rate of pay for the machine men on company account in such workings.

The companies use this form of contract instead of a guarantee contract where the company takes the mining chances instead of the miner, so that they can keep the less efficient of the miners at work until they either quit of their own accord or else work up into experienced miners, earning the average pay. This is a different principle from that used in the West where every miner allowed to stay underground is guaranteed at least so much per shift and the company is the one that gambles on the

nature of the ground that will be encountered. There, however, only the best of the miners are paid on contracts and nothing is thought of firing a man, while in the copper country the discharging of a miner is a rare thing and the companies feel that they must help along the inefficient as well as the efficient, when they do practically all the work on contract.

The companies sell supplies to the miners at about four times their actual cost. This is not done to make any profit on them from the miners, as the figure that is paid on the contract is given with the men knowing what price they will have to pay for supplies; it is done to compel the men to be economical in the use of supplies. The principal benefit resulting from this practice is, that it makes the miners drill a sufficient number of holes so that the ground will be broken small enough and will not have to be blockholed to get it into the cars. Unless great care is exercised, the company is apt to find that in order to save in the amount of dynamite used per ton of ore broken, the miner is compelled to drill more holes than would be economical with dynamite furnished to him at the market price.

#### ONE-MAN MACHINES

Some difficulty is being met with in introducing the one-man machine in the stopes, where often the drill has to be mounted on a column 10 ft. long. The ore dips at such an angle that a man has a none too secure foothold when he lifts his machine and bar. For that reason the Osceola jack is being adopted for use on the small machines, as the post itself can be lifted out of the jack and the two parts carried about separately in the stope. This is no small advantage, for owing to the width of the lode, a two-screw jack is necessary to secure a firm set-up.

Because it is practically impossible for one man to stand the post alone in these stopes, it is planned either to have the trammers help the machine men make their set-up, or else to place three machines in a stope and have four men working on them, as then there is always an extra man to help in case a hole fitchers, to get dynamite, and otherwise make himself useful. To insure that the men will understand how to take full advantage of their work on the one-man drills, the machine men before they are placed alone on one of these machines, are made to work with an instructor. This drill instructor is a man who has had a considerable experience on one-man machines and he shows the miner the different tricks that make the work easier and the machine man must stay on the instruction machine until he is judged efficient enough to go it alone

without having any trouble. In this way care is taken that the men will not condemn the machines because of prejudices they have formed.

(To be continued.)

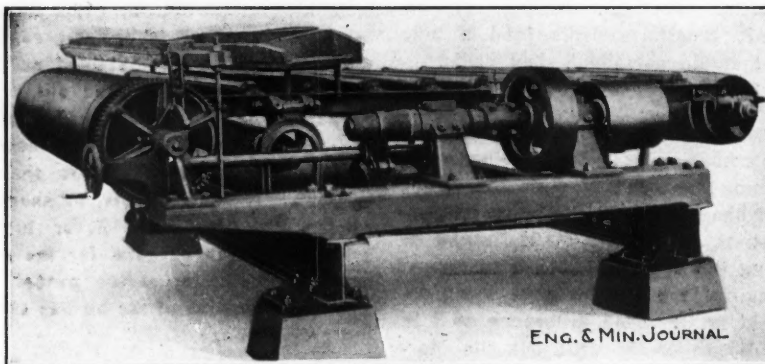
### The Pacific Vanner

The Pacific vanner is an improved Frue vanner built by D. D. Demarest Co., of San Francisco, Calif. The entire machine is made of steel and iron, designed to be set up on four independent concrete posts, making a rigid and durable construction. It has the same side shake as the Frue. The belt travel takes in all parts involved in the Frue travel, and includes some improvements over the Frue feed. The belt tightener not only tightens but engages and disengages the gear and regulates the speed. Cone pulleys are employed for regulating the speed of the belt exactly the same as on the Frue machine.

The moving frame is supported on four independent vertical double standards, the two standards on each side resting on

for this mechanism to get out of line. Most of the wearing parts are protected by removable bearings. Beyond the desired adjustment of grade and travel the machine requires no attention to keep it in operating order.

The distributing box is the G. G. Gates patent, which operates as a classifier. The fines are discharged from the forward end; the heavier parts at the rear end; thus the fine material is not mixed on the belt with the coarse, but is separated and has a chance to make its way out. The machine is equipped with a Gates patent step belt, designed to handle exceedingly fine concentrates. The belt is 20 ft. long and 6 ft. wide; the moving frame is 9 ft. long. The whole machine occupies about 120 sq. ft. of floor space as against about 220 sq. ft. occupied by two 4-ft. Frues. The first installation of the Pacific vanner was at the Stickels mill of the Utica Mining Co. at Angels, Calif. This machine was installed in November, 1911, and has made a satisfactory record. Eight of these machines are in operation in the new 20-stamp mill built by the



PACIFIC VANNER WITH BELT REMOVED

the side bar. These standards are longer than the supporting springs of the Frue, giving a flatter motion to the belt and a nearly uniform travel; in other words, with the flat motion given by the long supports every point of the belt gets about a uniform side travel. The main front roller of the moving frame is designed to be adjusted vertically. This adjustment changes the grade of the belt without the necessity of adjusting the small rollers. The supporting standards are independently adjustable, so that it is but the work of a minute to raise or lower the frame at either corner and thus give it any grade desired; or it may be leveled up sideways.

The machine is provided with a single eccentric; the eccentric rod has three prongs, thus holding the machine firm and making all parts move together. The rod is adjustable in the hub of the eccentric, so that by moving the adjustment screw in the eccentric the right position of travel may be obtained. All the moving mechanism is mounted on a single cast-iron sole plate. There is no chance

East Eureka Mining Co. at the Poundstone mine; they were placed in commission in May.

### East Butte Report

The report of the East Butte Copper Mining Co. for the year ended Mar. 31, 1912, shows 95,910 tons of company ore treated, of which 65,038 tons averaged 6.9%, and 30,872 tons averaged 2.86%. In addition 47,135 tons of custom ore were treated. Total production was 12,167,363 lb. of copper; 396,524 oz. of silver; and 17,959 oz. of gold. The cost of mining, including development, was \$4.14 per ton. The cost of production is given at 9.46c. per lb. of copper.

Development work amounted to 7865 ft. of drifts and crosscuts, and two strikes of previously unknown veins were made. In addition the mine equipment has been overhauled. A new dust chamber, 200x50x40 ft., and stack, 15-ft. diam. by 180 ft. high, have been erected, and a Dwight-Lloyd sintering plant put in. In the converter department, basic lined converting has been adopted.

# Physiological Effects of CO

An interesting pamphlet on carbon monoxide has recently been issued by the Bureau of Mines, in which attention is drawn to the dangerous properties of this gas and to the use of mice and birds for detecting its presence in mine air. The author quotes largely from various publications of Dr. J. S. Haldane of Oxford University, who for many years has made special study of the subject of mining hygiene and the dangerous gases met in mines. The author states (p. 6): "According to Haldane, carbon monoxide has no other effect than that resulting from its interference with the oxygen supplied to the tissues, and apart from its property of combining with the hæmoglobin it is physiologically indifferent, like nitrogen." The author also outlines an experiment in which he remained for twenty minutes in an atmosphere containing 0.25% of carbon monoxide, "at the end of which time he suffered only a slight headache, although later he became ill. The illness lasted for several hours and was accompanied by nausea and headache." The quotation from Haldane, and this experiment, are likely to give a false impression as to the dangerous properties of this gas; it has therefore seemed wise to give a few facts that others may not be led to repeat the experiment made by the author of the pamphlet, and to give some idea of the dangerous nature of this gas even when present in very small amount.

Carbon monoxide is a product of incomplete combustion. It is present in large quantities in producer gas and water gas, and in dangerous amounts in the gases from boilers and furnaces of all kinds. It is often present in large proportions, and always in dangerous amounts, in powder smoke, in the gases from underground as well as surface fires, and in the afterdamp from explosions of firedamp and coal dust.

## CO MAKES HAEMOGLOBIN INERT AS AN OXYGEN CARRIER

Carbon monoxide has the property of forming a compound with the hæmoglobin of the blood. The effect of this is to make the hæmoglobin, so combined, practically inert and to prevent it from acting as a carrier of oxygen. When so much carbon monoxide is absorbed that the greater part of the hæmoglobin is inert, death results. The affinity of carbon monoxide for hæmoglobin is more than 200 times greater than that of oxygen, so that when present in the air, even in small quantities, it is freely absorbed by the blood. Carbon monoxide is not displaced by oxygen but is dissociated by natural processes, and escapes in the ex-

Carbon monoxide produces symptoms of poisoning when inhaled in small amounts because it renders the hæmoglobin of the blood inert as a carrier of oxygen. The effect is cumulative and may result in death several years after exposure. Some cases of miners' phthisis are attributed to the effects of carbon-monoxide poisoning.

Note—An article by Prof. Henry S. Munroe entitled "Physiological Effects of Carbon Monoxide," published in the School of Mines Quarterly, July, 1912.

pired air. Where large quantities are absorbed, it may be several days before the last traces disappear. According to Doctors Edsall, von Jaksch, Haldane, and other authorities, 0.05% of carbon monoxide is dangerous. According to Haldane, severe symptoms were observed from breathing air containing 0.02%, or one part in 5000. With this small amount present the blood becomes 20% saturated after about 20 hr., producing slight giddiness and shortness of breath. At this point an equilibrium seems to be established, and the dissociation of the gas keeps pace with its absorption. With increasing percentages of carbon monoxide, the saturation of the blood becomes greater and the time required to produce the maximum effect shorter. With 0.08% present, the blood becomes 50% saturated within a few hours; it becomes scarcely possible to stand and even slight exertion results in loss of consciousness, the senses are confused and the judgment is impaired. Sometimes the victim either becomes stupid and drowsy, or much excitement results, not unlike the effects of alcohol. Another experiment by Doctor Haldane proved that with 0.20% CO in the air the blood becomes 50% saturated in 70 min. With 0.25%, the amount present in the Bureau of Mines, experiment, this dangerous condition would be reached in less than one hour.

## CO PRODUCES CONGESTION IN THE VITAL ORGANS

According to von Jaksch, the absorption of 0.8 gram of carbon monoxide is fatal. According to Haldane, if death occurs gradually the hæmoglobin is usually about 80% saturated with carbon monoxide. Post-mortem examinations of persons who have died from carbon monoxide poisoning show that the effect is to produce intense congestion of the vital organs, especially in the brain, usually accompanied by small hemorrhages. It

is possible that this congestion is due to the attempt of nature to make good the diminished efficiency of the blood by supplying larger volumes at needed points.

Even when death does not occur, serious results are likely to follow from the absorption of this gas by the blood. The after effects are lesions, cysts and local softening of the brain tissue,<sup>1</sup> inflammation of the membranes of the stomach and intestines, pneumonia, bronchitis, pleural effusions, inflammation of the kidneys, fatty changes in the heart, anemia, splenic enlargement and other derangements of vital organs, sometimes resulting in death even after several years. It is believed that Sir Clement LeNeve Foster was a victim to carbon monoxide poisoning which occurred on a visit as chief inspector of mines to a mine in Cornwall a few years before his death. From the full record given by Mr. Foster of his symptoms while exposed to the gas underground it does not appear that there could have been more than 0.08% of carbon monoxide present, nor that his blood could have been more than 50% saturated, although direct evidence on both these points is lacking. The experiment made by the author of the paper recently issued by the Bureau of Mines, in which he exposed himself for 20 min. to an atmosphere containing five times as much carbon monoxide as is known to be dangerous, was therefore hazardous and even though the experimenter apparently suffered but little ill effect a somewhat longer exposure would certainly have resulted in serious injuries, the after effects of which might have proved fatal.

## MINERS' PHTHISIS FROM CO POISONING

One of the most serious dangers from the presence of carbon monoxide in the air of mines is the effect upon the health of workmen who are daily exposed to the breathing of small amounts of this gas. The blood, when partly saturated, is thereby rendered less able to perform its proper functions, so that the patient suffers from anemia and all the complications that may result from this weakened condition. According to Doctor Edsall, the disease known as miners' phthisis

<sup>1</sup>In a personal letter, Prof. Walter B. James, of the College of Physicians & Surgeons, states that a peculiar local lesion of the brain, with softening of the lenticular nucleus is fairly characteristic of carbon monoxide poisoning. The action of the gas upon this area has not been satisfactorily explained. It has been suggested that it is due to the peculiar angle at which minor blood vessels are given off to this area from the arterial trunks. According to Doctor James, the remote consequences of monoxide poisoning is a serious matter. His cases have shown mental aberration of a peculiar type, with great slowness to response, going on to cerebral degeneration and death.

has been shown to be due chiefly to carbon monoxide poisoning. Recent observations have shown that for some hours after a blast, under the conditions of ordinary mining, carbon monoxide may be present in the air in dangerous amounts, and undoubtedly the blood of men engaged in sinking, drifting, and stoping where the circulation of air is deficient is partially saturated with carbon monoxide the greater part of the time.

**EFFECT OF CO IS CUMULATIVE**

By some authorities it is believed that the serious effects above outlined, due to absorption of carbon monoxide by the blood, are supplemented by direct toxic action on the nervous system, on the muscles, the heart and other organs. It is believed by others that there is a cumulative action and that those who have been poisoned by this gas are more likely to become victims when again exposed to it. It is quite certain that dissociation of carbon monoxide from the blood is slow and that those whose blood is partly saturated will sooner fall victims where larger quantities of the gas are breathed than those whose blood is free from this gas. Men who have repeatedly suffered from carbon monoxide poisoning becomes very sensitive to the gas, and in most instances are compelled to abandon work in which they are compelled to breathe air containing it.

**MANIFESTATIONS OF CO POISONING**

The symptoms by which carbon monoxide poisoning may be detected are not difficult of recognition. The blood becomes a brilliant cherry-red, and in serious cases red or bluish-red spots appear on the front of the neck, on the trunk, thighs and elsewhere, lasting for some days, and in fatal cases apparent after death. The mental disturbances, weakness and lassitude, have been noted. This is followed by headache, accompanied by nausea, often lasting 24 or 48 hr., even in slight cases. In more serious cases, headache may recur at intervals for some months. Loss of consciousness with convulsions, may occur several hours after the poisoning. One of the first symptoms is weakness in the knees and legs, sometimes lasting for days, with aching from the knees to the ankles. Local pains in the region of the heart, and palpitation of the heart, are common and may recur at intervals for a month or more. Foster, and several others, have published valuable notes on these symptoms, which will be found in the appendix of Foster and Haldane's "The Investigation of Mine Air."

Clear zircons of brownish-orange or reddish color are cut for gems and are then known as hyacinths.

**The Peck Centrifugal Concentrator**

The Peck centrifugal concentrator has been briefly referred to in the JOURNAL from time to time as being in experimental operation at Anaconda, Mont. These operations are now being continued with improved apparatus. A large number of patents have been granted to P. F. Peck

cal spindle driven by the lower pulley shown in the illustration. The top of the pan is open except for the broad ring B, attached to the outwardly flanged top. The upper edge of the pan is encircled by the discharge launder C. Within the outer pan is an inner pan D, called the deflector. This is rigidly attached to a sleeve E, surrounding the vertical spindle. To the upper end of the sleeve a

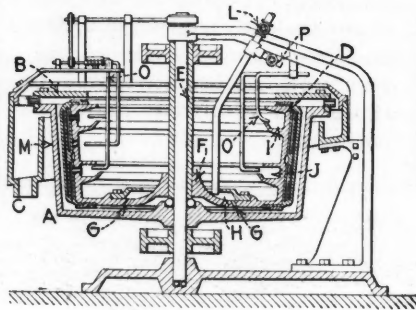


FIG. 1 Section

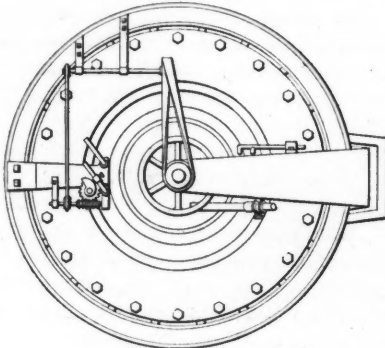
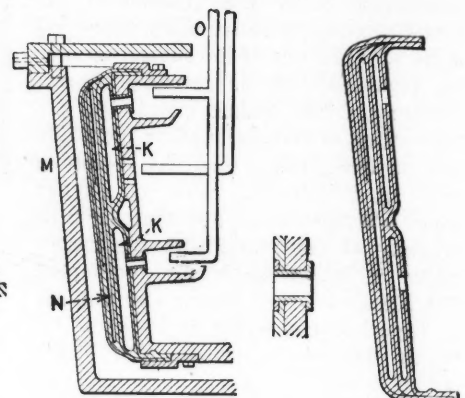
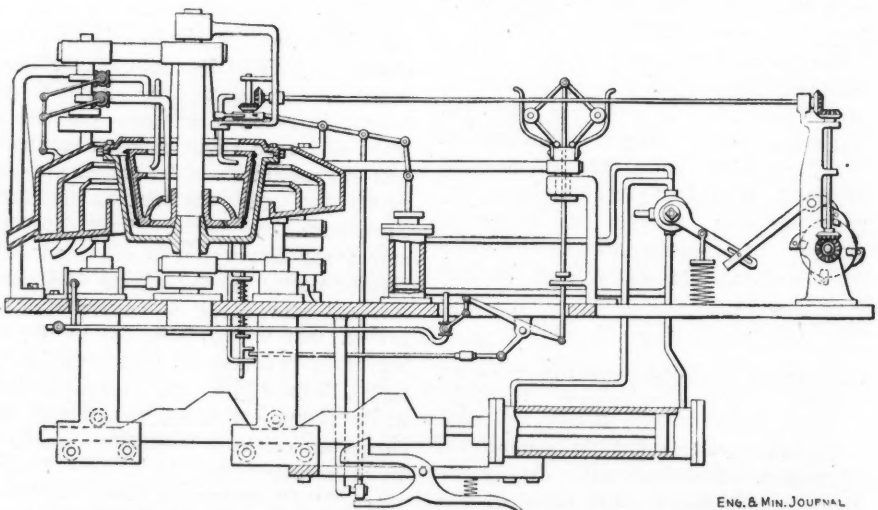


FIG. 3 Plan



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FIG. 2 Details of Canvas Cover of the Revolving Bowl



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FIG. 4. ANOTHER FORM OF PECK CENTRIFUGAL CONCENTRATOR

and from one of these the following description has been written.

