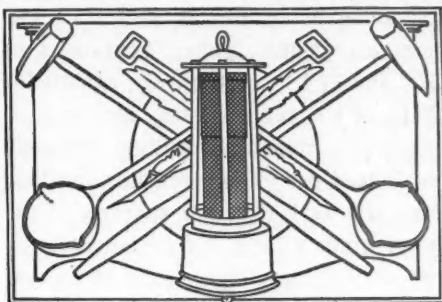


# THE ENGINEERING AND MINING JOURNAL

PUBLISHED WEEKLY

By the Hill Publishing Company, 505 Pearl Street, New York • John A. Hill, president; Robert McKean, secretary • London Office, 6 Bouverie Street, London, E. C., German Office, Unter den Linden 71, Berlin, Cable: Engminjour, N. Y. • Subscriptions payable in advance, \$5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, \$6.50



in Canada • To foreign countries, including postage, \$8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs • Notice to discontinue should be written to the New York Office in every instance • Advertising copy should reach New York Office by Thursday of week before date of issue • Entered at New York Post Office as mail matter of the second class.

VOL. 90

NOVEMBER 12, 1910.

NO. 20

### CIRCULATION STATEMENT

During 1909 we printed and circulated 534,500 copies of THE ENGINEERING AND MINING JOURNAL.

Our circulation for October, 1910, was 50,500 copies.

November 5..... 11,000  
November 12..... 9,500

None sent free regularly, no back numbers. Figures are live, net circulation.

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\*Illustrated.

## Nevada Consolidated's Report

The fourth annual report of the Nevada Consolidated Copper Company is all that a mining company's report ought to be and may well be adopted as a model by other managements who are desirous of treating their stockholders squarely. It is, in fact, of a character to excite both envy and shame—envy on the part of those who are unable to show such a grand record of success, and shame for those managements which continue to make the scurvy reports that we have so often berated. In the case of Nevada Consolidated, moreover, the full data presented may be accepted with unqualified belief, thanks to the esteem in which Mr. Yeatman is so properly held, and the stockholders of this company, and those of the public that may think of becoming stockholders, are consequently in a position to place a close valuation upon its stock.

Taking up the most important points of this report, it appears that the beginning of the last fiscal year the development of ore amounted to 30,073,000 tons, averaging 1.991 per cent. copper. During the succeeding 12 months these reserves were added to by 14,500,555 tons, averaging 1.28 per cent. These figures represent the original orebodies, out of which 3,421,275 tons, averaging 2.153 per cent. have already been mined, and 791,457 tons are estimated as unpayable on account of slopes, i.e., in order to mine it too great a proportion of barren ground would have to be removed. The orebodies have now been practically delimited.

It will be noticed that the ore added

during the last 12 months has been of much lower grade than previously and obviously represents in chief the deeper part of the deposit. The copper will not be produced from this ore at so low a cost as at present, but it will be the last ore to be mined, and what improvements in methods may come to pass before the end of 10 years no one can foretell. However, it is fully to be recognized that Nevada Consolidated is now producing its cheapest copper, for although the Ruth and Veteran orebodies are of materially higher grade than the Eureka, their costs will be more than proportionately higher. Moreover, the Eureka mine itself has heretofore been producing from its best ore.

It is doubtful if Mr. Yeatman has included the Veteran orebody in his latest estimate. By comparison with his last previous report it appears to be omitted. In that previous report the Ruth orebody was put down at 8,000,000 tons. Estimating it at 2½ per cent. copper, we reckon that the remains of the Eureka-Hecla-Liberty orebody are 18,651,725 tons, averaging about 1.67 per cent. copper and 14,500,555 tons averaging 1.28 per cent. The average grade of the ore mined from the Eureka pit in 1909-10 was 2.06 per cent. copper, against 2.34 per cent. in the previous year and it is to be expected that the general tendency in this particular will be downward.

To what extent will economies in production costs offset the diminution in ore grade? In 1908-09 on the treatment of 1,065,387 tons of ore, yielding 34,527,823 lb. of copper, the cost per pound of copper was 7.47c.; in 1909-10, the treatment of 2,237,028 tons, yielding 62,772,342 lb.,

gave an average cost of 7.05c. This reduction upon a lower grade of ore is of course, to be attributed chiefly to the operation of the plant at full capacity, with all the initial wrinkles smoothed out. Some further economies are forecasted, but considering that physical conditions will gradually become more unfavorable and that the item of repairs and renewals will tend to increase, it seems to us to be wholly improbable that production-cost will continue to decrease with the grade of the ore.

Before going further, however, we must refer to the methods of the auditor in determining the costs. Let us make haste to say that his statements impress us as showing the real costs, and all of them, without any attempt to befuddle by deferred charges, transferrals to capital account, etc. The cost of mining ore in 1909-10 was 15.4c. per ton, and an additional charge of 15c. is made to cover stripping, these figures including repairs and renewals, proportion of general expense, etc., while the charge for removing overburden includes not merely that overlying the ore, but also all that must be removed to extract the ore. The auditor's statement shows mining cost of 32c. per ton of ore; freight, 27c.; milling, 62c.; a total of \$1.21 for these items. Smelting cost \$6.29 per ton of concentrates, this evidently being direct operating expense. A charge of \$4.92 per ton is made for the use of the Steptoe plant, which stands at \$8,005,024. The Steptoe subsidiary company set aside \$394,628 for depreciation reserve (an unusual and commendable practice) evidently computed on basis of 5 per cent., and \$41,852 for repairs and renewals, and finally repaid to the parent company \$627,385 in dividends, wherefore the actual cost of the use of the Steptoe plant was only \$1.95 per ton of concentrates. Inasmuch as the outlay for the Steptoe plant figures in the capital stock of Nevada Consolidated, a lower amortization of the latter than is otherwise necessary may conservatively be reckoned. Freight on blister copper and refining of same cost 1.57c. per lb., which seems to allow an extraordinarily large profit to the refiner, while the selling commission of 1 per cent. is as high as anything going nowadays. The cost per pound of copper computed on basis of operating expense as reported was 9.77c. The proceeds from gold and silver, plus dividends from

Steptoe company and Nevada Northern railway, less interest on outstanding bonds and maintenance of Cumberland-Ely were 2.72c. per lb. of copper, making the net cost of the latter 7.05c.

Now how will these data apply to ore averaging only 1.67 per cent. and 1.28 per cent. copper, giving extractions of 22.7 and 17.4 lb. respectively, against the 28 lb. of last year. We may assume mining, transportation and milling to remain unchanged per ton of ore; also smelting, inasmuch as it does not appear that the lower grade of ore, higher in chalcopryrite, will give any higher ratio of concentration. Consequently we may expect these costs, amounting to about \$2 per ton of ore and representing about 7.14c. per lb. of copper at present (offsets not figured), to become respectively about 8.80 and 11.44, being increases of 1.66 and 4.30c. Assuming credits for gold and silver, railway earnings, etc., to continue as at present, we should look for a production cost of  $8\frac{1}{2} @ 8\frac{3}{4}c.$  per lb. in working up the 1.67-per cent. ore, and something like  $11 @ 12c.$  on the 1.28-per cent. Lest these figures be erroneously compared with those of other producers, it must be remarked once more that they include an allowance for the extinguishment of the company's large investment in plant. The richer ore of the Ruth mine is hardly to be expected to yield copper at less than  $8\frac{1}{2}c.$ , in view of the higher mining expense that it will necessarily incur.

The company's milling capacity is close to 3,000,000 tons per annum. In 1909-10 the amount treated was 2,237,028 tons, the monthly figures ranging from 120,782 tons in January, to 242,847 tons in July. Production was restricted by cold-weather difficulties during the winter months, and in order to improve market conditions since July. Adversities of one kind or another are always likely to happen and must be given allowance. If we estimate Nevada Consolidated's annual ore treatment at an average of 2,500,000 tons with its present plant, we shall be sufficiently liberal. Upon this basis the reserves of the Ruth mine and of the better grade of ore in the Eureka-Hecla-Liberty will be worked out in 10 or 11 years; the lower grade of ore will last for about six years longer.

In attempting a valuation of the company's stock upon the data given, it must be remembered that the company has al-

ready accumulated a surplus of quick assets amounting to \$2,633,617 and an amortization fund for the Steptoe works amounting to \$495,195, which, if swelled annually by 5 per cent. of the cost of those works, should extinguish their cost in less than 20 years, and finally there is the Nevada Northern railway, whereof the finances are not disclosed in this report.

### Report of the Committee on Atomic Weights

The International Committee on Atomic Weights, 1911, has made its annual report, the accepted tables being printed elsewhere in the JOURNAL. There are several changes, lithium (from 7.00 to 6.94) being the most striking. The changes represent the result of a year's work with improved apparatus, new and better chemical methods, and, possibly, more careful manipulation.

However, such a revision as in the case of lithium leads to the question of how far long strings of significant figures in chemical analyses are justified. Last year, for instance, with  $Li = 7$ ,  $P = 31$ , and  $O = 16$ , we should have calculated  $Li_3PO_4$  as containing 18.103 per cent. lithium; this year with  $Li = 6.94$ ,  $P = 31.04$ , and  $O = 16$ ,  $Li_3PO_4$  contains only 17.97 per cent. of lithium. No further comment than the figures seems needed on the practice of using several significant decimal places on any except the very commonest elements when they are determined in other than elemental form.

### The Copper Statistics for October

The report of the Copper Producers' Association for October may be taken favorably or unfavorably, largely according to the state of the liver of the critic. At first sight the reduction of 9,531,600 lb. in the American accumulation is satisfactory. The continuance of the large deliveries, both foreign and domestic, is also satisfactory, although pessimists will say that some of this copper undoubtedly went into invisible stocks. Unsatisfactory, however, was the increase in the daily rate of production from 3,986,660 lb. in September to 4,079,650 lb. in October.

For our own part we were agreeably surprised by the October report, our mind having been fully prepared for an un-

favorable showing as to the accumulation. Although we confess to a disappointment with respect to the production, upon the whole we consider the October statistics to be satisfactory and favorable. The increase in the rate of production means either that the August curtailment of the smelters has not become manifest in the refinery statistics as soon as expected, or else that the refiners had more crude copper in stock than was supposed. Both of these things were probably true. The smelters' statistics since July have shown substantial decreases, and sooner or later the refiners' must do the same.

The really good thing about the October statistics is that the total stocks reported for Europe and America decreased by 22,747,600 lb. If that rate of decrease be maintained, the rosier anticipation of sensible observers will be fulfilled.

### Conservation of Mineral Lands

The address of the President before the National Conservation Congress, which we published recently in *extenso* so far as his remarks respecting mineral lands went, displays great rationality of thought and lucidity of expression. It is obvious that the President has had the benefit of excellent professional advice, which he has assimilated thoroughly. To his ideas respecting the coal, oil and gas, and phosphate lands that still remain the property of the nation we give our approval, almost unqualified.

We are unable, however, to agree to the proposal that the law of the apex, applying to metalliferous deposits, should remain unchanged. The President admits that this law had led to much litigation, and ought not to have been the law, but he thinks that it is now so fixed that the benefit to be gained by a change is outweighed by the inconvenience that would attend the introduction of a new system, and he thinks after all that the mineral land laws have worked fairly on the whole.

In fact, the law of the apex has been abolished by common consent in many of the important mining districts of the West, for the simple reason that it is unworkable. In some cases, as at Leadville, this conclusion was reached after extraordinarily costly litigation, upon which lawyers fattened; in other cases the law of the apex was practically nullified by con-

solidation of all interests, as at Butte; in other cases it was fortunately discarded at the beginning, as at Ely. The result is that in such important mining districts as Bisbee, Globe, Clifton, Bingham, Ely and Leadville we have at the present time in practical operation the simple custom of side line property rights which has prevailed from the beginning at Lake Superior and has relieved that happy mining district from the incubus of dispute and litigation. The idea that the law of the apex cannot conveniently be changed is, therefore, a theory that is confronted by the condition that it has been changed in many cases by common consent and without inconvenience.

The President and James J. Hill, at the same meeting, called a halt to the emotional rhapsodies that have been brought forth about conservation and deprecated the agitation in favor of the Federal Government assuming enterprises that should be undertaken by the States, or by private capital. Mr. Hill, as usual, was highly sensible. We are bound to agree with him that there has been much foolish talk about conservation, and that what is especially needed is economy in the use of our natural resources. He said properly that output is determined, not by the producer, but by the consumer, and that the withdrawal of resources tends to increase the price to the consumer. "Conservation does not mean forbidding access to resources that could be made available for present use," said he. "It means the freest and largest development of them consistent with the public interest and without waste." This certainly expresses a sound economic principle.

### Grade of Ore and Price of Product

In the JOURNAL of Sept. 10 we referred to the idea of considerable prevalence that in times of high prices it is best to mine the lower grades of ore, saving the higher grades for hard times. By a coincidence, our London correspondent, who is a mining engineer of note, referred to the same matter in discussing the affairs of the Dolcoath mine.

The policy of this Cornish tin-mining company has been to produce less metal when the price for tin is high, and more when it is low, the idea being that the

company shall always show a profit, whatever the price of tin may be.

Our London correspondent characterizes this as an unsound policy, saying that it would be better for the shareholder to have good ore worked when the price rules high, not only because more money would be obtained for the tin, but also because the profit in the mine would be more quickly turned into cash. Moreover, the interests of the community would be better served. Insofar as dividends are concerned, if there should be periods when no profit could be shown, they could be easily tided over by accumulating a cash reserve in times of large profits, out of which dividends could be paid during the periods of low returns.

Applying the same principles to copper production, we should have seen a greatly increasing production when the price for that metal rose to 25c. per lb., and, latterly, perhaps, a diminishing production instead of the steady increase that has disturbed this business during the last two years.

The signs that we are going to have a rejuvenation of the scheme for a general copper consolidation multiply every day. The beggars are steadily marching to town; some in rags, some in tags, and some in velvet gowns. Those who are in rags and tags are eager to exchange the loads that they have been lugging for some valuable loot, while the wearers of velvet gowns are too impatient to wait for the dividends from the good and noble mines and would rather have railway bonds, etc. If the Supreme Court makes a decision of the monopoly cases that will be otherwise than absolutely adverse to combinations the gates of the town will be open.

The Granby company, having purchased a new mine in British Columbia, is entering upon the policy of replacing a moribund property by a new one. The chief question in such cases is: Will the first gamble be successful? Stockholders are seldom asked if they desire to have the company risk its money in a new and entirely foreign venture; or if they would not prefer to liquidate the old one. But, of course, they can sell out, i.e., if they are lucky enough to find a market.

# CORRESPONDENCE and DISCUSSION

Views, Suggestions  
and Experiences of Readers

## Effect of Stopping Drill Dust on the Health

I see an inquiry in the JOURNAL as to the reason why the dust made by a stopping drill has such a bad effect on the lungs of the miner whereas the dust in a mill does not seem to be injurious to the mill man. I have noticed this myself, and have also had trouble with the dust from the stopping drill getting in my eyes, which marks in another way the difference between the two dusts. The cause lies in the different natures of the two dusts. The mill dust is composed of very fine particles; otherwise they could not float in the air. The dust made by the drill contains all-sized particles from coarse sand to the finest dust, but contains a large proportion of sand, with sharp corners and edges. As I am not a doctor I will not try to describe the action of these grains of rock on the lungs, but they cannot take care of them the way they can of fine dust, which, mixed with water, is nothing but slimes. The final effect of too many of these sharp grains in the lungs is well known to miners where stopping drills are much used.

If an arrangement could be used by the miner which would keep these coarse grains out of his system he would not be subject to miner's consumption. Where he finds he is obliged to breathe in much drill dust it would be well to tie a handkerchief about the mouth and nose to keep out the coarse particles.

ANOTHER MINER.

Sombrerete, Zac., Mexico, Oct. 27, 1910.

[While it seems to be the case that the angular drill dust is worse to breathe than is mill dust, yet the latter is severe also on its breathers, and dry-crushing establishments often spend considerable sums to mitigate this evil, not alone on account of loss of metal, but also on account of sanitary considerations. There have, undoubtedly, been cases where the lives of the millmen have been shortened markedly by inhaling dust, even where no poisonous elements were contained in the ore. It seems possible that there may be a greater density of dust particles per cubic inch in a mine, owing to poorer ventilation and small spaces, which with the greater angularity and size of the particles may cause disease to develop with greater rapidity among miners, but millmen are not immune even with the finer dust.—EDITOR]

## Proposed Simplification of the Cyanide Process

Bruno Mierisch in the JOURNAL of June 25, 1910, outlines two simplified schemes of cyanide treatment, which, so far as I know, have never been tried in practice. They seem to me, however, to offer theoretical advantages of sufficient promise to encourage their trial on a practical scale.

The reasons why metallurgists responsible for the successful operation of new plants do not follow the proposed simplifications are: (1) A sufficient wash cannot be secured by passing three precipitated cyanide washes of 0.7 ton each and one water wash of 0.5 ton through each ton of 50 per cent. solution pulp; (2) an unnecessary increase in the number of zinc boxes, and an increased cost for precipitation would result; (3) loss of cyanide would be excessive; (4) no additional profit per ton of ore treated would result.

### RESULTS AT GOLDEN STAR MILL

To back my reasoning, I cite conditions at the Golden Star Mining and Milling Company's mill, at Polaris, Ariz., when I started it in August, 1910. No ore containing less than \$25 per ton went into the mill, and it often carried from 2 to 4 oz. of gold per ton. Extraction averaged about 95 per cent. All the ore was slimed, in a 4-lb. cyanide solution, in a silex-lined Abbe tube mill. The solution contained from two to four pounds of lime per ton. The average loss of cyanide was 2.23 lb. per ton of ore treated, and the solution of gold was fairly complete by the time a Pachuca tank was filled.

### RESULTS OF WASHING BY THE CROSSE METHOD

With a 50 per cent. pulp, each ton of solution entering the Pachuca tanks from the tube mill would have contained at least \$30 of dissolved gold. Had this pulp entered a Crosse-Pachuca tank filled with cyanide solution each ton of pulp would have displaced 0.7 ton of solution, which after passing the respective zinc boxes, would have flowed successively through tanks Nos. 2, 3 and 4 of the flow sheet designated as "A" in Mr. Mierisch's article. Washing by the Crosse method (assuming a complete mixing of original solution and wash, as the pulp in the inner cone is in agitation), with a precipitated solution carrying 10c. per ton dissolved gold, the

value of the solution issuing from the filling tanks would be \$12.50; from tank No. 2, \$5.25; from tank No. 3, \$2.23; from tank No. 4, \$1; and after application of the water wash, \$0.50.

It is immaterial whether the solutions issuing are assumed to come from the successive tanks, or from the same tank on successive days. The value of the solution issuing from tank No. 5 is also the value of the remaining solution run to waste, with the pulp. The increased loss in cyanide would be 0.88 lb., representing an additional cost of 22c. There is also a loss in lime. A larger volume of cyanide wash could be given, but the average cost of precipitating gold from a ton of solution is 3.36 cents<sup>1</sup>.

### COMPARISON WITH FILTRATION RESULTS

The cost of filtering a ton of slime with the Butters box, treating 4000 tons per month is 10.74c.<sup>2</sup> Amortization of Butters plant, assuming a life of five years for the mine, will not exceed 6c. per ton treated. Loss of dissolved gold need not exceed 3c. per ton of original ore.

### COMPARISON OF LOSSES AND EXPENSES OF CYANIDE METHODS.

PROPOSED SIMPLIFICATION OF CYANIDE PROCESS.	
Run to waste in pulp, per ton of ore..	\$0.50
Increased loss of cyanide, 0.88 lb. @ 25c. per lb.....	0.22
Precipitation of 3.58 tons of solution @ 3.36c. per ton of ore.....	0.12
Total.....	\$0.84
FILTRATION METHODS.	
Filtration per ton of ore.....	\$0.1074
Amortization of plant.....	0.06
Loss of dissolved gold.....	0.03
Precipitation of 2.6 tons solution @ 3.36c. ....	0.087
Total.....	\$0.2844

As shown in the tabulation the increased loss and expense by the proposed simplification is 55c. per ton treated, and the loss would generally be greater, due to the fact that the gold usually goes into solution more slowly.

### A NEW SUGGESTION

A satisfactory method would be: To dilute the pulp running into the Pachuca tanks to, two of solutions to one of dry pulp; agitate, settle, and decant; add precipitated solution; agitate, settle and decant; run the pulp to an Oliver continuous filter, which treats pulp at a working cost of 12.23c.<sup>3</sup> per ton. One man

<sup>1</sup>"Cyaniding Gold and Silver Ores," Julian and Smart, p. 362, old edition.

<sup>2</sup>"The Filtration of Slime by the Butters Method," E. M. Hamilton, *Min. and Soc. Press*, June 22, 1909.

<sup>3</sup>"Cyanide Plant Practice at the Minas de Tajo," George Tweedy and Roger L. Beals, *Bull.*, A. I. M. E., February, 1910.

can attend to the filter, tanks and decantations. No additional tanks would be required, as solution of gold goes on during settlement, decantation and filtration.

DANA G. PUTMAN.

Tuquerres, Colombia, S. A., Sept. 15, 1910.

Stamp Drop Sequence

I have just made a diagram, to illustrate for my students the question of the best order of dropping stamps in a battery. This may be of interest to readers of the JOURNAL.

In the diagram, columns A, B, C and D are modifications of the "California" 1-4-2-3-5 order of dropping, and columns E and F are the "Homestake" order 1-3-

if the ore is fed at the middle of the mortar, as is usual.

HENRY S. MUNROE.

Columbia University, New York, Oct. 20, 1910.

California Oil Prices

The JOURNAL of Oct. 29, 1910, reports the price of crude oil at points around San Francisco at 60c. per bbl. and 30c. at the wells. The San Francisco harbor commissioners recently awarded the contract for their fuel oil at 85c. per bbl. to the Union-Independent Agency.

A Los Angeles despatch to the California Oil World dated Oct. 26, gives the following:

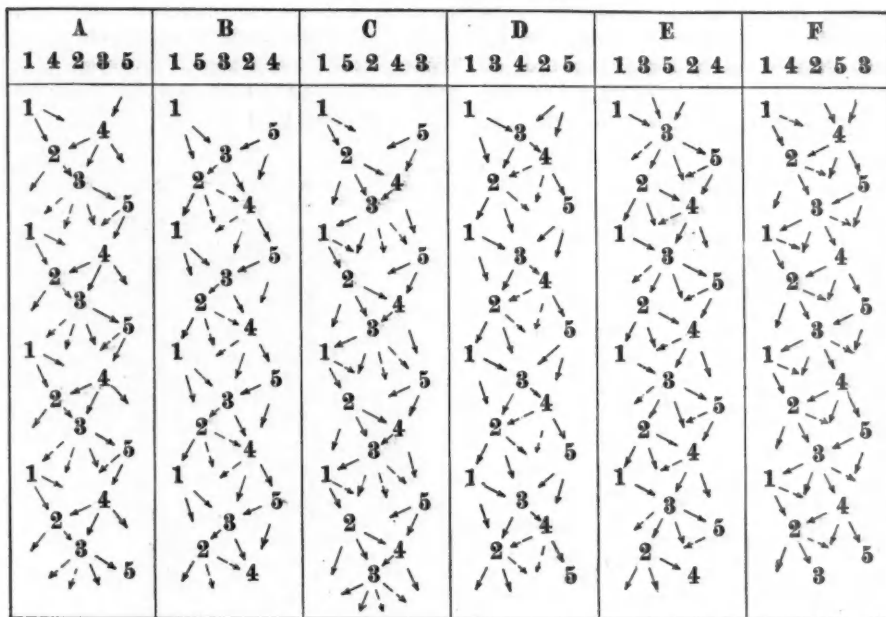
"The Agency price for September, after deducting 10 per cent. due the Union and 1/2c. per bbl., which goes to the Agency, is 43.98c. per bbl. Against

been able to bring together the following list, which, however, I have reason to believe is not entirely complete. I have drawn the line at 10 lives lost, but I, of course, am particularly interested in disasters causing a considerable loss

CHRONOLOGICAL LIST OF PRINCIPAL COAL MINE DISASTERS IN NORTH AMERICA.

Year.	Date.	Name of Mine, or Locality and State.	Lives Lost.
1869	Sept.	Avondale, Penn.	179
1873	.....	Drummond, N. S.	73
1880	March 29	Richhill, Mo.	23
1880	.....	Fort Pitt, N. S.	44
1883	Feb. 16	Braidwood, Ill.	69
1883	Nov. 23	Kettle Creek, Penn.	17
1884	Jan. 24	Crested Butte, Colo.	59
1884	Feb. 20	West Leising, Penn.	19
1884	March 13	Pocahontas Mine, W. Va.	114
1884	.....	Johnstown Mine, Penn.	14
1885	.....	McBeam Mine, N. S.	13
1890	May 15	Ashley Mine, Penn.	26
1890	June 16	Hill Farm Mine, Penn.	31
1891	Jan. 27	Mammoth Mine, Penn.	109
1891	Feb. 21	Spring Hill, N. S.	125
1892	July 23	York Farm Mine, Penn.	15
1893	Jan. 10	Como, Colo.	24
1894	Feb. 13	Gayland, Penn.	13
1896	Feb. 18	Vulcan Mine, Colo.	49
1896	March 23	Berwind Mine, Penn.	13
1896	June 28	Twin Shaft Mine, Pitts-	58
		ton, Penn.	
1899	June 16	Caledonia Mine, N. S.	11
1899	Dec. 10	Carbonado Mine, Wash.	33
1899	Dec. 23	Brazella Mine, Penn.	20
1899	Dec. 23	Sumner Mine, Penn.	19
1899	.....	North Carolina	22
1900	March 6	Red Ash Mine, W. Va.	46
1900	May 1	Schofield, Utah	200
1900	Nov. 2	Berryburg, W. Va.	15
1901	Feb. 15	Union Mine No. 6, B. C.	63
1901	March 2	Diamond Mine, Wyo.	28
1901	May 15	Chatham, W. Va.	10
1901	June 10	Port Royal Mine, Penn.	20
1901	Sept. 30	Extension Mine, B. C.	16
1902	Jan. 14	Milby and Dowe Mine,	10
		I. T.	
1902	Jan. 25	Lost Creek Mine, Ia.	22
1902	May 19	Fraterville, Tenn.	184
1902	May 22	Fernia Mine, B. C.	127
1902	July 10	Johnstown, Penn.	112
1902	Aug. 7	Bowen No. 3 Mine, Colo.	16
1902	Sept. 15	Algonia, W. Va.	17
1903	Jan. 23	Primero, Colo.	24
1903	July 1	Hanna, W. Va.	235
1903	Nov. 21	Ferguson Mine, Penn.	17
1904	Jan. 25	Harwick Mine, Penn.	179
1904	April 3	Ziegler, Ill.	53
1904	April 23	Eleanor Shaft, Penn.	13
1904	Dec. 1	Diamond Mine, Wyo.	18
1905	Jan. 4	Bluefields, W. Va.	22
1905	Jan. 18	Panther Creek, W. Va.	18
1905	Feb. 20	Virginia City, Ala.	108
1905	Feb. 27	Welch, W. Va.	15
1905	Mar. 18-19	Rush Run, W. Va.	24
1905	April 3	Ziegler, Ill.	47
1906	Jan. 4	Coaldale, W. Va.	22
1906	Jan. 18	Detroit & Kanawha, W.	18
		Va.	
1906	Feb. 8	Parrall Mine, W. Va.	23
1906	March 22	Century, W. Va.	23
1906	April 21	Trinidad, Colo.	23
1907	Jan. 23	Primero, Colo.	20
1907	Jan. 26	Pence Mine, W. Va.	12
1907	Jan. 29	Stuart, W. Va.	85
1907	Feb. 4	Thomas Mine, W. Va.	25
1907	May 1	Whipple Mine, W. Va.	16
1907	Dec. 1	Naomi Mine, Penn.	34
1907	Dec. 6	Monongah No. 8 Mine,	359
		W. Va.	
1907	Dec. 19	Darr Mine, Penn.	239
1908	Jan. 12	Lick Branch, W. Va.	105
1908	May 1	Mt. Lookout, Penn.	12
1908	Aug. 26	Halleyville, Okla.	29
1908	Nov. 28	Marianna Mine, Penn.	154
1909	Jan. 10	Leiter Mine, Ill.	26
1909	Nov. 13	St. Paul Mine, Cherry,	266
		Ill.	
1909	Dec. 28	Lick Branch, W. Va.	51
1910	Jan. 31	Primero, Colo.	75
1910	Feb. 1	Drakesburg, Ky.	30
1910	April 20	Mulga, Ala.	40
1910	April 21	Amsterdam Mine, Ohio.	16
1910	May 5	Palos, Ala.	83

Order of Stamp Drop



The Engineering & Mining Journal

EFFECT OF VARYING STAMP-DROP SEQUENCES

5-2-4 and the same reversed. The resulting wave movements in the mortar are indicated by arrows. Where the movement of the material is prevented by an adjoining or near-by stamp this is indicated by a broken line. The "California" order is said to give a more uniform distribution of feed, the "Homestake" tending to crowd the ore to one end of the mortar, requiring that the end stamp shall have a longer drop. In columns E and F it is apparent that the interference spoken of above has much to do with the crowding of the ore at one end of the mortar.