The Peck centrifugal concentrator is a cyclically acting device for wet concentration of ore. The separation is effected and the lighter or gangue minerals discharged during the first phase of the cycle; the concentrate is discharged during the second phase.

The machine consists, as shown in Fig. 1, of an outer pan A, attached to a verti-

pulley is attached. The inner and outer pans may, therefore, be independently revolved and at different speeds.

To the bottom of the inner pan a ring F, is attached forming the feed chamber H. Holes G, connect the feed chamber with the space between the bottoms of the inner and outer pans. Around the inner face of the inner pan are two ring troughs I and J. These connect with the outer expansion chambers K, by sev-

eral small passages which can be seen upon careful inspection of the illustrations.

The operation of the concentrator is as follows: The two pans are set in motion and the pulp is conveyed to the feed chamber through the pipe *L*. From the feed chamber the pulp flows out into the space between the bottoms and rises in the space between the sides of the two pans. Here the separation is effected. The heavier particles tend to move toward the inclined inner face *M*, of the side of the outer pan and form a crust of concentrate. The lighter particles rise up to the ring attached to the flanged upper edge of the outer pan and flow out through the passages shown in the illustration, into the launder *C*. The lighter particles are prevented from settling on the layer of concentrate on the face *M*, because of the scouring action of the current caused by the deflector or inner pan revolving at a different speed from the outer pan.

When a sufficiently thick crust of concentrate has formed on the face *M*, the feed is shut off by closing the valve in the supply pipe *L*. Then the valve *P* in the lower branch of pipe *L* is opened and clean water is admitted to the feed chamber. At the same time the speed of the outer vessel is reduced, the centrifugal force that holds the concentrate crust on the face *M* thereby being weakened so that the force of the inflowing water from the feed chamber is sufficient to carry the concentrate upwards into the launder *C*, which conveys it to a different receptacle from the one into which it discharged tailing during the first phase of the cycle. This completes the cycle and the machine is again ready to receive and separate another charge of pulp.

As the separating operation is dependent upon the proximity of the outer face of the deflector to the top of the layer of concentrate on the face *M*, it is necessary to make provision for contracting the inner pan as the thickness of the crust of concentrate on the face *M* increases. This is accomplished by making the outer face *N* of the inner pan, of canvas made water-tight by coating with rubber. Between the canvas cover and side proper of the inner pan are the chambers *K*, which, as has been already noted, connect with the troughs *I* and *J*. At the beginning of the first phase, these troughs and chambers are full of water, which, because of its centrifugal force, generated by the rapidly revolving inner pan, causes the canvas walls to bulge out and come in close proximity to the face *M* of the outer pan.

The bulging canvas face is gradually retracted from the face *M*, as concentration progresses, by removing the water from the chambers *K*, and the troughs *I* and *J*. This is done by adjustment of

the scoop pipes *O*. These are vertical pipes bent at right angles near the bottom, and dipping into the troughs *I* and *J* as shown in the drawing, and in the direction opposite to the rotation of the inner pan. By gradually moving these pipes to the position of the tangent to the circle of water in the trough, the water may be gradually withdrawn from the chambers *K*, and troughs *I* and *J*. The movement of these pipes is done automatically by the worm and cam shown in Fig. 3, the movement being so timed that all the water will be removed at the instant that the bed of concentrate on the face *M* has attained its maximum thickness and the second phase of the cycle is about to begin. Of course provision is made for again admitting water to these chambers and troughs so that the deflector may be again expanded at the beginning of the first phase of each cycle.

All these events in the cycle of the concentrator are mechanically controlled, the mechanism being so adjusted that the events occur in sequence and in the proper order.

In Fig. 4 another type of the concentrator is shown, there being three collecting launders which are actuated by adjustable mechanism so that the troughs are so moved in relation to the discharge orifice that one receives concentrate, another tailing, while the third catches a middling product.

## Arbuckle Zinc Field, Oklahoma

By J. I. BLAIR\*

The new Arbuckle zinc field, situated eight miles southwest of Davis and in the heart of the Arbuckle Mountains in Murray County, southern Oklahoma, began to be prospected and developed immediately after the last allotment of the Indian lands. Since that time several cars of surface carbonate ore have been shipped and a few cars of blende in the form of concentrate.

Soon after the field was opened the camp boasted the name Robinette and was granted a post office. Both wood and water are scarce. The timber would probably be exhausted in two years if the camp became prosperous. Drilled wells would be the only source of water.

The country is a rolling plateau reaching an elevation of 1400 ft. formed by folded and faulted gray limestone, known as the Arbuckle limestone which is 6000 to 8000 ft. thick. This limestone lies in regular beds that dip and crop on the surface, rendering the country unfit for agricultural purposes and poor for grazing land. These tracts are destitute of

\*901 W. Ninth St., Coffeyville, Kan.

timber but where porphyry hills are found they are covered with a good quality of heavy oak timber.

### LIMONITE AND BLENDE FOUND

Of the minerals that have been found limonite is the most abundant. This ore occurs in regular strata interbedded with the limestone and is of good quality. It measures from one to four feet in thickness, but is not traceable for any distance. Zinc minerals occur in brecciated limestone in beds and in irregular deposits which outcrop over the entire section. No important discoveries of lead have yet been made. Besides these ores, molybdenite, scheelite and greenockite are found in small quantities; the latter occurs only associated with the zinc minerals.

The zinc ore is mined by openpits. It is a fairly clean ore and occurs as the sulphide at the grass roots, assaying 4 to 10% zinc as mined, an approximate assay of this ore being as follows: ZnS, 14%; CaCO<sub>3</sub>, MgCO<sub>3</sub>, 70%; BaCO<sub>3</sub>, 5%; Fe and Cd, 3%; SiO<sub>2</sub>, 5%; not determined, 3%. Associated with the blende as gangue are minerals calcite, dolomite and limestone.

The company developing the properties in the vicinity of the Hope-Schoeber district has a 75-ton mill which has had a varied experience due to the presence of the mineral witherite, which owing to its high specific gravity follows the blende, thereby contaminating the concentrates and enriching the tailings. At this mill there is a pile of tailings containing about 1000 tons which assay 6% zinc. At present the mill is being remodeled to treat these tailings.

### A 75-TON CONCENTRATOR

A typical day's mill run is as follows: 75 tons of 6% ore yield 4½ tons of concentrates, gross value \$200. Cost of production: Transportation to railroad at \$2.75 per ton, \$12.40; freight to smeltery at \$2.25 per ton, \$10.10; royalty at 12½%, \$25; operating expenses (labor), \$30; powder, caps and fuse, \$4; fuel (wood) at \$2.50 per cord, \$9; incidentals, \$1.50; total cost, \$92; net profit \$108. The high royalty is due to the fact that the present owners hold a sublease. The figures given for fuel are misleading in that but a limited supply of wood is available and when this is exhausted the fuel question will become a serious proposition.

Consul Maxwell K. Moorhead, of Rangoon, reports that wolframite has been discovered in commercial quantities in the Tavoy and Mergui districts of Lower Burma and also in the Southern Shan States. The total production in 1911 amounted to 995 short tons, which is more than double the previous year's production. Nearly the entire output was shipped to Germany.

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19,651—SURVEYOR'S BACKSIGHT SCONCE. F. L. Fisher. (Eng. and Min. Journ., June 8, 1912; ½ p., illus.) 20c.

19,652—TURBO COMPRESSORS—Use of Turbo Compressors in the Mining Field. George E. Edwards. (Min. and Eng. Wld., July 6, 1912; 3½ pp., illus.) 20c.

19,653—VENTILATION—Modern Ven- tilating Machines. W. Charlton. (Iron and Coal Tr. Rev., June 21, 1912; 3½ pp., illus.) Paper before So. Staffs. and War- wickshire Inst. of Min. Engrs. 40c.

19,654—WEIGHING DEVICE—Selbst- tätige Wiegevorrichtung zur Ermittlung des Wageninhaltgewichts. E. Blau. (Gluckauf, June 1, 1912; 2½ pp., illus.) Automatic weighing device for determi- ning the loading capacity of vehicles. 40c.

#### SAMPLING AND ASSAYING

19,656—ANALYSIS—Fortschritte auf dem Gebiete der Metallanalyse im Jahre 1911. Doring. (Chem.-Ztg., June 18 and 29, July 4, 1912; 6 pp.) Progress in the analysis of metals in 1911. 40c.

19,657—FLUORINE—Fluoranalysen. Drawe. (Zeit. f. angew. Chem., July 5, 1912; 1 p.) Analysis of fluorine. 40c.

19,658—GAS ANALYSIS—Die Verwen- dung des Zeiss'schen Interferometers zur technischen Rauchgasanalyse. Mohr. (Zeit. f. angew. Chem., June 28, 1912; 4½ pp., illus.) The use of the Zeiss interfe- rometer for the technical analysis of smoke gas. 40c.

19,659—MECHANICAL SAMPLING of Ores. O. Binder. (Mines and Minerals, July, 1912; 2½ pp., illus.) Various devices for taking representative samples from large or small quantities of ore. 40c.

19,660—"SALTING" of Samples and Means of Detection. George A. James. (Min. and Eng. Wld., May 25, 1912; 1½ pp.) 20c.

19,661—SAMPLING AND VALUATION OF ORES. A. Rzehuika. (Min. Journ., June 29, 1912; 1½ pp.) 40c.

19,662—SMELTER ASSAYS—Quick Combination Methods in Smelter Assays. A. T. French. (I. M. M. Bull. 95, 1912; 3 pp.) Remarks on paper previously in- dexed.

19,663—SPECIFIC GRAVITY DETER- MINATION—Practical Application of the Specific Gravity or Moisture Flask. H. Stadler. (Journ. Chem., Met. and Min. Soc. of South Africa, Apr., 1912; 1½ pp.) Author's reply to discussion. 60c.

#### INDUSTRIAL CHEMISTRY

19,664—AMMONIA—The Manufacture of Aqua Ammonia and Sal-Ammoniac Direct from Raw Gas Liquor. R. W. Hil- genstock. (Chem. Engr., May, 1912; 6 pp., illus.) 40c.

19,665—AMMONIUM SULPHATE from Ammonia and Sulphur Dioxide. Wal- ther Feld. (Met. and Chem. Eng., July, 1912; 2 pp., illus.) The extraction of am- monia and hydrogen sulphide from coal gases and the direct production of am- monium sulphate therefrom, using sul- phuric acid. 40c.

19,666—ATMOSPHERIC NITROGEN—La Fixation de l'Azote Atmospherique par l'Emploi des Nitrures d'Aluminium. F. Marre. (Genie Civil, May 11, 1912; 2½ pp.) 40c.

19,667—CYANAMIDE—Advance of Cy- anamide Industry in the United States. (Am. Fertilizer, June 29, 1912; 1½ pp.) 20c.

19,668—FERTILIZER FACTORY, A Modern. Peter S. Gilchrist. (Am. Fertilizer Hand Book, 1912; 9½ pp., illus.) Des- cribes plant capable of treating 20,000 tons of acid phosphate per annum.

19,669—MILK OF LIME—Mechanische Kalkmilchbereitung. Korten. (Gluckauf, June 29, 1912; 1½ pp., illus.) Mechanical preparation of milk of lime.

19,670—NITROGLYCERIN—The Beha- vior of Nitroglycerin when Heated. Wal- ter O. Snelling and C. G. Storm. (U. S. Bureau of Mines, Technical Paper 12, 1912; 11½ pp., illus.) Describes investigations made in the explosives laboratory of the Bureau of Mines.

19,671—POISONING—Occupational Poi- soning in Chemical Trades. W. Gilman Thompson. (Journ. Ind. and Eng. Chem., June, 1912; 3 pp.) 60c.

19,672—SULPHURIC ACID—Improved Sulphuric Acid Chambers. Thomas H. Norton. (Journ. Ind. and Eng. Chem., July, 1912; 2 pp.) 60c.

19,673—SULPHURIC-ACID INDUSTRY in the United States. (Am. Fertilizer, June 15, 1912; 2½ pp.) From "Mineral Resources of the United States." 20c.

19,674—WATER TREATMENT—Elec- trolytic Treatment of Water. G. D. Van Arsdale. (Eng. and Min. Journ., July 13, 1912; 1½ pp., illus.) 20c.

19,675—WATER TREATMENT—The "Luminator" Purification Treatment of Water for Steam Boilers. William Cullen. (Journ. Chem., Met. and Min. Soc. of South Africa, Mar., Apr. and May, 1912; 6½ pp., illus.) \$1.40.

#### MATERIALS OF CONSTRUCTION

19,676—CEMENT—Autoclave Boiling Test for Cement. H. J. Force. (Eng. News, June 13, 1912; 5½ pp., illus.) 20c.

19,677—CEMENT INDUSTRY in the United States in 1911. Ernest F. Burchard. (Advance Chapter from Mineral Resources of the U. S., 1911; 39 pp., illus.)

19,678—CINDER CONCRETE—Some Observations on the Disintegration of Cinder Concrete. George Borrowman. (Journ. Ind. and Eng. Chem., June, 1912; 1½ pp., illus.) 60c.

19,679—PORTLAND CEMENT—Free Lime in Portland Cement. H. E. Kiefer. (Journ. Ind. and Eng. Chem., May, 1912; 3½ pp.) 60c.

19,680—PORTLAND CEMENT—The Distribution of Power in Portland Cement Manufacture. Richard K. Meade. (Journ. Ind. and Eng. Chem., May, 1912; 2 pp.) 60c.

19,681—PORTLAND CEMENT—United States Government Specification for Port- land Cement. (Circular of the Bureau of Standards, No. 33, May 1, 1912; 28 pp., il- lus.)

19,681—REFRACTORIES—The Testing of Clay Refractories, with Special Refer- ence to Their Load-Carrying Capacity at Furnace Temperatures. (Technologic Pa- per of the Bureau of Standards, No. 7, Dec. 15, 1911; 78 pp., illus.)

19,682—SAND-LIME BRICK—The Pro- duction of Sand-Lime Brick in 1911. (Ad- vance Chapter from Mineral Resources of the U. S.; 3 pp.)

## PERSONALS

Mining and metallurgical engineers are invited to keep *The Engineering and Mining Journal* informed of their movements and appointments.

C. W. Purington left London on July 20 for Nome, Alaska.

James E. Pope has resigned as president of the New York Metal Exchange.

Frederick G. Clapp, of Pittsburgh, is examining oil properties in West Virginia.

G. Allen Crane, managing director of the Aporoma Goldfields, Ltd., of Peru, has gone to London.

Anthony J. McMillan, liquidator of Le Roi Mining Co., has arrived at Rossland, B. C., from England.

Edward R. Zalinski, of Salt Lake City, Utah, has been examining mines in the Jarbidge district in Nevada.

R. H. Elliot, of Berkeley, Calif., has been appointed mine superintendent at the Liberty Bell mine in Colorado.

Hon. W. H. Hearst, Ontario minister of mines, will shortly leave on a tour of inspection through Northern Ontario.

Charles Poirier, manager of the Vipond mine, Porcupine, Ont., has resigned, in order to practice as a consulting engineer.

Henry H. Armstead has returned to Guanajuato, Mexico from his recent trip to New York and will remain three months.

R. B. Lamb, consulting engineer of the Crown Chartered and Swastika mines, Ontario, has gone on a vacation trip to England.

Albert H. Fay, formerly on the editorial staff of the *JOURNAL*, but now with the Bureau of Mines and stationed at Pittsburgh, is visiting New York.

Frank W. Royer has opened an office as mining engineer in the Union League Building, Los Angeles, Calif. He still retains his office in the City of Mexico.

Elanchar M. Snyder recently returned to Los Angeles, Calif., from an examination near Globe, Ariz., and has left again to examine a property in the southern part of Nevada.