In columns B and D it will be seen that effective waves are started toward each end by the middle stamp 3, which is followed immediately by the adjoining stamps 2 and 4. Either of these two orders of drop should prove satisfactory

this is a charge of 7.8c. per bbl. sold to cover total expense of storage, leaving the settlement price 36.18, about 1c. above August and 1.18c. more than the guaranteed certificate price. This releases the oil in storage from any further charges on that account, leaving it clear. Deliveries for the month were 750,000 barrels."

OIL PRODUCER.

Bakersfield, Cal., Nov. 4, 1910.

Coal Mine Disasters

In connection with an extended inquiry into coal-mining accidents, I am anxious to obtain as complete a list as possible of all the important disasters which have occurred in coal mining in this country. With much labor, I have

of life. I shall be greatly obliged to the readers of the JOURNAL if they will call attention to errors and omissions in the list, as given below.

FREDERICK L. HOFFMAN.

Newark, N. J., Nov. 4, 1910.

# DETAILS of PRACTICAL MINING

Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

## A Modified System of Back Stopping

BY J. E. WILSON\*

The accompanying sketch shows a simple, safe and economical method of stopping where the cost of labor and timber is a serious consideration. The method is a modification of the back-stopping scheme. For the introduction of this style of stopping it is only necessary to drive one or two raises at a 45 deg. or less angle depending a great deal on the dampness of the ore to be mined. Where the ore is dry the raises may be driven at a flatter angle. Stopping can be started as soon as the raises are advanced about 20 ft. Work should begin above the chute, care being taken to cover the latter

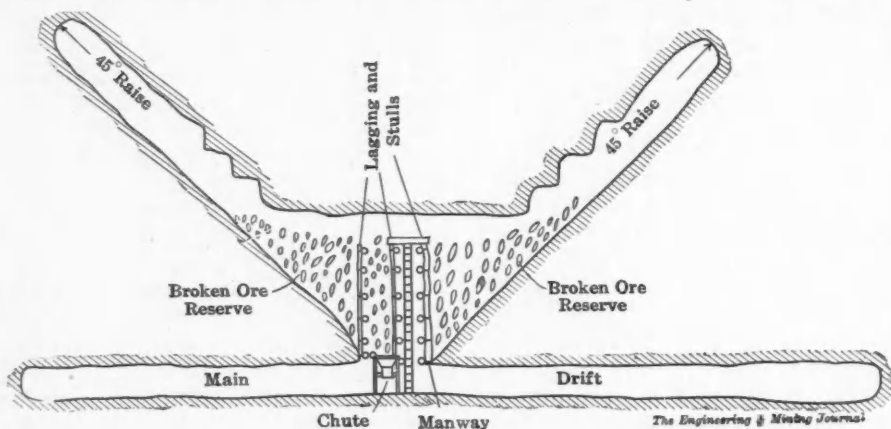
to discharge and thus impairing the result of the entire round. This failure of a round to break the rock properly means much added expense, is quite annoying, and worst of all, exceedingly dangerous as the following shift may accidentally pick or drill into the missed hole; this has often occurred with disastrous results.

The main features in this method of mining are the elimination of shovellers, as all ore broken will run into the chute by gravity, and of expensive scaffolding. No timber is needed, except that for the manway and chute, thus reducing expenses to a minimum. When the stope is mined to the level above the process of drawing the reserve ore can be started either from the top or lower set of lagging, as the case may be. I would recommend, though, to draw from the top,

The weight of the houses per square foot of floor area varies from about 4.4 lb. in the smallest size down to 3.2 lb. in the larger sizes, while the prices range from about 80c. per sq.ft. of floor area for the smallest down to about 65c. per sq.ft. for the largest size. From the above data a miner knowing about the size of house he desires, can closely approximate its weight and cost.

## A Hard Way to Lower Mine Timbers

The accompanying sketch illustrates a case of bad management, in which an outlay of \$25 would save much time, money and hard work. The mine is a small one, which is all the more reason for mine economies.



SCHEME OF BACK STOPPING EMPLOYED AT THE DOLORES MINE

so, as not to destroy timbers while the first few rounds are being blasted. The first bench or step mined will be slightly wider than the chute and manway combined and the length will increase as the stope advances, thus gaining stopping back for every foot raised. The broken-ore reserve will start from the first set of lagging put in, as only the overflow will go into the chute. The filling of ore serves for miners to stand upon while drilling the back.

### CARRYING STEPPED BACK AIDS IN BREAKING ORE

The most advantageous method of breaking ground, according to my experience, is the bench or step system, which is illustrated in the sketch. This system eliminates the common and serious trouble of the cut or "relief" hole failing

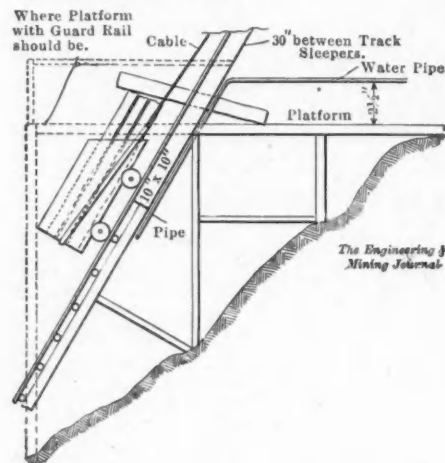
\*Mine superintendent, Dolores Mining Company, Madera, Chihuahua, Mex.

as all boulders can be broken before entering the chute. I am now using this method in the Dolores mine with quite satisfactory results.

## Portable Houses

One of the continual problems of the prospector and miner is that of his cabin. To a certain extent this is being answered by the builders of portable houses. These range in size from 7x9 ft. to about 18x30 ft. in floor space, which means from one to six rooms.

These houses can be set up or taken down without any tools in three hours, or less, are weather proof, and the material is also guaranteed against mildew or rot. They are usually screened, and completely proof against insects, a matter of great importance in tropical or mosquito-infested districts.



REMEDYING A DIFFICULT METHOD OF LOWERING TIMBER

To begin with, the platform from which the timbers are loaded into the skip is small and there is a water-pipe line in the way of the workmen. The farther side has no guard rail so that in case a man falls off he has to depend upon the kindness of a 50-deg. slope 150 ft. long to catch him after dropping 25 ft. A splendid chance for a suit against the operating company!

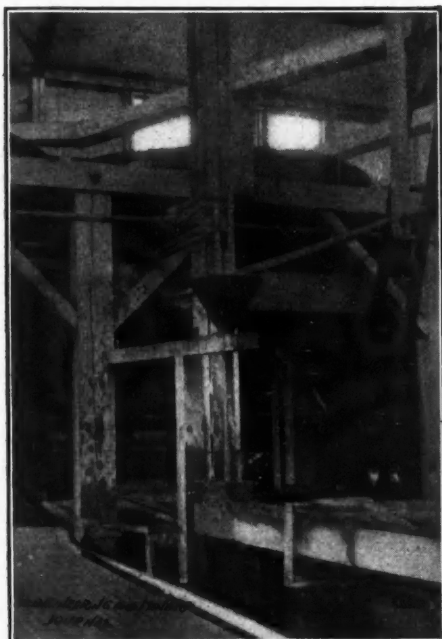
The skip can be brought within about 4 ft. of the edge of the platform. The bail is in the way and the cable passing between the rail supports leaves a working space of only 15 in. on each side. The timbers handled are the usual mine timbers, 8 to 10 ft. long and up to 12 in. in diameter. Two men balance themselves between the rails, hold to the cable with one hand and with a pair of tongs, lift, pull and swear until the timber finally slides into the skip. Occa-

sionally a timber misses the skip and falls down the incline, thus being a source of danger and damage.

In this particular case it would have been an easy matter to have built a platform out to the skip and stop the skip at this level. The men would then be directly over the skip and loading would be an easy matter. Judging from the surroundings the present system has been in use many months. Is it any wonder that some mines fail, even with fair orebodies? Good common sense seems to be lacking here.

### Piping for Callow Cone Installations

As with other devices used to settle or thicken pulp, the discharge pipe on the Callow cone is liable to become stopped up, although this has been guarded against by bringing the discharge opening as near level with the height of the feed as is practical and thus enabling the use



PIPING FOR CALLOW TANKS, OHIO COPPER MILL, LARK, UTAH

of as large a discharge opening as possible. This clogging is especially apt to occur when the feed to one of the devices fed by the Callow cones has to be shut off. At the Ohio Copper Company's mill William Kidney, superintendent, has devised an ingenious way of arranging the piping of the Callow cones so as to facilitate their starting after a shut-down.

The funnel on top of the pipe taking the feed to the Wilfley table is used on account of the necessity of breaking off the discharge pipes of Callow tanks at a height only a little below that of the feed coming to the tanks. The funnel breaks the continuity of the discharge pipe and ends the siphoning action. Each of the Wilfley tables takes the feed from two Callow tanks. There are two cross pipes at each table. Clear-water pipes are car-

ried along beside the Callow tanks just a little higher than the level of the discharge pipes from the tanks. These pipes provide the water for washing the floors and for starting the cones when they get stopped up. A T-connection is made between the lines where a discharge pipe crosses the line of the water pipe and a valve is put on the connecting pipe. The accompanying half-tone shows the arrangement of the piping.

When a discharge pipe becomes stopped up, the valve connecting with that discharge pipe is opened slightly and by placing the hand over the discharge opening of the Callow pipe the water is forced up through the discharge pipe of the Callow cone into the tank itself, and the pulp is started flowing. Thus the tank is made ready for work without any dirtying of the floor. It is an easy and effective way of doing the work, and is especially useful where a number of Callow tanks are employed.

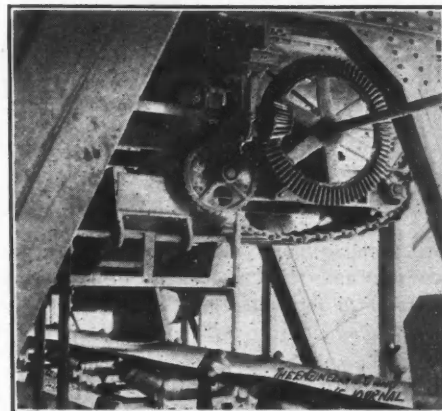
### The Use of Cyanide Tailings for Stope Fillings

In West Australia fatalities from the vitiation of the air of mines by the fumes arising from the tailings from cyanide treatment used for filling stoped ground, have been reported. In such cases it appears that wet, fresh tailings have been run directly into the mine without any previous exposure to the air by heaping on the surface. The West Australian royal commission, in dealing with this subject, recommended that tailings should not be used for filling: (1) In the wet state; (2) when they contain more than 0.01 per cent. of their weight of cyanides calculated as cyanide of potassium; (3) in any part of a mine where there is not a current of air passing freely. The Australian method of stope filling with cyanide tailings is a dry-filling system, whereas a water-borne system by which the dry sands are sluiced into the empty stope and the water drained off, leaving the sand in a compact mass, is used on the Rand, in the Robinson mine.

The Transvaal mines department arrived at the conclusion that a solution containing prussic acid loses the latter rapidly by evaporation into the air. In the case of tailings being used for filling stopes, it is considered likely that the drainage from the sand containing cyanide will come into contact with acid water from the mines, and that some prussic acid will be formed. The Transvaal Mining Regulations Commission is therefore of the opinion that the percentage of cyanide in tailings used should be low and good ventilation should be required. A recommendation is made that the regulation of the West Australian commission in this matter be adopted, pending the results of further investigations to be conducted in the Transvaal.

### Traveling Belt Ore Feeder

At the Boston Consolidated mill there was installed a feeder of the traveling-belt type, somewhat similar to those in use at coal bunkers of a few mines in Pennsylvania. When the mill was being designed, it was the intention to mine the ore by means of steam shovels. On that account, it was anticipated that there would be numerous boulders in the ore coming to the mill. To handle such a feed either a feeder of the traveling-belt type or one of the reciprocating-pan de-



TRAVELING BELT ORE FEEDER AT BOSTON CONSOLIDATED MILL

sign can be used. The traveling-belt type was selected and this feeder has given excellent results after two years of service and has required practically no repairs.

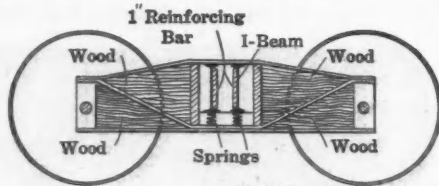
It is the design of A. J. Bettles. The chute openings in the sides of the bins are stopped with three inclined horizontal slats as the openings are 4 ft. high. In case of boulders or freezing causes the blocking of the chutes, the ore can be started again by punching with a bar through the stoke or punch holes.

The flow of ore is stopped by the traveling-steel belt as the surface of repose of the ore intersects that of the belt. The belt is 30 in. wide and is driven by a ratchet wheel operated by a pawl from an eccentric shaft. The speed of the belt travel is adjustable by means of the eccentric arm from 1 1/4 in. to 6 in. per revolution of the eccentric shaft which is driven by means of a set of gear wheels run by a rope drive from the motor operating the gyratory crushers and the belt conveyer. The feeder is thrown out of gear by raising the pawl that operates the ratchet wheel. The ore from the feeder belt falls into a steel chute that has an inclination of 30 deg. in the direction of the travel of the conveyer belt so as to reduce the impact of the ore falling on the conveyer.

A model of the Copper Queen mine is being prepared and will be presented by Dr. James Douglas to the American Museum of Natural History in New York.

## Reinforcing Steam Shovel Trucks

The accompanying sketch shows the way in which steam-shovel trucks are being rebuilt at some of the mines on the Mesabi range. The shovels are subject to heavy strains and rough usage and in many cases the trucks upon which they are mounted actually bend and twist out of shape. The truss is now being filled with 5-in. oak plank cut to size and driven in securely. The I-beams on the



REINFORCED STEAM-SHOVEL TRUCK

trucks also bend occasionally, near the center, and it is necessary to reinforce them with 1-in. plates as shown.

## Ventilation for Transvaal Mines

Treating the subject of mine ventilation, the Mining Regulations Commission of the Transvaal makes recommendations for the sectional ventilation of the mines. The ventilating currents from downcast intakes should be split at the entrance of every working drive, such entrances being provided with brattices so constructed that the openings for the passage of air can be varied as required. After passing through the workings air should be led as directly as possible to the main return airway.

### USE OF MECHANICAL VENTILATING APPLIANCES NECESSARY

Recognizing the insufficiency of the ventilation in most of the Transvaal mines, it is recommended that in all portions of a mine or workings where the natural ventilating current is insufficient, suitable mechanical appliances for ventilation be erected and operated. The courses for the supply of air to all working places, and of foul return air from such places, should be kept separate and disused drives, stopes, etc., where possible, should be completely closed in.

It is further recommended that plans and sections of every mine be kept at the mine office and these drawings show airways, direction of air currents, position of brattices, etc., drawings to be posted to date at intervals of not more than three months. Not less than once every three months, chemical determination of the following samples should be made at each mine: Air 100 ft. from the face of all drives; 50 ft. from the face of all winzes and shafts; from the

bottom of upcast shafts; from all stopes connected by only one drive.

### REGULATIONS FOR LOCAL VENTILATION

With regard to the subject of the local ventilation, the Mining Regulations Commission recommended as follows: (1) That the use of mechanical appliances is indispensable for adequate ventilation of certain sections of a mine outside of the circuit of natural ventilation; (2) that every working place where rock drills are used be furnished with suitable arrangements for laying and removing dust, smoke, gases, etc., and that no man shall return to a working face until the air is free from noxious gases caused by blasting; (3) that the intake pipes to compressors be led outside of the engine room to where the air is of suitable degree of purity; (4) that the lubricating oil used in compressors have a flash point of not less than 600 deg. F.; (5) that periodical inspection by a responsible mine official be required for

## Method for Sawing Lumber

BY A. LIVINGSTONE OKE\*

The accompanying sketches illustrate a method employed by itinerant sawyers on the Iberian peninsula, for sawing logs into plank without a saw-pit. These men go from village to village in the more remote districts, taking with them, as their complete outfit, one or more long two-handed rip saws, an axe, a few triangular files, and the pair of front legs shown in Fig. 2. The latter are carefully selected with a view to lightness and strength, as well as the shape, and are usually made from a tree with a branch at the right angle; this single tree is then split centrally to give the two halves shown. It is important that they should be light in order not to add unnecessary weight to the sawyer's pack.

### PLANKS SAWED WHERE USED

The tailpiece or "lizard," is made on

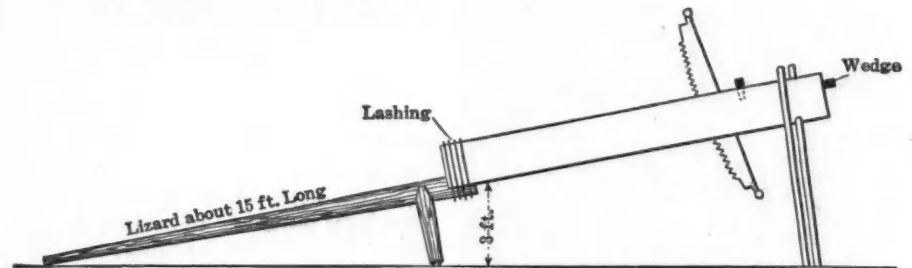
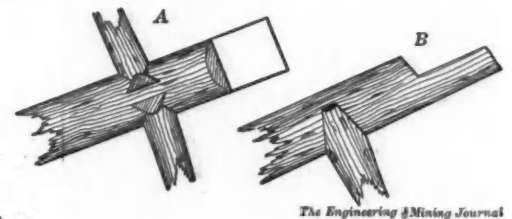


FIG. 1



FIG. 2



ARRANGEMENT FOR SAWING LUMBER

air cylinders of compressors; (6) that where mechanical ventilation is not provided, the compressors be kept running for at least two hours between shifts at not less than 20 lb. pressure, except when necessary to stop for repairs; (7) that the vicinity of the collar of downcast shafts be kept clear of ashes, cinder heaps, and as far as possible of smoke.

Rubbing a tracing with a cloth moistened with a solution of gum camphor in alcohol will, according to the *Scientific American*, remove undesired lines. A little firm rubbing, though not entirely removing the lines, leaves them so thin and transparent that a comparatively slight application of a soft rubber completes the erasure, and the surface is in a far better condition than if the lines are removed by an ink eraser or similar means.

the spot, and the detail sketches A and B show the method of fixing the two front legs in to a wedge-shaped dovetail. In making the saw-cuts the front supports are passed, one at a time, to the other side of the saw, the log being supported temporarily with one hand while the other shifts the support. As this arrangement is a double three-point support, the whole apparatus is remarkably firm and rigid when in use. One sawyer stands on the log while the other works, kneeling, below.

I have made use of this method advantageously in mining work where a regular saw pit was not available. By its use the timber can be sawed at the place where it is to be actually used; the necessity of carrying heavy logs about is thus obviated.

\*Resident manager, Argentina & General Exploration Company, Rodeo, San Juan, Argentina.

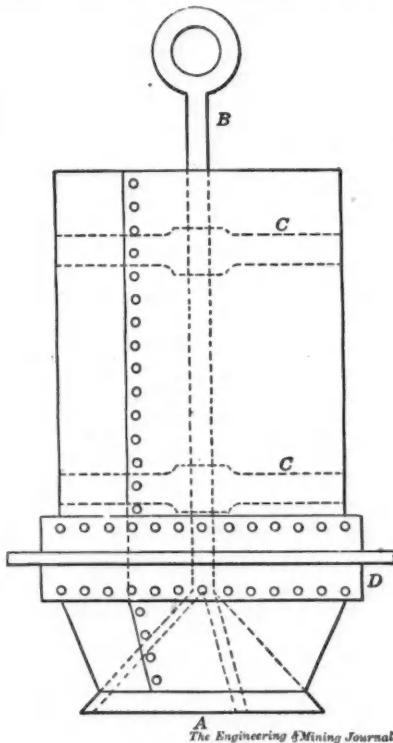


### A Kiln Charging Device

An apparatus used around Chicago iron furnaces for charging dolomite-kilns, seems adaptable to many classes of work.

It consists of a cylinder of heavy sheet steel terminating in an inverted truncated cone of the same material. A cone A, supported on the inside by a spider which is fastened to a steel rod B, closes the bottom. The rod B is free to move in two steel spiders C. D is a section of T-rail fastened around the body of the charger. In filling the cylinder, the whole device is supported on A. When it is to be moved it is picked up by a crane, by means of the ring on top.

The tops of the kilns are so arranged that they just fit the T-rail; the device has only to be set down on the



KILN-CHARGING DEVICE

furnace and the contents discharge into the kiln. If the cylinder is to be emptied on the ground, blocks are placed to catch the T-rail. By setting down on a flat-car the apparatus can be transported from one building to another.

It is believed by the Forestry officials that last summer's forest fires either burned or killed between 1 and 2 per cent. of the total stand of the national forest timber. At the present rate of cutting from the national forests, six billion feet (the amount destroyed), is equal to 12 years' supply; but it is less than one-sixth of a single year's cut in the entire country, or enough to keep all our lumber mills busy for something under two months.

### Influence of Number of Templet Holes in Sampling Copper

BY DONALD M. LIDDELL\*

It appears that in the sampling of pig copper by the ordinary templet drilling, as the number of holes in the templet is increased, the silver assay diminishes up to a certain point, after which it remains fairly constant.

A table is given herewith showing the influence of the number of holes in the templet on the silver assay, the number of holes being those per quarter bar.

It seems that the explanation of this may lie in the following: If the surface of a copper slab be examined at about the same distance from the edge that the pig is thick, there will be found a well marked line, showing where the cooling of the slab from the bottom upward has

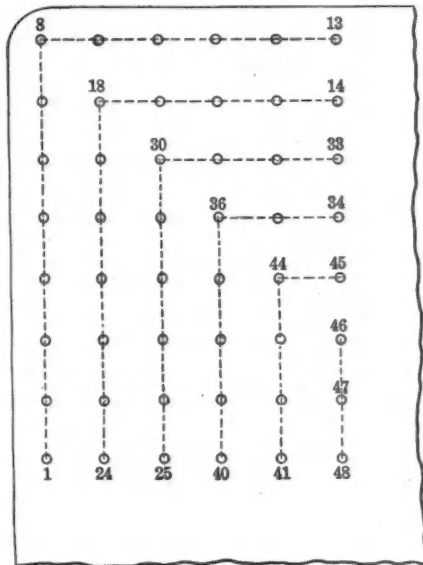


FIG. 1

TEST DRILLING ON COPPER BARS

met the cooling of the pig from the upper outer edge inward. The drillings from along this line are usually much richer than those from either side of it, and are sometimes richer than any others in the slab.

EFFECT OF TEMPLET HOLES ON SILVER ASSAY.

Holes.	Silver Assay.	Holes.	Silver Assay.
2x3	76.1 oz.	5x8	73.8 oz.
3x4	75.7 oz.	7x11	73.7 oz.
4x5	74.8 oz.	8x12	73.8 oz.
4x7	74.7 oz.	.....	.....

Typical assays, showing this enriched zone, are given in the table to accompany Fig. 1, which is a quarter-section of a slab 18½x30x1½ in., weighing approximately 225 pounds.

\*Editorial staff, ENG. AND MIN. JOURN.

If one consider the case of a copper bar drilled as shown by the X's on a 4x5 templet and as shown by the O's on a 6x5 templet, Fig. 2, it will be seen that the two vertical rows of drill holes A A will, in each case, just about hit the enriched zone, while in the case of the

SEGREGATION OF SILVER IN COPPER.

Hole Numbers.	Brand A oz. per ton.	Brand B oz. per ton.	Brand C oz. per ton.
1-13	133.69	62.6	404.9
14-24	149.94	69.0	454.7
25-33	136.65	63.41	443.1
34-40	145.05	63.81	.....
41-45	151.00	63.10	.....
46-48	150.09	60.60	448.02

6x5 drilling there will be two rows of holes in what is probably a poorer portion of the pig, to decrease the general average. If the number of vertical rows (as they come in the illustration) is held a constant, and the number of horizontal rows increased, the same argument holds, while in actual practice we get the two-

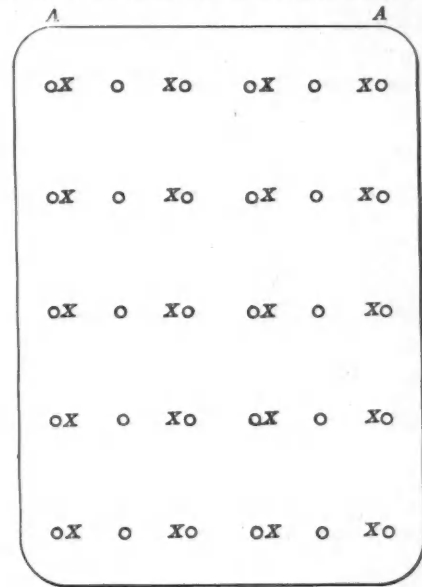


FIG. 2

TEMPLET-HOLE DIAGRAM

fold benefit of increasing the number both ways simultaneously.

What the gold does is not discussed above, since in general the gold variations are much less widely marked than the silver, and the probable error of observation bears a higher ratio to the contents.

As an interesting addendum to the above assay tables may be noted one of reversed segregation due to lead in the copper, where the outside row of holes showed 66.7 oz. Ag, the extreme corner hole 67.9 oz. and the inside hole 65.7 ounces.

According to the report of the Mines Department of the Transvaal, for the half year ended June 30, 1910, the Rand mines used 5,278,299 lb. of cyanide, 4,017,114 lb. zinc, 4,925,494 lb. drill steel, and 6,000,000 lb. candles.

## Calamine at Leadville

Dr. S. F. Emmons addressed the following letter, from Dinard, France, under date of Oct. 11, to the editor of the *Leadville Herald-Democrat*:

"I have just received clippings from your issues of Sept. 20 in regard to recent discoveries of zinc carbonates and silicates in the old workings of Leadville mines, and fully agree with you that these discoveries may prove of great economic importance.

"It is in the normal order of development of a mining district that when exploitation has gone so deep that increasing expenses and decreasing yield have reduced the margin of profit, exploitation turns again to upper levels in search of ore that may not have paid to work when first opened, but which under present changed conditions may be profitably extracted.

"At the time of my first study of the Leadville district in 1880, I was much puzzled to know what had become of the zinc, since by analogy with similar deposits in the Ten Mile district, I reasoned that the original sulphides of Leadville must have contained much zinc as well as lead. I only succeeded in finding a few needle-like crystals in limestone joints that resembled gypsum, but proved on chemical examination to be silicate of zinc. I assumed then that owing to the superior solubility of the zinc sulphate, the oxidation products of that metal had been carried much further than those of lead before being transformed into the now stable carbonate, and had possibly been entirely removed in the run off.

"Blow's observation that on Iron hill secondary zinc blende had accumulated in the upper part of the sulphide zone seemed to account for some of the missing zinc, and from the accounts published by you it is evident that much of it has accumulated as calamine in the zone of change from sulphide to oxide.

"Though I have particularly desired to study the zinc of Leadville, I have never been able to, because in 1880 mine workings had not yet reached it, and when I next visited the district (1890) they had gone beyond it, and owing to the soft nature of the ground in that zone the drifts leading to it were for the most part caved and inaccessible.

"It certainly seems rather strange that those in charge of mines, when this zone was exploited, did not notice such bodies of calamine as you describe, but it must be borne in mind that calamine is generally a white-brown earthy looking material, which would not attract attention, unless especially sought for, and that it was pay ore rather than material of only mineralogical interest that they were seeking, and at that time zinciferous ores were a particularly undesirable product."

## Transvaal Mining Notes

### JOHANNESBURG CORRESPONDENCE

In the editorial columns of the *JOURNAL* of Aug. 20 the connection between the work of the coal miner and that of the metal miner is dealt with. There is an instructive instance of this in connection with the management of the group of mines held by the house of Eckstein on the Rand. They foresaw that especially in the far-east Rand in the future, mining would have to be carried on in beds of banket dipping from five to 25 deg. and decided to find out if coal-mining methods of laying out levels and of haulage of ore could be introduced to advantage. They, therefore, appointed Stuart Martin, a coal-mining engineer from England, as a consulting engineer and in some of the mines on the far-east Rand basin, coal-mining methods are to be adopted.