J. Morgan Clements, of New York, and Howard W. DuBois, of Philadelphia, have been examining mineral claims in the vicinity of Hazelton, Skeena district, British Columbia.

Dr. R. A. Daly is mapping a geological section along the Canadian Pacific Railway between Revelstoke and Golden, in the mountain section through which the railway passes, for the Geological Survey of Canada.

H. A. Brandt, formerly superintendent of the British Columbia Copper Co.'s Napoleon mine and mill, at Boyds, Wash., is now in charge of the company's Lone Star and Washington mines, at Darrell, Washington.

Capt. Harry Johns, for the last two years superintendent of the British Columbia Copper Co.'s Wellington group mines, Boundary district, B. C., recently examined a mining property in Montana for that company.

L. E. Ives, for some time past on the editorial staff of the *JOURNAL*, has resigned to accept a position with the Penton Publishing Co., of Cleveland, O., as mining and assistant engineering editor of the *Iron Trade Review*.

P. W. Sothman, chief engineer of the Ontario Hydro-Electric Commission, has resigned his position to become the head of a firm of consulting engineers. F. A. Gaby, assistant engineer to the Commission, will be his successor.

H. Kenyon Burch has been appointed chief mechanical engineer for the Inspiration Consolidated Copper Co. T. R. Drummond, superintendent of the company's Inspiration mine, now has charge of the Live Oak mine also.

W. Fischer Wilkinson has resigned his position as principal of the Cornwall, England, School of Mines. He is succeeded by J. J. Beringer, who was the principal for several years prior to 1910, when Mr. Wilkinson was appointed.

Hon. T. W. Crothers, Dominion minister of labor, Ottawa, Canada, was in British Columbia and Alberta early in July. At Fernie, in Crow's Nest Pass district, B. C., and at Lethbridge, Alberta, he was interviewed by deputations representing the coal miners.

Oscar H. Reinholt, recently with the Bureau of Mines, has left Pasadena, Calif., to examine occurrences of potash and phosphate in southeastern Idaho for Los Angeles interests. He will tour the Yellowstone National Park before returning and afterward will locate permanently in San Diego.

William C. Potter, mining engineer, formerly prominent in the business of the American Smelting & Refining Co., which he left in order to become president of the Intercontinental Rubber Co., has resigned from that position in order to accept the vice-presidency of the Guarantee Trust Co., of New York. Mr. Potter will not sever his connection with the Intercontinental Rubber Co., having been named chairman of its board of directors.

Dr. George H. Ashley has been appointed administrative geologist of the United States Geological Survey. This is a new office and makes the holder virtually vice-director of the survey, placing him in complete charge of the organization during the absence of the director, and in addition giving him charge of certain functions of the organization the whole time. Dr. Ashley has been a geologist of the survey since 1901 except for the years 1910 and 1911, when he was state geologist of Tennessee.

## OBITUARY

Henry Pennock died in New York, July 24, aged 72 years. He was born in Chenango County, N. Y., and went to Colorado when a young man. He was interested in a number of mines in that state and in Alaska. He retired and returned to New York several years ago.

R. B. Nickerson, formerly manager of the Mikado and Laurentian gold mines in the Manitou Lake district of northwestern Ontario died in California July 14. He left Canada for the Pacific Coast a few weeks before his death, with the intention of returning. He was well known in Canadian mining and business circles.

Isaac McHose died at Reading, Penn., July 24, aged 89 years. He was one of the pioneer ironmasters of eastern Pennsylvania. He helped to build the first anthracite furnace, at Catasauqua in 1839. Later he built and operated blast furnaces at Norristown and Reading. He was one of the organizers of the Temple Iron Co. He retired from business some years ago.

## Societies and Technical Schools

*Iron & Steel Institute (Great Britain)*—The autumn meeting will be held at Leeds, England, Sept. 30-Oct. 4. Besides the business sessions there will be visits made to works in Leeds and the immediate neighborhood, and to places of interest in the vicinity.

*Society of Chemical Industry*—The annual general meeting will be held in New York Aug. 31 to Sept. 3. On the evening of Sept. 3 members will go to Washington, and Sept. 4 to 13 they will participate in the proceedings of the International Congress of Applied Chemistry in that city. On Sept. 13 the final business meeting of the Society of Chemical Industry and the annual dinner will be held in New York.

*Canadian Mining Institute*—A meeting of the institute will be held in Victoria, B. C., on Sept. 18 and 19, next. The main object of this meeting is to afford Western members the opportunity of expressing their views on a number of questions relating to the business affairs of the institute, including proposed amendments to the by-laws and other questions of present importance. One or more sessions will be devoted to the reading and discussion of papers; and members proposing to contribute to the program are invited to communicate at once either with E. Jacobs, secretary of the Western branch, Victoria, B. C., or with the secretary of the institute, at Montreal. Arrangements are also being made for a meeting at Lethbridge, Alberta, of which further particulars will be sent out later.

# Editorial Correspondence

From our Representatives at Important Mining Centers

## San Francisco

July 25—The Southern Oregon & Northern Mining Congress, held at Yreka, Siskiyou County on July 19 and 20 was attended by delegates from all of the important mining districts in the extreme southern end of Oregon and the northern end of California. Yreka is the county seat of Siskiyou county and is reached by rail from Montague, a station on the main line of the Southern Pacific. From Yreka the mines are reached only by a wagon road or trail. The town is headquarters for a large amount of mining business, but is at a disadvantage in being off the main line, and because the mines are isolated. The next session of the Congress will be held at Redding in Shasta County. All of the counties in southern Oregon and northern California were well represented in the exhibits of mineral products. The exhibits from Josephine and Jackson Counties in Oregon, and Shasta and Siskiyou in California were so nearly alike that no prizes were awarded. W. H. Storms, state mineralogist for California delivered an interesting and comprehensive address upon the general condition of mining in the state and the work that is expected of the state mining bureau. M. E. Dittman of Kennett, spoke on copper in Shasta County and the condition of the copper market. J. W. Dyer, of Siskiyou County gave an interesting talk on the position of the prospector and also the mineral wealth of Scott Valley. The resolutions adopted by the congress included particularly a request for a large appropriation for conducting the state mining bureau. The congress appreciated that one of the reasons that the California mines have not been better presented to the general public was that the bureau has not been sufficiently recognized financially. The congress insisted on a resolution that the Federal government revoke all concessions and patents issued to the Southern Pacific company for lands in northern California on which minerals have been or may be discovered.

## Denver

July 27—The fate of the Denver Northwestern & Pacific Ry., better known as the Moffat Road, now operated from Denver to the Routt County or Yampa coal field and Steamboat Springs, a distance of 214 miles, is now being decided in this city by a noteholders' protective committee. It will be decided whether the road

will be sold, or the committee will lend its aid to the stockholders by a further extension of the time for the payment of notes, with a possible change of the receivers and of the policy or operating the road. Newman Erb, receiver of the Pere Marquette R.R., is also here and it is said that he may be asked to act as joint receiver with the present ones, Dodge & Perry.

Following the purchase of 400,000 shares of El Paso Consolidated by Swiss bankers it is now announced that an eastern syndicate, through J. P. Young of Colorado Springs, has offered 25c. per share for a controlling interest of the Isabella Mines Co. owning 120 acres on Bull Hill in the Cripple Creek district. This includes the Empire State mine. The property is credited with a production of \$2,000,000 and some rich gold ore was marketed; two carloads at one time brought \$316,000. The capitalization is \$3,000,000, of which 471,000 shares are in the treasury. E. E. Quentin, of Denver, is president and A. C. Gardner, manager of the mine. The mine is shipping regularly, but the purchasers intend to do extensive deep development.

## Salt Lake City

July 25—The Utah Apex is shipping 200 tons of lead ore and 50 tons of concentrates daily. Extensive development is being done, and large tonnages are being added to the reserves. During June the production averaged 183 tons per day, which included about 50 tons of concentrates. The mill is treating about 175 tons of ore daily. Operations in the new electric haulage system installed in the Parvenue tunnel began July 6. The line is over 3000 ft. long. The motor is a General Electric 3-ton, 20-hp., and hauls a train of 30 loaded cars, each carrying 1½ tons out of the mine. A 220-volt direct-current is used, furnished from a motor-generator set by the Telluride power company. The better haulage facilities will make a saving in mining costs, and make increase in the output possible. Net profits for the 14 months ended July 1 amounted to \$210,000 in round numbers.

The suit brought by the Conkling Mining Co. against the Silver King Coalition Mines Co. involving title to a strip of ground 135 ft. wide on the western end of the Conkling claim, and an accounting for ore mined therefrom, has been settled in favor of the defendant. The decision handed down by Judge Marshall,

of the United States district court, awards title to the ground in question to the defendant, and holds that the apex of the Crescent fissure vein in which the ore occurs is within the Monroe Doctrine, Cumberland, and Constitution claims, which are the property of the Silver King Coalition Co.

## Butte

July 24—The Anaconda Copper Co. is preparing to begin operations at the Southern Cross mine in the Georgetown mining district, purchased last spring, and for some time a force of men has been engaged in cleaning up the workings in preparation for the work. The shaft was only sunk about 400 ft. by the original operators, and the company will install modern machinery, electrically operated, and sink a three-compartment shaft, 300 ft. below the present deepest workings. As this is the deepest mine in the camp the Georgetown district is practically virgin territory as far as mining is concerned, and with the thorough course of development which will be pursued by the powerful company owning the Southern Cross, will come the first real knowledge as to the existence of commercial orebodies at depth.

During a recent electric storm, lightning struck the main flue leading from the Washoe smeltery to the stack, causing the falling in of the roof for a length of 50 ft., and compelling an immediate shutdown of the furnaces. It was at first believed that it would entail a suspension of work at the plant for some time, but a large force of men was put to work repairing the damage and the furnaces are in blast again after a shutdown of only two or three days.

The Conrey Placer Mining Co., which is operating four large gold dredges at the mouth of Alder Gulch, has just purchased from James Garrison, of Willis, the Duncan, Fehring & Garrison placer ground, consisting of 85 acres in Alder Gulch, opposite Adobetown, for \$16,000 cash. This ground was among the richest in Alder Gulch and has been worked with excellent results for many years by the ground-slucing method. Most of the gravel has been worked in that manner, but it is believed that only a small percentage of the gold was extracted. The Conrey Placer Mining Co. now owns practically the whole of Alder Gulch from Nevada, a mile below Virginia City, to Alder, a distance of eight miles, the

only exception being a fraction of a claim at Junction, owned by James H. Vanderbeck. It is believed that the company will build a dredge for the working of the newly acquired ground in the near future.

#### Kingman, Ariz.

July 25—A petition is being circulated in the county with the intent of invoking the referendum on the miners' lien law. It is understood that similar petitions are being circulated in Yavapai, Graham and Cochise Counties. The measure seems to be in general disfavor, one local paper stating that on account of its passage, the Consolidated Mines Co. has closed its leases, thereby throwing several hundred men out of employment. Of course, such actions may be taken in protest to the law and may influence sufficient voters to cause the recall of the measure before it has had a fair trial. To one not directly affected, it appears that it would foster legitimate enterprises and discourage wildcat ventures if its intent were properly considered and the necessary agreements for mutual protection were made between mine owner and lessee. Although the conditions imposed would undoubtedly work a hardship upon many until the effect of their operations were clearly shown by the temporary curtailment of development, it is believed that these same conditions are a step toward putting that branch of mining upon a better basis, incidentally protecting the miner and the merchant against financially irresponsible operators.

#### Negaunee, Mich.

July 27—The valuation of mines at Ironwood for 1912 has been completed by the local assessor. The three mining companies, Oliver Iron Mining Co., Newport Mining Co., and Cleveland-Cliffs Iron Co., were given 10% reduction on real estate values, but the personal-property assessments of the mining companies was increased by \$1,796,875 over last year's figures. The total assessment, real estate and personal, of the Oliver Iron Mining Co., in Ironwood, is \$16,752,890, which is distributed among the Norrie, East Norrie, Aurora and Pabst mines. The Newport Mining Co., owned by Ferdinand Schlesinger, of Milwaukee, is assessed at \$9,340,644, which is practically all from the big Newport mine, the largest iron mine in Michigan. The Ashland mine, owned by the Cleveland-Cliffs Iron Co., is assessed at \$162,000, besides which there is a valuation of \$192,000 on personal property, making a total of \$364,000 against the company.

The school for miners started by the Cleveland-Cliffs Iron Co., for training men as foremen, has been started with classes at Ishpeming and Gwinn. The number of members has increased from 50 to 130, and it is proposed to engage

an assistant for the instructor, J. H. Swent. It is desired to keep the different class divisions small, preferably less than 20, to permit individual instruction.

#### Jarbidge, Nev.

July 23—Recent developments on the Success have been highly satisfactory to the owners and of great importance to the future welfare of the district. Two ore-bodies have been encountered on the lower level, 400 ft. below the outcrop, showing better grade and greater width than in either of two levels above. This is the greatest depth yet attained in the camp and the block of rich ore found here will have a tendency to stimulate the opening of other properties at depth. There have been several other places where veins have been opened at depths of 100, 150 and 250 ft., but increase in grade was not as pronounced as at the Success. The engineer in charge for Mr. Wingfield ran in a tunnel along a small vein which showed little quartz and hardly any gold, for a distance of over 400 ft.; after a careful survey and figuring the possible difference in dip as shown between the upper workings in this mine and those of the adjoining Bluster mine, he concluded he was not on the main vein and ran a crosscut west for about 70 ft., where the Bluster vein was cut, showing quartz, but little gold. After drifting both north and south along this vein for about 75 ft. in each direction, the conclusion was reached that the gold in the vein did not go down as far as 400 ft. and Mr. Wingfield gave up his option on the property. After the snow was off the ground and the surface water was no longer causing annoyance, the owner of the mine tried to find the ore on this lower level. He worked for several weeks cleaning up the tunnels and timbering, then started to go ahead with both drifts. He had run less than 10 ft. in each when the vein matter suddenly changed and soon the owner had a full face of the best ore found in any part of the mine. The dip of the vein to the east had been less than expected and the inclination of the ore shoots to the north was greater, thus leaving the former work in the barren part of the vein between two oreshoots.

#### Albuquerque

July 27—The smeltery of the Santa Fé Gold & Copper Co. was blown in on July 25, according to reports from San Pedro mining camp; 200 men are employed in the mines and plant. The monthly payroll is \$30,000. Superintendent Haines Gridley, and other officials of the company were present when the plant started. The smeltery, which is 21 miles from the Santa Fé railway and 18 miles from Stanley, the shipping station on the New Mexico Central, starts out with an output of 200 tons per day. The company has about 3400 acres of land, and the best ore yet remains to be

handled in spite of the fact that in years past the company has turned out hundreds of thousands of dollars worth of products. It is mining chiefly copper, which contains silver and gold. In 1901 the ore averaged 4.25% copper, 3 oz. silver and 0.08 oz. gold. The smeltery produces a 60% matte, which is sold to the American Smelting & Refining Co. The coke is received from Raton.

#### Toronto

July 26—The trial of four men arrested for high-grading at Cobalt took place at North Bay, July 23, before Judge Valin. The principal witness against them was George P. Williams, the Pinkerton detective, who gained their confidence and ostensibly joined an expedition to rob the Timiskaming mine. One of the prisoners was discharged and the others convicted and sentenced as follows: Robert Pierce, 14 months' imprisonment; John Mitchell, 13 months, and Peter Cassell, 9 months.

Final arrangements have been made to change the location of the mining town of Frank, Alberta, which is in danger of destruction from a landslide. The municipal authorities have called for tenders to be received by the end of July for the removal of all the buildings.

#### Porcupine

July 26—The action of several of the mines in the Pearl Lake district reducing the wages of their employees to correspond to the scale paid by the Dome and Hollinger has given rise to rumors concerning a general strike throughout the district. The possibility of such action by the miners is most unlikely, as the union has not a strong hold, and is in a weak financial condition. The presence of so many foreigners among the miners is also another argument against a strike, as the union finds it almost impossible to influence them.

#### Nelson, B. C.

July 20—There is some talk here of a consolidation of Sheep Creek properties and the erection of a central reduction plant. The mines considered can be divided into two groups: The Queen Kootenay Belle, and other properties in the immediate vicinity, on the south side of Sheep Creek; on the north side, the Nugget, Motherlode and perhaps the Golden Fawn. The topography of the district is suitable for a scheme of this kind, as at this point the valley narrows into practically a cañon. The Nugget-Motherlode series of veins parallel each other and can be developed at considerable depth from the Sheep Creek slope. At present these properties are running small mills, with their attendant disadvantages. A central mill, and up-to-date reduction methods, would probably cut down the costs and increase the recovery.

# The Mining News

The Current History of Mining

## Alaska

*Alaska Treadwell*—During June the mills were operated 30 days crushing 82,180 tons of ore for a gross yield of \$204,577 and \$96,458 net yield.

*Alaska Consolidated*—This company is employing a large force of men to open its Nugget Creek mines. A crosscut at 200 ft. recently cut the large calcite-bornite vein. The condition of the trail alone prevents shipments by pack train. Preparations are being made to sink a shaft 250 ft. at which depth crosscutting will be done. A pumping plant will soon be delivered at Strena, to be sledded in on the first snow. About 1000 sacks of 65% ore are piled on the dump and another year's development is expected to place sufficient ore in sight to warrant the erection of a reduction plant.

*Rarus*—At this group of claims on the Kuskutana River, the property of the owners of the Alaska Consolidated, there is a contact vein about 400 ft. wide. A contract has been let for 100 ft. of tunnel to Danielson & Oeterson. Alfred B. Iles is manager.

*Kuskutana Copper Co.*—Twelve men are working on two of the levels and results are said to be satisfactory. The property is the southern extension of the Rarus and was taken over last autumn by E. F. Holden. One level has entered the mineral zone after passing through the limestone at a depth of 100 ft. The drift is being continued to tap other veins.

*Kennicott*—These mines are shipping 50 tons of ore per day and the concentrator will probably be running smoothly in a few days.

## Arizona

### COCHISE COUNTY

*Calumet & Arizona*—It is reported that the company is developing an openpit mine that it has held under option for several years. It is said that for some years to come, steam shovels can be used with little stripping.

### GILA COUNTY

*Barney*—Churn-drill hole No. 3 on the Barney group west of, and adjoining the Live Oak mine, has been discontinued at a depth of 1015 ft., and the exploration of the claims has been finished. No more holes will be drilled and the Lewisohns will relinquish their option on the property. Three holes were drilled, one 1450 ft., one 600 ft., and one 1015 ft. deep,

none found ore, although sulphides of iron and copper were discovered in small quantities.

*South Live Oak*—Churn-drill hole No. 2 is over 655 ft. deep in granite. No ore has yet been discovered.

*Old Dominion*—Reports state that an immediate increase in the output to 500,000 lb. per month, is planned. Lower-grade ore will be treated.

*Southwestern Miami*—Churn-drill hole No. 5 corresponding to hole No. 3 of the Barney group and which was being drilled at the junction of the Barney, Southwestern Miami, and Inspiration Consolidated properties at the equally shared expense of the three companies, has been discontinued at a depth of 1015 ft. without ore having been discovered, although the schist was found to be slightly mineralized. Three other holes are being drilled as rapidly as possible, the deepest of which is over 720 ft. deep. All holes are in schist.

*Miami*—Two churn-drills are at work developing the northeastern part of the property where it is officially stated that a large tonnage of low-grade ore is being proved. Diamond-drilling continues on the 570-ft. level.

## California

### AMADOR COUNTY

A committee of 125 men has been named by the board of supervisors to confer with the state highway commission regarding the extension of the county roads in Amador and Sacramento counties to connect with the proposed state highway. It is understood that if the connection is made Amador's share of the expense will have to be raised by a bond issue.

*Bunker Hill*—The 73d. monthly dividend was paid on July 15, at the rate of 7½c. per share. The semi-annual statement shows that the dividends for the six months aggregated \$90,000; surplus in treasury July 1, \$40,613. Ore mined and milled, totaled 31,475 tons, yielding between \$5 and \$5.50 per ton. The mill was operated 151 days, and was hung up from Feb. 12 to Mar. 9, owing to the breaking of a skip cable. As a large amount of development is in progress the directors intimate that it may be expedient to reduce the rate of dividends. The drain tunnel at the 1250-ft. level has been cleared, thus making an extra outlet from the mine. The sinking of a second shaft

is contemplated. E. Hampton, superintendent.

*Keystone*—The shaft was deepened 102 ft. in June, the formation being hard greenstone. The new compressor and blower are operating in good order. C. R. Downs, Sutter Creek, manager.

### CALAVERAS COUNTY

The Utica Mining Co. which supplies water and electric power for other mines at Angels Camp besides its own has tapped the supply reservoir at Silver Lake, thus assuring a supply for the mines and the town for the next three months. At the end of February there was fear of a shortage of water, but the April and May rains provided against such shortage as might affect the mining.

*Lightner*—Sinking is now in progress below 900 ft., where a good block of ore was recently disclosed.

*Utica*—A new shoot of ore is reported at the Cross shaft, disclosed in the prospect winze.

*Gold Cliff*—A new orebody is reported in this mine, which is one of the Utica properties, and which adjoins the Dolling. F. J. Martin, superintendent.

### ELDORADO COUNTY

*Yeadon*—This property at China Hill near Eldorado has been bonded to San Francisco and Oakland men who are proceeding with development.

*Greenstone*—Development is in progress by New York men, and it is reported that the work of the last six months has shown some fine prospects.

*Davidson*—This property near Placerville is being prospected by shaft, drift and opencuts. E. M. Morgan, manager.

### KERN COUNTY

*Goodhope*—A large body of ore is reported to have been blocked out in this mine. The control of the Consolidated Mines Co., which operates the mine, has not been settled yet.

*Blackhawk*—This mine is being operated by the owner, D. A. Blue. A shaft is being sunk 200 ft. on a well defined vein. This vein averages about 5 ft. wide. There is a 5-stamp mill in operation, crushing \$18 ore.

### MARIPOSA COUNTY

*Treasure*—The 300-ft. shaft is being deepened. Drifts were driven from the 250-ft. level 300 ft. north and 175 ft. south. Drifts will also be driven from the 300-ft. level. The mine is equipped

with a 10-stamp mill, electrically driven. J. W. McGinn, of Hornitos, superintendent.

#### PLACER COUNTY

*Big Bursar Mining Co.*—This company has purchased the properties of the Orpheum Mining Co. in the Ophir district. The price is not made public, but it is estimated that the mill and other equipment are worth about \$50,000. K. Wertheimer, of San Francisco is president; Charles H. Peach, of Newcastle is secretary.

*Republic*—Snedakar & Foley have purchased a compressor and will install it at this Grouse Cañon mine.

*Home Ticket*—W. S. Keith, manager, has suspended work on this property on account of shortage of water.

*Pacific Mining Co.*—Installation of the pumping plant at the Big Bar placer mine has been completed.

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## Colorado

#### CLEAR CREEK AND GILPIN COUNTIES

*New Era*—This Trail Creek mine is being unwatered with the view of further development in the lower workings. James Cousins, manager.

*Stanley*—During June the fifth level south heading was advanced 130 ft. The drift has passed through another porphyry dike and is again in ore. The best ore is usually found just south and west of each porphyry intrusion.

*Gem*—The reconstruction of the shaft house is under way; George Keys, contractor in charge of the work.

*Mattie*—Additional development is planned. The mill in Chicago Creek is being overhauled. A contract has been let to sink the main shaft 300 ft. and the work will be started at once. The shaft is now about 700 ft. deep.

*Bates*—This mine in Chase Gulch is now being reopened after a long period of idleness. Trial shipments have been satisfactory.

#### LAKE COUNTY—LEADVILLE

*Fairplay*—Gold ore is being sacked which was taken from a 3-ft. streak which produces about five tons daily; 20 tons of medium-grade ore are being hoisted daily.

*Colonel Sellers*—From the lower levels 5000 tons of zinc sulphide ore are being hoisted daily. Manager Barglar can increase his output as soon as the smelters have increased capacity.

*Yak Tunnel*—About 12,000 tons is the output of this property for the month. The company is prospecting in Vegas territory at the head of Big Evans.

#### SAN JUAN DISTRICT

*Camp Bird*—The total net profit for June operations at all the properties of the company was £33,400.

*Smuggler-Union*—The new mill is in operation and treating about 350 tons per day, about 35 tons of which is from old dumps in Marshall Basin.

*Lewis*—The trail through Bridal Veil Basin to this mine is open and the transportation of supplies and concentrates by mule train has commenced. Concentrates produced last autumn are being taken to the railroad for shipment. Development was continued during the winter with satisfactory results. T. L. Livermore is manager.

*Ophir Consolidated*—The crosscut tunnel is over 1800 ft. long and has cut two blind veins that show fair milling ore. The Butler vein is expected to be cut within 50 feet.

*Carbinera*—This mine on Silver Mountain is shipping from one to two cars per week of lead-silver ore, to the Salida smeltery, that nets about \$40 per ton.

*Alta*—This mine, owned and operated by the Wagner Development Co. is shipping about 40 cars per month of lead-silver concentrates.

#### TELLER COUNTY—CRIPPLE CREEK

*Strong*—Since the drainage of the shaft of this mine at Victor, by the deep drainage tunnel, the shipments have been increased to two cars per day of high-grade ore. Samuel McDonald is manager.

*Gold Coin*—The complete success of the deep drainage tunnel is exemplified by the fact that in this mine at Victor, the water has receded 160 ft. since the flow was first tapped in the heading. It is still receding at the rate of 4 in. per day and is now 75 ft. below the 10th level. In the west end of the district the recession is still greater.

*Montrose*—From a lease started only three weeks ago by Martin & Walker, on the Montrose shaft on Ironclad Hill, ore is already being mined and a shipment is ready to go out.

*Petril*—A five-car shipment of ore is reported by Finley & Rankin, lessees from the Petril on Squaw Mountain. The ore is being mined through the Squaw Mountain tunnel.

*Molly Kathleen*—The plant will be steamed up at once by Abram Rapp, who has been given a lease by Gartner & Co., the owners, and extensive development will be done.

*Squaw Mountain Mining Co.*—A 15-hp. electric hoist has been installed on the April Fool claim, and a shaft will be sunk at once. The company has its headquarters at Springfield, Mass. Manager Cole in charge.

*United States Reduction & Refining Co.*—The company has opened its cyanide plant near the Standard mill for the treatment of the tailings from the plant, amounting to about 90,000 tons. The plant will treat about 700 tons per day

and 25 men will be employed at the work, according to Supt. C. A. Sheetz.

*Jennie Sample*—General Manager John T. Hawkins of Colorado Springs has leased the dump to Morgan & Churchill; they have billed out the first shipment of mill ore.

*El Paso*—The Nicholls shaft will be completed to the 800 level by Aug. 1, opening 250 ft. of virgin ground, and a heavier hoisting plant is being erected, which will largely increase the producing capacity.

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## Idaho

#### LEMHI COUNTY

The Gilmore camp is shipping about 150 tons per day of lead-silver-gold ore averaging from \$30 to \$40 per ton.

*Gilmore*—The company recently opened a 10-in. vein of gold ore, of exceptionally high grade.

*Oriole*—This company is contemplating leasing the Mountain Boy mine, four miles from Gilmore. M. R. Lare is secretary, at Gilmore.

#### SHOSHONE COUNTY

*Tamarack & Chesapeake*—It is reported that the officers have been instructed, at a recent special meeting of stockholders, to complete the organization of the Tamarack & Custer Consolidated Mining Co., which will be a consolidation of the Tamarack & Chesapeake with the Custer company.

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## Michigan

#### COPPER

*Osceola*—Operations have been resumed at all the shafts of the Osceola's North Kearsarge branch. It is said that the pumps are handling the water satisfactorily and that practically no tonnage was lost.

*Wolverine*—Developments in the Osceola lode on Wolverine territory have not been encouraging. The lode was found in the crosscut driven from the shaft to intercept it, but results were somewhat disappointing. Wolverine averaged 24½ lb. copper per ton for June output.

*Calumet & Hecla*—Under the provisions of an indenture dated Mar. 1, 1909, between the Calumet & Hecla Mining Co. and the City Trust Co., trustee, notice is given that all of the outstanding 5% gold coupon notes of the Calumet & Hecla company, dated Mar. 1, 1909, and issued under the indenture will be paid and redeemed by it on the next semi-annual interest date, Sept. 1, at par and accrued interest, at the Old Colony Trust Co. Interest on the notes will cease on Sept. 1. The notes to be redeemed amount to \$1,000,000 and were for 10 years, pay-



ment being anticipated. They were issued for the purchase of Bigelow properties, the total cost of which was \$8,519,000; a total of \$5,819,000 in 10-year notes remains outstanding.

#### IRON

The Jones & Laughlin Steel Co., is the most extensive user of diamond drills on the Marquette Range. The Cleveland-Cliffs Iron Co., the largest producer of the district, which had a dozen drills in commission a few years ago, is now doing little exploratory work, the development of the deposits already discovered being sufficient to occupy its attention for years to come.

*United States Steel Corporation*—This corporation is testing a number of tracts in the Republic field and in the Fence River country, but has fewer drills working than in former years.

*American-Boston Mining Co.*—This company, at Diorite, will install in its power plant, a 500-kw., 2300-volt Curtis turbo-generator, that will be furnished by the General Electric Company.

*Salisbury*—At this mine of the Cleveland-Cliffs Iron Co. in Ishpeming, the old Cornish pump, which has done service for many years, will shortly be changed for an electric centrifugal pump to be run from the company's new water-power plant; an electric hoist will also be installed.

*Mineral Mining Co.*—At the Konwinski or Wauseca mine at Iron River, the new air shaft is nearly completed.

*Jones & Laughlin Co.*—At the Forbes mine at Iron River, operations have been delayed by waiting for the new steel headframe. It is expected to start shipping ore this autumn; 50 men are employed, 12 of whom are engaged in sinking the shaft, which is down 200 feet.

*Breitung-Kaufman*—The big high-grade stockpiles at the Mary Charlotte and Breitung-Hematite mines are fast becoming depleted. These ores are among the highest grade soft ores on the Marquette range.

#### Montana

##### BUTTE DISTRICT

*Anaconda*—The Pennsylvania mine of the Anaconda company was closed down July 17 for remodeling the hoisting engine for compressed air in place of steam. Immediately preparations were begun toward the resumption of sinking the main shaft, three compartments wide, from its present depth of 1800 ft., to the 2000-ft. level. A station will be cut when this level is reached, and crosscutting to the veins will be started. For sinking a small single-drum hoist, to be run by compressed air, is being placed on the 1800-ft. level, and sinking will be begun before Aug. 1. Retimbering of the air

shaft, three compartments wide, from the 1400-ft. level to the surface, which was commenced some months ago, has now reached a place slightly above the 700-ft. level, and will be continued uninterruptedly to the surface, which it should reach within the next three or four months. The development work being carried on by the driving of the south crosscut on the 1800-ft. level, will be continued during the shutdown. The breast of this crosscut is now about 1775 ft. from the shaft, and advance is being made at the rate of about 100 ft. per month. In addition to this work, development will be carried on as formerly by a drift on the 1800-ft. level, a raise on the 800-ft. level, and a drift on each of the 1400- and 1500-ft. levels. No stopping will be done, nor ore hoisted during the shutdown. The chippy hoist will be kept in commission as usual during the period that the mine is closed, for lowering supplies, and for hoisting to the surface, waste taken from the shaft and development workings.

*West Gray Rock*—The shaft was sunk from the 1300- to the 1600-ft. level, and was completed to this level early in July. A station has been cut on the 1400-ft. level, and similar work has been started on the 1600-ft. level. On the former level exploration work is being carried on, and will shortly be commenced on the bottom level. A new surface plant consisting of a carpenter shop, machine shop, and blacksmith shop, is in the course of erection, and a new and modern changehouse, containing 280 steel lockers and 12 shower baths, as well as a separate compartment for the use of the shift bosses, has just been completed. A new timber yard has been graded and is ready for stocking with mine timbers; also a trestle has been constructed for a spur from the railroad track to the timber yard so that the timber may be skidded direct from the cars to the yard platform. There are about 210 men on the payroll at present, and an average of 11,000 tons of ore is being hoisted monthly.

*Butte & London*—It is reported that a crosscut in a northeasterly direction has been run from the High Ore mine of the Anaconda company on the 2000-ft. level through a claim adjoining the Butte & London property on the west, intersecting a wide vein carrying high-grade ore in commercial quantities. This vein passes through Butte & London ground and is said to apex in it. It is believed that a deal will be closed whereby operations in the Butte & London will soon be resumed.

*Silver Bow*—About 125 men are employed underground and on the surface, and an average of approximately 6000 tons of ore is being hoisted monthly. The quintuplex electric pump recently installed on the 1000-ft. level is pump-

ing about 240 gal. of water per minute to the surface. This water carried in solution about 0.1% copper, and it flows through a precipitating plant on the surface, which is operated under a lease from the company. The old Riedler steam pump, which was used before the electric pump was installed, was left connected on the 1000-ft. level, and is used whenever it is necessary to shutdown the new pump for the changing of plungers or other repairs.

*Berkeley*—Sinking has been resumed in the shaft from the 1000-ft. level, and a crosscut is being driven on the 1500-ft. level of the Tramway mine to a point under this shaft, when raising will be commenced to meet the sinking force. On account of bad air encountered in this crosscut from the Tramway workings, only one shift of eight hours each day, is working there. There are about 225 men on the payroll, and about 14,000 tons of ore is being hoisted per month.

#### Nevada

##### COMSTOCK LODGE

*Ward*—The Starret pump has been lowered to the 2200 level. The work of pumping out the shaft to the 2475 station has begun.

*Consolidated Virginia*—Sinking in the ore chimney below the 2400-ft. level has been started. A drift in the same vein at the top of the 3-compartment raise on the 2300, will also be undertaken soon.