### CIRCULAR SHAFT FOR THE NEW MODDERFONTEIN MINE

The New Modderfontein mine has a holding of some 1207 unworked claims which contain anything from 20 to 40 million tons of ore. It is at present working from outcrop incline shafts and crushing 45,000 tons per month with 180 stamps, and tube mills. Mr. Martin now proposes to sink a circular shaft 2000 ft. vertical on the dip. The adoption of a vertical shaft is a return to coal-mining practice but as details of the lining to be adopted are not available, it is difficult to criticize the proposal. On the far-west Rand where a thousand feet of water-bearing dolomites have to be penetrated, a water-tight lining for the shaft is necessary, and circular shafts seem called for; but on the east Rand, though dolomite is present, most of the water is met with in exploring the reef horizon and there appears at first sight no advantage in first cost or in mining facilities, in this proposal. This, however, has no doubt had consideration, and the circular shaft will be sunk. As the reef will lie at 10 to 15 deg., levels will be driven 500 to 600 ft. apart on the dip and in the soft shale footwall main-haulage levels equipped with endless-rope haulage will be run at every 1800 or 2000 ft. and all ore will be sent down self-acting haulages to these levels for conveyance to shafts. At the Cason mine of the East Rand Proprietary Mines a main and tail-rope system of rope haulage has reduced the cost of haulage 10 per cent. as compared with Kafir labor and reduced the Kafir labor 75 per cent. so that there is no doubt that haulage system will come more and more into use on the Rand. Gasolene locomotives for haulage may have a future now mechanical ventilation is attracting more attention; but liquid fuel is not cheap on the Rand.

### NEW MILL FOR THE CASON MINE

It is proposed to erect a new mill at this shaft to treat 40,000 tons per month and the Butters process has apparently been adopted entirely for future installations on this group. Apparently this process should be known as the Patterson process after C. G. Patterson, the inventor.

### RENEWED ACTIVITY IN THE KLERKSDORP FIELD

Attention is again being directed to the Klerksdorp goldfields about 150 miles to the southwest of Johannesburg; this field is known by G. A. Denny's writing. Several of the abandoned mines are being reopened, now that mining costs are reduced. On the Africander mine there are 142,187 tons of ore developed assaying 8.2 dwt. over 37.8 in. Owing to the introduction of sand filling, the costs on some of the mines are tending to rise. Costs on the Village main reef rose about 7d. per ton last month owing to this cause. The necessity of putting in wooden brattices accurately scribed to fit the inequalities of rock on foot- and hanging-wall and the need of some binding material to consolidate sand in the stopes when filled are proving drawbacks to the method.

### TRANSVAAL COPPER MINING

Copper mining in the north of the Transvaal is developing and on the completion of the railway will show an expansion. The Messina Copper Company is engaged in opening extensive old workings in schistose granite and have reached a depth of over 300 ft. There are 90,000 tons of 10 per cent. copper ore developed and a monthly production of from 200 to 300 tons of 50 per cent. concentrates with 300 to 400 tons of 12 to 14 per cent. concentrates has been maintained for the last two years. Mining and transport and treatment costs come to 24s. 6d. per ton and the total cost of 50 per cent. concentrates is £16 10s. per ton landed and sold in London. The railway will largely reduce costs as ore has now to be carted over 100 miles to rail. At No. 4 level the lode shows 27 ft. of 10 per cent. ore and the old workings give evidence of several lodes having a long strike, so that in the future the Transvaal must be considered as a competitor in the copper market.

An interesting work about to be undertaken in the Negaunee district, Michigan, is the removal of the city burial grounds to a new location. The present cemetery is underlaid with ore which is to be mined by the Cleveland Cliffs Iron Company, and that corporation not only has provided the municipality with a larger and more desirable acreage, but it will bear the expense of the removal from the present tract.

## Asbestos in Wyoming

BY H. C. BEELER\*

Asbestos occurs near the town of Casper, in Natrona county, Wyoming, covering a tract on Casper mountain and about eight miles southeast on upper and lower Smith creek.

Casper mountain is the general name in this vicinity, for the western end of the Laramie range. It consists of a granite

sile strength and spinning quality, free from iron and other injurious minerals and is capable of being spun and manufactured into the highest grades of asbestos product. The fiber varies in length from a hair to four inches in the cross fiber and has been found nine inches in length in the slip fiber of good spinning quality. Good judges of fiber place it in a class with the best commercial fiber of Canada and Europe.

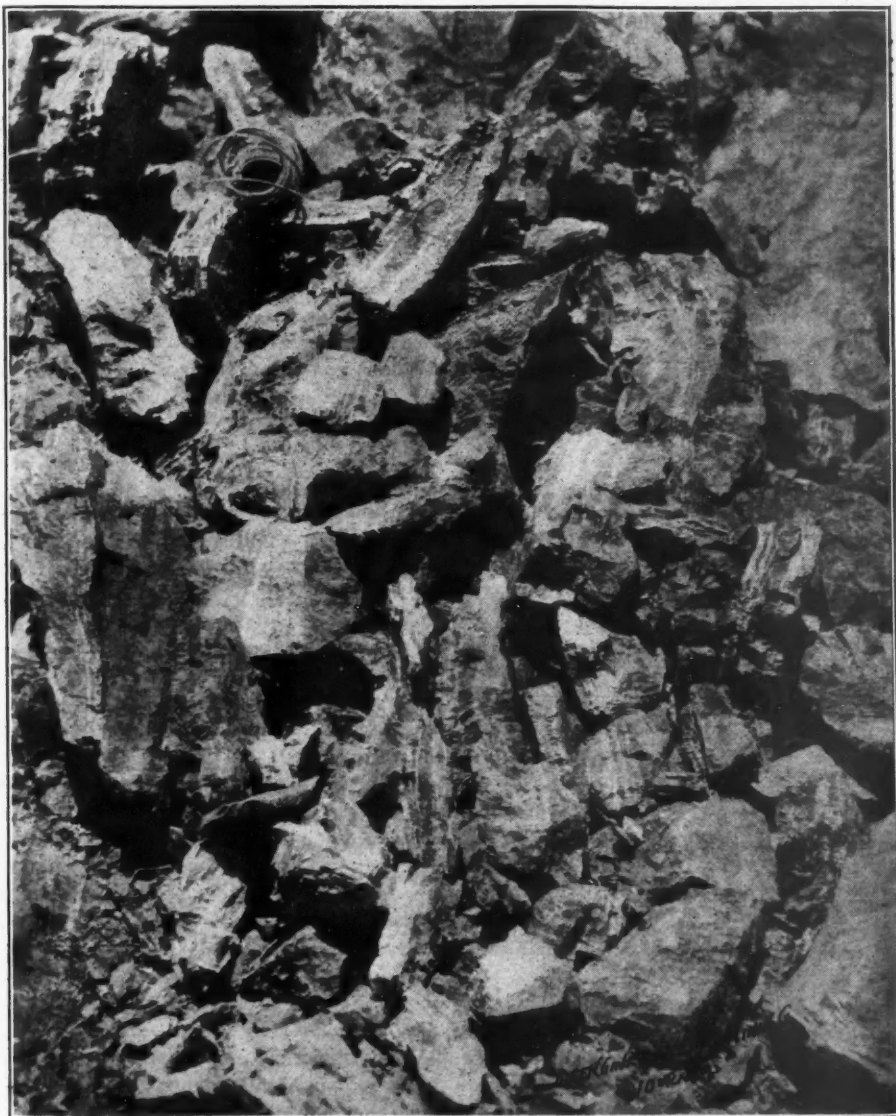
working out exactly as predicted by the designer, C. H. Parker, of Thetford Mines, Province of Quebec, Canada,

### QUARRYING OPERATIONS

The quarries are opened for about 300 ft. wide and cover the faces of two hills above the mill, connection being made with the mill bins by chutes and cable from the second hill. Work during the spring has put the quarries in shape to produce a large tonnage during the coming year. The method consists in open quarrying, rough sorting the long or No. 1 crude, and sending the mill rock to the mill below.

The mill rock runs from 5 to 10 per cent. fiber and the product of the test runs shows a high grade of material, the length and strength of the milled fiber comparing favorably with the commercial product of the older Canadian mills.

The International company is proceeding with development work on its holdings and will erect other mills as soon as the trade demands, as there is practically an unlimited demand for fiber. The size and occurrence of the fiber is plainly shown in the accompanying photograph.



ASBESTOS BEARING ROCK, CASPER MOUNTAIN FIELD, CENTRAL WYOMING

core, cut by serpentine and diorite dikes, with the sides of the range covered with sedimentary formations sloping to the valleys north and south. The general trend of the range and of the granite core is east and west. In general, the serpentine dikes have a southeast and northwest trend and vary in width from 100 ft. to over 500 ft., the asbestos-bearing zones being well defined and showing from a streak to 50 or 60 ft. in width.

### CHRYSOTILE ASBESTOS OF GOOD QUALITY

It is a chrysotile asbestos of high ten-

\*Mining engineer, Boston building, Denver, Colo.

### INTERNATIONAL COMPANY HAS 200-TON MILL

The International Asbestos Mills and Power Company control the greater portion of the commercial area of the district. Its principal property, on Smith creek, has been developed by a number of quarries, cuts and shafts in the asbestos rock. The company has just completed a fiberizing mill on upper Smith creek, with a capacity of 200 tons of asbestos rock per 24 hours. The test runs shows a high grade of material, the rock yielding a higher percentage of fiber than was anticipated and the process

## Coal Lands in Utah Withdrawn

Notice of the withdrawal by President Taft of 322,560 acres of coal land in Summit county, Utah, bordering on the Wyoming line, was received by the local land office, Oct. 22. The land has been withdrawn from settlement, location or entry, and is known as Utah Withdrawal No. IV. A number of transfers and additions to the Uintah and Ashley national forests have been made by order of the President. These changes are the result of field examination by the United States Department of Agriculture, in pursuance of a general plan for the correction of all national-forest boundaries.

## A Hungarian Natural Gas Well

A natural gas well<sup>1</sup> of tremendous flow has been struck at Kessármás, Hungary. The drill hole is 951 ft. deep and the flow of gas is about 31,782,600 cu. ft. per 24 hours. The gas carries about 99.25 per cent. of methane (CH<sub>4</sub>), with a heat value of about 8500 to 8600 calories. The gas escapes from the drill with a velocity of about 420 miles per hour, causing a roar which can be heard about 2½ miles. The Hungarian government builds great expectations on this discovery and has sent a commission of four mining experts to the United States to study the methods in vogue for the utilization of natural gas in Pennsylvania, West Virginia and Ohio.

<sup>1</sup>Oest. Zeit. f. B. und H.

# German Miners' Insurance and Annuity Funds—III

Discussion of Widows' and Orphans' Pensions. Average Widow's Pension \$45 per Year; Average Orphan's Pension Amounts to \$18.42

BY FREDERICK L. HOFFMAN\*

The General Pension Fund of the Bochum Union with an active membership of 289,060, in 1909, supported 20,860 widows at the end of the year, of whom 1403 were widows of mine officials, and 19,457 were widows of mine workmen. The number of widows pensioned on account of accidents was 3516, and 17,344 on account of sickness. The rate of pensionable widows in proportion to the active membership was, therefore, 72.16 per 1000, or 149.51 for mine officials, and 69.57 for mine workmen. The higher rate for mine officials is due to the higher age attained. The rate of widows pensioned on account of accidents was 12.16 per 1000, and 60.0 per 1000 on account of sickness. Considering mine workmen alone, the respective rates were 12.14 and 57.43 per 1000 of active membership.

The aggregate amount of support paid to the 20,860 widows during 1909 was 3,910,066 marks (\$930,596), of which 522,641 marks (\$124,389) was paid out on account of accident pensions, and 3,387,425 marks (\$806,207) on account of sickness pensions. The General Pension Fund was reimbursed to the extent of 390,528 marks (\$92,946) by the Mine Owners' or Operators' Mutual Insurance Accident Institution, liable by law for widows' pensions on account of mine accidents.

#### MINE OWNERS ASSOCIATION PAYS 76 PER CENT. OF WIDOWS' PENSIONS ON ACCOUNT OF MINE ACCIDENTS

The average widow's pension during 1909 was 187.44 marks (\$44.61), or 337.74 marks (\$80.38) for the widows of mine officials, and 176.61 marks (\$42.03) for the widows of mine workmen. Considering mine workmen only, the average accident pension to widows was 144.22 marks (\$34.32), and the average sickness pension 183.45 marks (\$43.66). Of the former amount the average return made by the Mine Owners or Operators' Mutual Insurance Accident Institution was 109.54 marks (\$26.07), leaving a net payment on this account by the Pension Fund of 34.68 marks (\$8.25), or 24 per cent.

#### ECONOMIC EFFECTS OF SICKNESS STRIKINGLY SHOWN

The net increase in the number of widows' pensions during the year 1909 was 2049, of which 460 were accident pensions, and 1589 were sickness pen-

sions. Of the 2049 new pensions, 872 were from the active membership of the Fund, and 1177 were from the inactive or invalid membership. These figures emphasize the two sources of the pension payments to widows, the claimants being either: first, the widows of men killed while at work, or of men accidentally injured or incapacitated with resulting death; and, second, the widows of men dying from general causes, leaving, as the case may be, dependent children, or other dependent members of the family, which, under the law, are provided for. Of every 100 new pension cases of this class, 42.6 were from the active membership and 57.4 from the invalid membership, but the proportions are widely at variance according to the pensionable cause, having been 90.7 per cent. for the active membership in the case of accident pensions, and only 28.6 per cent. in the case of sickness pensions; the corresponding proportions for the invalid membership were 9.3 per cent. for accident pensions, and 71.4 per cent. for sickness pensions. These are extremely suggestive figures, emphasizing the truly tremendous economic importance of sickness and invalidity more or less the result of industrial activity. They prove that by far the largest proportion of dependent widows require to be provided for on account of mine workers' previous sickness or physical impairment, or incapacity to work, while actually and relatively a much smaller proportion of such cases arises out of mine accidents and their resulting consequences.

Additional proof of the economic importance of the whole question of social dependence is brought out by the fact that the average age of widows of active members pensioned during 1909 was only 36.3 years, or, respectively, 40.5 years for widows of mine officials, and 36.1 years for widows of mine workmen. Considering mine workmen only, the average age of widows of accident pensioners was 33.9 years, and of sickness pensioners, 38.1 years. The average age of widows of invalidity pensioners was 53.2 years, or, respectively, 58.8 years<sup>1</sup> for mine officials, and 52.8 years for mine workmen. Considering mine workmen only, the average age of widows of accident pensioners was 41 years, and of sickness pensioners, 53.3 years.

#### WORKING LIFE LESS THAN 20 YEARS

The average duration of previous occupational activity, of the active deced-

ents, was 16.0 years, and of decedents among the invalids, 22.6 years. Among the former the average duration of previous employment was 23.2 years for mine officials, and 15.5 years for mine workmen. Considering mine workmen only, the average duration of previous employment was 13.9 years in accident pension cases, and 17.0 years in sickness pension cases. Among the deceased invalidity pensioners the average duration of previous employment was 30.2 years for mine officials, and 22.1 years for mine workmen. Considering mine workmen only, the average duration of previous employment was 13.7 years in the case of accident pension cases, and 22.5 years in the case of sickness pension cases.

#### OVER ONE-THIRD OF PENSIONED WIDOWS REMARRY

During the year 1909 there were 1318 widows' pensions terminated, of which 759 were on account of death, and 559 on account of remarriage. Among widows in receipt of pensions the death rate was 3.56 per cent. and the remarriage rate 2.63 or a total termination rate of 6.19 per cent. The death rate among widows receiving accident pensions was 1.1 per cent., and among widows receiving sickness pensions 4.06 per cent. The remarriage rate among widows receiving accident pensions was 5.81 per cent. and among widows receiving sickness pensions, 1.99 per cent.

The average age at death of widows receiving pensions was 68.9 years, or 70.2 years for widows of mine officials and 68.8 years for widows of mine workmen. Considering mine workmen only, the average age at death was 56.7 years for widows receiving accident pensions and 69.5 years for widows receiving sickness pensions. The average age at remarriage, of all widows receiving pensions, was 37.6 years, or 39.0 years for widows of mine officials, and 37.6 years for widows of mine workmen. Considering mine workmen only, the average age at remarriage was 33.6 years for widows receiving accident pensions, and 39.9 years for widows receiving sickness pensions.

#### AVERAGE WIDOW'S PENSION LASTS 10 YEARS

The average duration of pension payments to widows, terminated during 1909, was 10.5 years, or 13.7 years for widows of mine officials, and 10.3 years for widows of mine workmen. The average duration of pensions terminated by death

\*Statistician, Prudential Life Insurance Company, Newark, N. J.

was 15.1 years, and by remarriage 4.2 years. For mine workmen only the averages were exactly the same. Considering, however, only the widows of mine workmen receiving accident pensions, the average duration during which the pension was paid was 12.1 years in the case of pensions terminated by death, and 3.8 years in the case of pensions terminated by remarriage. In the case of sickness pensions these averages were, 15.3 years for pensions terminated by death, and 4.4 years for pensions terminated by remarriage.

#### LAST YEAR 31,586 CHILDREN OF INVALID MEMBERS WERE PROVIDED FOR

The invalidity pension fund includes provision for the children of invalid or deceased members, but changes in the law have been made within recent years, which indicate a transfer of the liability for some of the dependents of this class to other funds. In 1909 there were 31,586 children of invalid members provided for by the fund, of which 5445 were accident pensioners, and 26,141 sickness pensioners. The ratio of children entitled to pensions to pension-receiving members was 0.99 in 1909, having gradually diminished on account of changes in the law from 1.28 in 1907. In 1909 the ratio of pensioned children was 0.51 for mine officials, and 1.01 for mine workmen. The total amount paid out on account of pension-receiving children was 1,215,321 marks (\$289,246). The average pension or benefit paid to children of mine officials was 53.66 marks (\$12.77), to mine workmen, 38.13 marks (\$9.07), and to both classes combined, 38.48 marks (\$9.16). The average attained age of pensioned children in 1909 was 7.9 years, or 8.7 years for the children of mine officials, and 7.9 years for the children of mine workmen.

#### PROVISION FOR DEPENDENT HALF ORPHANS

Quite distinct from the foregoing class of children, that is, those whose fathers were members of the invalidity pension fund, and whose support was, therefore, provided for, more or less, through the fund, are the children of pensioned widows, which are considered as a separate class. The number of such children in 1909 was 18,957, of which 5424 were children pensioned under accident pensions, and 13,533 were children pensioned under sickness pensions. The ratio of children to pensioned widows was 0.9, or 0.5 for widows of mine officials, and 0.9 for widows of mine workmen. That is to say, while the number of pensioned widows at the end of the year was 20,860, the number of children of such widows on the pension roll of the fund was 18,957. The low ratio of children to widows is due to the fact that only children under 14 years of age are provided for on account of their nat-

ural dependence and for educational purposes. On account of the lower average age of widows receiving accident pensions the ratio of dependent children to widows was 1.5 against 0.8 for widows receiving sickness pensions. The total amount of pensions paid on this account in 1909 was 742,313 marks (\$176,670), or an average pension of 39.16 marks (\$9.32) for every pensioned child, or 70.18 marks (\$16.70) for the children of mine officials, and 37.99 marks (\$9.04) for the children of mine workmen. The average amount paid in children's pensions to every widow on the pension roll in 1909 was 35.59 marks (\$8.47), or 34.36 marks (\$8.18) for the widows of mine officials and 35.67 marks (\$8.49) for the widows of mine workmen. Considering mine workmen only, the amount paid to widows receiving accident pensions was 58.18 marks (\$13.85), and to widows receiving sickness pensions 30.92 marks (\$7.36).

#### CHILDREN PENSIONED ONLY UNTIL 14 YEARS OF AGE

The number of widows pensioned in 1909 was previously given as 2049; these brought upon the fund 3873 pensionable children. The ratio of such children to pensionable widows was, therefore, 1.72. The ratio of pensionable children to widows receiving accident pensions was 2.5, and for widows receiving sickness pensions, 1.5. In other words, the ratio of pensionable children is naturally much larger among the new members of the fund than among the membership of the fund as a whole. This is, of course, accounted for by the increasing age of the children of previously pensioned members, which constantly eliminates those who have attained to the age of 14 years. This also explains why the relative amounts are much larger in the case of new members than in the case of the total membership of the fund, since the new members have relatively nearly twice the number of children to be provided for. That is to say, while the ratio of pensionable children to widows was 0.9 for the fund as a whole, it was 1.7 for the widows pensioned in 1909; and while the average amount paid in pensions to a widow on account of dependent children in 1909 was 35.59 marks (\$8.47) for the child annuitants as a whole, it was 68.58 marks (\$16.32) for the new claimants of this class upon the fund.

The average age of the children of widows receiving pensions in 1909 was 8.6 years, or 8.0 years for the children of widows receiving accident pensions, and 8.9 years for the children of widows receiving sickness pensions. These ages are slightly above the corresponding ages of the dependent children of invalidity members, which constitute a separate class.

#### CLASSIFICATION OF PENSIONABLE CHILDREN

Aside from the foregoing two groups of dependent children provided for by the fund, that is, those whose fathers were receiving invalidity pensions during their lifetime, and those whose mothers were receiving invalidity pensions as widows, there is a third class of full orphans provided for by the fund, and the number of such dependent children in 1909 was 1159. Of this number 61 were the orphans of mine officials and 1098 the orphans of mine workmen. The total amount paid out on account of these orphans was 89,697 marks (\$2,347), and the average amount 77.39 marks (\$18.42), or 112.21 marks (\$26.71) for the orphans of mine officials, and 75.46 marks (\$17.96) for the orphans of mine workmen. The average attained age of these children in 1909 was exactly 10 years, or 9.5 years for the orphans of mine officials and 10.0 years for the orphans of mine workmen.

Summarizing these facts regarding the support of dependent children under the provisions of the General Pension Fund, it has been shown that in 1909 there were 31,586 dependent children of invalid members, 18,957 dependent children of pensioned widows, and 1159 orphans of mine officials and mine workmen, or a total of 51,702. The average duration of children's pensions is not shown in the report, but it may be approximately estimated at from six to seven years. Of course, the actual amount paid is naturally lowest for the dependent children of invalid pensioners, whose own support in part provides for the support of dependent children, and given in the report at 38.48 marks (\$9.16); the average amount paid to dependent children of pensioned widows was almost the same, or 39.16 marks (\$9.32), while the average amount paid on account of full orphans was 77.39 marks (\$18.42) per annum.

#### Oil in Washington

A correspondent reports that oil has been struck on the Christopher property, near Olympia, Wash., on the east side of the Grand Mound prairie. Oil is said to have been found at 1170 ft. after passing through a 30-ft. vein of coal about half-way down. One gas well is stated to have been found in the northern part of the field, the product of which is used in heating and lighting a near by ranch house.

Alaska has now about 370 miles of railway. This mileage, according to the press bulletin of the U. S. Geological Survey, is distributed among nine different systems. Construction work is proceeding on two lines, and some progress has been made on a number of other transportation enterprises.

## Latest South African Stamp Mill Practice

LONDON CORRESPONDENCE

Some interesting novelties are embodied in the new 200-stamp mill erecting on the City Deep mine, near Johannesburg. The 200 stamps are arranged in units of 10, each unit being driven by a separate 50-h.p. motor. In order to keep the center of gravity as low as possible the stamps, weighing 2000 lb. new, have short stems and long heads.

For the king posts reinforced-concrete pillars 14 in. wide, with heavy cast-steel frames on them, are substituted for wood. This frame carries the cam shafts and stem guides. The guide blocks for the stems are bolted to steel guide bars, with a wooden cushion between to minimize

thus provided around the pebble feed and the cone classifiers, from which the pulp is fed to the mill.

All amalgamation takes place after the tube mills, in a separate building erected for the purpose, seven shaking amalgamating tables being provided for each tube mill. The risks of gold stealing, and accidentally greasing the plates are thus very much lessened.

## Washington as a Mining State

The State of Washington is credited by the press bulletin of the U. S. Geological Survey with about 60 or 70 productive mines, most of them being lode mines.

Stevens county is the largest producer of gold, silver, copper and lead, more than half of the gold of the State

## The Patio Process

BY FRED MACCOY

The *patio* process for the extraction of silver from its ores is being so rapidly replaced by the cyanide process, that a few years more will see its complete abandonment. As the majority of younger mining men will never see the process in operation, I have collected what data I could by observation and copious questioning of the Mexican operators and offer it for what it is worth, without attempting to go into the technique of the operation.

The process, with some slight deviations depending on locality and ores, is as follows: The ore is first sorted into three grades; the best being reserved for the charcoal smeltery, the middle grade



FIG. 1. OLD SPANISH MILL

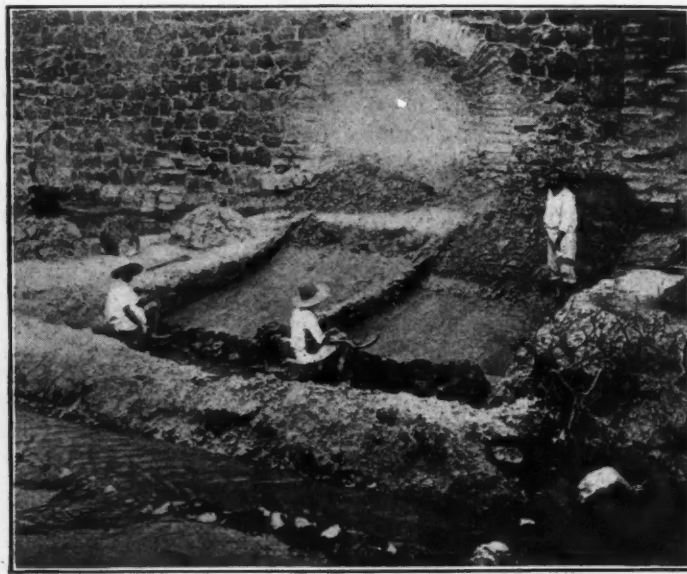


FIG. 2. RECOVERING AMALGAM IN PLANILLAS

vibration. Perhaps the most interesting feature is the fact that, in order to lessen vibration and breakage of cam shafts, bearings are placed between each stamp, as well as in the usual places, thus making 11 bearings to each cam shaft. The foundations for the mortar boxes are of reinforced concrete with a half-inch layer of felt between mortar box and foundation. Steel and concrete are used throughout practically the whole mill, woodwork being conspicuous by its absence.

In order to keep up the heavy expected duty of nine tons per stamp per 24 hours, each battery of five stamps is provided with two challenge feeders, feeding between the second and fourth stamps of each mortar box.

An innovation in the tube-mill department is that the mills are driven from the outlet end, the inlet end being thereby less crowded. This arrangement is obviously less dangerous and more convenient for working, as more room is

coming from that county alone. The annual production of the State is estimated at not over \$250,000 in gold, 80,000 to 90,000 fine ounces of silver, 300,000 to 400,000 lb. of copper, and 1,500,000 lb. of lead. There has been little variation from these figures for several years, though it is expected that the official returns for 1909 will show an increase, mainly owing to activities in the Republic district. In general, it may be said that the silver, copper and lead output of Washington seems to be slightly on the increase; some falling off has been apparent in gold, but the amount has not been large.

In the Republic district a number of mines have recently been reopened. The amount of gold from this district in 1909 is estimated to be probably double the yield in 1908. The Director of the Mint estimates the gold production of Washington at \$377,900 in 1909, against \$253,700 in 1908, and the silver output at 73,500 fine ounces in 1909, against 86,800 fine ounces in 1908

for the *patio* and the lowest being thrown over the dump. It is from some of these old dumps that many of the modern mills are getting good profits.

### FIRST PULVERIZATION IN STAMP MILLS

The middle grade is broken under wooden stamps of about 200-lb. weight, shod with iron, or, in many districts, in a form of Chilean mill. Fig. 1, is of one of these old mills. The iron wheel in this mill was shipped from Spain in segments weighing approximately 300 lb., and from Yera Cruz was freighted on muleback over 250 miles of mountain roads. The stamps or mills crush to  $\frac{1}{4}$  in. or smaller, but not fine enough for amalgamation. The fine grinding is done in a machine called *arrastre*.

This *arrastre* is a circular masonry vat of 10 to 12 ft. in diameter, with cut joints in the masonry so as to make it waterproof. In the middle of the vat is a

\*Chief engineer, Esperanza mine, El Oro, Mexico.

post pivoted on the bottom and revolving in a collar reaching across the vat overhead. From this post project arms, usually four in number, with one longer than the rest, to which hooks are attached for hitching horses or mules. From these arms there are suspended by rawhide ropes, heavy blocks of granite or other hard stone, which in dragging over the sands, reduce them to slimes or *lama*.

The usual charge of sands for regrinding is 30 *arobas* or 750 lb. Grinding commences and water is added, little by little, until there has been added an equal weight to the sand charge, taking in all nearly 24 hours. By this time the sands are reduced to slimes and are ready for the *patio*.

#### THE PATIO DESCRIBED

The floor of the *patio* is almost level, with a slight grade for drainage, and is paved with flagging. The paving stone

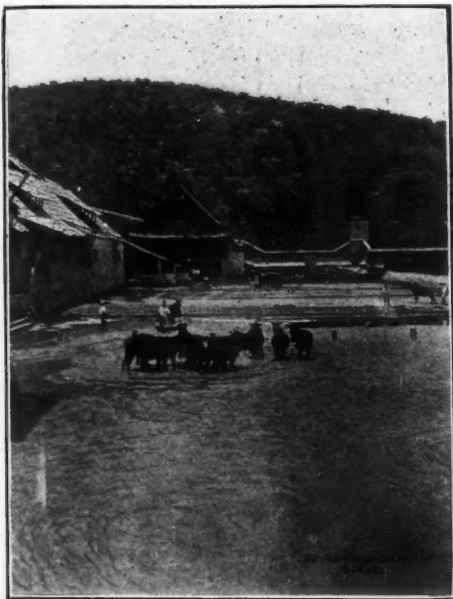


FIG. 3. MIXING THE TORTA

used in Guanajuato patios is a sedimentary rock, the origin of which was probably volcanic ash stratified by falling in water. The result is a beautiful green-lined flagstone, highly prized for ornamental masonry. On this paved floor a *torta* of from 75 to 100 tons of *lama* is spread to a depth of one foot, and 5 per cent. of salt added. The *torta* is then mixed by driving mules round and round it, an illustration being given in Fig. 3.

After a thorough mixing, the *torta* is treated with the *magistral* (copper sulphate), about 1 per cent. of the weight of the *torta* being added. Mercury is then spread over the whole by being shaken through a canvas bag, the mercury falling in tiny globules. Approximately 5 grams of mercury is added for each gram of silver supposed to be present. The *torta* is again trodden for several days or until

it is judged to have all of the available silver extracted.

#### FINAL STAGE IS WASHING

It now goes to the washing tanks, masonry cisterns five feet deep and eight feet in diameter, usually three of them with slightly different elevations, so that the overflow of one goes to the next. The *torta* is here thoroughly washed, and the slimes sluiced out, leaving the amalgam behind. In some haciendas the tailings are passed over *planillas*<sup>1</sup>, to catch any stray amalgam. These *planillas* are seen in Fig. 2.

The extraction by the process varies with the ores, as high as 90 per cent. being claimed for some districts, but 75 per cent. is nearer the average. In many places the tailings from the old *patios* are being retreated by cyanidation with good results. A great many of the older buildings of Guanajuato were built of *adobes* made from these slimes, and when a section of the older part of the city was torn down to make room for the Mexican Central station grounds and freight yards a lot of old *adobes* were sold for cyaniding, to the San Matias mill.

### Manufacture of Metallic Tungsten and Ferro-Tungsten

BY L. R. PRATT\*

The raw material for the manufacture of tungsten and its alloys, arrives at the works in the form of concentrates carrying 60 to 70 per cent.  $WO_3$ , and is sampled in the usual manner by coning and quartering. A charge of ore, mixed with a sufficient quantity of carbonate of soda to combine with the tungstic acid, is roasted for four hours in a gas-fired brick furnace, after which it is raked out direct into a power-driven dissolver, containing water, which is an upright V-shaped cast-iron vessel with a shaft running through the bottom on which several large cams revolve. After thorough dissolving, the solution is pumped through a filter press; the press retains the roast residue, which contains 0.5 to 1 per cent. tungsten and is laid aside for further treatment; the liquor passes by gravity to large pans on top of the above-mentioned brick furnace where it is allowed to boil for several hours. It is then conveyed to a power-driven crystallizer, containing a live-steam coil, for further crystallization. By this time the solution is thick and heavy and a large centrifugal pump is required to pass it to the next stage of the operation, which is to the sodium-tungstate filter press where the crystallized tungstate of soda is extracted, the mother

liquor running into a vat for further treatment. This material is now conveyed to a large power-driven mixer and the proper proportion of HCl added to precipitate the yellow oxide. An eye test is sufficient here to determine when the material is ready for removal. This is done by gravity, the solution going to a *montejus* which forces it into the tungstic-acid filter press. After the removal of the yellow oxide cakes from the press they are placed in large iron pans, broken up and the pans placed in a gas-fired oven which has sliding doors in the sides for the insertion of rakes to further break up and turn over the oxide as it is drying, after which the tungstic acid is thoroughly mixed with a secret compound, which acts as a reducing agent; clay-lined crucibles are filled with the mixture and sealed up with air-tight clay caps. The crucibles are now set in a gas-fired crucible furnace where, after several hours of heating, the contents are reduced to powder metal of 99.25 per cent. to 99.50 per cent. purity, carbon 0.50 to 0.15 per cent. The resulting metal in the crucible is in the form of a closely sintered mass which has to be loosened up with a hand bar. It is then dumped into iron pans, conveyed to a pebble mill and ground. Specific gravity tests by English and American authorities showed this metal to be 19 to 19.25.

#### PRODUCTION OF FERRO-TUNGSTEN

The concentrates are placed in a clay-lined crucible with the proper proportion of steel (low-carbon steel—preferably tool-steel scrap), rod graphite and a secret compound to assist reduction and fluxing and the crucibles placed in a gas-fired crucible furnace and smelted for several hours at a high heat. For a 30 per cent. tungsten alloy a crucible will last on an average of three heats. For a 65 to 75 per cent. tungsten alloy, a crucible will last but one heat, and often will crumble when being lifted from furnace. The higher grade alloys, such as 85 per cent., are made in the electric furnace directly from the tungsten concentrates and steel. This alloy contains from 1 to 1.5 per cent. carbon. However, an exceptionally pure 80 to 85 per cent. tungsten alloy can be made by heating the powder metal with low-carbon steel scrap in the crucible furnace. This operation requires much lower heat. Of course, this latter is not an economic success as usually a better price is received for the powder metal than for the alloy, although at one time steel manufacturers offered a higher price for a 75 to 80 per cent. alloy than for the pure powder metal, claiming that they sustained a loss of the powder metal by dusting, when it was added to the charge, whereas with the high-grade alloy they got the benefit of everything added.

<sup>1</sup>ENG. AND MIN. JOURN., Aug. 20, 1910.

\*Grasselli, Ind.

# The Outlook for Hydrometallurgy of Copper

Discussion of the Limitations of Smelting Processes. Difficulties of the Wet Methods. Theoretical Advantages in Their Favor. Present Processes

BY WILLIAM E. GREENAWALT\*

Chemical methods have revolutionized the metallurgy of gold and silver, and it is not at all improbable that they will also be an important factor in the metallurgy of copper. Practically all the copper produced at the present time is won from ores by smelting, converting, and electrolytic refining. In most of the smaller plants, however, matte is the end product.

Copper ores, as a rule, are not self-fluxing. Many ores do not contain sufficient sulphur to produce a suitable matte. Not infrequently sulphide ores are hauled several hundred miles to provide the sulphur necessary for matte when smelting oxidized ores. For smelting, coke, iron, limestone and sulphur are required. As an average of about 10 per cent. of coke is required for blast-furnace smelting, fuel becomes expensive unless the smeltery is favorably situated. More fuel is required in reverberatory than in blast-furnace smelting, approximating 30 per cent. of the furnace charge. Iron and limestone for fluxing purposes are usually found close to the copper deposits, but these fluxes are frequently barren of metal content and so act as a diluent of the ores.

#### SMALL SMELTERIES SHIP AN INTERMEDIATE PRODUCT

At the smaller smelteries, converters are not usually installed. Under such conditions smelting is simply a method of concentration. The resulting matte, containing from 30 to 50 per cent. of copper, has to be shipped to the refineries. The limitations of smelting are economic and not technical. Almost any ore can be smelted, but it is not always profitable. In treating the ores by a chemical process, economic considerations again are the guiding factor. The whole matter, therefore, resolves itself to a matter of cost per ton of ore treated or pound of copper produced.

#### TYPICAL TREATMENT TERMS FOR ORE

Unless a chemical process can be devised to treat profitably the ores from the smaller mines, the only alternative lies in smelting to a copper matte or shipping it to some smeltery. The following example will illustrate what it means to ship Arizona ores. The ores assayed gold, \$2.70 per ton; silver, 18 oz.; Cu, 21 per cent.; SiO<sub>2</sub>, 68; Fe, 5; CaO, 1; Mn, 1; CO<sub>2</sub>, 2; insoluble, 2. The payments were:

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Gold if over one-tenth ounce at \$19 per oz.; silver if over one ounce at 95 per cent. of the New York quotations; copper if 3 per cent. or over at 90 per cent. of full wet assay at the quotation for electrolytic cathodes less three cents per pound. All metallic iron paid for at five cents per unit, and lime if over 3 per cent. at six cents per unit. The deductions were 10c. per unit for all insoluble; 5 per cent. of zinc free, the excess at 50c. per unit, and arsenic, antimony and bismuth, 3 per cent. free, the excess at 50c. per unit. The treatment charges were f. o. b. smeltery, on basis of 3 per cent. copper, wet assay, \$3 per short ton, 10c. deducted for each per cent. of copper contained in excess of 3 per cent.; moisture, minimum allowed was 1 per cent. To the treatment charge was added \$1.50 per ton when any lot contained concentrates or fines, of which 25 per cent. would pass through a screen with opening  $\frac{1}{4}$  in. square. The sampling charge on lots of under two tons was \$2 per lot.

#### VALUE AND TREATMENT CHARGES COMPARED

Taking these rates on this silicious ore we find that the actual value of the metal in the ore is \$66.30. The smelter deductions are \$18.63. There is a credit of 25c. for the 5 per cent. of iron, and a deduction of \$7 for the 70 per cent. insoluble. The quoted treatment charge on the ore is \$1.30 per ton. The full smelting value of the ore is \$66.55. The total deductions, not including moisture, etc., are \$26.93. It costs \$8 for freight and cartage to get this ore into the smeltery, to say nothing of sampling charges and other incidental expenses. Therefore the total expense and deductions for shipping this ore are not less than \$34.93 per ton, although the nominal treatment cost is only \$1.30 per ton.

#### WET METHOD NEEDED

As this ore is typical of numerous deposits in the West it shows why many mines are unprofitable. In view of these facts it seems strange that no decisive advance has been made in the chemical treatment of copper ores. The example given could be treated chemically at only a fraction of the cost for shipping or smelting. The difficulty in chemical methods has been largely commercial. Sulphuric acid and iron for the ordinary chemical process are not always economically available. However, the

method need not be limited to sulphuric acid as the solvent, nor to iron as the precipitant. The problem, therefore, is to find a solvent which can be cheaply produced and cheaply regenerated, and to find a precipitant which is commercially feasible.

#### PREDICTIONS OF VARIOUS METALLURGISTS

The practical solution of the treatment of copper ores by chemical processes is optimistically predicted by metallurgists and electrometallurgists of note, as may be gathered from a few typical opinions. Sherard O. Cowper-Coles (in a paper presented at the Bristol meeting of the British Institution of Mechanical Engineers, July 26, 1908) states that "the advantages of an electrolytic process as compared to a smelting process are many, and the day is not far distant when copper will no doubt be leached direct from the ore and electrolyzed with insoluble anodes to produce finished copper sheets, etc., in one operation direct from the ore without any intermediate process of smelting." Bertram Blount (in his book "Practical Electro-Chemistry," page 88) states that "it is evident that the electrolytic winning of copper as distinct from its refining, has not yet been remuneratively accomplished; that it will be achieved in the near future is probable enough."

#### A GREAT FIELD FOR INVENTION

"Meanwhile it presents an excellent field for invention, but what is wanted is perhaps not so much a totally new device as a well-schemed plan embodying perhaps nothing but what is common knowledge but planned so as to be thoroughly permanent as a whole and with its perishable parts easily and cheaply renewable." When these difficulties have been surmounted, the chemical, and especially the electrochemical methods, will have to be reckoned with in the copper industry. When the deposition of the copper by the electric current with insoluble anodes is satisfactorily accomplished, power will be the most important factor. This is now rendered available almost anywhere by the high-tension now in use.

#### REQUIREMENTS OF A SUCCESSFUL PROCESS

Many copper ores contain silver, and some contain gold in paying quantities. Any wet method to treat successfully this character of ore must extract the silver and gold; or conversely, if the



ore has the greatest value in the precious metals the copper must be profitably extracted with the other metals.

A successful wet method must to a large extent be regenerative. To use the solvent for only one dissolving of the copper from the ore, and the precipitant for one precipitation, is in most cases prohibitive. In regeneration, however, something must be consumed, either chemicals or power, or both. The cost of these chemicals or power will be the crucial test of the process.

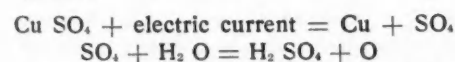
#### ORDINARY SULPHURIC ACID METHOD NON-REGENERATIVE

By the ordinary method of dissolving the copper with sulphuric acid, and precipitating with iron, neither acid nor iron is available for more than one cycle, and hence the process which is chemically admirable is commercially inadequate. If a chemical precipitant is used, as for example hydrogen sulphide,



the acid may be regenerated in an amount equivalent to that combined with the copper, but the copper is precipitated as the sulphide and not as metallic copper. The cheap production of hydrogen sulphide in the large amounts required would be one of the essentials of a process based on this reaction, but this is not an insurmountable difficulty.

In electrolytic methods power is the principal element consumed. Taking, again, the case in which the copper is dissolved as sulphate by sulphuric acid, we have



in which the copper is precipitated as the metal, while an amount of acid is regenerated equal to that combined with the copper.

This looks simple enough; nevertheless there are difficulties to its practical realization. In smelting there is no difficulty in getting good results from ore having 10 per cent. lime, 30 per cent. iron, and 40 per cent. silica; the difficulty lies in getting such a mixture. So in the electrolysis of copper-sulphate solutions obtained from leaching ores, there are many difficulties to overcome.

One of the greatest of these difficulties lies in the insoluble anode. No satisfactory insoluble anode has yet been discovered for sulphate solutions. Lead has given the best results, but the lead is peroxidized to some extent, and the difficulties with the lead anode are greater than the difficulties of the copper cathode. If the solution is pure and the current density low, there is no difficulty in getting a reguline cathode deposit of any reasonable thickness. If, however, the solution is impure, as it is certain to be, and a current density used which might be considered practical, a reguline

deposit cannot be obtained, and the difficulties become exasperating.

#### THEORETICAL EFFICIENCY OF ELECTROLYSIS

Theoretically, copper sulphate is electrolyzed at 1.2 volts, and the current will deposit 2.614 lb. per 1000 ampere-hours. That is to say, a current of 1000 amp., in one hour, in one cell, will deposit 2.614 lb. of copper. Or figured in another way, one horsepower per day of 24 hours will deposit 38.9 lb. of copper. Under these conditions the cost of power is not a serious item. It is one thing, however, to pass a current through the electrolyte at so low a current density as to get nearly the theoretical voltage, and quite another thing to drive it through at the rate of 25 to 75 amp. per sq.ft. to bring the size of the electrolytic installation within reasonable limits.

The acid consumed in the treatment of the ore is always greater than that combining with the copper alone. As in the cyanide and chlorination processes, in which only a small proportion of the chemicals is consumed in actually dissolving the metals, so in a copper process much of the acid consumed is wasted on worthless elements. This extra consumption of acid must be provided for either by purchase, or by some scheme of extra regeneration.

#### NO UNIVERSAL METHOD YET FOR COPPER, GOLD AND SILVER

Neither gold nor silver is soluble in sulphate solutions, so that when sulphuric acid is the basis of the solvent an extra treatment must be resorted to, if the ore contains precious metals worth recovering. Cyaniding is usually suggested as the method of recovering the precious metals after the acid treatment for the copper. Anyone who has tried this on a working scale will know that it is not an easy thing to do. The changing of large quantities of any ore from extreme acidity to the alkalinity necessary for the successful application of the cyanide is a matter for serious consideration.

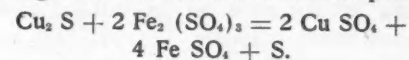
Copper solutions obtained as the result of leaching ores are usually impure. To what extent these impurities will interfere with the process will depend largely on the nature of the ore and the means adopted for the purification of the solution when it becomes so foul as to interfere seriously with the operation. No electrolytic method is likely to be generally successful if purification is necessary at every cycle. Iron salts, in sulphate solutions, are likely to lower the efficiency of the deposition, because the current changes the iron from the ferric to the ferrous condition and back again, as the solution passes from cathode to anode and from anode to cathode, with useless expenditure of energy. To obviate this, and other difficulties, diaphragms have been used, but diaphragms

again introduce an element into the operation which complicates it.

In addition to the ordinary sulphuric acid process above mentioned, two other electrolytic processes have become more or less known, but neither of these has achieved commercial success. Both of these processes require diaphragms in the electrolysis, and the failure of both of them has been more due to the chemistry than to the electrolysis.

#### SIEMENS-HALSKE PROCESS

In the Siemens-Halske process a solution of ferric sulphate is used as the solvent of the copper; the ferric sulphate being converted into the ferrous sulphate.

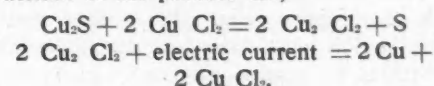


The solution of ferrous and cupric sulphates is then passed through the cathode compartment of an electrolytic cell, where the copper is deposited. The solution freed from copper is then passed through the anode compartment, where the ferrous sulphate is regenerated to ferric sulphate. The regenerated ferric-sulphate solution is again applied to the ore, and the cycle repeated until the copper is sufficiently extracted.

When a solution containing ferrous and cupric sulphate is electrolyzed, copper is deposited while the iron remains in solution. If the electrolysis is performed in a cell without a porous diaphragm the ferrous sulphate is oxidized to ferric sulphate at the anode, and reduced again to ferrous sulphate at the cathode. The power represented by these changes appears as heat, and is useless. It therefore becomes necessary to keep the anode solution separate from the cathode solution to save this useless expenditure of energy and to return the solution to the ore as ferric sulphate, which dissolves copper, while the ferrous sulphate does not. The diaphragm problem need not be serious in the process. What is serious is the lack of a suitable insoluble anode, and the indifferent nature of the solvent. Ferric sulphate is not an energetic solvent of copper. The time required for the solution of the copper and the fineness to which the ore must be crushed are important factors in practical operation.

#### HOEFFNER PROCESS

The Hoefpner process, while somewhat similar to the Siemens-Halske process, does not present entirely the same difficulties. In the Hoefpner process cupric chloride is the solvent, which in dissolving the copper, is converted to the cuprous chloride. The fundamental reactions of the process are,



The cuprous chloride solution is passed through the cathode compartment

of an electrolytic cell, while another portion, diluted with the exhausted or partially exhausted liquor, is passed through the anode compartment. A portion of the copper in the cathode solution is deposited on the cathode while the liberated chlorine makes its appearance at the anode, where the cuprous chloride which flows through the anode compartment is converted into cupric chloride. The cupric chloride is then again returned to the ore to dissolve more copper, and the cycle repeated as often as may be necessary to get the desired extraction.

This process was tried in Europe in 1892 but was not successful, the reasons given at that time for its failure were unsatisfactory anodes and diaphragms. Neither of these difficulties would be a serious objection at the present time; suitable anodes for chloride solutions have long since given satisfactory results, and the diaphragms are no longer a serious obstacle, however desirable it may be to dispense with them. The more essential difficulty of the Hoepfner process lay in the indifferent nature of the solvent. Cupric chloride cannot be regarded as an energetic solvent of copper either from its oxide or sulphide ores. The ores treated by this process from the Sulitjelma mines in Northern Norway was a cupriferous pyrite containing from 9.5 to 12.25 per cent. copper, and from 32.6 to 24.5 per cent. iron. This ore was treated without roasting, and the surprise is that under such conditions the process met with any encouragement at all. When large quantities of copper have to be extracted per day an efficient and energetic solvent must be employed.

#### THEORETICAL ADVANTAGE OF CHLORIDE SOLVENTS

One advantage of the Hoepfner process over a sulphate process, is that the electric current deposits, theoretically, twice as much copper per ampere from a cuprous solution as from a cupric solution, e. g., 1000 ampere-hours will deposit 5.229 lb. of copper from a cuprous solution while the same current will deposit only 2.614 lb. from a cupric solution. Similarly, when iron is used as the precipitant, twice as much copper is precipitated per pound of iron from a cuprous solution as from a cupric solution, and this is one of the advantages of the Hunt-Douglas copper process as compared with direct precipitation from a sulphate solution. Later, Douglas proposed electrolyzing the solid cuprous chloride to deposit the copper, instead of using iron.

various other chemical and electrochemical methods have been devised to do for copper what chlorination and cyanidation have done for gold and silver. There is no reason why some of these should not be operated successfully under favorable conditions. Every metallurgical

process has its limitations, and the wisdom of the metallurgist is frequently exercised to know what these limitations are.

#### EFFECT OF IMPROVEMENT ON METALLURGICAL PROBLEMS

Frequently an improvement in a metallurgical scheme or apparatus changes its entire outlook. Cyanide was not looked upon favorably for the treatment of gold ores until McArthur and Forest pointed out that success depended upon using extremely dilute solutions for dissolving the gold and zinc shavings for the precipitation. Cyanidation of silver ores was not a success until sliming and filtering were made possible. Before the advent of the copper converter, copper smelting was much limited, because the resultant product presented as difficult a problem as the smelting to copper matte. Later electrolytic refining made it possible to bring the ordinary smelter copper into competition with lake copper. The water-jacketed blast furnace has done much to increase the rate of driving and the length of campaigns in smelting, and now the annoying dust problem in blast-furnace smelting seems likely to be entirely eliminated by the recent advances made in sintering. Similarly the chemical methods of copper extraction are sure to forge ahead in the near future. The anode problem, once so serious, has been overcome for chloride solutions, and it may not be entirely hopeless for sulphate solution. Diaphragms may be dispensed with. Electrolyzers can be devised which will have large capacity and be automatically operated. Power can be cheaply transmitted, and, as power is the basis of any electrolytic method, the prime mover, whether it be a steam or gas engine or a hydroelectric installation, may be situated anywhere within transmissible distance, although this distance need rarely exceed 50 miles.

#### POSSIBILITIES OF WET COPPER EXTRACTION

Oxidized ores are best adapted to any solvent process. It does not follow, however, that sulphide ores cannot be treated successfully or economically. No method has yet been made public which offers a probability of successfully treating sulphide ores without roasting. To decompose large quantities of sulphide ore by chemical methods, as would be necessary in large installations, is a serious undertaking.

Roasting is no longer the expensive operation it once was. A perfect roast is neither required nor desired in copper extraction by wet methods. A perfect roast would be fatal to the success of the operation. Roasting, for smelting work, is now regularly done for 25c. per ton of ore, and there is no reason why, in a reasonably large installation, roasting for a solvent process should not

be done for 40 to 50c. per ton under ordinarily favorable conditions. The question might then arise, if roasting is necessary, and fuel is required for roasting, why not smelt? Even assuming that roasting requires as much fuel as blast-furnace smelting, the fact still remains that any available fuel may be used in roasting, while in smelting, coke is desirable, even if not necessary. Furthermore, in smelting, fluxes have to be provided, and the copper matte produced is no more salable in the open market than a good quality of ore. If the ore is suitable for smelting, it would be foolish to advocate a chemical method. All ores are not well adapted to smelting, neither are all ores adapted to chemical methods, and the wise course for the metallurgist to pursue is to consider the limitations of the process under consideration.

The nature of the solvent has much to do with the limitations of the wet processes. Acid solvents are the only ones which have met with much encouragement from a technical point of view. Copper is soluble in many alkaline solutions, but alkaline solvents present great difficulties, especially if electrolysis is to be made the basis of the process. If copper ores contain sufficient lime to interfere seriously with an acid process, it is questionable if a wet method would present any advantages over smelting. Nevertheless, with a suitable alkaline solvent there would be a wide field on ores containing much lime or magnesia. Iron need not present any great difficulties either with an acid or alkaline solvent. The fixation of atmospheric nitrogen, either as nitric acid or ammonia, may ultimately result in a successful method of dissolving copper from its ores. Nitric acid presents serious difficulties, however, both as to solution of the copper and as to its precipitation if a regenerative scheme is contemplated. Ammonia presents somewhat similar difficulties, and the additional difficulty of operating with a gas instead of a liquid. Hence the lines along which success in a solvent method may be expected have been pretty well established, although it does not follow that a radical departure from these lines will result in failure.

#### THE ADVANTAGES OF A WET PROCESS

The advantages of a successful electrolytic process over smelting on ore adapted to it, will be:

The ore may be treated directly at the mine, in any unit, without the admixture of other ores or flues; if the process is electrolytic, power may be acquired from any transmissible distance; the end products are pure copper which may be sold at the full market price direct to the consumer, and gold which may be disposed of at the mint.

# Mining Methods Employed at Cananea, Mex.—II

Pillar Caving System at Cananea-Duluth Mine Yields Cheapest Ore.  
Back Stoping at Elisa Requires Little Timber. Opencut Most Expensive

BY MORRIS J. ELSING\*

The method of mining employed by the Cananea-Duluth mine gives by far the cheapest ore in the district.

Pillar-caving is a combination of overhand stoping on ore and a caving system. As is necessary in nearly all caving methods, the first step is to prospect and thoroughly outline the orebody by means of drifts and raises. Fig. 1 shows an orebody on the 200 level which extends above the 100 level.

#### IV—PILLAR-CAVING SYSTEM

After sufficient prospecting work has been done, the size of the sections to be mined and the pillars of ore to be left were decided upon. Pil-

is 8 ft. 5 in. high and the second set is 7 ft. 4 in., making practically 16 ft. from the rail to the top of the second set. This completes the regular raise sets, for at the top of the second set drifts are run connecting all the raises in the section. These drifts are then widened from 12 to 15 ft., after which they are carried up vertically by means of overhand stoping, the miners working on ore, only enough ore being drawn off so as to permit them to be within easy reach of the back.

These drifts are finally carried up to the level above, cutting out a number of small pillars which have been cut loose from the waste above by the

side pieces. As the back advances, the chutes are carried up, surrounded with ore.

#### HORSE OF WASTE

The matter of handling a horse of waste is not difficult, as it can be broken and easily drawn off through one or more of the raises that are carried up from the level. It has been found possible in mining by this system to place the raises close together, thus almost entirely eliminating the wheelbarrow by shoveling directly into a chute.

#### DRAWING THE ORE

The next operation is to draw the ore. This is accomplished by drilling holes in the solid ore which surrounds the second square set in each raise, as shown by the hatched portion in Fig. 1. These holes, after being blasted, form a mill-hole around the raise. In this way the ore is drawn off with the occasional use of a small amount of powder. The chute planking comes out with the ore. The short pieces are usually unbroken, while perhaps 50 per cent. of the side pieces are unbroken and can be used again. By this means all the ore is drawn from the section and the small pillars are left standing.

#### MINING THE PILLARS

The pillars crush down and break, due their own weight and a few small slips that usually exist in this class of porphyry ore. In case a pillar does not break down, a drift is run on the level underneath it and a raise is run up a short distance into the bottom of the pillar. One side of this raise is filled with holes, the base of the pillar is blasted out and the pillar falls. From this drift a new set of inclined raises in the bottom 16-ft. block of ore are used to draw off the ore in the pillars. These raises are merely flat sloping floors of heavy timbers, with head room blasted out so that a man can stand up and bar and draw the rock down the chute and into the car. The chute bottom is made almost flat, so that the ore cannot run down it, but piles up at the bottom. Large boulders are easily plugged and blasted at the mouth of the chute without injury to the timbers. Any waste can be sorted before it is loaded into the cars and need not be mixed with the ore. The small boulders are broken with hammers before being loaded into the cars.