##### CLARK COUNTY

*Yellow Pine*—The first dividend amounting to \$28,508, or 3c. per share on the stock outstanding, has been declared and is payable July 25, 1912. It is the intention of the company to declare a regular monthly dividend of 1c. per share, amounting to \$10,000, and to divide the surplus quarterly. At the present rate of output, the surplus will exceed the regular dividend. Orders have been placed for a classifier and additional concentrating tables of the Overstrom type; a new pumping plant is to be installed. The force at the mine has been increased, and considerable development is contemplated.

*Lost Sheep*—Charles F. Byram, of Chicago, has purchased a controlling interest in this property, on the north slope of Charleston mountain, about two miles from Harris Springs. Development is being done under the superintendence of J. E. Armstrong. The deposit is a vein of copper glance and carbonate in sandstone, containing gold and silver.

*Pilgrim*—The shaft is now 160 ft. deep; stringers of lead carbonate ore have been found in the face. Hardy & Robbins are owners of the property; Harvey Hardy, manager.

## ELKO COUNTY—JARBIDGE

*Etta B.*—A. S. Baty has started work on this claim. Some of the coarsest gold specimens found anywhere in the camp were taken from this claim late last season from a prospect hole on the Bacon vein. The Bacon vein was traced for about two miles and gold was found along it on five different properties.

*Buff*—There is a tunnel about 30 ft. on the vein which is beginning to show ore of more even grade. The vein has been opened by trenches. There is more iron sulphide in the vein here than at the north end of the camp, although as far as tested the surface ores are low in gold.

*Sixth Crater*—About one mile east of the Buff and just over the ridge near the head of Cougar Creek, several parties are working and some rich specimens of ore have been found, but there is considerable snow, and it is hard to tell as yet whether this gold comes from quartz in place or from float.

## ESMERALDA COUNTY

*Florence-Goldfield*—The new orebody on the 250-ft. level has been explored extensively and an excellent grade of milling ore has been opened. The main shaft is about 1175 ft. deep.

*Goldfield Merger*—The work of enlarging the Grizzly Bear shaft of the Consolidated is nearing completion, and drifting will soon be resumed on the 1300-ft. level.

*Sandstorm-Kendall*—Lateral work has been suspended and sinking of the old Kendall shaft from the 420-ft. point to the 500-ft. level is progressing. A three-drill compressor was recently installed.

*Goldfield Merger*—Rapid progress is being made in the sinking of the large shaft which has now reached a depth of 1150 feet.

*C. O. D. Consolidated*—A winze is being sunk in the milling ore recently encountered on the 100-ft. level. If conditions warrant the present small hoist will be replaced with a larger one.

## HUMBOLDT COUNTY

F. C. Alsdorf, representing New York men, is drilling for copper ore at Red Butte, about 60 miles west of Winnemucca. Indications are said to be favorable.

*Barber Cañon Placer Mines*—Messrs. Mead and Jackson, of Denver, have taken over these mines in Barber Cañon, about 20 miles southwest of Winnemucca. Machinery has been installed, including a No. 9 Cameron pump and a 50-hp. boiler, and development has been commenced. J. B. Truett, Mill City, Nev., is superintendent.

## LYON COUNTY

*Mason Valley*—During the first 15 days in July, the smeltery treated 10,877 tons

of ore, an average of 735 tons per day. The number of custom shippers is increasing satisfactorily, at present amounting to over 50. During the above period the smeltery received 1759 tons from these custom shippers, an average of 117 tons per day.

*Tonopah Mining*—During the quarter ended May 31, ore worth \$832,074 was milled. Gross value of mill products was \$751,916. Net income was \$453,795 and \$15,239 were spent on exploration.

## NYE COUNTY

Shipments in tons from Tonopah mines to date and for the week ended July 18, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3,350	96,369
Tonopah Belmont	1,950	59,026
Montana-Tonopah	1,022	29,532
Tonopah Extension	1,036	28,283
West End	750	20,549
Midway	40	300
MacNamara	458	10,935
North Star	.....	80
Totals	8,606	245,074
Estimated value	\$240,150	.....

The Cash Boy, Monarch Pittsburg and Great Western properties resumed operations this week.

*Tonopah Extension*—The mill clean-up for the first fortnight of July resulted in the shipment of 25 bars of bullion, weighing 2770 lb. (estimated value \$31,200), from 2304 tons of ore. The big orebody on the 500-ft. level has also been opened on the 600-ft. level. In the extreme western workings 900 ft. west of the shaft the western ore shoot has been opened on the 660-ft. level.

*MacNamara*—The 50-ton filter press in the mill was struck by lightning, July 19, entailing a loss of \$4000, fully covered by insurance. Not a leaf was injured. While a new filter press is being installed the output of the mine will be maintained by shipments to the smelters.

*Jim Butler*—Shipments to the old Belmont mill at Millers will be commenced in a few days. The property shows reserves of over 20,000 tons, said to assay from \$25 to \$33 a ton.

*Tonopah-Belmont*—The new mill commenced operations July 24. The plant comprises 60 stamps, 8 tube mills, 12 Deister concentrators and complete cyanide plant; cost \$450,000, and one year was required for building.

*Golden Anchor*—The crosscut from the 985-ft. level entered the foot-wall side of the vein July 24 and shows the ore to be of much higher grade than when cut in the shaft. A more powerful hoist and a 10-drill compressor plant has been installed.

*Mizpah Extension*—Rich ore has been found on the 1000-ft. level. A shipment will be made soon.

*Halifax*—A crosscut to the vein has been started from the 1400-ft. level.

*Tonopah Midway*—A car of high-grade ore from the 535-ft. level was shipped this week.

## New Mexico

## GRANT COUNTY

Phelps-Dodge officials were in Fierro recently looking over the mining claims and inspecting operations. Operations of late have been increased at Fierro and the shaft on the gold-copper mine will be sunk 200 feet.

The output of the mines at Fierro has been more than doubled this month, and two trainloads of 14 or 16 cars each of ore are shipped out daily or an aggregate of 1200 tons. About half of this is mined by the Colorado Fuel & Iron Co., which is again working the "86" mine as well as the Jim Fair.

*United States Copper Co.*—At Hanover ore is being taken from the Philadelphia mine, which is proving to be a valuable property, the grade of the ore improving with development. Floods during the last week have threatened to carry away much of the railroad track between Hanover and Fierro and the railroad company has a large force of men at work strengthening the weak places.

*Chino*—During June production amounted to about 1,540,000 lb. of copper. Good progress is being made at the concentrator. Three units are in commission. One unit has been shut down pending certain adjustments, but two units are always in commission. Some of the steam shovels are now working in clean sulphide ore, which should increase the extraction. This is now said to average between 65 and 72%.

## LUNA COUNTY

*Tres Hermanos*—Three shafts are sinking in ore, some of which is of shipping grade. This is being stored. D. Hathaway is foreman.

*Victoria*—Frank Wyman is making regular shipments to the El Paso smeltery. A car of high-grade zinc carbonate was recently shipped to Iola, Kan.

## SOCORRO COUNTY

*Deadwood Mines*—The erection of the new headframe and resetting the hoisting engine were accomplished in record time. The mine equipment is again complete and regular hoisting established. The new 50-hp. auxiliary engine for the mill is about ready for operation.

*Deep Down*—Lessees continue to send a good tonnage of ore to the custom mill.

*Ernestine Mining Co.*—The new oil engines are giving excellent service. During the week 595 tons of ore were treated, yielding 78 sacks of high-grade concentrates, and the usual amount of precipitates, which are being smelted. The low weekly tonnage was due to shortage of water for a few days, but the summer

rains have started and there will doubtless be an ample flow in the creeks for the continuous operation of all the mills henceforth.

**Oaks**—The week's development on the Pacific and Johnson mines yielded 70 tons of ore which was sent to the Deadwood mill. The last 115 tons treated from these mines averaged \$22 per ton.

**Mogollon Gold & Copper**—Three shifts are sinking the winze in the Little Charlie tunnel, now down 80 ft. Proceeds of ore taken out in development are more than ample to meet development expenditures.

**Iron**—A good tonnage of ore is being delivered to the Deadwood mill from the development of this group.

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## Oregon

### LANE COUNTY

**Treasure**—This mine, formerly owned by an English syndicate, has been sold.

**Great Northern**—Considerable development has been done on this property. The buildings that were destroyed by fire last autumn, have been replaced and men are getting the machinery in shape.

**Vesuvius**—F. J. Hard, manager, states that he will have the 10-stamp mill at this mine in operation soon. Good free-milling ore has recently been opened in the lower levels.

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## Pennsylvania

**Pittsburgh Steel Co.**—Rapid progress is being made on the construction of the blast furnaces at Monessen. Men are working night and day, except Sunday. Four of the stoves of the first blast furnace have been practically completed, and work has been started on four more of the second blast furnace.

**American Sheet & Tin Plate Co.**—Announcement is made that the American Sheet & Tin Plate Co. will construct at once two additional openhearth steel furnaces at its Vandergrift, Penn., works making a total of 12 furnaces, and utilizing all the space it now has in its present buildings for this purpose. It is quite likely that four additional furnaces will be added later.

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## South Dakota

**North Homestake**—The company has completed about 450 ft. of development on the 620-ft. level of the mine, at Maitland, with satisfactory results.

**Golden Reward**—D. D. Findley is cleaning up the company's old smeltery at Deadwood, with encouraging results. Several cars of furnace bottoms have been shipped, together with flue dust and miscellaneous gatherings from the ruins of the old furnaces and stacks.

**Castle Creek**—The dredge at Mystic is operating steadily after the winter shut-down. During the idleness the boat was

thoroughly overhauled and some minor changes made. Rollers were put in the main screen to break up clay balls which it was found were carrying off an appreciable amount of gold.

**Golden Summit**—This mine, at Hill City, operated by D. Canfield, has recently produced some unusually rich ore. The high grade has been shipped to smelters and the balance treated in the stamp mill on the ground.

**Forest City**—A new 10-stamp mill has been erected on the property and is said to be one of the best-equipped small plants ever built in this district. It is practically ready to run. The mine contains a small vein of high-grade, free-milling quartz.

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## Utah

### BEAVER COUNTY

**Horn Silver**—June shipments are given as 20 cars; nine cars as the July output thus far. About 70 men are employed.

### JUAB COUNTY

Tintic shipments for the week ended July 19 were 192 cars.

**Gold Chain**—Shipping ore has been followed for 80 ft. on the 700-ft. level, and it has been developed for 90 ft. above and 50 ft. below it. Ore has been found on the 500, which appears to be a continuation of the blocks on the lower levels. From 500 to 600 tons weekly are being shipped.

**Lower Mammoth**—During the first six months of 1912 over 2000 ft. of drifting and 350 ft. of raising was done. Much of this work was done on the 1000 and 1500 levels. On the former, where cross-cutting west into unexplored ground has been done, a fissure opened 125 ft. from the west side line is being followed. On the latter, new ground to the north and west of the shaft, showing much mineralization is being prospected. A drift to the north from this level is 230 ft. in Gold Chain ground, and that company is paying the expenses of the work. Receipts were \$19,376, which includes \$10,000 from assessment No. 29 and \$186 from assessment No. 30 (the latter amounting to \$10,000 did not fall delinquent until July 19), and an overdraft of \$7564, July 1. Expenditures, labor, supplies, etc., including an overdraft of \$5091, July 1, were \$19,376.

**Grand Central**—The drift to the southeast on the 2300-ft. level is within 30 to 40 ft. of a point directly below the winze in ore from the 2200. The output for the week ended July 19 was 14 cars.

**Beck Tunnel**—Ore has been opened on the 175-ft. level in a drift to the southwest. During the week ended July 19, four cars were shipped.

### SALT LAKE COUNTY

**Utah Consolidated**—During the first

six months of 1912 there were shipped 100,808 dry tons of copper ore and 8025 dry tons of lead ore, net earnings being estimated at slightly over \$300,000. The tonnage of lead ore in sight has been increased over the figures given in the last annual report, and the copper ore reserves have been maintained at approximately the same tonnage and grade.

**Utah Metal**—The tunnel is within 2600 ft. of completion; the Bingham side is in 1600 ft., and the Tooele side 7600, the total projected length being 11,800 feet.

**Bingham-New Haven**—A dividend of 10c. per share, amounting to \$22,869, has been paid; up to date \$2 a share has been paid. The property, which adjoins the Utah Consolidated, is controlled by Eastern men.

**Utah Copper**—The June output amounted to 9,234,465 pounds.

**South Hecla**—A mineralized cave has been opened on the Quincy level under the Kate Hay shaft, where a heavy flow of water was encountered. Drifting to the left is being done to avoid the water, and to cut the vein beyond the cave.

**Michigan-Utah**—Shipments for the last 30 days amounted to 600 tons of ore, averaging \$30 per ton. The work of constructing the 4½-mile tramline to Tanners Flat is in progress, and it is expected that the line will be in operation by the end of August. The initial capacity of the line will be 100 tons daily, and ore from both the Utah Mines Coalition and the City Rocks will be sent out via this route, which, it is thought, can be kept open through the winter.

### SUMMIT COUNTY

**Alta-Emerald**—Articles of incorporation for a new company to be known as the Alta-Emerald Mining Co. are being prepared with a view to operating the Emerald claim in Alta near the South Hecla. The property is being opened through an old tunnel in the gully near the Alta-Hecla boarding house. This tunnel, which is 600 ft. in, will, with 40 ft. more work, reach a place 200 ft. below the discovery shaft on the Emerald.

Park City shipments for the week ended July 19 were 4,711,620 pounds.

**Snake Creek Tunnel**—The tunnel is 500 ft. in, or about one-third of its projected length. The face is in limestone mineralized with iron pyrites. A large flow of water has been developed.

**Barry-Coxe**—The first shipment for 1912, amounting to 120,000 lb., has been made.

**John the Revelator**—Leasers on this property in the Snake Creek district have shipped three cars of ore. The ore contains copper, silver, lead and gold.

### TOOELE COUNTY

**Consolidated Mercur**—New ore has been opened, which assures another six months' operation, at least.

## Canada

## ALBERTA

It is reported that surveys will begin soon for the system of 1450 miles of railway line of the Northern Territorial Ry., financed by an English syndicate and capitalized at \$40,000,000. The road will extend from Fort Churchill, on Hudson's Bay, to Port Essington on the west.

*Edmonton Portland Cement Co.*—Work on the plant of this company at Marlboro, 140 miles west of Edmonton, is progressing rapidly, 80 cars of machinery having arrived on the ground where all the foundation work has been completed. It is expected that the mill, which has a capacity of 1500 bbl. per day, will be in operation early in October.

## BRITISH COLUMBIA

*Granby Consolidated*—The following is a summary of the results of June operations: At the mine 102,200 tons of ore was shipped in 28 working days, a daily average of 3720 tons; development work consisted of 428 ft. raising, 419 ft. drifting, 55 ft. sinking and 1415 ft. of diamond drilling. At the smeltery 2256 tons of ores other than from Granby mines were received; 102,045 tons of Granby and 1862 tons of foreign ores were smelted.

*British Columbia Copper Co.*—Shipments of copper since July 1 exceed those for the corresponding month last year by nearly 100,000 lb. The company on Aug. 1 will have on hand in cash and free metal an aggregate exceeding the amount on hand at the time of the declaration of the dividend paid on July 1, while the visible ores of its own mines and of proprietary companies is said to be greater than ever before.

*Surprise*—The raise has been connected with the old workings above. The distance raised was about 860 ft., and this was done with hand drills. Several shoots of ore were passed through.

## NEW BRUNSWICK

*Minto Coal Co., Ltd.*—This company has been organized with a capitalization of \$400,000 to take over the coal interests recently acquired by Sir Thomas Tait in Queen's and Sunbury Counties, in the Grand Lake district. Estimates place the amount of coal in the deposits at nearly 2,000,000 tons. The company is erecting upward of 40 houses at Minto for its employees and preparing to ship coal in large quantities over the Gibson & Minto R.R. by the end of the year.

## ONTARIO

Copper has been found in Lebel township, 20 miles north of Englehart, according to an official report received by the Timiskaming & Northern Ontario Ry. This is practically the first official assurance of the existence of copper fields in the district.

## ONTARIO—COBALT

Shipments of ore and concentrates, in tons, from Cobalt for the week ended July 26, and for the year to date, are:

Beaver.....	38.85	219.75
Buffalo.....	30.71	727.96
Casey Cobalt.....		212.15
City of Cobalt.....		812.51
Cobalt Lake.....		399.24
Cobalt Townsite.....	27.00	880.68
Chamb.-Ferland.....		257.05
Coniagas.....		1,143.63
Crown Reserve.....		302.08
Drummond.....		330.30
Hudson Bay.....		408.27
Kerr Lake.....		424.14
La Rose.....	46.27	2,090.47
Lost and Found.....		15.00
McKinley-Darragh.....	72.89	1,592.11
Nipissing.....		1,235.63
O'Brien.....	09.39	345.62
Provincial.....		22.22
Right of Way.....		180.01
Timiskaming.....	30.78	659.24
Trethewey.....		283.54
Wettlaufer.....		229.04
Totals.....	315.90	12,671.64

## ONTARIO—PORCUPINE

*Tough*—An option has been taken on this Swastika property by C. A. Foster, of Haileybury.