#### FURTHER DEVELOPMENTS

The next step is to mine out the sections on the other side of the large sup-

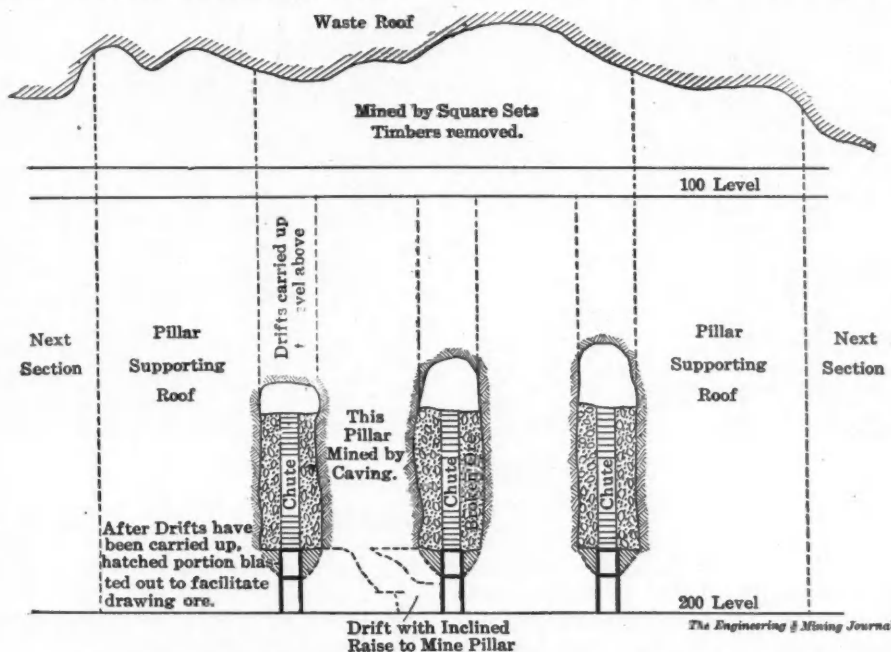


FIG. 1. VERTICAL SECTION, SHOWING PILLAR-CAVING SYSTEM, CANANEA-DULUTH MINE

lars are usually about 50 ft. wide, with sections from 75 to 100 ft. wide extending across the body. Because of the irregularity of the upper portions of these bodies it is necessary that they be mined by means of square sets in order to follow rich stringers.

At the Cananea-Duluth the orebody is mined by square sets from the 100 level to the top of the ore. These sets are then all removed and the pillar-caving system proper begins. In the meantime the section to be mined is blocked out on the 200 level by means of drifts and regular square-set raises are put in at intervals, as shown in Fig. 2. The sill raise set

square-set stope and are now partially supported by the ore surrounding them.

#### CONSTRUCTION OF CHUTES

Formerly, cribbed chutes of 8x8-in. timbers were carried up in the broken ore with a manway compartment, 2½x5 ft., and a chute, 5x5 ft. It has been found that a 3-in. plank chute is practically as good, with a saving of considerable timber. The inside dimensions of the combined chute and manway are 3 ft. 3 in. by 6 ft. The chute in the clear is 3 ft. 3 in. square, with a manway 2 ft. 6 in. wide. The 3-in. planks are placed on edge, with ends beveled at 45 deg. The dividing partition is a 3-in. plank which fits into a notch cut in the

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porting pillars *A* and *A'*, Fig. 2. This is as far as the method has been worked out and therefore future developments will be watched with great interest. There are several courses which can be followed in the subsequent mining. If the back and the pillars supporting it are sufficiently strong, it may be possible to mine out another section directly under the first, from the 300 level to the 200. Again, it may be possible to mine the supporting pillar by caving it, as in the mining of the smaller pillars, provided that the waste roof will stand without any support. If, however, the main pillar could not be mined in this way, the back over the sections on either side of the pillar would be made to cave in and the pillar itself would be mined by the slicing system. If this last were done, the remaining ore below the 200 level would be mined by the slicing system.

The method has been considerably changed from that first employed. Orig-

inally the section was mined without leaving the small pillars. It was then simple overhand stoping on ore. The back then was usually quite unsafe, not because of any great weight, but merely due to large masses of ore breaking away on small fractures, which are common in almost all kinds of porphyry. After one of these stopes caved, burying several men, the system as described was evolved. Since then it has given the greatest satisfaction and as now employed is quite safe, as the men always work near the back and when mining the pillars they are well protected.

**COST OF PILLAR CAVING**

The pillar-caving system produces the cheapest ore at Cananea. The method requires practically no timber and the greater part that is necessary can be used again. In practically every step in this method the breaking of the ore is done with the least possible amount of

**V.—BACK STOPPING ON WASTE AT THE ELISA MINE**

powder and labor. The cost will probably not average more than 40 to 50c. per ton of ore.

At the Elisa mine the ore is chalcopryrite in metamorphosed limestone, carrying with it considerable waste. The waste and the ore are strong, and therefore need little supporting. Here a system of overhand stoping on waste is used with great success. The method consists in sorting the ore and the waste in the stope, leaving the latter for filling upon which to work. Since approximately 50 per cent. of the rock broken is waste, it is necessary to add more as the stoping progresses. This is obtained from prospect work and other nearby workings on the levels above. The drilling is done by means of air-hammer drills, while in some places the regular piston drills mounted on columns are used.

150 ft. There is great flexibility in the system, as it is not necessary to lay out a stope with definite boundaries. Work can begin without as much prospecting as in the other methods. In fact, the actual mining by this system is the most efficient prospect work that can be done. The ore can be followed anywhere and

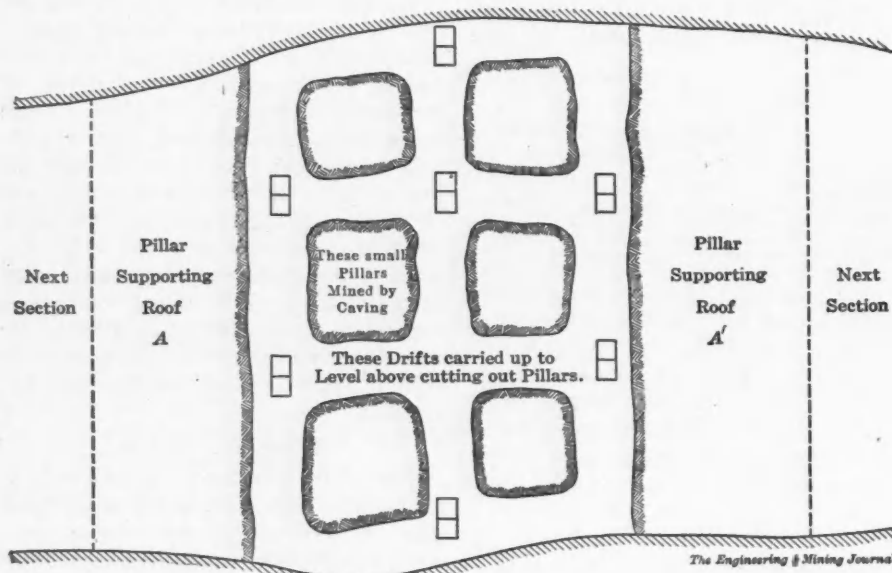


FIG. 2. PLAN OF PILLAR-CAVING SYSTEM, 16 FT. ABOVE LEVEL

Little supporting timber is needed, and that usually for stulls and headboards. These are placed wherever there appears to be a loose slab or boulder. No attempt is made to support the main back.

The ore is shot directly on the waste. The charges used are as small as possible, for with large charges fines would be produced. This is to be avoided, as the fines cannot be sorted, and besides they are easily lost in the waste filling. Before shooting, all stulls in the immediate vicinity are removed and used over again. Cribbed chutes are carried up in the waste and are placed as close as possible to avoid the use of the wheelbarrow. However, it is not always feasible to place these chutes close together, where the body has a more or less irregular pitch. In such a case a plank runway is constructed upon which the wheelbarrows are run to the nearest chute.

Stopes are sometimes quite large, 75x

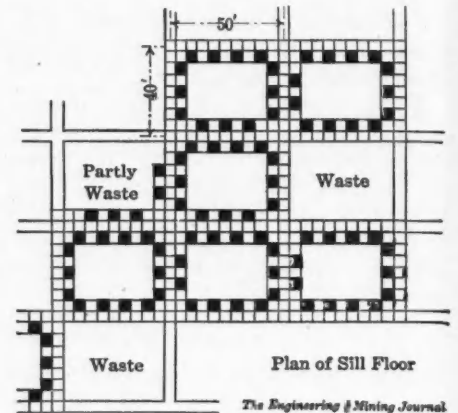


FIG. 3. PYRAMID SYSTEM AT VETA GRANDE MINE

it is rare that square sets would be necessary in mining irregular offshoots. Whenever the ore spreads out horizontally, piston drills mounted on columns are required, and where the ore is vertical, air-hammer drills are the most effective. Low-grade ore can be left as pillars supporting the roof. The most effective sorting is accomplished by blasting the ore large and breaking it with hammers. In this way the least fines are produced. On the whole, this system is not different from the practice generally followed in overhand stoping on waste.

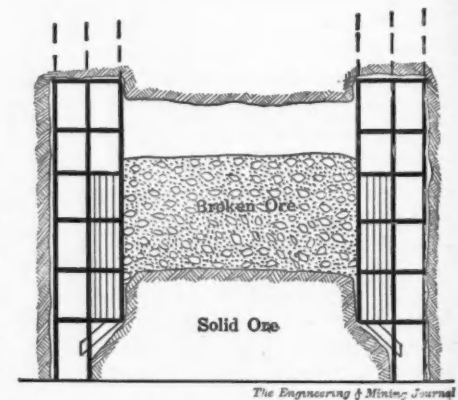


FIG. 4. VERTICAL SECTION THROUGH A PYRAMID STOPE

**COST OF BACK STOPPING**

This is a cheap system, as little timber is required and the blasting of the ore is done under the most favorable circumstances. The cost depends upon several conditions and varies considerably, principally by reason of the amount and the distance that the extra waste filling has to be trammed to the stope. There are times when it is an advantage to

have this waste room convenient, and in this way the cost of prospect work is reduced, as this waste need not be hoisted. The cost for labor and timber would not exceed from 75 to 85c. per ton of ore.

#### VI—THE PYRAMID SYSTEM OF STOPPING AT THE VETA GRANDE

A system of stoping is used at the Veta Grande which combines square setting and overhand stoping on ore. On the main level the ore is first blocked out with a series of drifts at right angles to each other, one way the drifts being 40 ft. apart, and the other way 50 ft. apart, center to center. The general appearance resembles a checkerboard. All the drifts are timbered with regular sill-floor stope square sets. Chutes are put in every other set. On the next floor above the drift regular stope square sets are put in and the square-set chutes are carried up one floor. On the third floor, that is 16 ft. above the rail, the square sets are

#### DRAWING THE CORE

After the whole body has been worked out in this way, the ore is drawn from the chutes. A certain amount has to be blasted again as it packs. At the Veta Grande where this system has been worked, ore broken in the stopes before the recent shutdown was not drawn for nearly two years after it was mined. In this case a considerable amount of powder had to be used to loosen the packed ore, on which account only a few of the square-set timbers could be saved. However, if the ore could be drawn soon after being broken, the amount of the powder needed would be less and a large percentage of the timbers could be saved.

After all the ore that can be drawn from the chutes is removed, there will still remain a pyramid-like mass in the center of each rectangle which cannot be removed in this way. It was from this fact that the system received its name. The pyramid of ore is later drawn by driving

waste roof and the drawing of the ore does not commence until all have been mined out.

#### REQUIREMENTS FOR THE APPLICATION OF DIFFERENT METHODS

The requirements of the pillar-caving system at the Cananea-Duluth, the pyramid system at the Veta Grande and the overhand-stopping method at the Elisa can all be considered together. For their application it is absolutely necessary to have a strong, solid ore and a strong roof. It is necessary that both the ore and the waste roof shall require no support with the exception of a few stulls to hold up small slabs and loose boulders.

In the case of the pillar-caving system, it is necessary that the ore have definite boundaries and be of a sufficiently large size to work to an advantage. With this and the pyramid method, the body should be large so that it can be divided into sections and be blocked out as shown in Figs. 2 and 3, preferably extending from one level to the next. The amount of waste in the ore must always be small. A small amount of sorting can be done in stopes and the waste drawn off through chutes, but the proportion of ore to waste must always be large. Again, in both of these systems, if the ore were inclined to pack, they could not be applied, as the ore could not be economically drawn. If the ore did pack it would practically have to be mined over again.

With the Elisa method of back stoping on waste, the regularity and the size of the body are not of great importance. If the roof stands properly the ore can be followed anywhere. However, the ore cannot be irregular with bunches of rich ore mixed with waste.

#### ADVANTAGES AND DISADVANTAGES OF METHODS

The pillar-caving system has such rigid requirements that its application is quite small. With the exception of this its disadvantages are few and unimportant, while on the other hand it is the cheapest method of mining. Besides, the ventilation can easily be kept good and it is comparatively safe.

The greatest disadvantage of the back stoping on waste is the fact when the ore is high grade the tendency of the sulphides is to produce fines, and as these are shot down on the waste the loss is considerable. When fines are produced, it is impossible to save all of the ore. On the other hand it has numerous advantages as indicated above.

The pyramid system is not well liked. It takes much timber, and where so large a mass of broken ore stands before being drawn, it takes considerable labor and powder to loosen and draw it. This is its chief disadvantage. In general the great advantage of these methods is that each gives the cheapest ore under the particular conditions outlined.



VETA GRANDE MINE, CANANEA, SHOWING CAVED GROUND

put in above the row in the drifts only and the included rectangle is mined out on this floor. From here up this continues with the square sets and the chutes carried up slightly in advance of the central portion of the rectangle.

Enough ore is drawn off through the chutes to give the miners sufficient head room to work on the ore. In this way these different rectangles outlined by square sets are carried up to the limits of the orebody. There are several kinds of chutes that can be used, and it is not necessary to carry up a regular square-set chute. A simple beveled plank chute is just as good and uses less timber. In mining one of these rectangles the back is filled with holes and all fired together. If there is a horse of waste in the ore it can be easily removed and dropped into the chutes and trammed away. A large amount of waste is left in pillars. The rows of square sets are lagged on the outside, holding the ore in the center of the rectangle until the drawing commences.

a drift into the center of the block and with a raise one set above the sill the remaining ore is drawn. The stoping proper does not commence until 16 ft. above the level, the object in this being to preserve the level drifts with 16 ft. of solid ore above the rails which would be mined from the level below.

The method of mining the block of ore on the level directly below would depend entirely upon the condition of the waste roof to which the first section had been mined. If the roof were treacherous and unsafe, it would be caved and the remaining ore could be mined by the slicing system. Fig. 3 shows the actual method of blocking out the orebody. As shown, chutes are put in every other set with no two chutes opposite each other, as this would obstruct the drift. The chutes are merely small openings cut in the solid ore with a couple of chute jaws and a door attached to the timbers. Fig. 4 shows a section across one of the rectangles. One after the other of these rectangular blocks is carried all the way up to the

GENERAL COMPARISON OF COSTS

The figures given as the cost of mining are approximations only. At nearly all of the mines more than one system is used and no attempt has been made to segregate the items of expense to each system, but rather to each mine. At nearly all the mines the cost of mining is figured as including prospect, development, dead work and repairs, tramping of the ore and waste. The figures given are estimates from these total costs of mining after a certain amount has been deducted for variable costs. That is, these costs include the cost of the labor and the timber per ton required in each method with the ore delivered to the mine cars at each particular stope. They are intended to serve as a basis for comparison between the different methods, as this only is of any value.

PILLAR-CAVING SYSTEM CHEAPEST

The pillar-caving system holds the record for low costs. An average cost of mining over a considerable period of time would not exceed from 40 to 50c. per ton. This is not due entirely to the system employed, but may be partially attributed to the fact that the Cananea-Duluth mine is young and all conditions are most favorable to cheap mining. With the slicing system the average cost of mining would be from 60 to 70c. per ton, including timber, which runs from 10 to 11 bd.ft. per ton. The back stoping on waste also ranks as one of the cheap methods. The cost per ton depends largely upon the amount of waste in the ore. Under the conditions in Cananea it probably costs about 75 to 85c. per ton. The pyramid system probably produces ore for 80 to 90c. per ton, and the square-set system, including 27 to 31 bd.ft., should range from \$1.20 to \$1.40 per ton.

The opencut mining at Puertocitos has the highest cost of all, approximately \$1.70 per ton of ore. The reason for this is the fact that a large amount of waste has to be handled for every ton of ore. On the other hand this figure includes powder and practically all charges except freight on the ore to the smeltery. No prospect and development work are necessary, and the dead work consists in the stripping, which is included in this figure. No compressed air is used and consequently there are no charges for this nor for the maintenance and repairs for machine drills. Therefore, when everything is considered, this cost is not high.

CONCLUSION

The lessons taught by the mining practice at Cananea are numerous. It has been clearly demonstrated that the slicing system can be applied to ground where it had long been supposed that square setting was the only available method and it follows that in all probability it can be applied with much suc-

cess in other camps under similar conditions where the square-set method is used today.

The value of the square-set system of mining as an auxiliary to other methods is strongly emphasized. It is, however, looked upon very much as a necessary evil; it is never used unless conditions absolutely demand it and in addition, it cannot be used for a low-grade ore.

To a great extent, the low costs of mining at Cananea are due to the introduction of these methods, but on the other hand, it can be clearly seen that in order to introduce them it is absolutely necessary that the conditions be favorable.

The Atomic Weights

The International Committee on Atomic Weights, consisting of F. W. Clarke, T. E. Thorpe, W. Ostwald and G.

New Jersey Zinc Mining

From 1880 to 1909 the Franklin Furnace mine of the New Jersey Zinc Company produced 3,737,047 tons of ore. In 1909 it produced 428,303 tons, of which 72,858 were taken from the opencut. This is an increase of 71,846 tons over 1908. R. M. Catlin, the superintendent, reports that operations in 1909 were carried on in 40 different stopes and about 700,000 ft. of timber were placed.

The Palmer shaft, commenced in 1906, was continued full size to the 1150-ft. level, or 1445 ft. on the incline. Much of the shaft has been heavily timbered while the four tracks of 70-lb. steel rails have been laid on concrete piers. The permanent shaft headgear and equipment have been completed and two new 22x48-in. duplex, direct-acting double-drum, Allis-Chalmers corliss hoisting engines have been installed.

INTERNATIONAL ATOMIC WEIGHTS, 1911.

Element.	Symbol.	Atomic Weight.	Element.	Symbol.	Atomic Weight.
Aluminum	Al	27.1	Molybdenum	Mo	96.0
Antimony	Sb	120.2	Neodymium	Nd	144.3
Argon	A	39.88	Neon	Ne	20.2
Arsenic	As	74.96	Nickel	Ni	58.68
Barium	Ba	137.37	Nitrogen	N	14.01
Bismuth	Bi	208.0	Osmium	Os	190.9
Boron	B	11.0	Oxygen	O	16.00
Bromine	Br	79.92	Palladium	Pd	106.7
Cadmium	Cd	112.40	Phosphorus	P	31.04
Cæsium	Cs	132.81	Platinum	Pt	195.2
Calcium	Ca	40.09	Potassium	K	39.10
Carbon	C	12.00	Praseodymium	Pr	140.6
Cerium	Ce	140.25	Radium	Ra	226.4
Chlorine	Cl	35.46	Rhodium	Rh	102.9
Chromium	Cr	52.0	Rubidium	Rb	85.45
Cobalt	Co	58.97	Ruthenium	Ru	101.7
Columbium	Cb	93.5	Samarium	Sa	150.4
Copper	Cu	63.57	Scandium	Sc	44.1
Dysprosium	Dy	162.5	Selenium	Se	79.2
Erbium	Er	167.4	Silicon	Si	28.3
Europium	Eu	152.0	Silver	Ag	107.88
Fluorine	F	19.0	Sodium	Na	23.00
Gadolinium	Gd	157.3	Strontium	Sr	87.63
Gallium	Ga	69.9	Sulphur	S	32.07
Germanium	Ge	72.5	Tantalum	Ta	181.0
Glucinum	Gl	9.1	Tellurium	Te	127.5
Gold	Au	197.2	Terbium	Tb	159.2
Helium	He	3.99	Thallium	Tl	204.0
Hydrogen	H	1.008	Thorium	Th	232.4
Indium	In	114.8	Thulium	Tm	168.5
Iodine	I	126.92	Tin	Sn	119.0
Iridium	Ir	193.1	Titanium	Ti	48.1
Iron	Fe	55.85	Tungsten	W	184.0
Krypton	Kr	82.92	Uranium	U	238.5
Lanthanum	La	139.0	Vanadium	V	51.06
Lead	Pb	207.10	Xenon	Xe	130.2
Lithium	Li	6.94	Ytterbium (Neoytterbium)	Yb	172.0
Lutecium	Lu	174.0	Yttrium	Yt	89.0
Magnesium	Mg	24.32	Zinc	Zn	65.37
Manganese	Mn	54.93	Zirconium	Zr	90.6
Mercury	Hg	200.0			

Urbain, has made its current report, from which the accompanying table is reprinted.

Lithium, phosphorus, strontium and vanadium are the commonest elements which show changed weights. In a separate article, C. W. Easley details work upon the atomic weight of mercury, tending to prove the accepted value is 0.3 per cent. too low, i.e., that Hg = 200.62, and Clarence W. Balke gives the result of his researches on tantalum as proving that Ta = 181.52, a half point higher than the table. It will be of interest to note what action is taken on these results a year from now.

Journ. Am. Chem. Soc., October, 1910.

Three electrically-driven centrifugal pumps have been installed on the 1050-ft. level. Two smaller centrifugal pumps will be installed in a station just below the lowest level (1150 ft.) to raise to the main 1050-ft. sump such water as originates below that level. Two additional small electric centrifugal pumps will also be placed just below the 300-ft. level.

Two three-phase, 1500-kw., 480-volt turbo-generators, which will furnish electric power for the operation of the pumps and electric tramways have been installed; electric haulage in the 300-ft., 750-ft., 950-ft. and 1150-ft. levels by 6-ton locomotives was put into operation in early 1910.

# Some of the Characteristics of Chilean Mills

Chilean Mill Essentially a Sliming Apparatus. Its Value Not Fully Appreciated at One Time. Coming Again into Merited Favor

BY HERBERT A. MEGRAW\*

The modern tendency to reduce the costs of mining and milling at every possible point has lately touched the matter of grinding in a more serious manner than ever before and a multitude of experiments with every kind of machine which might be used for the purpose have been made, and their results offered for comparison with the work of the older machines. In South Africa much study has been given to the question, and the development of the heavy gravitation stamp has been pushed to a remarkable degree. This development has been remarkable from more than one point of view, and it may be deemed surprising that so much study and attention have been given to a device which engineers, almost as a unit, have for years agreed in calling an illogical and expensive machine. And ultimately even the latest development of the stamp has shown no basic change from its original form. The latest forms of the gravity stamp are simply heavier than the older forms, accomplishing by sheer increase of falling weight an increase in the work done, while it has yet to be shown that the stamp mill has shown any notable increase of work done per horse power or per unit of cost. As a matter of fact it is extremely difficult to make comparisons of the costs of crushing with different stamp batteries. The cost data, as usually published, are incomplete in some way and are not to be relied upon when anything depends on the results of the comparison.

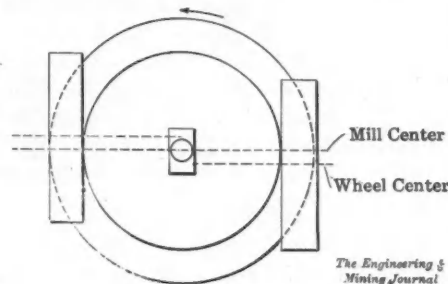
## ORIGINAL PURPOSE OF THE CHILEAN MILL

Those engineers who have practised in Latin America have found, among other native devices, the chilean mill. As is perfectly well known, the chilean mill is simply the original form of edge runner, and as it was devised to suit the needs of the metallurgical processes of the earlier days, it is perhaps only natural to find that it was not suited to the needs of later metallurgical processes. It was developed in view of its adaptation to the needs of the patio process of amalgamation, in which it was desirable to grind the ore as fine as possible, even to the point of making a slime of it. The machine was developed with an eye to filling this requirement as far as possible and of course every effort was made to develop it in that direction. Later developments in metallurgy made the slime

product an objectionable matter, difficult to handle and usually unprofitable. Particularly was this true with the development of cyanidation, where the standard treatment was percolation and slime was impossible to handle to advantage. At that stage in the history of metallurgy we found manufacturers of machinery making every possible effort to make a mill of the chilean principle which would not make slimes, a glance over the advertisements of that period giving one an idea of the claims made for the different classes of the machine. This effort never was successful.

## ESSENTIALLY A FINE GRINDER

The machine is inherently a fine grinder, and no effort of inventive genius was able to make it anything else. The result was that the chilean mill practically went out of use and has been almost forgotten. At this time, when the



MANTEY TYPE, CHILEAN MILL

making of slime is an object universally striven for, the mill has begun to reclaim its own. It has not yet become widely used, but its advantages are becoming better known and it seems likely that it will eventually make a place of its own in metallurgy. It was the fortune of the writer lately to have occasion to use some chilean mills of the old style. The results accomplished by the use of these mills seems worthy of attention, and it is proposed here to make some comparisons of the work done by them with that performed by stamps according to published data.

The particular mills under consideration are those installed in the Santa Elena mill of the Compañía Minera Angustias, Dolores y Anexas at San Luis de la Paz, Guanajuato. The mills, according to their marking, were built several years ago by Read, Campbell & Co., of London, and are of the type formerly used in connection with the patio process of treatment in Latin-American countries. They are built after what is known as the

Mantey patent design. The principle of this design is that the centers around which the crushing wheels revolve are set back of the vertical center of the mill, thus causing a slight drag of the wheels over the dies instead of a perfect rolling motion. This aids toward fine pulverization, delivering a product consisting largely of slime. Fig. 1 shows the Mantey idea, the effect of which can be readily understood.

## SANTA ELENA INSTALLATION

The mills, as installed at Santa Elena, have the crushing wheels of iron, and so arranged that they may be filled with lead, as they are in this case, thus adding materially to the crushing weight. The work which these mills are doing is worthy of note. The ore is delivered to them by feeders of the bump type and the rate of feed is under perfect control. The principle of the feeder is shown in the diagram, Fig. 2. The ore, previous to delivery to the mills, is passed through a rock crusher so that the mill feed consists of pieces, the largest of which will pass through a two-inch ring. The crushing wheels make 15 revolutions about the vertical axis of the mill, and require 15 h.p. each for the performance of their work. At present they are crushing through a 40-mesh steel-wire screen, and the duty under these conditions is 1.042 tons per hour, or about 25 tons (metric) per 24 hours. The solution used is eight to 10 tons per ton of ore. An average screen classification of the mill product is as follows:

## CRUSHING IN THE SANTA ELENA CHILEAN MILLS.

Screen.	Percentage of Product.
On 60 mesh	1.15
Through 60 on 80 mesh	5.65
Through 80 on 100 mesh	0.15
Through 100 on 200 mesh	25.75
Through 200 mesh	67.30

## CHARACTER OF ORE TREATED

It may be said that the ore upon which these results are obtained is an ordinary quartz carrying silver sulphides, such is characteristic of Guanajuato mines, and is neither harder nor softer than the average. Experiments have been made with the mills using a Ton-Cap screen, the width of the opening being the same as the opening of the regular 40-mesh steel-wire screen. This showed a no-

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table increase of the duty of the mill, and in the future that screen will be used. The cost of operation of the mill is given in the following table, it being based upon the life of a set of tires and dies, which is 18 months with full efficiency. In fact, they usually last nearly or quite two years, but with a diminishing efficiency after 18 months, so that figure is taken as the standard. The complete set of two tires and the set of dies cost 1625 pesos delivered at the mill. With 18 months' use, these will crush about 12,600 metric tons of ore.

COSTS OF CRUSHING AT SANTA ELENA.

	Pesos per Ton Milled.
Labor.....	0.03
Lubrication.....	0.01
Power.....	0.288
Tires and dies.....	0.129
Extra repairs.....	0.010
<b>Total.....</b>	<b>0.467</b>

In this connection I would call attention to the article<sup>1</sup> showing data on the work of Chilean mills, by Francisco Narvaez. These mills at the Hacienda La Union have been at work a number of years and their results are well worthy of careful study. Narvaez has given in detail the costs of work at Pachuca, including depreciation on the mill, but as this item is rarely included in published data, I have eliminated the item from his figures, and the costs at La Union under these circumstances are 0.558 peso per ton.