*Dome Lake*—The Merrill Metallurgical Co. will design a 10-stamp mill for this company.

*Algunican*—This company will develop the Bougan mine, in Whitney township.

## QUEBEC

*Amalgamated Asbestos*—The Standard mill at the Thetford mines, owned by this company, was destroyed by fire on the night of July 21. The loss was largely covered by insurance.

## YUKON TERRITORY

An extension of the White Pass railway from White horse to the Tantalus coal fields, 120 miles, has been announced.

*Yukon Gold*—Cable advices from Dawson report the gross production for June as follows: 856,600 cu.yd. dredged, compared with 667,339 cu.yd. dredged in June 1911; average recovery per yard 73c., against 57c.; value of bullion produced \$626,400, against \$381,449. For the season to June 30 last there were 1,460,400 c.yd. dredged, against 1,173,917 cu.yd. in the same season of 1911; average recovery per yard 76c., against 55c.; value of bullion produced \$1,116,700 against \$654,668.

## Mexico

## DURANGO

*Mexican Iron & Steel Co.*—This Monterey company is negotiating for the purchase of the "Iron Mountain" at Durango.

## GUANAJUATO

*Guanajuato Consolidated*—The report for 1911 shows net profits of \$13,419. Surplus increased to \$38,175. The management estimated ore reserves at between 800,000 and 1,400,000 tons upon which a profit could be shown.

## JALISCO

*San Pedro Analco*—The United States Smelting, Refining & Mining Company has relinquished its option on this silver property on the Santiago River after an investigation of several months during which considerable development was done. The mine is owned by the Gill interests of Guadalajara.

## MICHUACAN

The Concepcion mine in the Tlalpujua district and the Santiago west of this district are under option to Canadian men. Both properties are controlled by Samuel Lederer.

## SONORA

*Greene-Cananea*—At the last meeting of the directors of the Greene-Cananea Copper Co., at which a dividend of 25c. per share was declared, payable Aug. 31, it was decided to pay dividends quarterly, beginning with next December. It is believed that the rate will be continued at 25c. per share. The company has re-adjusted the wage scale. The premium system has been abolished and work hours reduced from 9½ to 9 per day.

## Russia

*Sissert Co., Ltd.*—This company has been promoted in London, with \$5,000,000 capital, to take over the Sysstertski District Mining Co., owning over 340,000 acres of copper and other mineral land in the Ural Mountains.

## Asia

## CHOSEN

*Oriental Consolidated*—During May the mills crushed 25,230 tons of ore yielding gross receipts of \$130,334. Operating costs were \$75,302; improvements, development, etc., \$3473. Net profit for the month was \$51,558.

## SIBERIA

*Lena Goldfields, Ltd.*—A press dispatch recently received reads: At the Lena goldfields, where hundreds of workmen were recently shot down, and where a senator, with a large staff, sent by the Czar, is now making a strict investigation, the relations between the offended workmen and the much-criticized local representatives of their employers have suddenly taken another turn for the worse. It is reported that the men have decided to leave the mines, and request the government to assist them to quit work. They have just sent away the widows and orphans of their murdered comrades. At a mass meeting of workmen from all the mines, only six out of 3000 voted against the resolution to leave the region. It is said that Captain Treshchenko in command of the troops at the goldfields, has been committed for trial for illegally accepting large sums of money from the officials of the company.

# The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

## COAL TRADE REVIEW

*New York, July 31*—Coal trade in the West is gradually improving. Demand for steam coal is good while dealers and consumers are beginning to think of winter stocks.

The Lake trade is still held up by congestion at the upper ports. Vessel owners are complaining of delays in unloading, while many cars are kept waiting at the Lake Erie ports.

The seaboard bituminous trade is more active than for some time. Local demand at consuming centers is better, and coastwise trade more active.

The anthracite collieries are still working hard to fill orders. In the seaboard trade another 10c. comes off the summer discount on Aug. 1, increasing schedule prices by that amount.

*British Coal Trade*—Exports of fuel from Great Britain, with coal furnished to steamships in foreign trade, six months ended June 30, long tons:

	1911	1912	Changes
Coal.....	31,493,959	26,173,323	D. 6,320,636
Coke.....	462,559	388,108	D. 74,451
Briquettes.....	851,867	635,283	D. 216,584
Total exports.....	32,808,385	27,196,714	D. 5,611,671
Steamer coal.....	9,558,647	8,125,897	D. 1,432,750
Total.....	42,367,032	35,322,611	D. 7,044,421

Imports of coal for the six months were 10,647 tons in 1911, and 169,144 in 1912; increase, 158,497 tons.

## IRON TRADE REVIEW

*New York, July 31*—Notwithstanding various predictions to the contrary, the iron and steel markets have not materially relaxed their activity. New orders, while not quite so numerous as in June, are still large, while specifications on contracts continue to come in freely. The mills are rushing work and find it hard to keep up with deliveries. The intensely hot spell of mid-July has not been repeated, making steadier working possible.

Steel prices are now advancing with considerable rapidity, and there is a controlled market in the sense that sellers are individually avoiding the naming of prices other than those which are generally quoted. There is, of course, no formal agreement to maintain prices, none being necessary when the market is so clearly an advancing one, as buyers are specifying heavily and placing such additional contracts as are acceptable with the same confidence they showed in 1909 when precisely similar conditions

obtained. It can no longer be said that deliveries of steel products are only against actual current consumption. There can be no question that many buyers are accumulating stocks as they did in the fall of 1909, simply because prices show a continued upward tendency. The only question is how long prices will continue to advance, and when the point will come that buyers will begin to draw upon their stocks instead of adding to them. Such a point will be reached eventually and when it arrives the steel trade will find itself in an uncomfortable position.

Pig iron is still quieter than finished material. Foundry buying has been good, and there is a fair demand for basic pig. Prices are firm, with a tendency to advance, but the number of furnaces ready to blow in is rather a check on increases in price.

The American Iron & Steel Association reports the make of pig iron for the first half of 1912 at 14,072,274 tons, an increase of 2,405,278 tons, or 20.6% over the first half of last year.

*United States Steel Corporation*—The statement for the quarter ended June 30 gives the following figures for net earnings over operating and maintenance expenses:

	1911	1912
April.....	\$9,412,573	\$7,509,207
May.....	9,590,444	8,846,821
June.....	9,105,503	8,746,237
Total net.....	\$28,108,520	\$25,102,265
Renewal and subsidiary charges.....		\$5,075,119
Interest and sinking funds.....		7,311,963
Total charges.....		\$12,387,082
Surplus for the quarter.....		\$12,715,183
Dividends.....		12,658,700
Balance.....		\$56,483

The dividends paid were 1 $\frac{3}{4}$ % on the preferred and 1 $\frac{1}{4}$ % on common stock. For the six months ended June 30 the net earnings were \$42,929,238; surplus over charges, \$19,081,749; dividends paid, \$25,317,594, leaving a deficit of \$6,235,845 for the half-year.

## Baltimore

*July 29*—Exports for the week included 3,495,320 lb. steel rails and 212,880 lb. rail joints to St. John, Newfoundland; 931,620 lb. steel rails and 113,813 lb. rail joints to Nuevitas, Cuba; 1,336,329 lb. castings, 6,711,459 lb. structural steel and 1,763,375 lb. miscellaneous iron and steel to Panama. Imports included 1095 tons ferromanganese and 81 casks silicospiegel from Baltimore; 33 casks manganese ore from Hamburg; 6000

tons manganese ore from Batum, Russia; 4675 tons pyrites from Huelva, Spain; 25,075 tons iron ore from Cuba.

## Birmingham

*July 29*—Pig-iron manufacturers in Southern territory are not anxious to sell iron further at \$11.50 for No. 2 foundry. The product is being sold right along for delivery during the latter part of the year, in the fourth quarter, at \$12, and while \$11.50 has been the price for iron for immediate, or third-quarter delivery, but one or two companies are handling any quantity of that business. The make during the month of July will show but little improvement over June. One blast furnace went into operation during the month. Two other furnaces are scheduled to blow in during August but there is a probability of a furnace now in operation being blown out. With but one exception, all companies are depending on the probable make for deliveries and there is a little delay on low-grade irons. The greater portion of the accumulated iron in the Southern territory, in fact practically all of it, belongs to one company and that company is in a comfortable position. Furnace companies in the South recently had opportunity of booking considerable foreign business, but the shipping interests could not make a favorable rate.

There is still a good demand for steel rails and fabricated steel and the plants of the Tennessee Co. have good prospects for the balance of the year. There is some demand for steel-wire goods and the plant of the Southern Iron & Steel Co. at Gadsden can continue in steady operation if there is no interruption through legal sources. Further litigation is threatened in the federal courts. In the meantime efforts at reorganization are being made and the plans for financing the company are being pushed.

Foundry and machine-shop proprietors in the Southern territory still report trade a little quiet. Labor troubles with molders are to be noted, more than 200 men being out, their demands being for 9-hour day and \$3.25 per day minimum.

There is still a little charcoal iron being manufactured in the Southern territory with the quotation for the product holding around \$22 per ton. The scrap-iron market is fairly good yet.

The receivers of the Alabama Consolidated Coal & Iron Co. are keeping one blast furnace in operation with coal and ore mines and coke ovens sufficient to supply raw material.

### Chicago

July 29—The pig-iron market has been active in the last week and all lines of finished products show a strong market. Sales of pig iron have aggregated 60,000 to 70,000 tons, a very large record, and there is evident a general disposition to cover all needs for the last half, while some consumers would like to contract for their first-quarter supplies. The furnace agents, however, will not go into 1913 on the basis of last-half prices. Northern No. 2 foundry is 50c. stronger than last week, being now held firmly at \$15.50, furnace, which means \$15.90@16 delivered locally. Southern No. 2 foundry remains at \$12, Birmingham, or \$16.35, Chicago. The demand for Northern is such that it bids fair to advance further within a few days.

The pressure on the local mills for deliveries of iron and steel products continues so great that little business is being sought, but it comes in large volume. Bars are in large demand, with 1.40c. the minimum quotation on iron bars and soft steel bars selling at 1.43c. Structural material is in large demand over a wide territory and sales are running about 20,000 tons a week. Railroad supplies are in like condition; the demand for standard rails and track fastenings is heavy and continuous. The railroads seem at last to have come to the long-expected point of supplying their needs generally. For plates and sheets the demand is large, while sales of wire products have been but little checked by advanced prices. Billets continue scarce at \$31 for openhearth forging. General trade conditions are very good and promise to become better because of encouraging crop prospects.

### Cleveland

July 29—It seems to be harder than usual this season to keep the balance on Lake traffic. Ore movement is heavy, but coal movement is blocked by the congestion at the upper Lake docks, and many boats are going up light.

**Pig Iron**—Business is fair, but prices in this district remain low. Quotations, Cleveland delivery, are \$15.15@15.25 for bessemer; \$13.75 @14 for No. 2 foundry; \$13.25 for forge; \$16.25@16.50 for Lake Superior charcoal.

**Finished Material**—Mills in this district have work enough on hand to carry them for four months or so; some of them up to the end of the year. The trouble now is to get the material out in time. More advances are expected on new orders.

### Philadelphia

July 31—Now that the coke situation has improved and cost of pig-iron production can be known, there is more disposition to reply to inquiries for fourth quarter and even later delivery. Prices

are nominally 25c.—in a few cases 50c.—higher on good brands. The point is, will present asking prices hold as actual selling prices? The situation favors makers from every point of view, but even so, certain makers might be moved from their position if large orders were to be had. At present most buying is in small lots. The Southern pig-iron situation is strong and local furnace interests feel safe against competition for an indefinite period. The possible wabbling in prices hinted at above will come, if it does come, from Southern irons. Basic iron, though quiet, stands a good chance to sell in large lots. Forge iron keeps moving in small lots. Low-grade iron for pipe is wanted. No. 2 X foundry is \$16; gray forge, \$15@15.25; basic, \$15.50, and low phosphorus, \$20 per ton.

**Steel Billets**—Openhearth, \$24.40, bottom price, and forging, \$29.40, inside price, at which some business has been closed.

**Bars**—The movement in common iron for late delivery is active and recent business has been booked at a fractional advance. Quotations: 1.32½@1.37½c. Business is accumulating at several mills, and steel bars are especially active.

**Sheets**—A further advance in sheets is very near, according to the views of manufacturers. In fact, on ordinary business for early delivery, an advance is in force.

**Pipes and Tubes**—The volume of business for July from this territory exceeded that of any month for a long period, especially in tubes.

**Plates**—Further advances are inevitable in view of the enormous requirements in sight. Even on fourth-quarter and later deliveries, quotations made on very recent inquiries show there is a general upward movement. Mills are not in position to accommodate belated customers who want early deliveries.

**Structural Material**—All ordinary business is taken at a further advance of \$1 or \$2 per ton, to say nothing of premium rates which are becoming rather frequent.

**Scrap**—Good grades of scrap are exhausted. Prices are marked up 50c. per ton and the supply is quickly absorbed.

### Pittsburgh

July 30—The mills are advancing bars, plates and shapes \$2 a ton. Probably because previous advances showed too much appearance of unanimity, the present advances are announced on behalf of a single interest first, others following at a respectable distance. On Monday it was announced that the Republic Iron & Steel Co. had advanced its price on bars \$1 a ton, from 1.25c. to 1.30c., while on Tuesday it was announced that the Jones & Laughlin Steel Co. had advanced its price

on plates and shapes \$1 a ton, from 1.30c. to 1.35c. By the end of the week the whole market will doubtless be at the higher level.

Late on the afternoon of July 24 the National Tube Co. decided to advance merchant steel pipe and boiler tubes one point, or about \$2 a ton, and the next day independent producers followed. It develops that when steel pipe was advanced in June some of the iron-pipe mills made a corresponding advance, while a prominent eastern producer did not, and no general advance in iron pipe can occur until this interest first works up to the existing level.

**Pig Iron**—The Westinghouse Air Brake Co. has bought between 15,000 and 20,000 tons of forge and foundry iron, for delivery over the balance of the year, from half a dozen producers on the basis of \$13.50, furnace, for No. 2. The Standard Sanitary Manufacturing Co. is inquiring for 5000 tons of foundry and forge iron for fourth-quarter delivery, while the Pittsburgh Steel Co. and the Colonial Steel Co. are in the market for basic iron and the American Steel Foundries is understood to have bought about 10,000 tons of basic for Alliance. Bessemer iron has been quiet, but the market seems to be on the verge of a heavy buying movement on the part of large steel companies, similar to that which occurred from June to October, 1909, and which sent the market up. Bessemer is already quotable 25c. higher, simply from the withdrawal of lower quotations, and without any active movement, though it is a fact that the Steel Corporation has quietly bought several lots in the past few weeks. The market stands quotable as follows: Bessemer, \$14.50; basic, malleable and No. 2 foundry, \$13.50; forge, \$13.25, all f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

**Ferromanganese**—There was considerable contracting for ferromanganese just before last week's advance from \$48.50 to \$51, consumers apparently having gotten wind of a prospective advance. Some of this contracting extended into next year, and a large part, though probably not half, the consumption for the first half of next year is now under cover. The market is now quotable at \$51 for prompt metal and on contracts for any period to July 1, 1913, f.o.b. Baltimore.

**Steel**—A sharp difference is to be observed between bessemer and openhearth steel, the former being in good supply, with ample deliveries on contracts, though no steel is actually pressing upon the market, while in the latter deliveries are usually less than requirements and consumers are constantly inquiring for additional tonnages. In one or two cases sales of sheet bars have been made for fourth quarter, but as a rule sellers are refusing to quote at present, evidently expecting a higher market. For prompt and

third-quarter delivery the market is quotable as follows, though sometimes it is hard to secure deliveries at the prices named: Bessemer billets, \$21.50 to \$22; bessemer sheet bars, \$21.75@22; openhearth billets, \$22@22.50; openhearth sheet bars, \$22.50@23; axle billets, \$27; forging billets, \$28@29, all f.o.b. maker's mill, Pittsburgh or Youngstown. Rods are stiffer, at \$25@26, several makers quoting only the higher figure.

**Sheets**—Specifications are very heavy, perhaps heavier than in June, and the question of delivery takes precedence, with many buyers, over the question of price. Mills are running better, as repairs are almost completed. As a rule delivery on new specifications can only be made in from six to eight weeks in black and galvanized and in from three to six weeks in blue annealed. We quote: Black sheets, 28-gage, 2@2.05c.; galvanized, 28-gage, 3.05@3.15c.; blue annealed, 10-gage, 1.45@1.50c.; Painted corrugated, 28-gage, 2.20@2.25c.; galvanized corrugated, 3.10@3.20c., per lb., Pittsburgh.