The difference between the costs at Santa Elena and La Union is due entirely to the item of labor, which, it seems, is more in Pachuca. At Santa Elena one man takes care of two mills on each shift, while at La Union Narvaez charges one man on each shift for each mill and at a higher cost than is necessary here. The mills at La Union grind less ore in a longer time, which makes their costs higher than at Santa Elena, but, on the other hand, the product of the mills at La Union is much finer than is made here. The matter of the fineness of the product is a detail which can easily be arranged with the mills. The arrangement depends upon the objects in view and the conditions under which they must be obtained. We find our costs most favorable under the conditions now obtaining.

COMPARISON OF DIFFERENT INSTALLATIONS

An accompanying table shows a comparison of the product of the Chilean mills at Santa Elena, Hacienda La Union and at the Loreto mill of the Compañia Minera Real del Monte y Pachuca. The latter uses 14 mills of the old style, each grinding 22 tons per day.

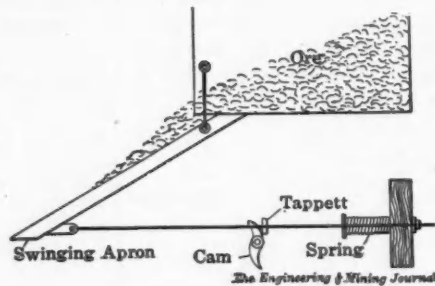
The data on the Loreto mill are taken from those published by McCann<sup>2</sup>.

It is stated here that the mills at Loreto make a finer product than stamps at a less cost for power and consumption of steel, that is, tires and dies, but the statement is also made that the repair cost is greater with the mills than with

COMPARISON OF MILLING AT DIFFERENT MEXICAN CAMPS.

Screen.	Santa Elena, Per Cent.	La Union, Per Cent.	Loreto, Per Cent.
On 40 mesh.....	0.00	0.00	0.25
On 60 mesh.....	1.15	0.00	2.50
On 80 mesh.....	5.65	0.41	7.50
On 100 mesh.....	0.15	1.50	10.25
On 120 mesh.....	.....	.....	2.50
On 150 mesh.....	.....	13.45	10.50
On 200 mesh.....	25.75	4.75	8.25
Through 200 mesh.....	67.30	80.00	54.00
Net per cent. through 100 mesh.....	93.05	98.20	75.25

stamps. This statement seems to require some explanation in view of the costs given at Santa Elena and La Union, for the repair cost is essentially tires and dies and we do not find other repairs amount to much. The costs



SHAKING FEEDER

given for the Loreto mill do not separate those due to stamps and those for Chilean mills, the total for both being given as 0.94 peso per ton milled. It seems natural to suppose that the greater part of this expense belongs to the stamps.

At the Loreto mill there are 40 stamps working under the same conditions as the Chilean mills, that is, with 40-mesh screen. The table shows the product of these stamps compared by the same authority with that of the San Francisco mill of the Guanajuato Consolidated Mining and Milling Company, using stamps with a punched-slot screen equal to 50 mesh, and the product of the stamps<sup>3</sup> at Minas del Tajo, Rosario, Sin., Mexico.

The costs given for San Francisco include general expenses and a proportion of all fixed charges, but deducting all these the cost of operation amounts to 0.98 peso per ton milled. At El Tajo, the costs are given as \$0.4812, equal to 0.9642 peso.

Other costs given by McCann for

<sup>2</sup>Beneficio de Metales de Plata y Oro por Cianuracón, p. 210.

<sup>3</sup>Bull. A. I. M. E., Feb., 1910.

stamp battery work are: Dos Estrellas, mill No. 1—breaking and crushing, 0.848 peso; tube milling, 0.312; total, 1.160 pesos; product 80 per cent. as slime and 20 per cent. as sand; Dos Estrellas, mill No. 2 (Cedro)—breaking and crushing, 0.874; tube milling, 0.356; total, 1.230 pesos; product 65 per cent. as slime, 35 per cent. as sand; San Rafael, Pachuca, report of company, 1909; grinding and concentration, one peso per ton milled.

In this case fine grinding is resorted to, making a product which is all treated as slime. The cost of concentration is not a large item, probably about 10 centavos per ton, leaving the balance of about 0.90 peso per ton for grinding. This is about the most favorable result yet published for reduction with stamps and tube mills, and, it seems, is still higher than the work performed by Chilean mills.

At the Pinguico mill, Guanajuato, there are 40 stamps and regrinding is done in two 6-ft. Akron Chilean mills and one Bryan mill, product 40 per cent. sand and 60 per cent. slime. The costs are: crushing, 0.19; batteries, 0.63; regrinding, 0.45; total, 1.27 pesos per ton milled.

McCann<sup>4</sup> notes that the Mexican Mines of El Oro make a slime product entirely at a cost of \$0.30 per ton for all grinding, or 0.60 peso. This seems extraordinary compared with the costs here given for stamp milling. In view of the fact that it is stated that the 40 stamps are moved by two 65-h.p. motors and that there are six tube mills, each having its 75-h.p. motor, a total of 580 h.p., it seems that the cost of power alone would reach or pass that figure, even if the entire power of the motors is not needed for the regular work. The capacity of the mill is said to be 260 tons per day. It seems that the figure stated must either be in error, or that there is some especially favorable condition to account for the cost.

COMPARISON OF CHILEAN MILLS AND STAMPS

It is extremely interesting to compare the costs above given for Chilean mills and stamps. It must be remembered that careful study of the conditions under which each plant is working should be made before arriving at conclusions. The costs of different items vary widely in different districts. The character of the ore may be entirely distinct, some ores are so hard that it would be foolish to try to reduce them with a Chilean mill. The cost of power is not likely to be the same in different districts and other conditions may alter, favorably or otherwise. The cost of power at Santa Elena is much higher than in those districts served with hydro-

<sup>4</sup>Loc. cit.

<sup>1</sup>ENG. AND MIN. JOURN., Nov. 21, 1908.



electric power, and labor is cheaper than in most other camps. The product delivered by the different mills must be compared also, as in some cases the chilean mills deliver a produce more favorable than stamps and tube mills combined. It seems clear that the chilean mills will, used alone, deliver a more favorable product than stamps alone and at a less cost. Also that, even if tube

COMPARISON OF STAMP MILLS AT DIFFERENT CAMPS.

Screen.	Loreto, Per Cent.	San Francisco, Per Cent.	Tajo, Per Cent.
On 40 mesh....	0.4	0.89	2.51
On 50 mesh....	3.3	2.71	.....
On 60 mesh....	15.1	6.92	11.08
On 80 mesh....	11.70	10.71	1.52
On 100 mesh....	9.90	0.34	3.70
On 120 mesh....	1.60	10.41	.....
On 150 mesh....	6.50	7.65	17.30
On 200 mesh....	6.00	1.72	50.10a
Through 200 mesh....	45.50	58.65	.....
Net product through 100 mesh.....	59.60	78.43	67.40

a Through 150 mesh.

mills are used in each case for regrinding, the one working after chilean mills will have considerably less work to do.

ADVANTAGES OF THE CHILEAN MILL

One of the greatest points of advantage with the chilean mill is that it is subject to much less stoppage for repairs. The tires and dies lasting a year and a half makes the stoppage due almost entirely to the changing of screens, and as this item is considerably less than with stamps, loss of time is much reduced.

In this paper we have been talking about the old style of mills and it would seem natural that modern efforts to improve the mill would be successful. In this connection might be noted the Lane mill, a modern adaptation of the chilean-mill idea, the makers of which guarantee a repair cost of less than four cents per ton.

There are on the market any number of modernized chilean mills which are operated at a high speed in order to obtain capacity. I am of the opinion that these mills will never accomplish the results attained by the slow-speed mills. High speed means rapid wear and a good opportunity for accidents, more wear on screens and all the ills that come with rapidly moving parts. Slow speed and heavy weight are the best means of crushing ore economically.

Undoubtedly the slow-speed chilean mill is being overlooked as a grinding machine. It certainly merits consideration, for, at least with a large number of ores, its costs are much lower than can be obtained with stamps.

Mexico has an area of 767,000 sq.m. and a population of 13,607,260 or 17.7 persons per square mile.

Thiocyanate Determination of Copper

BY U. TSUKAKOSKI\*

There are many precipitants for copper, of which alkaline thiocyanates seem to be the best, because of complete precipitation of the copper, shorter time required for precipitation and complete elimination of impurities such as arsenic, antimony, bismuth, etc.

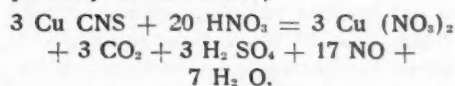
The cuprous thiocyanate (CuCNS) is easily dissolved in hot nitric acid. The copper-nitrate solution thus obtained is equally applicable to any of the methods of copper determination, as the iodide, cyanide, and electrolytic methods. Or the copper is determined by the permanganate method by treating the cuprous thiocyanate with fixed alkaline hydroxide.

I tried the following combined method with satisfactory results, using potassium thiocyanate as precipitant and the regular iodide method for the determination of copper.

As the treatment of the sample with mineral acids and the precipitation of copper with alkaline thiocyanate is well known, I will merely outline the treatment of the cuprous thiocyanate with nitric acid.

If the bulk of the cuprous thiocyanate obtained is large, it is better to wash most of the precipitate back into the original beaker, in which the precipitation was made, with the least possible amount of wash water. Dissolve the precipitate in the beaker with 1 to 2 c.c. of strong nitric acid and boil two to three minutes. Pour the dissolved copper solution over the previous filter paper so as to dissolve any of the precipitate which remained on the filter paper. If the bulk of the precipitate is small, washing back the precipitate is better omitted and the filter should be treated with hot dilute nitric acid (1:1) by means of a wash bottle.

Wash the filter with hot dilute nitric acid two or three times to dissolve the precipitate completely. After washing with acid use hot water several times to wash down any of the dissolved copper. The copper solution should be received in a clean beaker. The reaction of nitric acid upon cuprous thiocyanate would probably be as follows,



Boil the copper nitrate solution for a few minutes, add ammonia in slight excess and boil off the excess of ammonia, then add acetic acid (2 or 3 c.c.). Cool down the cupric acetate solution to room temperature and determine the Cu by the iodide method.

\*Douglas, Ariz.

The comparative results shown in the accompanying table may be of interest. Comparing these results, it will be noticed that the results by the method A are consistent with those by B and C. The results, A, were obtained by my first experiments but those in B and C by the usual method.

COMPARATIVE RESULTS BY THIOCYANATE, THIOSULPHATE AND ELECTROLYTIC METHOD.

Sample No.	A Per cent. Cu.	B Per Cent. Cu.	C Per Cent. Cu.
1	15.15	15.10	.....
2	21.20	21.16	21.15
3	13.70	13.72	13.67
4	14.15	14.15	13.95
5	14.95	.....	14.90
6	14.00	14.03	13.95
7	4.075	4.07	4.10
8	11.70	11.63	11.65
9	4.50	4.51	4.60
10	15.25	15.20	.....
11	14.10	14.04	14.05
12	13.50	13.51	13.50
13	14.85	.....	15.00
14	11.65	11.60	11.70
15	22.40	22.35	22.35
16	14.05	14.06	14.05
17	4.05	4.04	4.10
18	4.50	4.54	4.57

A—Results obtained by the method described above, using same standard sodium thiosulphate for titration as with C.

B—Results obtained by the electrolytic method, using sulphuric acid electrolyte, containing 2 or 3 c.c. of free strong sulphuric acid, 1 c.c. of strong nitric acid and 5 or 6 grams of ammonium nitrate, the current density being ND<sub>100</sub> = 0.16.

C—Results obtained by precipitating the copper by sodium thiosulphate and determining the copper by iodide method.

The Texas Company

This oil company, controlled by John W. Gates and associates, has made a complete report to the New York Stock Exchange, of which the main items are as follows: The company is one of the largest Southwestern oil producers, with 1058 miles of pipe-line and tankage capacity of over 20,000,000 bbl. The gross revenue for the fiscal year ending June 30 was almost \$10,000,000. The annual production is about 500,000,000 gal.

Operations are being extended and for this purpose \$3,000,000 6 per cent. 10-year notes were sold recently at par for cash.

To facilitate the maintenance of its vast oil business, the Texas Company owns over 1000 miles of telegraph and telephone lines. Its refineries, four in number, have a daily capacity of 30,000 bbl. The company maintains 240 distributing agencies, and also has one in Antwerp which supplies northern continental Europe. In addition full cargo shipments are made from Port Arthur to all foreign countries. The company's carriage equipment comprises 1010 tank cars and a fleet which has a bulk capacity of 210,000 barrels.

## Mill of the Randfontein Central Gold Mining Company

By E. M. WESTON\*

The Randfontein Central mine is situated on the western extension of the Witwatersrand beds about 20 miles from Johannesburg. Ore will be hauled from five shafts to the central reduction works by steam locomotives. Only one conveyer belt is employed on the plant, all other work being done by mechanical haulage employing the old ropes from hoists. The reduction plant consists of 600 stamps of 1650 lb., with 16 tube mills designed to crush 150,000 tons per month. The length of the mill building is 634 ft., width 69 ft. The steel work, which consists chiefly of the light framework for the roof, weighs 550 tons, and there are 70,000 sq. ft. of corrugated iron covering the roof and walls.

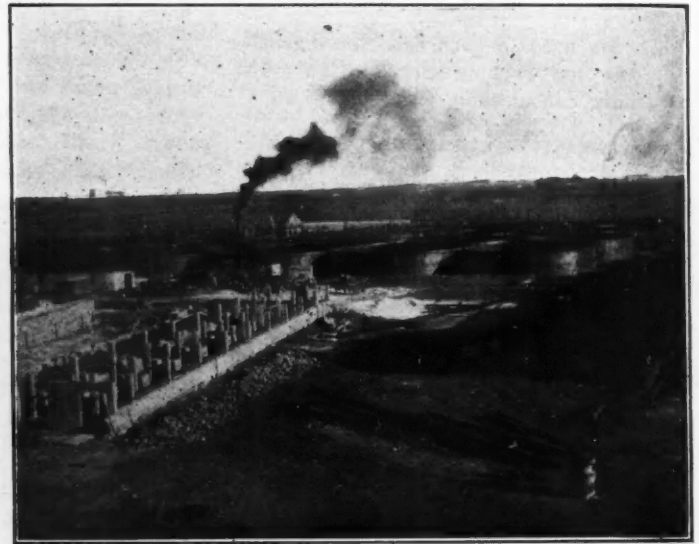
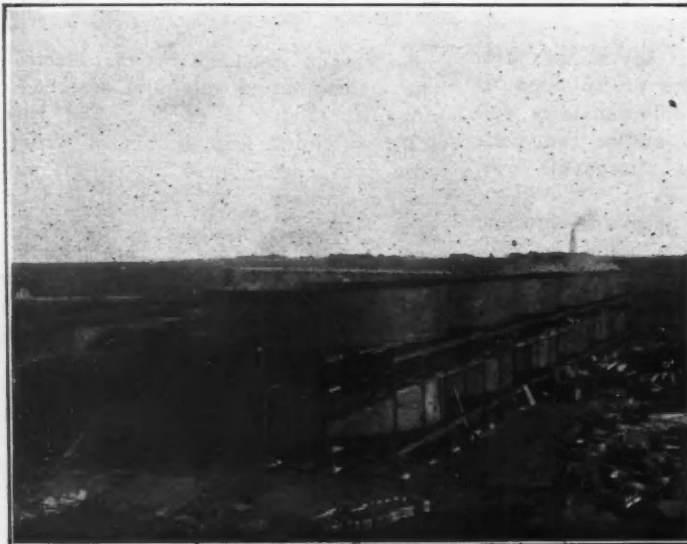
broken cam shafts to be utilized some five stamp drives are provided. There are no amalgamating plates in the stamp mill, shaking amalgamating plates being provided after the tube mills.

The cyanide sand plant consists of two groups, one at the east and the other at the west of the mill, each consisting of one row of six upper collecting tanks, and 12 lower treatment tanks in two rows of six each, one row being directly underneath the collecting tanks and the other as shown in the photograph parallel to it on same level. All sand tanks are 60 ft. diam. by 15 ft. deep. One collecting tank serves two treatment tanks. The sand is transferred from the collecting vat to the outside treatment vat by hand tramping in two cars running on staging having a slight down grade across the top of the treatment tank. The framework of the supports is of the usual type of built-up steel girders to form columns and channel-beam girders. The load of each column is 270 tons.

building 237x100 ft. All sand will be elevated by ten centrifugal sand pumps of 10-in. diam., six for coarse sand, four for fine sand. The slime will be elevated by four 12-in. centrifugal pumps, all these being of local manufacture after the designs of Robeson-Davidson. Mechanical haulage will transport residues to the tailings dump at the rate of 440 tons per hour. David Gilmour, the consulting mechanical engineer to the Randfontein Estates, is responsible for the design and erection of this huge plant and it is to his courtesy that the accompanying illustrations are due.

## Mineral Production of the Province of Ontario

The selling value at the mines of the 1909 mineral production of the province of Ontario is given at \$32,981,375, which is an increase of 28 per cent. over the best previous record. The value of the



SLIMES PLANT, RANDFONTEIN CENTRAL GOLD MINING COMPANY

### MILL BUILT ON TRIED PLANS

The design of this mill has followed more conservative lines than did that of the City Deep mill recently described. The battery and mill-bin framework are of pitch pine, the battery posts being, however, bolted in sockets to the concrete foundations for the mortar boxes. These boxes are bolted down to the concrete foundation which has a central tunnel along its base, thus differing from the City Deep type of foundation where the bolts are laid in grooves on the surface of the back and front of the foundation.

### FOUR HORSEPOWER PER STAMP PROVIDED

The stamps are driven in groups of ten by a 40-h.p. motor and the driving pulley is set between the two five-stamp boxes to reduce torsional stresses. To enable

\*Mining engineer, 20 St. Mary's buildings, Johannesburg, Transvaal.

### DETAILS OF SLIME PLANT

The slime plant lies between the two sand-treatment plants and consists of 25 tanks, 70 ft. diam. by 14 ft. deep, with bottoms coned to a further depth of seven feet. The slime pump house is in the center of the tanks. The frame of the extractor house can be seen in the photographs beyond the slime tanks; it is 300 ft. long and 70 ft. in width, and below it out of sight are eight solution storage tanks 60 to 70 ft. in diameter and 12 ft. deep. The photograph shows the foundation for the tube-mill plant of 16 tube mills 22x5½ ft. each. The reinforced-concrete framework seen is for the motors and classifiers for tube mills which will be erected in two parallel rows of eight each on the ground level, their discharge being elevated to shaking tables for amalgamation and thence to sand pumps. These will be housed in a steel

production, as refined, is estimated at \$37,000,000 or 41 per cent. of the total Canadian output. Silver (almost entirely from the Cobalt district) amounted to \$12,464,722; pig iron to \$6,301,528; nickel \$2,790,798; all other metallic minerals \$1,425,448.

### NONMETALLIC MINERALS

The total value of all nonmetallic minerals was \$10,052,879, of which portland cement was the most important, with a value of \$2,897,348. The production of petroleum fell off 26 per cent. to \$559,478, this being the most notable decrease.

At the fourth international conference of American republics it was decided to change the name of the International Bureau of American Republics to the Pan American Union which will continue to disseminate information regarding our Southern neighbors.

# An Incident in Colliery Electrical Work

BY JAMES A. SEAGER \*

The engineering staff connected with a colliery is not always as fully informed regarding electrical matters as would appear to be advisable, having regard to the great extent to which electricity is now being used in colliery installations. This may be due partly to the fact that electrical engineering is of comparatively recent date so far as its application to colliery practice is concerned; also the spread of technical information among colliery engineers regarding electricity has not been so rapid or complete as the extension of its uses. To this may be added the fact that by its nature electrical engineering is based more on theoretical and abstract matters than is mechanical engineering which deals largely with solid and visible materials, and the practical man employed in a colliery is, therefore, not so well adapted to acquiring the necessary details concerning an electrical plant as he is with regard to mechanical apparatus.

## IGNORANCE WITH REGARD TO USES OF ELECTRICITY

Whatever may be the reason, there is no doubt that a large amount of ignorance with regard to the uses of electricity is to be found among colliery men; one example is better than a long discussion of the matter in order to bring home the truth of these remarks. An instance may be narrated of the way in which the absence of technical knowledge very nearly involved a colliery in disaster. The incident occurred some little time ago so that there is probably now no objection to the matter being made public.

It was decided by the management of a large colliery to install an electrical plant consisting of a generating station of an original capacity of 300 kw. (which has since grown to nearly ten times that value) and a distributing system passing down the pit shaft for the purpose of supplying haulages, etc., and also the workings in the main seam, which was situated some 300 fathoms below the surface. The electrical plant was placed in a building adjacent to an existing steam-raising plant some little distance from the downcast shaft. Between the house containing the electrical apparatus and this shaft, there was a culvert or pipe of mild steel 3 ft. in internal diameter which emerged in the shaft about 10 ft. from the top. This was utilized as a culvert for air and water pipes, and upon the electrical installation being decided upon, it was judged expedient to carry the

electric cables from the generating plant through this pipe and down the pit shaft.

## TEACHING THE MEN TO BE CAREFUL

By an arrangement with the manufacturer of the electrical plant the whole of the labor, both skilled and unskilled, required for the erection of the apparatus was provided by the colliery, the engineers simply sending one man to supervise the erection of the engines and another to supervise the installation of the electrical plant. This latter was of the alternating-current three-phase type operating at 500 volts between phases. Previous to the installation of this plant, a small amount of direct current had been used at 200 volts and the electrician at the colliery had been accustomed to touch live parts with impunity. One of the first things that the contractor's man had to teach the local men was that it was not safe to touch any live part on the 500-volt alternating-current system. This he did when the first engine and generator were installed by bringing the excitation as low as possible so as to give a pressure of 200 volts and then inviting electricians to touch a terminal. The shock that they got was quite sufficient to convince them of the unpleasantness which would be experienced on 500 volts, and they acted as excellent missionaries in warning all the men in the pit that they should on no account go near the electrical plant. This point is mentioned to show how completely in the dark the men on the supply were as regards the plant they were to operate and explains the incident which is now to be related.

## THE CABLE WAS FASTENED IN A WOOD CASING

In order to be beforehand with the electrical contractor and to get the work through as quickly as possible, the local staff decided to erect the cable before the arrival of the dynamos and motors. This they did by uncoiling the cable, which was of the three-core paper-insulated and lead-covered type, in the room built for the generating plant, taking it through the culvert to the pit shaft and winding it again on to a drum placed in the pit cage. To accommodate the cable down the pit shaft, wood casing approximately 3x4 in. in section was grooved out so as to fit the cable tightly and thus the cable was supported along its length. This was a wise precaution inasmuch as it is well known that if an unarmored lead-covered cable is supported from the top, the weight of lead and its ductility cause it to creep and, overlapping in

some places, to break away at others, leaving the paper bare. This casing was fixed to the timbering in the shaft and when the cable was put into position, it was covered by means of a board screwed over the top of the trough. The cable down the shaft was run in three lengths with two joints and all this work was complete when the superintending electrician of the contract arrived at the colliery.

When the work had so far progressed that one of the haulage gears with its motor and oil switch was in position at the bottom of the shaft and one of the generating sets and switchboards was erected and connected up in the dynamo room, it was decided to give this part of the installation a trial run. The insulation was tested by means of an ohmmeter and it was rather low, but yet sufficiently high to make it entirely safe to try the plant. On running up, however, with the haulage switch open, the main fuse of the alternator at once blew. Another set of fuses was inserted and the plant tried again with a like result, and this continued for some little time. Finally, however, the fault was brought down to such small dimensions that it was possible to run the plant up on a single strand of No. 22 copper wire in each pole, and to keep it running under these conditions. It was then judged that the fault had been dried out and the main fuses of proper capacity were reinserted.

## CABLE SETS SHAFT ON FIRE

The contractor's electrician then went down the mine to the haulage motor, which was situated about four hundred yards inby, and ran up the motor without any trouble. After shutting down for a short time, however, and attempting to start up again he found that no current was obtainable and started to walk back toward the downcast shaft but had not gone far before he noticed a strong smell of burning bitumen. Almost at the same time he met a pit boy running into the mine yelling that the downcast shaft was on fire. As there were about a thousand men in the mine at the time, the effect of such a cry would have been an instant stampede and probably loss of life, so that the boy was silenced by vigorous methods and driven back to the bottom of the shaft. Here it was found impossible to get up and means of communication was for a time broken down. After an hour's waiting, however, the electrician got to the surface and found the colliery electricians awaiting him, who told him that the weak place in the cable had at least been found. On going down the

\*Blackett street, Newcastle-on-Tyne, Eng.

shaft again for inspection, it was found that at a certain point about 40 yd. down, the casing and cover had been sheared away by an electrician to a distance of about two inches as cleanly as if a saw had cut into it and the cable was also cut through in the same way. The strong draft down the shaft had, of course, assisted the conflagration and there was a considerable amount of burning about the place.

#### NO PRECAUTION MADE TO INSURE SAFETY OF LEAD COVER ON CABLE

The contractor's electrician at once insisted upon a thorough examination regarding the way in which the cable had been put into the trough, and several lengths of the cover were removed. This revealed the fact that in quite two dozen places, there were gashes (some of them 12 in. in length) in the lead covering, the paper showing completely through; and on an explanation of this being demanded, it transpired that when the operation of putting the cable into position had taken place, no precaution had been made to insure safety of the lead cover. It had simply been unwound in the dynamo room and pulled through the culvert without any attempt at support or any preparation of the culvert with wood facing as should have been done.

As the various lengths of the culvert were jointed together with internal flanges the effect of drawing the heavy lead-covered cable over sharp projecting iron edges can easily be imagined. After lecturing the colliery engineers on the inadvisability of stripping the lead covering from a paper-insulated cable and of then putting it into place and covering it up without saying anything about it, the contractor's engineer washed his hands of the whole job until a fresh cable had been ordered and put into place, a somewhat expensive job for the colliery.

#### THE FAULT IS OFTEN WITH THE MEN AND NOT THE APPARATUS

The above incident obtains its value from the fact that it demonstrates how extremely carefully the supervision work must be carried out in collieries, having regard to the ignorance which seems to exist among colliery engineers upon electrical matters. It would seem to be almost incredible that anyone should imagine that a cable subjected to such treatment should be expected to stand up to its work in a downcast shaft whose walls were covered by a trickle of water and whose atmosphere was thoroughly damp. But the above illustration is not an invention. For this reason it is valuable as possibly explaining to a certain extent the outcry which has recently been raised regarding the safety of electrical apparatus in mines. Very often the fault does not lie in the apparatus itself but in the extremely careless way in which it is treated.

## The Coal Industry in South Wales

The output of coal in South Wales during 1909 was 50,364,000 tons. The most important occurrence during the year was the enforcement of the eight-hour act, which became operative on July 1, 1909. Previous to this time, practically all of the mines were hoisting for 10 hours per day at top speed, without cessation. The sudden enforcement of the shorter working day automatically reduced production. Coincident with the introduction of the eight-hour day, the mine owners terminated all wage agreements with the miners, claiming that that increased cost of mining coal forced on them by the Act, necessitated reduction in the wage rate. After protracted negotiations between the Miners' Federation and the Coal Owners' Association, a new sliding scale of wages was agreed to on April 8, 1910. The agreement was made for a period of five years, and the wages paid now stand at about 10 per cent. below the wages paid in 1908.

#### OUTPUT PER MAN

The output of coal per man during 1909 was 246 tons, which compares with an output of 271 tons in 1906. The reduced production is attributed entirely to the eight-hour act.

It is claimed by the owners that the miners boycott cutting machines. The miners say cutting machines are unsuitable to the seams. Only a limited number are in use.

One effect of the eight-hour act has been to increase working cost and reduce production, which has resulted in an improvement in prices, enabling the principal colliery companies to maintain a small profit. The average net profit of six of the most successful companies during the last five years works out at 38c. per ton; this means a dividend on the capital invested of from 8 to 20 per cent. There is another side to the picture, however. A group of six other important companies, with a total capital of more than \$24,000,000, paid \$5,000,000 in wages and earned nothing in 1909 for the owners.

## New Natal Colliery Adopts Central Power Supply Scheme

#### SPECIAL CORRESPONDENCE

Construction work at the Utrecht colliery, situated near the town of that name in Natal, South Africa, has been completed, and the mine has started to produce coal. The interesting point concerning this new colliery is the fact that it will be run entirely by electricity. The current will be generated on the spot, and will be used for the hoisting engine,

the ventilating fan, hauling skips, and for all the purposes where power is needed, as well as for lighting. The colliery officials also propose to provide light for the town, and eventually to undertake a general system of power distribution about the district for agricultural and industrial purposes.