**Connellsville Coke**—Sales of prompt furnace coke have been made in the past week at \$2.20@2.25 and the situation has been relieved from the sellers' standpoint in that there is practically no coke awaiting shipping instructions, so that sellers are somewhat firmer, and the immediate effects of the break noted a week ago are past. Both prompt and contract furnace coke is offered at \$2.25, but sellers evidently expect an advancing market, after the ice has been broken by a few contracts on this basis. Inquiry is relatively light, and the furnaces which contested so long against the \$2.50 price are still disposed to defer inquiring as long as possible. Considerable coke, however, will have to be bought for August delivery. Furnace coke is unchanged at \$2.40@2.50 for prompt and \$2.40@2.75 for contract.

**St. Louis**

**July 29**—The pig-iron market during the last week has been quite brisk and quite a few inquiries and contracts have been received. Furnaces are, of course, not working full as yet as prices would not warrant it. It is thought that in the course of the next week prices will probably advance a little. The current figure is \$11.50@12 per ton, Birmingham, for Southern No. 2 foundry, or \$15.25, St. Louis. Northern iron is a little dull at present and brings \$15.75 per ton, St. Louis.

Coke is firm at \$5.65 per ton, St. Louis, for good foundry.

**Iron Ore Trade**

A little buying of Lake Superior ore is going on to fill up stocks. Prices remain the same: Bessemer ores, 55% iron and under, 0.045% phosphorus, \$3.75

for Old Range and \$3.50 for Mesabi; nonbessemer ores, base 51.5% iron, \$3.05 for Old Range and \$2.85 for Mesabi; all f.o.b. Lake Erie docks.

The Spanish-American Iron Co. has some surplus of ore mined, and has been selling some to furnaces in the East. This ore is a bessemer ore, 55 to 60% iron, and has been sold at a price equivalent to 7.25c. per unit, f.o.b. cars, Philadelphia. This would put the price to \$4.25@4.50 at furnace.

**British Iron and Steel Trade**

Exports and imports of iron and steel and of machinery in Great Britain, six months ended June 30, as valued by the Board of Trade returns, were:

	Exports	Imports	Excess
Iron and steel	£21,550,651	£5,713,864	Ex. £15,836,787
Machinery	15,689,186	3,427,375	Ex. 12,261,811
Outlery and hardware	5,893,524	3,852,853	Ex. 2,040,671
New ships	2,696,590	.....	Ex. 2,696,590
<b>Total</b>	<b>£45,829,951</b>	<b>£12,994,092</b>	<b>Ex. £32,835,859</b>
<b>Total, 1911</b>	<b>45,384,013</b>	<b>12,030,655</b>	<b>Ex. 33,353,358</b>

Increase in total exports this year, £445,938; increase in imports, £963,437. The quantities of iron and steel were, in long tons:

	1911	1912	Changes
Exports	2,274,495	2,253,668	D. 20,827
Imports	901,769	886,673	D. 15,096

The increase of value in imports was entirely in machinery and hardware.

**METAL MARKETS**

**New York, July 31**—The metal markets this week have been rather variable, and in some cases inclined to speculation. Prices have been generally firm, with small changes only.

**Gold, Silver and Platinum**

**UNITED STATES GOLD AND SILVER MOVEMENT**

Metal	Exports	Imports	Excess
<b>Gold</b>			
June 1912..	\$ 7,149,035	\$ 5,611,057	Exp. \$1,537,978
" 1911..	3,074,755	4,767,714	Imp. 1,692,959
Year 1912..	33,374,836	25,264,342	Exp. 8,110,494
" 1911..	13,251,562	33,773,026	Imp. 20,521,464
<b>Silver</b>			
June 1912..	5,045,944	4,879,485	Exp. 166,459
" 1911..	5,777,703	3,506,446	Exp. 2,271,257
Year 1912..	33,668,972	25,264,219	Exp. 8,404,753
" 1911..	34,443,203	21,960,601	Exp. 12,482,602

Exports from the port of New York, week ended July 27: Gold, 272,100, chiefly to Argentina; silver, \$1,176,081, largely to London. Imports: Gold, \$204,620; silver, \$148,667, principally from Spain and South America.

**Gold**—The price of gold on the open market in London remained at the bank level, 77s. 6d. per oz. for bars and 76s. 4d. per oz. for American coin. Some gold was taken for India and a little for Germany. No large exports from New York are reported.

**Iridium**—The price for pure metal is unchanged at \$63 per oz., New York.

**Platinum**—The market is still rather quiet but steady. Dealers ask \$45.50 per oz. for refined platinum and \$48 per oz.

for hard metal, 10% iridium. The foreign market is rather inactive, but firmer.

Our Russian correspondent writes, under date of July 18, that prices are nominal and subject to negotiation but remain unchanged. Quotations for crude metal, 83% platinum, are 9.80 rubles per zolotnik at Ekaterinburg and 37,500 rubles per pood at St. Petersburg—equivalent to \$36.85 and \$36.75 per oz., respectively. The Duma has passed the law prohibiting the export of crude platinum from Russia. The law will take effect in the fall, and consequently all the metal available is being exported to be held in stock abroad.

**Silver**—The market continued steady on favorable Monsoon reports until July 30, when the price dropped to 27½d. in London on selling by China banks and also by the Indian bazaars.

**SILVER AND STERLING EXCHANGE**

July	25	26	27	29	30	31
New York....	60½	60½	60½	60½	60	60½
London.....	27½	27½	27½	27½	27½	27½
Sterling Ex.	4.8770	4.8770	4.8750	4.8745	4.8740	4.7820

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

Shipments of silver from London to the East, Jan. 1 to July 18, as reported by Messrs. Pixley & Abell:

	1911	1912	Changes
India.....	£4,865,300	£3,858,200	D. £ 800,100
China.....	890,400	933,500	I. 43,100
<b>Total</b> .....	<b>£5,548,700</b>	<b>£4,791,700</b>	<b>D. £ 757,000</b>

Messrs. Samuel Montagu & Co. write from London, July 11: "The higher level of price, about 28 instead of 24d., has had apparently considerable influence on the consumption of silver by the Continent. Compared with the first six months of 1911 the exports in ounces of the last half year to other countries of Europe show a reduction of about 50%. This falling off is especially marked in the case of France (65%) and Russia (55%). The movement of silver to China and India has not been affected to anything like the same degree. The exports to these two countries have only decreased 11%. The imports from Germany and France combined have nearly doubled."

Gold in the United States July 1, is estimated by the Treasury Department as follows: Held against gold certificates outstanding, \$1,040,057,369; in Treasury current balances \$165,996,878; in banks and circulation \$607,445,193; total \$1,813,499,440. Gold held against certificates includes bullion as well as coin.

Coined silver in the United States July 1, as estimated by the Treasury Department: Standard dollars \$565,350,367; subsidiary coins \$169,812,806; total \$735,163,173. Of this \$481,541,000 are

held in the treasury against silver certificates outstanding.

Copper, Tin, Lead and Zinc

NEW YORK							
July	Copper		Tin	Lead		Zinc	
	Lake, Cts. per lb.	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.
25	17 1/2 @17 3/4	17.45 @17.50	44 1/2	4.70 @4.75	4.57 1/2 @4.60	7.10 @7.15	6.95 @7.00
26	17 1/2 @17 3/4	17.45 @17.50	44 1/2	4.70 @4.75	4.57 1/2 @4.60	7.05 @7.10	6.90 @6.95
27	17 1/2 @17 3/4	17.45 @17.50	44 1/2	4.70 @4.75	4.57 1/2 @4.60	7.05 @7.10	6.90 @6.95
29	17 1/2 @17 3/4	17.40 @17.50	45 1/2	4.70 @4.75	4.55 @4.57 1/2	7.05 @7.10	6.90 @6.95
30	17 1/2 @17 3/4	17.40 @17.50	45 1/2	4.70 @4.75	4.55 @4.57 1/2	7.00 @7.10	6.85 @6.95
31	17 1/2 @17 3/4	17.40 @17.50	45 1/2	4.70 @4.75	4.55 @4.57 1/2	7.00 @7.10	6.85 @6.95

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

July	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
	Spot	3 Mos	Best Sel'd	Spot	3 Mos		
25	78 1/2	78 1/2	84	200 1/2	197 1/2	18 1/2	26 1/2
26	78 1/2	78 1/2	84	202 1/2	200	18 1/2	26 1/2
27	.....	.....	.....	.....	.....	.....	.....
29	78 1/2	78 1/2	83	204	202	18 1/2	26 1/2
30	77 1/2	77 1/2	83	204 1/2	202	18 1/2	26 1/2
31	78 1/2	78 1/2	83 1/2	205 1/2	203	18 1/2	26 1/2

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. 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 1/2c.; £15 = 3.26c.; £25 = 5.44c.; £70 = 15.22c. Variations, £1 = ± 2 1/4c.

**Copper**—The violent fluctuations in the London standard market have continued to create unsettled conditions. The European demand for refined copper from this market has been all but completely cut off. At certain times during the week arbitrage transactions again became profitable and some operators quickly took advantage of this. Buying copper in Europe with which to fill contracts for delivery there released copper for delivery here, and the terms of the exchange permitted the offering at material concessions here. However, the demand from

American consumers has been only slight. Several first hands have offered electrolytic at 17 3/4c., delivered, usual terms, and some have effected business on that basis while others have failed to bring out orders. Some sales at 17.45c., cash, New York, are reported, and even under that. The business in Lake Copper has also been dull. Some sales of special brands have been made at as high as 17 3/4c. At the close, Lake copper is quoted at 17 1/2 @ 17 3/4c., and electrolytic copper in cakes, wirebars and ingots at 17.40 @ 17.50c. Casting copper is quoted nominally at 17 1/4 @ 17 3/8c. as the average for the week.

The London market for standard copper has been quiet and weakish. On July 25 it closed at £78 12s. 6d. for both spot and three months; on July 29 it declined to £78 2s. 6d. for spot, and £78 5s. for three months, and on July 30 both positions were down to £77 10s. The market closes somewhat better at £78 1s. 3d. for spot, and £78 5s. for three months. Cables report continued bear selling of three months and bear covering of spot, which explains the previous backwardation and the present small contango.

Copper sheets are 22 @ 23c. per lb., base for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 19 @ 19 1/4c. base, carload lots at mill.

Copper exports from New York for the week were 3141 long tons. Our special correspondent reports the exports from Baltimore at 1149 tons.

**Tin**—The market has been strong and advancing, due to the good American demand and the reduction in the quantities of Banka tin which will be sold at auction during 1913, amounting to a difference of 1800 tons. Prices have advanced steadily from 44 1/4 on July 25 to 45 1/2c. July 31, at the close.

In London, the market has also experienced a continued advance. On July 25 it was quoted at £200 10s. for spot, and £197 10s. for three months; on July 26, £202 10s. for spot, and £200 for three months; on July 29, £204 for spot, and £202 for three months; on July 30, £204 7s. 6d. for spot and £202 for three months. The market closes at £205 15s. for spot, and £203 for three months.

**Lead**—There is a fair demand, which, however, has been filled at somewhat lower prices. St. Louis is now quoted at 4.55 @ 4.57 1/2c. and New York at 4.70 @ 4.75 cents.

The London market for lead is very strong, and material for near-by shipment is scarce. Spanish lead is quoted at £18 17s. 6d. and English at £19 per ton.

**Spelter**—There has been a good demand, principally for fall shipment, which has been freely met, and large transactions have taken place at slightly lower figures. At the close the market

is quoted at 6.85 @ 6.95c., St. Louis, according to delivery.

The London market is slightly lower, good ordinaries being quoted at £26 2s. 6d. and specials at £26 7s. 6d. per ton.

Base price of zinc sheets is \$8.75 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Zinc dust is quoted at 7 1/4 @ 7 3/8c. per lb. in carload lots, New York.

Other Metals

**Aluminum**—The market has been quieter, with few sales. Prices are unchanged at 24 @ 24 1/2c. per lb. for No. 1 ingots, New York.

**Antimony**—Business continues active and prices are firmer. Cookson's is held at 8.60c. per lb. for spot and early deliveries and 8.50c. for September and forward. Hallett's and U. S. are 8c. for spot, while 7.50 @ 7.75c. per lb. is asked for Hungarian, Chinese and other outside brands.

**Quicksilver**—Business is steady and prices are unchanged. New York quotations are \$42.50 per flask of 75 lb., with 60 @ 62c. per lb. asked for retail lots. San Francisco, \$42 for domestic orders and 8.50c. for September and forward. is £8 10s. per flask, with £8 7s. 6d. asked from second hands.

**Dismuth**—The syndicate which controls the European production quotes 7s. 6d.—equal to \$1.80—per lb. in London. In New York a quotation of \$1.72 per lb. is made for metal produced from American ores.

**Magnesium**—The price of pure metal is \$1.50 per lb. for 100-lb. lots, f.o.b. New York.

**Nickel**—Large lots, contract business, 40 @ 45c. per lb. Retail spot from 50c. for 500-lb. lots up to 55c. for 200-lb. lots.

Zinc and Lead Ore Markets

**Platteville, Wis., July 27**—The base price paid this week for 60% zinc ore was \$59 @ 60. The base price offered for 80% lead ore was \$59 per ton.

SHIPMENTS, WEEK ENDED JULY 27

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point.....	753,310	.....	.....
Benton.....	479,300	.....	634,000
Hazel Green.....	320,000	.....	.....
Platteville.....	294,000	.....	176,400
Galena.....	286,900	.....	.....
Shullsburg.....	260,000	.....	.....
Cuba City.....	229,280	.....	.....
Linden.....	206,440	.....	60,000
Harker.....	146,860	.....	.....
Highland.....	131,200	.....	.....
Rewey.....	84,000	.....	86,200
Total.....	3,191,290	.....	956,600
Year to date.....	117,656,600	5,181,290	17,839,870

Shipped during week to separating plants, 2,522,600 lb. zinc ore.

**Joplin, Mo., July 27**—The high price of zinc sulphide ore this week was \$66.50, the base per ton of 60% zinc was \$58.50 @ 64. Zinc silicate sold at \$30 @ 32 per ton of 40% zinc. The average price, all grades, was \$58.48 per ton. The high price of lead ore was \$61 and the average price, all grades, was \$58.68 per ton.



The zinc market was still on the upward trend this week and one lot of ore sold for \$64 assay base. Competition, while not as strong as that of the two previous weeks, was spirited, but not near so much ore was purchased for delivery next week and this may mean that prices will go no higher, but the demand will prove whether they do or not.

SHIPMENTS, WEEK ENDED JULY 27

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville.....	4,434,990	.....	824,590	\$157,786
Joplin.....	2,159,360	.....	300,680	74,728
Galena.....	745,310	.....	97,860	25,245
Duenweg.....	660,430	.....	49,280	21,290
Alba-Neck.....	639,040	.....	11,600	19,831
Miami.....	318,560	.....	259,530	16,067
Oronogo.....	501,690	.....	68,640	15,027
Cave Springs.....	185,000	.....	168,370	10,601
Carl Junction.....	256,160	.....	.....	7,940
Granby.....	204,610	129,060	4,070	7,450
Spurgeon.....	.....	191,200	20,530	3,855
Jackson.....	113,470	.....	.....	3,290
Carthage.....	110,480	.....	.....	3,203
Aurora.....	57,280	67,830	.....	2,745
Springfield.....	88,000	.....	.....	2,500
Sarcoie.....	85,000	.....	.....	2,465
Stott City.....	57,290	.....	.....	1,660
Totals.....	10,616,670	388,090	1,805,150	\$375,683

7 mos. .... 304,734,540 18,548,120 52,239,380 \$9,546,388  
 Blende val., the week, \$315,373; 7 mos., \$7,826,301  
 Calamine, the week, 6,435; 7 mos., 277,846  
 Lead value, the week, 53,375; 7 mos., 1,442,241

MONTHLY AVERAGE PRICES

Month	ZINC ORE				LEAD ORE	
	Base Price		All Ores		All Ores	
	1911	1912	1911	1912	1911	1912
January.....	\$41.85	\$44.90	\$40.55	\$43.54	\$55.48	\$58.92
February.....	40.21	45.75	39.16	43.31	54.46	52.39
March.....	39.85	51.56	38.45	49.25	54.57	54.64
April.....	38.88	52.00	37.47	50.36	56.37	54.18
May.....	38.25	55.30	36.79	53.27	55.21	52.45
June.....	40.50	55.88	38.18	54.38	56.49	55.01
July.....	40.75	.....	38.36	.....	58.81	.....
August.....	42.50	.....	41.28	.....	60.74	.....
September.....	42.63	.....	41.29	.....	59.33	.....
October.....	42.38	.....	40.89	.....	54.72	.....
November.....	45.40	.....	43.25	.....	57.19	.....
December.....	44.13	.....	40.76	.....	62.03	.....
Year.....	\$41.45	.....	\$39.90	.....	\$56.76	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, July 31—No change is reported in the general market, which is quiet and steady.

**Arsenic**—The market has fluctuated sharply. American producers seem to be out of the market, and buyers have apparently been holding off as long as possible. Spot lots have been in demand and supplies are scarce. As high as \$4.25@4.75 per 100 lb. has been paid for spot; while \$4@4.12½ per 100 lb. is named for futures.

**Copper Sulphate**—Demand is steady and sales are good at unchanged prices, \$5.50 per 100 lb. for carload lots and \$5.75 per 100 lb. for smaller parcels.

**Nitrate of Soda**—The market is not especially active but is firm, and prices are unchanged, 2.45@2.50c. per lb. being named for all positions.

Petroleum

Oil production in California for the six months ended June 30 was 43,697,642 bbl., an increase of 3,331,530 bbl. over 1911. Deliveries were 33,020,127 bbl., a decrease of 1,222,878 bbl. Stocks on hand were 44,444,658 bbl. at the end of June.

MINING STOCKS

New York, July 31—On July 25 the Exchange was fairly active and prices improved. General Chemical had a sharp rise of 12 points. On the Curb there were large sales of Tonopah Merger and West End Extension. Cobalts were quiet. Copper shares were active but irregular. Heavy sales of Greenwater were made.

July 26 the Exchange was quiet but inclined to weakness, recovering toward the close. On the Curb there was some dealing in miscellaneous mining stocks, but coppers were quiet.

July 27 the Exchange was generally firm, on limited trading. The Curb was dull and dealings in mining stocks small, with few price changes.

July 29 the Exchange was a little weaker. Higher money rates tended to check speculation. On the Curb coppers were in demand, but irregular. Braden, Davis-Daly and Butte & New York sold freely. There were good sales of Tonopah Merger, Tonopah Extension and El Paso Consolidated at slight declines.

July 30 and 31 the Exchange was rather quiet, with only small fluctuations. The Steel statement had been generally discounted and produced little effect. The Curb was more active, with good sales of copper and other mining stocks at generally firm prices.

At auction in New York, July 25, the following securities were sold: Sloss-Sheffield Steel & Iron Co., 50 shares common, \$100 par, \$54.75 per share; United States Steel Corporation, 30 shares common, \$69.75 per share, 20 shares preferred, \$112 per share, and \$5000 bonds, 102½% of par; San Pedro Gold Mining Co., \$500 bonds, \$51; New Jersey Mineral Co., \$100 bond, \$53; United States Metal Products Co., 385 shares, \$100 par, \$22 per share; Monterey Coal & Mining Co., 75 shares, \$100 par, \$11 for the lot.

Boston, July 30—The market has been dull and narrow for mining stocks. There was no pressure to sell; on the other hand, buying orders were few. The result was that traders had no difficulty in depressing prices fractionally, but on very small business. In the more important stocks there were no appreciable changes. Calumet & Hecla sold at \$5.20; Osceola at \$116. Lake lost a fraction, as did Calumet & Arizona.

The half-yearly statements of the Calumet & Hecla subsidiaries show encouraging gains, which would have helped

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	April	May	June
Alaska shipments.....	1,243,911	1,720,391	4,134,569
Anaconda.....	25,480,000	25,800,000	.....
Arizona, Ltd.....	3,400,000	3,500,000	3,300,000
Copper Queen.....	6,806,425	7,024,087	7,622,730
Calumet & Ariz.....	4,104,000	4,424,000	4,160,000
Chino.....	1,150,000	1,275,850	1,474,979
Detroit.....	2,506,718	2,092,478	1,959,634
East Butte.....	1,400,000	1,445,000	.....
Mammoth.....	1,718,450	1,760,000	.....
Mason Valley.....	1,503,056	1,520,000	.....
Nevada Con.....	6,115,095	6,063,462	5,913,832
Ohio.....	675,000	685,000	.....
Old Dominion.....	2,167,000	2,180,000	2,130,000
Ray.....	2,611,920	2,924,913	2,992,500
Shannon.....	1,544,000	1,464,000	1,270,000
South Utah.....	284,215	236,884	.....
United Verde*.....	2,250,000	2,500,000	.....
Utah Copper Co.....	8,615,775	9,564,919	8,772,742
Lake Superior*.....	18,250,000	21,250,000	15,600,000
Non-rep. mines*.....	7,625,000	8,400,000	8,300,000
Total production.....	97,400,495	105,836,984	.....
Imports, bars, etc.....	26,842,014	25,836,519	.....
Total blister.....	124,242,509	131,697,503	.....
Imp. in ore & matte.....	9,350,972	6,410,226	.....
Total American.....	133,593,481	138,107,729	.....
Miamit.....	2,554,352	2,676,702	2,683,310
Brit. Col. Cos.:			
British Col. Copper	1,043,173	875,000	996,000
Granby.....	1,941,797	1,914,460	1,888,400
Mexican Cos.:			
Boleof.....	2,149,280	2,260,160	1,851,920
Cananea.....	4,654,000	4,600,000	4,310,000
Moctezuma.....	2,797,718	2,892,521	3,176,819
Other Foreign:			
Cape Cop., S. Africa	954,240	754,880	.....
Kyshtim, Russia.....	1,545,000	.....	.....
Spassky, Russia.....	649,600	694,400	757,120
Famatina, Argen.....	.....	.....	.....
Tilt Cove, Newf'd.....	119,869	123,087	.....
Exports from:			
Chile.....	6,496,000	3,696,000	9,856,000
Australia.....	9,408,000	7,840,000	8,176,000
Arrivals in Europe†.....	12,064,640	9,976,860	12,667,200

†Boleof copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER.

Month	U.S. Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
VI, 1911.....	124,554,312	61,655,561	71,460,519
VII.....	112,167,934	56,982,582	74,880,658
VIII.....	125,493,667	59,935,364	69,855,660
IX.....	115,588,950	57,311,584	50,824,011
X.....	118,255,442	64,068,307	60,084,349
XI.....	111,876,601	68,039,776	67,049,279
XII.....	122,896,697	65,988,474	79,238,716
Year.....	1,431,938,338	709,611,605	754,902,233
I, 1912.....	119,337,753	62,343,901	80,167,904
II.....	116,035,809	56,228,368	63,148,096
III.....	125,694,601	67,487,466	58,779,566
IV.....	125,464,644	69,513,846	53,252,326
V.....	126,737,836	72,702,277	69,485,945
VI.....	122,315,240	66,146,229	61,449,650

VISIBLE STOCKS

	United States	Europe	Total
VII, 1911.....	157,434,164	195,932,800	353,366,964
VIII.....	137,738,858	191,891,840	329,630,698
IX.....	135,441,501	191,228,800	324,670,301
X.....	140,894,856	191,945,600	332,840,456
XI.....	134,997,642	176,825,600	311,823,242
XII.....	115,785,188	164,281,600	276,066,788
I, 1912.....	89,454,695	158,323,200	247,777,895
II.....	66,280,643	154,651,200	221,131,843
III.....	62,939,988	141,142,400	204,082,388
IV.....	62,367,557	136,819,200	199,186,754
V.....	65,066,029	134,176,000	199,242,029
VI.....	49,615,643	117,801,600	167,417,242
VII.....	44,335,004	108,186,000	152,521,047

the market if it had been at all active. The present quiet seems likely to run into next month.

On the Curb, the most active stock was Stewart Mining. South Lake and Davis-Daly were firm. The Curb was perhaps a little more active than the Exchange.

Assessments

Company	Delinq	Sale	Amt
Belcher, Nev.	Aug. 15	Aug. 30	\$0.10
Belmont, Ida.	July 22	Aug. 22	0.002
Chollar, Nev.	July 7	Aug. 5	0.10
Confidence, Nev.	July 15	Aug. 9	0.20
Con. Imperial, Nev.	July 28	Aug. 21	0.01
Con. Virginia, Nev.	Aug. 11	Sept. 5	0.20
Conqueror, Ida.	July 20	Aug. 10	0.001
Denemora, Ida.	July 20	Aug. 20	0.002
Eagle Mt., Ida.	July 31	Aug. 22	0.00
Gould & Curry, Nev.	July 19	Aug. 12	0.05
Hypothek, Ida.	July 19	Aug. 14	0.005
Laclede, Ida.	Aug. 1	Aug. 24	0.003
Majestic, Ida.	July 16	Aug. 6	0.005
Manhattan Red Top, Nev.	July 12	Aug. 15	0.01
Mineral Farm, Ida.	July 15	Aug. 15	0.002
Mineral Hill, Nev.	Aug. 5	Oct. 5	0.01
National Copper, Ida.	July 15	Aug. 15	0.01
New Reliance, S. Dak.	July 15	Aug. 15	0.01
O. K. Silver Mining, Utah	July 15	Aug. 1	0.002
Oreano, Ida.	July 18	Aug. 19	0.001
Sandstorm-Kendall, Nev.	July 8	Aug. 8	0.01
Sierra Nevada, Nev.	July 4	July 30	0.10
Silver Mt., Ida.	July 15	Aug. 15	0.002
Springfield, Ida.	July 30	Aug. 31	0.002
Tonopah North Star, Nev.	July 15	Aug. 15	0.02
Union Consolidated, Nev.	July 12	Aug. 7	0.15
Utah, Nev.	July 12	Aug. 6	0.05
Yellow Jacket, Nev.	July 4	Aug. 12	0.10

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52.375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	59.043	23.794	24.081	27.190
March	51.454	52.745	58.375	23.690	24.324	26.875
April	53.221	53.325	59.207	24.483	24.595	27.284
May	53.870	53.308	60.880	24.797	24.583	28.038
June	53.462	53.043	61.290	24.651	24.486	28.215
July	54.150	52.630	60.654	25.034	24.286	27.919
August	52.912	52.171	59.428	24.082	24.082	27.919
September	53.295	52.440	59.428	24.567	24.209	27.919
October	55.490	53.340	59.428	25.596	24.594	27.919
November	55.635	55.719	59.428	25.680	25.649	27.919
December	54.428	54.905	59.428	25.160	25.349	27.919
Year	53.486	53.304	59.428	24.670	24.592	27.919

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

COPPER

Month	NEW YORK				London, Standard	
	Electrolytic		Lake		1911	1912
	1911	1912	1911	1912		
January	12.295	14.094	12.680	14.337	55.600	62.760
February	12.256	14.084	12.611	14.329	54.974	62.893
March	12.139	14.698	12.447	14.868	54.704	65.884
April	12.019	15.741	12.275	15.930	54.034	70.294
May	11.989	16.031	12.214	16.245	54.313	72.352
June	12.385	17.234	12.611	17.443	56.365	78.259
July	12.463	17.190	12.720	17.359	56.673	76.636
August	12.405	17.171	12.634	17.356	56.266	76.636
September	12.201	17.171	12.508	17.370	55.253	76.636
October	12.189	17.171	12.370	17.370	55.170	76.636
November	12.616	17.171	12.769	17.370	57.253	76.636
December	13.552	17.171	13.768	17.370	62.068	76.636
Year	12.376	17.171	12.634	17.370	55.973	76.636

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41.255	42.529	July	42.400	44.519
February	41.614	42.962	August	43.319	44.519
March	40.157	42.577	September	39.755	44.519
April	42.186	43.923	October	41.185	44.519
May	43.115	46.053	November	43.125	44.519
June	44.606	45.815	December	44.655	44.519
		Av. Year..		42.281	44.519

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4.483	4.435	4.314	4.327	13.009	15.619
February	4.440	4.026	4.266	3.946	13.045	15.738
March	4.394	4.073	4.238	4.046	13.122	15.997
April	4.412	4.200	4.262	4.118	12.885	16.331
May	4.373	4.134	4.223	4.072	12.984	16.509
June	4.435	4.392	4.292	4.321	13.260	17.588
July	4.499	4.720	4.397	4.633	13.530	18.544
August	4.500	4.405	4.405	4.260	13.530	18.544
September	4.485	4.356	4.356	4.744	13.530	18.544
October	4.265	4.139	4.139	4.532	13.530	18.544
November	4.298	4.181	4.181	4.532	13.530	18.544
December	4.450	4.332	4.332	4.532	13.530	18.544
Year	4.420	4.286	4.286	4.532	13.970	18.544

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

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5.452	6.442	5.302	6.292	23.887	26.642
February	5.518	6.499	5.368	6.349	23.276	26.661
March	5.563	6.626	5.413	6.476	23.016	26.648
April	5.399	6.633	5.249	6.483	23.743	25.644
May	5.348	6.679	5.198	6.529	24.375	25.790
June	5.520	6.877	5.370	6.727	24.612	25.763
July	5.695	7.116	5.545	6.966	25.006	26.174
August	5.953	7.116	5.803	7.116	26.801	26.174
September	5.869	7.116	5.719	7.116	27.750	26.174
October	6.102	7.116	5.951	7.116	27.256	26.174
November	6.380	7.116	6.223	7.116	26.795	26.174
December	6.301	7.116	6.151	7.116	26.849	26.174
Year	5.758	6.608	5.608	6.608	25.281	26.174

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

PIG IRON AT PITTSBURG

Month	Bessemer		Basic		No. 2 Foundry	
	1911	1912	1911	1912	1911	1912
	January	\$15.90	\$15.12	\$14.40	\$13.32	\$14.75
February	15.90	15.03	14.50	13.28	14.81	14.01
March	15.90	14.95	14.65	13.66	14.96	14.10
April	15.90	15.13	14.65	13.90	15.00	14.15
May	15.90	15.14	14.30	13.90	14.72	14.12
June	15.90	15.15	14.06	14.11	14.56	14.22
July	15.90	15.25	14.03	14.54	14.53	14.54
August	15.90	15.25	14.00	14.00	14.47	14.54
September	15.90	15.25	13.57	14.00	14.40	14.54
October	15.43	15.25	13.44	14.00	14.34	14.54
November	14.92	15.25	13.30	14.00	14.25	14.54
December	15.15	15.25	13.10	14.00	13.90	14.54
Year	\$15.72	\$15.12	\$13.94	\$13.32	\$14.49	\$14.00

STOCK QUOTATIONS

COLO. SPRINGS July 30		SALT LAKE July 30	
Name of Comp.	Bid.	Name of Comp.	Bid.
Acacia	.05	Beck Tunnel	.09
Cripple Cr'k Con.	.01	Black Jack	.12
C. K. & N.	.18	Cedar Talisman	.02
Doctor Jack Pot.	.05	Colorado Mining	.21
Elkton Con.	.65	Columbus Con.	.25
El Paso	.97	Crown Point	.02
Findlay	.05	Daly-Judge	\$5.85
Gold Dollar	.18	Grand Central	.57
Gold Sovereign	.02	Iron Blossom	1.25
Isabella	.13	Little Bell	.35
Jack Pot.	.04	Lower Mammoth	.03
Jennie Sample	.04	Mason Valley	13.00
Lexington	1.02	May Day	.12
Moon Anchor	1.0085	Nevada Hills	2.00
Old Gold	.03	New York	1.02
Mary McKinney	.69	Prince Con.	1.25
Pharmacist	.01	Silver King Coal'n	2.50
Portland	.91	Siox Con.	.04
Vindicator	.83	Uncle Sam	.15
Work	.01	Yankee	.07

TORONTO July 30		LONDON July 31	
Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	\$7.35	Hollinger	12.50
Hudson Bay	\$70.00	Imperial	.62
Temiskaming	37	Pearl Lake	.15
Wettable-Lor.	52	Porcupine	26
Apex	.01	Porcupine Tisdale	.01
Central	15.56	Preston E. D.	.01
Crown Chartered	.09	Rea	.25
Dobie	1.25	Standard	1.01
Dome Exten	.13	Swastika	.09
Foley O'Brien	.13	West Dome	.05

SAN FRANCISCO July 30

Name of Comp.	Clg.	Name of Comp.	Bid
<b>COMSTOCK STOCKS</b>			
Alta	.08	Belmont	9.37
Belcher	.42	Jim Butler	.65
Best & Belcher	.08	MacNamara	.22
Caledonia	1.13	Midway	.60
Challenge Con.	.13	Mont-Tonopah	2.35
Chollar	.11	North Star	.18
Confidence	1.00	West End Con.	1.65
Con. Virginia	.35	Atlanta	.25
Crown Point	.51	Booth	.08
Gould & Curry	.06	C.O.D. Con.	.10
Hale & Norcross	.18	Comb. Frac.	.19
Mexican	2.77	Jumbo Extension	.41
Occidental	.50	Pitts-Silver Peak	.99
Ophir	.99	Silver Pick	.13
Overman	.80	St. Ives	.30
Potosi	.03	Tramp Con.	.02
Savage	.11	Argonaut	\$2.00
Sierra Nevada	.24	Bmker Hill	\$4.50
Union Con.	.68	Cent. Enreka	.44
Yellow Jacket	.59	So. Enreka	\$2.00

N. Y. EXCH. July 30

Name of Comp.	Clg.	Name of Comp.	Clg.
Amalgamated	82 1/2	Adventure	8 1/2
Am. Agri. Chem.	60 1/4	Ahmeek	\$350
Am.Sm.&Ref.con	82 1/2	Algomah	5 1/2
Am.Sm.&Ref.pf	108	Allouez	\$40 1/2
Am.Sm.Sec., pf.B	87 3/4	Am. Zinc	30 3/4
Anaconda	41 1/2	Ariz. Com., cts.	5 3/4
Batopilas Min.	1 1/2	Bonanza	7 1/4
Bethlehem Steel	67	Boston & Corbin	40
Chino	31 1/2	Butte & Balak	3 1/2
Comstock Tunnel	10 1/2	Calumet & Ariz.	74 1/2
Federal M			