The adit workings on the mountainside are nearly a mile away from the power house, with which they are connected by an ascending and descending electric tramway. Adjoining the power house is the screening and washing plant, from which the coal will drop direct into railway cars. An unusual degree of freedom from sulphur is claimed for the product. The coal seam is 6 ft. thick and extends entirely through the mountain. Coal outcrops like those which led to the discovery of the Utrecht mine, occur all over the district.

The main entry, 6 ft. high by about 12 ft. wide, has been driven into the hill for a distance of about half a mile, and from this entry, cross entries and rooms are being driven, so that development work is progressing rapidly. The enterprise is under the control of two or three large English financiers; no company was constituted in the sense of public capital being either invited or embarked in the undertaking. The branch of railway leading up to the mine is 26 miles long, and is similarly controlled by private capital. There is little or no agricultural country developed at present on the line of railway, so that any profit must result from the transportation of coal. L. V. Withie is manager of the mine.

## Navy to Test Pacific Coast Coal

#### SPECIAL CORRESPONDENCE

Arrangements have been made whereby our naval vessels will carry on a series of tests with Pacific Coast coal from the State of Washington. All of the coal for naval uses on the Pacific Coast is at present brought around from the Atlantic Coast. All of the commercial vessels on the Pacific use Washington coal. Those who advocate the use of Pacific Coast coal point to the fact that the battleship "Oregon," which made her notable voyage around the coast of South America and arrived in time to participate in the battle of Santiago, used Pacific Coast coal, from Puget Sound to South America. It is conceded that the coals of the Pacific, ton for ton, have not the heating value of the Atlantic coal; however, it is insisted that the difference in relative cost is out of all proportion to the difference in efficiency.

The by-product coke ovens nearly completed by the Steel Corporation at Cary, Ind., are 550 in number and can make 1,650,000 tons of coke yearly.

# Danger of Inrushes of Surface Water

Thick Cover above Mines Desirable Where Surface Land Is Liable to Flood. Ten Lives Lost Working a Seam Having Only 18 ft. Cover

## SPECIAL CORRESPONDENCE

In the annual report for the collieries of West Scotland, Mines Inspector Thomas H. Mottram has given an account of a disaster at No. 41 pit, Caprington colliery, situated near Kilmarnock, in the county of Ayr, illustrating the danger that may arise from inrushes of surface water. Ten persons were drowned, the accident which occurred on Dec. 10, 1909, being caused by the roof of an abandoned stoop-and-room working, near the surface, giving way, with the result that a large body of water, which had during the night, overflowed from the river Ir-

ving subsidence of the surface. The seam was worked by the stoop-and-room method, and as the workings progressed north to the Irvine river, and so from that point onwards, the workings really formed an extension of those in existence from adjoining shafts 60 years ago. The size of the stoops left, varied from 5 to 10 yd. square, and the rooms were about 8 ft. 6 in. wide. The seam dips slightly northward and where the subsidence took place on Dec. 10, the thickness of the cover was about 18 ft. The strata consisted of sandstone and

### FIVE MEN ESCAPED THROUGH UPCAST

Another shaft known as the "new air pit" 12 yd. deep (marked B on plan, Fig. 1) is connected with the Blind coal workings 330 yd. eastward of No. 41. This pit is also an upcast, but acts for the east section alone, and five men who escaped by means of this outlet did so by with-

ing subsidence of the surface. The seam was worked by the stoop-and-room method, and as the workings progressed north to the Irvine river, and so from that point onwards, the workings really formed an extension of those in existence from adjoining shafts 60 years ago. The size of the stoops left, varied from 5 to 10 yd. square, and the rooms were about 8 ft. 6 in. wide. The seam dips slightly northward and where the subsidence took place on Dec. 10, the thickness of the cover was about 18 ft. The strata consisted of sandstone and

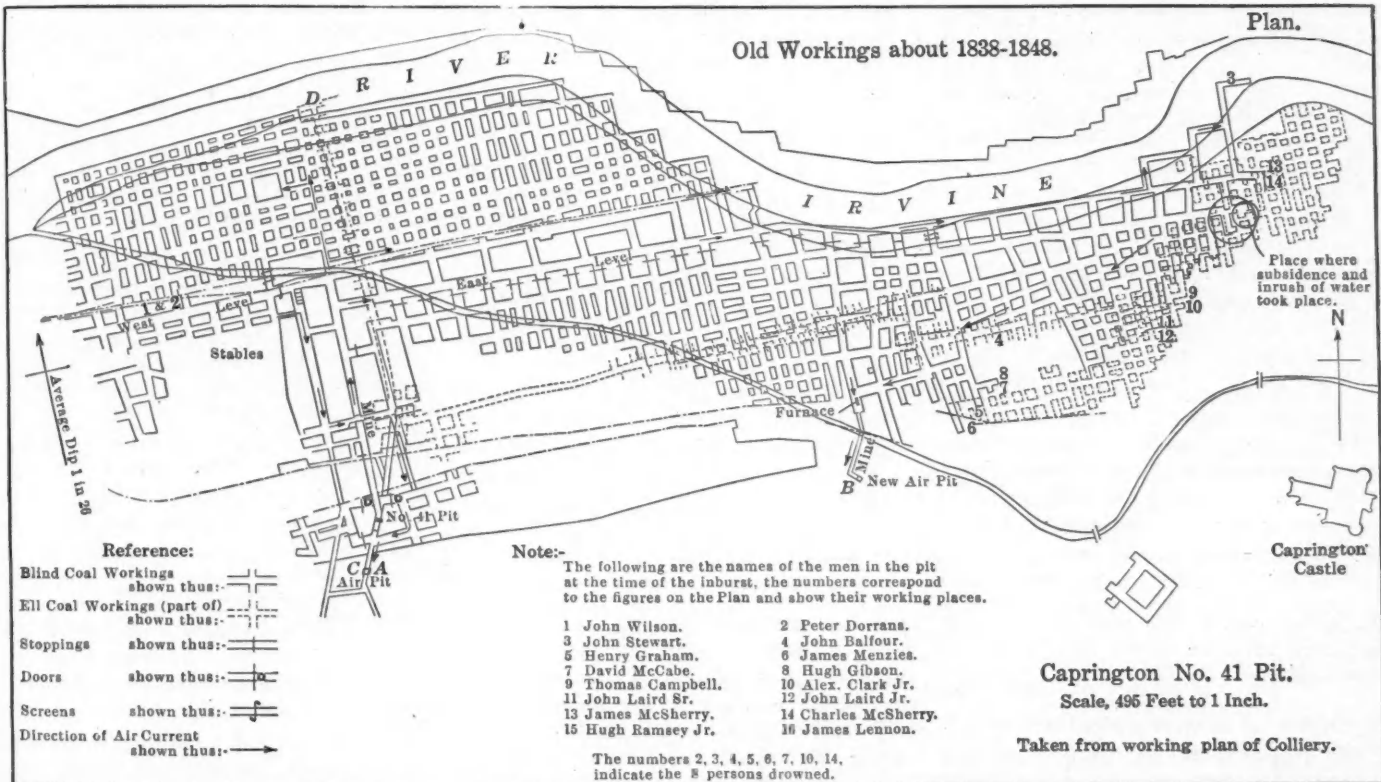


FIG. 1. PLAN OF CAPRINGTON COLLIERY, SHOWING SITUATION OF BODIES AFTER ACCIDENT

vine, or a stream running into it, poured into the old workings, and finding its way to No. 41 pit, ran down the shaft, forcing accumulated blackdamp in front of it.

According to the narrative of the inspector, No. 41 pit is one of several shafts belonging to the company that has worked the seams known as the Ell coal and the Blind coal. This shaft is the winding pit of the colliery, and by it the miners are lowered and raised daily. Twenty yards distant there is an upcast shaft, known as the air pit, sunk to the Ell coal, and connected to the Blind coal by a crosscut (see A on ac-

drawing the fire in the furnace, situated about 60 yd from the "new air pit" bottom. The air pits being shallow were not fitted with apparatus for raising or lowering persons, but such apparatus, though not in actual use at the time of the accident, was on the works belonging to the mine and available in accordance with the Mines Act.

The Ell coal, 3 ft 6 in. thick, was opened up from the No. 41 pit about 15 years ago. The working of it continued until 1906, when it was abandoned, the stoops formed by the first working being considered too small to remove without caus-

ing gravel, 12 ft.; Fakey sandstone, 566 ft.; Ell coal, 3 ft. 6 inches.

The present workings are in the Blind coal 3 ft. thick. As shown on the section, No. 41 pit is a little deeper than the position of the seam; a crosscut rising 1 in 50 intersects the coal north of the pit. Stoops were formed from 40 to 80 ft. square, and afterwards split or reduced as shown on the plan.

Like the Ell coal the Blind coal was also worked on the north side of the Irvine river many years ago, a barrier of coal being left between the old and new workings, as the former were thought to contain accumulated water.

## DETAILS OF THE ACCIDENT

On the night of the accident, the fireman encountered blackdamp, which put out his light. He tried to relight his lamp, but his matches would not strike. Arriving at the pit bottom he found the bottom also in the dark. Some time afterwards, water was heard rushing down the shaft from the Ell coal. From an examination of the working plans and from the level of the water, when the inspector arrived, it was seen how hopeless it was to effect the rescue of the 10 entombed men.

The position of the subsidence of the surface which let the water into the mine is shown on the plan. The opening into the Ell coal seam at a depth of 17 to 18 ft., was 14 ft. by 12 ft., and occurred at a point where two rooms or roadways 8 ft. 6 in. wide intersected; however, at the surface the gap was considerably larger, caused by the water in its descent washing a large quantity of sand and gravel into the old workings. The force of the deluge must have been great, for

safe to work the mine, but had the management appreciated or recognized the effect that a percolation of water and consequent saturation of the Ell coal roof might have on some part of the roof softer than the rest, the inspector thinks they would have elected to keep the men out of the mine when flooding of the surface existed, or was anticipated.

For the above data and the accompanying plans, indebtedness may be expressed to the annual report prepared by the Mines Inspector and issued by the Home office.

### The Use of Black Powder in Coal Mines\*

In the fields of the middle West, it is not now uncommon for a miner to use six kegs (150 lb.) of black powder in two weeks, while within the memory of men still active, one keg (25 lb.) would last two men for two weeks.

So great has the use of explosives be-

in nitrate, and there is also some volatile combustible matter distilled from the coal.

That the effect of coal in increasing the volume of gases produced is recognized by the miners is shown by the custom, fortunately not common, of replacing a part of the powder by coal drillings. It has been stated by miners in the Kansas field that a charge of six pounds of powder and one pound of coal drillings would do the work of a charge of seven pounds of powder.

Some of the gas mixtures, following the firing of shots, are so near the point of combustibility that they would be made combustible by a small admixture of methane or coal dust. It is evident, then, that the presence of such gases in the mine air must be considered a source of danger. This is especially the case when the gases are produced by black powder, as they might easily be ignited by the flame from a subsequent shot; but it would also seem to be the case if the gases are produced by other means. Some of the so called "safety" powders on the market produce large quantities of carbon monoxide, and it seems that the presence of this gas in the mine atmosphere is attended by danger, even though the flame of the powder itself will not ignite the gas.

#### THE PRESENT TENDENCY IS TO USE TOO MUCH POWDER

The present tendency in most mines is toward the use of more powder than is desirable. It is easier for the miner to shoot the coal than it is to mine it with a pick. There are three undesirable effects: 1. The roof is weakened and the number of accidents from falls of roof is increased. 2. The coal is shattered and its value decreased. 3. Large quantities of powder-gas are produced. The first two effects are greatly increased by the use of dynamite, a practice which is indefensible, but which it seems impossible entirely to prevent.

In case the miners are paid for run-of-mine coal, it is impossible to greatly restrict the use of explosives. When payment is made for lump coal, the miners are more careful, because the use of much powder decreases the proportion of lump coal, and, therefore, decreases the earnings of the miner. But even in this case the use of explosives may result in the breaking down of so large a quantity of coal as to compensate for the decrease in the proportion of lump, giving the miner as large earnings as he would receive if he produced less coal with a larger proportion of lump, and making the work of getting it easier.

#### ARRANGEMENT IN MICHIGAN MORE SATISFACTORY

The laws in Kansas require that payments may be made on a run-of-mine

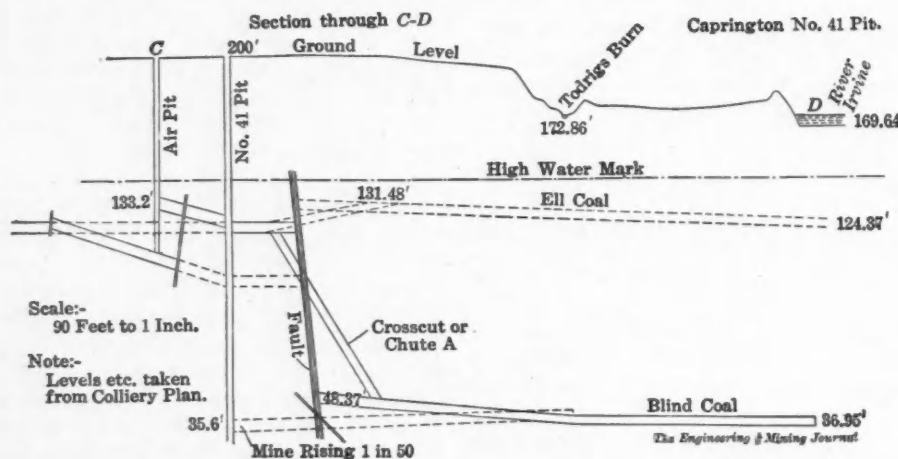


FIG. 2. SECTION SHOWING COVER ABOVE WORKINGS AND POSITION OF RIVER

the cavity was littered with trees, which had been uprooted in the vicinity of the subsidence.

#### PRIMARY CAUSE OF THE DISASTER

The inspector in his report says the primary cause of the disaster was the working of Ell coal from No. 41 shaft, where the surface cover was only 18 ft. thick. In the course of time, the Ell coal roof, which formed part of the cover deteriorated, then collapsed with the gravel and sand above, when the surface was flooded during the night. Mr. Mattsam says the question naturally arises why the management allowed this colliery to work when the surface cover in the Ell coal was only 18 ft. thick, and the underneath land was known to be subject to occasional flooding.

To him it seems doubtful whether the owners were justified in continuing to work the pit. Under normal conditions, that is, when there was no flooding of the surface, it was evidently comparatively

come in some fields that the skilled coal miner is hard to find, and the coal is not mined, but blasted. While so called permissible explosives are coming into use, the explosive most used in the United States today is black powder, which differs from gun powder in the use of sodium nitrate instead of potassium nitrate, with an accompanying change in the proportions of sulphur and charcoal.

#### POWDER FIRED IN PRESENCE OF COAL

Detailed experiments have made it apparent that powder fired in the presence of coal produces a larger percentage of CO than when fired alone. This is, of course, to be expected, as the coal has very nearly the effect of the charcoal of the powder, and the mixture of powder and coal behaves like a powder deficient

\*Abstract of a paper entitled "Gaseous Decomposition-Products of Black Powder, with Special Reference to the Use of Black Powder in Coal Mines," read by Clinton M. Young, at the Pittsburg meeting of the American Institute of Mining Engineers.

basis, and the result is the production of a large amount of slack. It seems to me that the arrangement obtaining in Michigan is more satisfactory. In this State the operator pays for run-of-mine or for screened coal at his own option, and the miner does not know on which basis he will be paid at any time. The miners have a representative at the scales, and the rate for screened coal is higher, so the arrangement seems fair to both operator and miner.

In Kansas the tendency toward the excessive use of powder is further increased by the fact that the powderjack has been abolished, and the operators are required to furnish powder in 12.5 lb. cans. As no powder is allowed to remain in the mine and the miners will not carry it back to the surface, each man is practically certain to use a can each day whether he needs it or not.

#### BLACK POWDER MAY CONTINUE TO HAVE A CONSIDERABLE USE

It appears that the objections to the use of black powder are not founded upon any question of the good or bad quality of the powder, for though many samples were examined, all were found to be good. The objectionable features are inherent in the nature of the explosive, but may be aggravated by the method of its use. But though it is seen that the gases produced may, under some circumstances, be combustible, it must be remembered that when the proper charge is used the danger is a minimum, and this explosive, being slow-burning, shatters the coal less than the more violent explosives. It is believed that black powder may continue to have a considerable use in mines free from gas, and in which the dust is sufficiently damp to prevent suspension in the air.

### Extracting Oil from Coke Smoke

#### SPECIAL CORRESPONDENCE

Preparations are being made at the plant of the Semet-Solvay Company, at Dunbar, Penn., to extract another ingredient from coke smoke. Already, by means of the retort coke oven, the company is getting coal tar, ammonia, and a number of other substances out of the waste from the oven. This proposed plan is to extract a light oil. The oil will be extracted from the naphthaline in the gas that the oven generates. Not only will this oil be of commercial value, but the plan will insure the extraction of a destructive element from the gas.

Investigation has shown that the naphthaline contained in the gas, produced by the retort oven, eats through the pipes and also leaves a deposit which clogs them. If this naphthaline can be removed in the form of a light oil, much benefit will result. The process of extracting

this oil from the gas is attended with danger because of its high explosive nature. The oil, after being refined, is said to possess a higher explosive quality than gasoline. It is of a reddish color.

If it is demonstrated that the destructive properties of the gas are extracted when the light oil is recovered, it is probable that the town of Dunbar will give the gas from the Semet-Solvay ovens another trial. This gas was tried once, but abandoned because the pipes were eaten away and were apt to clog.

### The Coal industry in Spain

According to a report made by Vice-Consul William Dawson, of Barcelona, the coalfields of Spain cover an estimated area of 4117 square miles. A total of 25,515 persons are employed in the extraction of bituminous and anthracite coal. Of the total number of persons employed, 1128 are females, who do work above ground. The coke industry employs 898 laborers, and the extraction of lignite 1417.

#### THE COAL OUTPUT IS INCREASING

The coal output of Spain is increasing, having risen from 1,730,000 tons, worth \$2,383,200 in 1895, to 3,690,000 tons, worth \$8,483,400 in 1908. The consumption of soft coal increased by 12 per cent. from 1904 to 1908, while production increased 27 per cent. Of the 1,941,000 tons imported in 1908, 1,911,580 tons, valued at \$11,010,701 were from the United Kingdom. British coal costs \$4.14 per ton in Spain; German, \$3.60; Asturian, \$3.60; and the coal from Leon, \$4.05. Freight rates on the coal from Great Britain are \$1.04 per ton, less 7c. for immediate discharge. It costs about 75c. per ton to bring the Asturian coal to market, and about \$1.53 to bring the coal from Leon.

#### SPAIN WILL CONTINUE TO IMPORT COAL

It is probable that unless methods of working the coal seams in Spain are radically improved, the consumers of that country will continue to import about \$10,000,000 worth of coal annually. Under ordinary circumstances, owing to high freight, American coal cannot compete with the British coal. If a regular service of boats were established, carrying coal from some Atlantic port to Spain and bringing back ore on the return trip, the rates might be reduced to a point where our coal could compete with the British product.

There are now 171 coal and coke companies operating on the line of the Norfolk & Western railroad in Virginia and West Virginia. These companies own 13,931 coke ovens. They shipped over the road last year 13,999,516 tons of coal and 2,969,496 tons of coke.

### COLLIERY NOTES

The consumption of coal in the United States is more than twice as great as that in any other country, and nearly equals the combined consumption of the United Kingdom, Germany, France and Belgium, and is actually greater per capita than in the United Kingdom.

Tests at one western mine, where a good grade of bituminous coal is mined, showed that 1 cu.yd. of mine-run coal weighed 1450 lb.; one cubic foot of the same mine-run coal weighed 53.7 lb. Expressed in another way, 1 cu.yd. of this coal weighed 0.72 ton, and it required 37.2 cu.ft. of the coal to make 1 ton.

The Davis Coal and Coke Company is to erect a central power plant at Thomas, W. Va., which will supply electricity to 12 of its mines in that vicinity. Contracts for the machinery have been awarded, and it is expected to have the plant ready for work by about Feb. 1. The main transmission lines will be about 11 miles in length.

It is advisable for every coal company operating one or more mines to make careful tests and prepare a table of weights of the different grades of coal produced at each mine. Such a table should give the weight per cubic yard in pounds, and the weight per cubic foot in pounds. The table should also show for each coal and for each grade of coal, the tons of coal per cubic yard, and the cubic feet of coal per ton.

Twenty-two of the 65 Belgian-type rectangular ovens at the Katherine plant of the Union Connellsville Coke Company in Pennsylvania are completed, and the work on the remaining ovens is progressing rapidly. The ovens will be charged by an electric larry, leveled by an electric leveler, pushed by an electric pusher, and the coke will be loaded into the cars by an electric conveyer. The watering machines will be automatic.

An interesting experiment in housing the miners is being made by one of the largest coal companies operating mines in Scotland, near the coast. The shafts of this company are situated along the Firth of Forth, and several entries run more than a mile under the sea. A dozen houses near the water are each to be provided with a bath room for the miners, including hot and cold water. The idea is that the workers will have two suits of clothing, one for use underground, and another for wear in going to and from the colliery. After work, they ascend the shaft, enter the bath, and reappear in ordinary street clothing. An inquiry at the company's office elicited the information that only about one miner in five will avail himself of these privileges, although the cost to each miner would not be more than \$10 a year extra, in addition to his rent.

## NEW PUBLICATIONS

**MINES OF AFRICA, 1910-1911 Edition.** By R. R. Mabson. 21s. *The Statist*, London.

**TWENTIETH CENTURY SHEET METAL WORKER.** By H. E. Osborne. *American Artisan*, Chicago.

**QUINQUENNIAL REVIEW OF THE MINERAL PRODUCTION OF INDIA DURING THE YEARS 1904 TO 1908.** By Thomas H. Holland and L. Leigh Fermor. 2 rupees. Records, Geological Survey of India (Calcutta), Vol. XXXIX, 1910.

**PROCEEDINGS OF THE SEVENTEENTH ANNUAL MEETING OF THE SOCIETY OF ENGINEERING EDUCATION, HELD IN NEW YORK CITY, JUNE 24 TO 26, 1909, VOLUME XVII.** Edited by Henry S. Munroe, Arthur L. Williston and Henry N. Norris. Office of the Secretary, Ithaca, N. Y.

**FACTORY ORGANIZATION AND ADMINISTRATION.** By Hugo Diemer. \$3. McGraw-Hill Book Company, New York.

The details of factory administration are set forth from an engineer's standpoint. The book is intended for officers, managers and accountants of industrial corporations.

**THE MECHANICAL APPLIANCES OF THE CHEMICAL AND METALLURGICAL INDUSTRIES.** By Oskar Nagel. Published by the author, New York.

Contents: Steam, water, gas and electric power; transportation of solids; liquids and gases; grinding and mixing machines; furnaces; filter presses; purification of gases; evaporating, distilling and condensing; drying appliances; measurement of temperature.

**MORE RECENT CYANIDE PRACTICE,** edited by H. Foster Bain. \$2. *Mining and Scientific Press*, San Francisco, Cal.

The volume is a compilation of many of the articles on cyanide practice which appeared in the *Mining and Scientific Press*, from October, 1907, to July, 1910. The individual articles cover a wide range and set forth the development of both theory and practice in all parts of the world. The contributors include many well known cyanide metallurgists.

**COMPRESSED AIR: THEORY AND COMPUTATIONS.** By Elmo G. Harris. \$1.50. McGraw-Hill Book Company, New York.

Contents: Formulas for work; measurement of air; friction in air pipes; hydraulic and centrifugal air compressors; special applications of compressed air; the air-lift pump; examples and exercises.

The volume presents a mathematical treatment of problems in compressed air, and is intended for the use of the thoroughly trained engineer.

**HYDRAULIC MINING: CLASSIFICATION, TEST AND VALUATION OF ALLUVIALS; WATER SUPPLY; METHODS OF WORKING ALLUVIALS, ETC., WITH SUPPLEMENTS ON ROADS FOR MINING PURPOSES AND MOTOR TRACTION, AND APPENDIX.** By C. C. Longridge. 20s. *The Mining Journal*, London.

Part I treats of placer deposits, prospecting and valuing ground. Part II: Water supply; reservoirs; ditches; flumes, and hydraulic pipes. Part III: Various forms of hydraulic mining and equipment. The volume is largely a compilation of articles which have appeared in various mining journals, and other technical publications.

**THE MINES DIRECTORY, Vol. I, 1910.** Cloth, \$5; leather, \$7.50. The Mines Directory Company, Salt Lake City, Utah.

This volume of 630 pages presents a directory of the mines of Arizona, California, Colorado, Idaho, Montana, Nevada and Utah; with about 30 pages under the head of "Miscellaneous," in which a number of companies in other States are briefly noted. There are also lists of custom smelting plants, mining-stock exchanges, mining brokers, bankers, etc. Some 75 pages are occupied by summaries of mining laws, and by statistical tables. The tables seem rather superfluous, especially as the figures in them, with a few exceptions, are only brought up to 1907. The directory gives for each mining company reported the situation of the property, capitalization, names of officers and such other particulars as were to be obtained; the notices being necessarily brief and condensed in form.

**RECENT ADVANCES IN THE CONSTRUCTION OF ELECTRIC FURNACES FOR THE PRODUCTION OF PIG IRON, STEEL AND ZINC.** By Eugene Haanel. Canadian Department of Mines, Mines Branch. Paper, 76 pages; Ottawa. Government Printing Bureau, 1910.

This publication presents in concise form an account of the latest improvements in connection with electrothermic processes for the smelting of iron ores and steel making. As an indication of its rapid development, Doctor Haanel notes that whereas in 1904 only four small electric furnaces were in operation in Europe, there are at present 67 in operation, 11 not working and 36 in course of erection. The most important advances have been made in Sweden, where the Domnarfvet furnace has been improved so as to increase the output considerably. With a charge of 55 per cent. Fe contents, when producing gray iron, 6283.11 lb. of pig iron per h.p. year is obtained; and when producing white pig iron, 6613.8 lb. per h.p. year. The furnace has been working constantly and acts satisfactorily. It is now proposed to develop 600,000 h.p., a large proportion

of which will be used in the exploitation of the Swedish iron-ore fields. Descriptions are given of the Cote-Pierron zinc furnace and the DeLaval zinc process as applied in a plant erected in London for demonstration purposes.

**ECONOMIC GEOLOGY, WITH SPECIAL REFERENCE TO THE UNITED STATES.** By Heinrich Ries. Third Edition, Revised, 1910. \$3.50. The MacMillan Company, New York.

In his attempt to cover both metallic and nonmetallic minerals in one volume of convenient size, Professor Ries has been driven to adopt almost a shorthand method of presentation. The author is professor of economic geology at Cornell, and in aiming to produce a textbook for use in his own classes, he has adapted the material primarily to give his students a summary knowledge of all the economic minerals mined, or consumed in large quantities, in the United States. As a book of reference for an engineer (which, it is fair to say, the author did not intend it to be) the volume is altogether inadequate.

As illustrating the condensed nature of the work, coal, the output of which has in recent years been worth more than that of all the metals put together, is covered in about 40 pages of reading matter; less than one page is devoted to the fields of Pennsylvania, and not even the names of the principal seams are stated. Copper receives the equivalent of about 20 pages of reading matter. As if to recompense for this superficial treatment in the text, the bibliographies at the ends of the chapters are comprehensive and well selected, though not absolutely complete. Discussions of such mooted points as the origin of coal and petroleum, the source and enrichment of mineral veins, and other debatable matters, are impartially presented from all points of view. The introduction of statistical tables is commendable as giving students an idea of the relative importance of the ores and minerals, and keeping before them the often overlooked fact that ores are mined for market and not solely for the purpose of giving them employment as engineers.

The book is plentifully illustrated with well selected and beautifully executed halftones from photographs of active mines. Such pictures have a decided educational value, and the extra thickness given to the book by inserting them on one side only of glazed paper is amply worth while. The value of many of the diagrams and nearly all of the regional maps inserted in the texts, however, is seriously impaired by their illegibility. Most of them have been reproduced from other publications, on a reduced scale, with the result that the legends can not be read without straining the eyes. In a textbook intended for studying at night, this defect can hardly be overestimated.



## i PERSONAL i

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

J. C. Beidelman, of Montreal, is in the Sturgeon Lake district.

Ernst F. Eurich, of New York, will spend the winter in Europe.

Edmund B. Kirby, of St. Louis, Mo., has returned from a trip to the Skeena River district in British Columbia.

L. B. Lincoln, vice-president of the Canadian Peat Society, is examining peat deposits near Winnipeg, Manitoba.

Kenneth Seaver has been appointed chief engineer of the Harbison-Walker Refractories Company of Pittsburg.

Morton Webber, of New York, has lately been in North Carolina, making mine examinations in behalf of New York interests.

William Frecheville, of London, England, was in Toronto recently on his return from an inspection of the Porcupine gold area.

Sydney Davies, of Newcastle-on-Tyne, England, is in Canada. He recently inspected the iron-ore deposits of the Gatineau, in the Ottawa district.

H. F. Lefevre recently returned to New York from Guatemala. He left again, Nov. 3, for Costa Rica and Nicaragua, to be gone about two months.

R. McL. Johnson, of the Quincy mine, has been appointed superintendent of the Adventure Consolidated Copper Company, with office at Greenland, Michigan.

G. E. Webber has resigned his position as general manager of the Rand Mines, Ltd., in the Transvaal, and will return to California after 17 years' work in South Africa.

Elias Rogers, of Toronto, Ont., president and general manager of the Crow's Nest Pass Coal Company, is visiting the company's collieries in Southeast Kootenay, British Columbia.

Peter Donaldson, of Glasgow, Scotland, president and managing director of the Dayton Coal and Iron Company, Ltd., Dayton, Tenn., is making his annual visit to the United States.

Robert H. Morris, formerly of Las Esperanzas, Coahuila, Mexico, recently visited the coal property in Similkameen district, B. C., owned by the Princeton Coal Company, of Spokane, Washington.

Charles H. MacMahon has resigned as consulting engineer of the American Smelting and Refining Company's exploration department, at Aguascalientes, Mexico, and has removed to Denver.

N. A. Carle, of Seattle, Wash., is in the Skagit river district, near the International Boundary line between Washington and British Columbia, investigating new

finds of gold ore for M. Robert Guggenheim.

Fred B. Close, of Los Angeles, Cal., identified with Michigan interests, has been in the Planet district of Arizona examining the Mineral Hill property belonging to A. J. Pickrell, of Prescott, Arizona.

Joseph A. Michel, for a number of years connected with the accountant department of the American Smelting and Refining company in Denver, Colo., has accepted the position of joint financial agent of the same company in its clearing house at Mexico City.

J. K. Griffith, who for nearly 22 years has been superintendent of the steel plant at Latrobe, Penn., built by the Latrobe Steel Company and since 1905 owned by the Railway Steel Spring Company, resigned, Oct. 31, continuing a relationship in an advisory capacity.

Warren B. Lippincott and James M. McClave announce that they have formed a partnership under the name of Lippincott & McClave, with offices at the Ideal building, Denver, Colo., as chemical and metallurgical engineers, giving especial attention to the treatment of complex ores.

A banquet was given in honor of William C. Franz, manager of the Lake Superior Corporation, by the citizens of Sault Ste. Marie and Steelton, Ont., on Oct. 21. The leading speakers were Hon. W. L. Mackenzie King, Canadian Minister of Labor, and Hon. W. J. Hanna, provincial secretary of Ontario.

C. Vey Holman has been appointed State geologist of Maine. Mr. Holman is a counselor-at-law at Bangor, Maine, and is lecturer on mining law in the Boston University Law School. He has been also for many years a practical miner, and at the present time is operating gold mines in Nova Scotia and is developing a deposit of molybdenite in Hancock county, Maine.

## + OBITUARY +

Major Liddell, assayer in the United State mint, at Bois , Idaho, died in that city on Nov. 7, aged 42 years. He had been a resident there for 19 years, first in the service of the local hydroelectric company, later in the employ of the mint. He was a former student of the Massachusetts Institute of Technology.

Robert Bunney died at Denver, Colo., Nov. 1, aged 69 years. He first went to Colorado about 1869, and engaged in mining in Gilpin county. He was connected with a number of the older companies in that district and had been manager of several mines. After 20 years in Gilpin he removed to Jefferson county. Five years ago he retired from active work and settled in Denver.

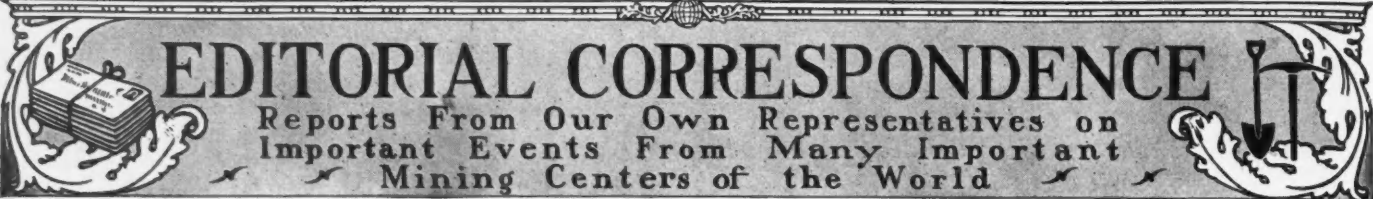
## SOCIETIES and TECHNICAL SCHOOLS

**Kingston School of Mining**—It has been decided to appeal to friends to raise \$20,000 to supplement the gift of \$40,000 by Prof. Nicol for the erection of the Nicol building for a metallurgical laboratory, as \$60,000 will be required for the purpose. The building will be a needed addition to the facilities of the school at Kingston, Ont.

**American Iron and Steel Institute**—The officers for the ensuing year are: President, Elbert H. Gary; vice-presidents, Powell Stackhouse, Willis L. King and Charles M. Schwab; treasurer, Edward Bailey; secretary, W. J. Filbert; assistant secretary, H. H. Cook. The board of directors includes William E. Corey, E. C. Felton, Elbert H. Gary, Charles M. Schwab, Powell Stackhouse, T. J. Drummond, W. J. Filbert, J. C. Maben, W. A. Rogers, E. A. Clarke, Willis L. King, Samuel Mather and John A. Topping.

**Association of Iron and Steel Electrical Engineers**—The annual convention was held at Pittsburg, Oct. 17-20. Much of the time of the convention was devoted to the discussion of safety devices and methods of prevention of accidents. Several interesting reports were read, and Dr. W. H. Tolman, director of the Museum of Safety, New York, delivered a lecture on "Safety." The following officers were elected: President, L. R. Palmer, Pittsburg; first vice-president, B. R. Shover, Youngstown, Ohio; second vice-president, C. W. Parkhurst, Johnstown, Penn.; secretary, James Farrington, Steubenville, O.; treasurer, E. W. Yearsley, Philadelphia.

**Western Pennsylvania Coal Miners' Institutes**—The Bituminous Committee of the Mining Department of the State Young Men's Christian Association met in Greensburg, Penn., and arranged for an extension of the institute work in the way of night schools intended chiefly for foreign-born miners. Secretary Dilts reported that since the last meeting of the committee on April 28, institutes have been conducted at New Salem, Republic, McClellandtown, Monongahela and DuBois. Permanent institutes are now at Monongahela, Brownsville, Republic, New Salem, Scottdale and Punxsutawney. Plans are being laid to open mining institutes in October, or as soon as possible at Irwin, Keystone, Jamison, Somerset, DuBois, Johnstown, McClellandtown, Marianna and Johnetta. Others are also being planned. First aid to the injured squads and classes for the teaching of English to non-English-speaking miners have been organized. The Mining School of the University of Pittsburg and the United States testing station, at Pittsburg, have offered to aid in the work of conducting these institutes.



## EDITORIAL CORRESPONDENCE

Reports From Our Own Representatives on  
Important Events From Many Important  
Mining Centers of the World

### San Francisco

Nov. 3—The mineral deposits in the Minarets region of Madera county near the boundaries of Fresno and Mono counties, have again attracted attention this summer. Companies and men from Mono and Inyo counties as well as from Madera, have gone into these high mountain ranges and made numerous locations. The principal mineral deposits are due west of Mammoth, Mono county, but in Madera county. A railroad is planned through from Mono county. While considerable development has been carried on this summer on several claims there has been no production. The deposits of iron ore in that section are the most extensive in California, but though several attempts have been made to exploit them on a large scale, little has thus far been accomplished. The same interests working iron ore by electric furnace at the Pit river mines, Shasta county, have made locations at the Minarets and have done considerable development this year. The altitude of the claims is in some cases 11,000 ft. and over. Even the approaches to the district are closed for half the year and the deposits are large so that there has been little encouragement for prospecting. Not only is iron found in the section referred to but veins carrying gold and silver have also been found. Much work is projected for next season.

It is cheaper now to ship bullion from mines in the interior to the Mint or Selby's in San Francisco by registered mail than by express. For this reason the mail service is used for this purpose much more than formerly. Moreover much less bullion than formerly is carried out by individuals although the Chinese miners prefer to carry their own bullion when they can. Most of these men send or bring the bullion to large merchants in Chinatown, who in turn deliver it to the Mint or refinery. The Chinese are still secretive as to their mining operations as they fear taxation.

While there is still a considerable over-production of oil in California, development work is going on in all the new fields. But in clearly defined districts, producers are curtailing development. In the Santa Maria field, Santa Barbara county, the Union company has shut down all its wells, and there is a resultant falling off of production in that field. In September the Southern oilfields yielded 840,800 bbl.; the Coast fields, 780,300; and the San Joaquin Valley fields 4,980,860 bbl.; a total from all fields for the month of 6,601,960 bbl. It is not so many

years back that this amount would represent the total yield of the State for a year.

### Denver

Nov. 7—The Tam O'Shanter and Montezuma groups, near Aspen, are striking and most interesting instances of early-day properties which lapsed into oblivion for a time, and are now, owing to changed conditions, again to the fore as big producers. In 1881, two Maine farmers, Chaney and Atkinson, who were prospecting in this State, in their wanderings over the high peaks happened to run across a great vein of silver-lead ore, which, as the country rock on either side had been eroded, stood up on the surface like a wall—in places 10 and 12 ft. high—of solid ore. It was purchased from these men by Jacob Sanders and Howard C. Chapin for \$100,000 before the locators had even sunk a 10-ft. hole. The late Sen. H. A. W. Tabor then purchased a half interest in it for \$100,000, and vigorous work was commenced, heavy shipments being made to Leadville, the ore averaging \$150 per ton.

At a depth of 75 ft., however, zinc came in along with the lead, and under a careless superintendent, who history says gave most of his attention to playing poker, and neglected to have his ore properly analyzed before shipment, 2000 tons were sent to a smeltery at Pueblo, and owing to the heavy zinc contents and the penalties assessed for an excess of over 3 per cent. zinc, the ore was dumped into the Arkansas river. Owing to this fact, and there being no transportation facilities other than pack animals, the ore would not pay to extract, and the mine was closed.

Four years ago, however, Mr. Chapin, one of the original owners, being aware of the change in conditions, got together a few capitalist friends, developed the veins at a depth of 600 ft. by a long cross-cut tunnel, and now has some 6000 ft. of workings, over 40,000 tons of ore blocked out, with a 100-ton mill down in the timber, and a 1½-mile overhead tramway, which will deliver the ore to the mill at an estimated cost of 10c. per ton. Enough ore has been treated at the mill of 50 tons daily capacity, hauling the ore from the mine in wagons, to prove its value, and that it can be treated at a handsome profit. This summer has been devoted to developing ore reserves, and adding 50 tons per day capacity to the mill, and building the tramway, all of which will be completed and in operation by Dec. 1.

The elevation of the mines is 12,000 ft.; the mill, 10,500 ft. There are 18 lode claims, and five mill sites. The average width of the ore in all the workings is from 2 to 3 ft. of ore which is shipped direct to the smelteries, and the concentrating ore from 4 to 8 ft. There are five distinct veins opened in the workings. The average of the crude concentrating ore is 26 oz. silver, 19 per cent. lead, and 6 per cent. zinc, and this can be concentrated three into one.

A tunnel of a mile in length, with its portal at the mill, would intersect these great veins about 1500 ft. below the lowest present workings. The mines are fully equipped with all necessary buildings, offices, sawmill, water-power plants, electric-light plant, etc. The property is 16 miles from Aspen, the nearest railway point.

It has been estimated that the life of the mine is 20 years' working by tunnel methods alone, and that under capable and economical management it will pay the owners \$125,000 per annum profit. Over \$200,000 has been expended in putting the mine into its present shape.

One of the forks of Cañon creek, which empties into the Uncompahgre river at Ouray, is Imogene creek, which heads at the top of Imogene basin; in fact, at the dumps of the Camp Bird mine, which outcrops along the face of an almost vertical cliff. On the top of this cliff is a plateau about half a mile across, while to the south is a drop into another basin, where heads the Savage fork of the San Miguel river. Here is located the Tom Boy mine. This gives the location of the two biggest gold mines in Colorado, both owned in London.

The Camp Bird during eight years from 1902 to 1910 has crushed 556,518 tons of ore for a gross yield of £3,385,378, with a profit of £2,211,340, the dividends paid amounting to 155 per cent. The story of the mine reads like a fairy tale. Of course, every mine has its life, and the ore reserves of that great mine are diminishing. The workings are down to the 1800-ft. level. But in May last the ore reserves were 83,900 tons, estimated to yield a net profit of £284,220. The strange part of it is that foreseeing the end, the company bought the Santa Gertrudis mine, in Mexico, which is also down to the 18th level, and therefore presumably has not a very long life ahead, though the several eminent engineers who examined it stated that the net profit on ore blocked out was far more than the price asked.

As stated in the early history of this mine, published in the JOURNAL of June 18, 1909, the outcrop of this vein showed nothing but low-grade galena, carrying \$12 to \$20 in gold, which in those days was worthless.

Strangely enough, the Tom Boy outcrop also showed nothing but coarse cube galena in a small streak, and for many years subsequent to 1876, it was abandoned in the fall, and relocated or jumped in the spring.

The reserves of this mine are estimated at 400,000 tons. The profits last month were \$25,000. The profits for the year were £64,489. Most of the ore is coming from the 1750-, 1900- and 2100-ft. levels, on the Cincinnati claim of the Argentine group of that company, a parallel vein to the original Tom Boy vein, which is not now being worked at all. The Tom Boy is generally supposed to be a subsidiary company of the Exploration Company of London, in which the Rothschilds are said to be the largest shareholders.

#### Butte

Nov. 6—Stockholders of the Butte & Superior Copper Company have recently received a circular letter issued by Amasa P. Peake, L. C. Barnett and C. O. Baldwin who constitute a committee appointed by the directors to supervise on behalf of the stockholders the expenditure of the money from the new bond issue. This letter gives a more detailed explanation of the company's financial condition than anything heretofore made public. There will be due on or before Jan. 1, 1911, \$264,835 and after January 1, 1911, \$384,272, making in all \$649,108. Under the company's contract with the American Metal Company payment to the metal company is to be made at the rate of \$1 per ton on all ore mined so this amount is not all due yet. For some months operations were carried on at a loss but in June of this year Foust jigs were installed at the Basin concentrator and since that time steady profits have been realized on all ore mined, the profits for August being \$19,021. The report states that after the subscriptions for the bonds have been completed, steps will be taken to list the stock on the large exchanges of the world. This report is exactly what has been needed by the stockholders for some time past and should tend to create confidence in the enterprise. There is no question but that the company has been financially embarrassed, the mine payday having recently been postponed to the 20th of each month, and in fact this recent statement frankly admits that such has been the case, but now that the true state of affairs has once been understood by the stockholders it is expected that they will rally to the company's support by a subscription to the new bond issue.

#### Salt Lake City

Nov. 5—While trading on the Salt Lake Stock and Mining Exchange has been light for some time, there has recently been an increase in the volume of business. The exchange, when listing a stock reserves the privilege of removing the same from the board on 10-days' notice. This right of removal can be exercised in case of fraud being shown, or when development on the property has been stopped. Any stock removed can be reinstated, when it is shown that work has been resumed. There has been a disposition on the part of members of the exchange to relieve the board of some of the stocks, which for some months past have been inactive.

It is reported that work is to be started soon by the Grasselli Chemical Company on a new zinc plant, which is to be built on the flat north of Park City in the neighborhood of Bates' ranch. The mill is to treat the tailings that have accumulated from the overflow of Poison creek, between Bates' ranch and Homer's ranch. The mill is to be an auxiliary to the plant now operating, and will make a product to be worked over by the present plant. It will have a capacity of 125 tons per day. The accumulation of tailings is approximately 3500 ft. long, 500 to 1000 ft. wide, and has an average depth of two feet.

#### Indianapolis

Nov. 3—The executive board of the United Mine Workers of America concluded a nine-day session today. In addition to attending to much routine business the board made arrangements to continue financing and supporting strikes in Ohio, Colorado, the Irwin district in Pennsylvania and Spring Hill, Nova Scotia. These strikes will continue until the mine owners are ready to make contracts with the United Mine Workers on the basis of the demands of the special Cincinnati convention. Recognition of the union is what the miners are fighting for in Nova Scotia. Twenty-six members of the board attended the meeting and there was little or no friction.

The State division of the Mine Workers' Union is preparing to test the constitutionality of the Indiana law regulating the shooting of coal in mines. Three arrests have been made of miners in the Miami coal mine for violation of the law. The law will be attacked on the ground that it is class legislation, as block coal miners are exempt from its provisions.

#### Birmingham

Nov. 7—The legislative committee of the Alabama Mine Operators' Association has drafted new mining laws which will be submitted to the legislature when it meets in January. This draft shows a complete change from the present laws. It is set forth that the changes desired

will make mining more expensive in this State, but the operators say that life and property will be safer. Mining rules are suggested that will require care on all sides. Six inspectors will be asked for instead of three and each of these will be men of experience. Thorough inspections of mines will be required. Ventilation and sanitation are properly covered. Shot firing in mines, the kinds of powder permitted in the mines and other subjects connected with the business are covered in the new bill.

An explosion of a pocket of gas in the sixth right heading of mine No. 1, of the Yolande Coal and Coke Company's mines, in Tuscaloosa county, during the night of Nov. 3, killed five men almost instantly. Two of the men were driving a heading and the other three were working near by. The accident happened during the night and less than a dozen men in all were in the mines or more fatalities might have been recorded. Chief State Mine Inspector, James Hillhouse and his two assistants rushed to the scene immediately and made a full investigation into the accident.

On Nov. 1, the inspectors sent out warnings to all the mine superintendents in the State, the bank bosses and mine workers, inasmuch as cold weather had set in and most explosions happened during this time. All of the men killed at Yolande were white. The total death list in coal mines in Alabama for the year has already gone above 225, against 129 in all during the whole of last year.

#### Phoenix, Arizona

Nov. 5—There has been hesitancy on the part of companies and individuals as to their plans, due to a desire to see how far the constitutional convention will go in direct legislation and strictures on corporations. While the initiative and referendum will surely be made effective, it now looks as though the provisions would be an improvement on the Oregon plan, and that any restrictions placed on new or foreign corporations will be an attempt, at any rate, to give the fullest protection to the stockholders, and are not to be viewed with alarm by investors.

#### Mexico City

Nov. 5—The enormous expansion of the cyanide milling capacity of the Pachuca camp, which will result from the completion of the La Blanca and Santa Gertrudis plants, the extension of the Real del Monte y Pachuca company's mills and from other new installations and improvements in old plants, will clearly place the camp far in the lead in Mexico in tonnage and metal product during the next year. Guanajuato has heretofore held the first place in mill capacity and is also increasing notably its plants.



# THE MINING NEWS

Reports of New Enterprises, New Machinery,  
Installations, Development Work and Property  
Transfers The Current History of Mining

## Alaska

Another express shipment of gold has been received at Seattle, the Haiditarod leading with \$307,000, Fairbanks \$187,000, Nome \$100,000 and \$31,000 from individual miners' pokes. An additional million and a half is expected by mail.

The Alaska Mexican, for the month ended Sept. 15, produced \$68,270, realizing \$38,867 profit; the average yield was \$3.58. The Alaska Treadwell produced \$181,121, with a net operating profit of \$83,990. Yield per ton was \$2.44.

*Matanuska Gold*—This company will install a five-stamp mill on the property on Knik arm in the spring. James W. Hamilton, of Seward, is manager.

## Arizona

### COCHISE COUNTY

*Tombstone Consolidated*—The company is taking out high-grade ore from the 700-ft. level. The pumping plant of the mine is discharging 6,500,000 gal. of water a day, which enables the development to be carried on without interruption.

### SANTA CRUZ COUNTY

At the Ivanhoe mine, in the Santa Rita mountains, five miles from Patagonia, James Johnston, superintendent, the results have been mainly successful and shipments of high-grade ore have been made. At the Silver Crown, in Silver Cañon, Josiah Bond has recently made shipments of high-grade copper-silver ore. The development is being continued. At the Bland property, small shipments of copper ore have been made. T. M. Heck, the owner, has also purchased the interest of Bob Carew and will continue the work on a new shaft. The Minnie mine, in the Patagonia range, now has a small shipment of high-grade ore ready. The World's Fair mine, owned by Frank Powers, is shipping silver ores and is continuing development. At the Joplin mine, in the Santa Rita mountains, a shaft is down 130 ft. and has opened up silver-gold ores. R. R. Richardson, of Patagonia, is in charge. Frank Reichert has made a shipment from the Helen Gould mine, near the Joplin, of lead-silver ores.

*Salero*—This mine in the Santa Rita Range, which has been shut down since the death of the owner, C. H. Ferry, of New York, followed by the death, within a few days of Dr. Blake, the consulting engineer, will probably not be opened at once. The mine has shipped about 100 tons of high-grade silver ore. The main shaft was down at time of quitting to 400

ft., and much work had been done on this level, showing the vein 20 ft. in width, but oxidized as at the surface. Appraisers have been appointed and the personal property at the mine will be sold.

### YAVAPAI COUNTY

*Arizona Mines Company*—This company owns the Tom Boy group of gold-copper claims in the Castle Creek district and is developing. David E. Dow, of Boston, is president, and Mark Bradley, Prescott, Ariz., engineer.

### YUMA COUNTY

The General Development Company, of New York, has suspended development operations at the property of the New Planet Copper Mining Company, and has surrendered the options held on large blocks of the stock of that company. This action is supposed to be due to the unfavorable condition of the copper market and the burden of financing purely development operations at this time. The General Development Company is said to own outright one-third of the stock of the New Planet Copper Mining Company, and it is thought that development will be resumed at the property under the General Development Company guidance as soon as market and financial conditions are more auspicious. The company commenced operations at Planet Sept. 1, 1909, and to Sept. 30, 1910, has spent about \$120,000. While some work was done in shaft sinking and crosscutting, churn drilling constituted the major feature of the development. It is known that favorable showings were made in one or two of the holes. Engineers have been in the field at Planet for Michigan interests which have secured control of an important group of claims, and an option is about to be closed on another group.

## California

### AMADOR COUNTY

*Fremont Consolidated*—The shaft at this property, Drytown, is 1650 ft. deep and will be sunk 300 ft. deeper. The 40-stamp mill is kept steadily running and dividends are being paid.

*Bunker Hill*—To the mill at this mine at Amador City an addition of 20 stamps is being made.

### ELDORADO COUNTY

*Stillwagon*—Work is being carried on steadily at this mine, Omo Ranch, and the mill is running full time on high-grade rock.

*Lucky Strike*—Roberts & Turnbaugh have put a two-stamp prospecting mill on

this mine near Kelsey and if the vein continues good, a larger mill will be installed.

### INYO COUNTY

*Arondo*—It is expected that the Harrison Reeves Company will buy this property in the Argus range, 50 miles from Johannesburg. It is equipped with a roller mill and cyanide plant.

### KERN COUNTY

At Randsburg, high-grade ore has been found on the 200 level of the Pearl Wedge. In the Santa Ana, Boison & Burke have found a good vein. Watchman Brothers and Cagle have taken a lease on the Santa Ana.

There has been great rivalry in making oil-land locations in the Lost Hills section of Kern county and many drilling rigs have been rushed to lands hitherto unwithdrawn in the hope of getting in on time. Now the news comes that the Government has withdrawn from entry all land in townships 25-21, 26-21 and 26-20. So in all cases where men have not begun to drill in those sections no locations can be made, much to the disappointment of large numbers of oil prospectors. It is reported that the Southern Pacific, having large interests there, will build a branch railroad into the new Lost Hills field from the McKittrick branch west of Button Willow.

### MARIPOSA COUNTY

*Bullion Hill*—An ore shoot carrying up to \$32 per ton, has been found in the American Eagle group of this company near Exchequer. B. D. Binns, manager.

### NEVADA COUNTY

The mining industry in Grass Valley district, Nevada county, is giving employment to more miners than for some years past. Some old mines are being reopened and in others substantial additions have been made to the force of men. Grass Valley is the leading quartz mining section of California, its gold product from ores being greater than in any other section.

*Oak Flat*—A rich strike has been made in this gravel mine near North Columbia, which will mean much to this old camp.

*Orient*—After some years of prospecting, good gravel has been struck in this mine above Nigger Tent. The mine is owned by residents of North San Juan.

*North Star*—A hoisting equipment has been provided for the Central shaft of this mine at Grass Valley.

*Florida*—Frank Rodrigues has made a good strike in this mine, about a mile below Edward's crossing.

## PLACER COUNTY

*Evening Star*—This mine, four miles from Auburn, after being idle some time, is about to be reopened by W. H. Gallagher and Wheeler Riley, of Grass Valley, and hoisting works, pumping plant, etc., have been installed. The mine has been productive in the past and has the same character of ore found in the Grass Valley and Nevada City mines. The shaft is to be sunk much deeper.

## PLUMAS COUNTY

*Gold Mountain*—This company, at Willow Creek, near Buck, G. W. Fagg, superintendent, is about to build a concrete-restraining dam to hold back its débris, and the site has been officially inspected by engineers of the California Débris Commission. Hydraulic mining is to be carried on.

## SIERRA COUNTY

*Gold Cañon*—This mine on the Middle Yuba river, near Alleghany, has been bonded to E. M. Parrish, and men have been put to work prospecting.

*Independence*—At this mine on Wolf creek near Alleghany, new machinery has been ordered, and the mine will be kept going all winter. F. A. Pearson is in charge for the parties holding the bond.

*Alaska*—On the vein recently encountered in this mine at Pike City, drifting and raising will be carried on until it is thoroughly opened up.

*Tightner*—This Alleghany mine continues to yield phenomenally rich ore. Recently one boulder gave returns of 40 lb. of gold.

*Sierra Buttes*—Machinery is being installed at this old mine near Sierra City, the recent strike in the bonanza lode being the cause of the revival. J. C. Folsom is superintendent.

*Clark's Cañon*—Deal & Dalrymple have struck pay gravel in the channel on their claim.

*Brown Bear*—Supplies, air pipe, rails, cars, etc., have been delivered preparatory to running a 1000-ft. tunnel to tap the channel.

*Oriflamme*—This Alleghany mine, on same lode as the Tightner, has developed a new and rich ore shoot which yields free gold, with 250 ft. of backs. C. C. Ward is manager.

*Sailor Ravine*—The Standard mine is shipping 18,000 lb. of sulphide ore to the smeltery, after having worked them twice for gree gold, still leaving an assay value of \$1 per pound.

*Mexican Mine*—C. York, the owner, is milling some of the free-gold ore at his custom mill, Downieville.

## SONOMA COUNTY

*Roblar*—This copper property, owned by the Ronsheimer Brothers, nine miles from Petaluma, is being actively developed. Some gold and silver are found in the ore.

## YUBA COUNTY

*Starkey*—This mine, in Brownsville district, has been sold to Charles A. Edner, A. G. Kuhlberg and San Francisco men, who are now developing the property.

## Colorado

## BOULDER COUNTY

The Inter-ocean, White Crow, Osceola and Monongahela claims at Sunshine are to be consolidated and worked through the Inter-ocean shaft. Manager Richardson will increase the force at once, and put the properties in shape for big production.

*Up-to-Date*—A strike of 5 ft. of silver ore is reported in this mine, in the Caribou district.

*Cashier*—This mine, under Manager Wood, is being equipped to work all winter and power to the hoist and mill will be supplied from the Central Colorado Power Company.

## CLEAR CREEK AND GILPIN COUNTIES

*Smuggler*—It is reported that Parachime and associates, who have a lease on this mine, are making regular shipments from a 10-in. streak of ore that runs 500 oz. silver per ton, and 50 per cent. lead. This streak has been developed for 175 feet.

*New York Tunnel*—A group of veins lying between the Smuggler mine and the Gold Belt Tunnel will be developed by the New York tunnel, on which work has just been resumed. A shipment was made from one of the veins lately which gave returns of 262 oz. silver per ton and 43 per cent. lead.

*Double Header Tunnel*—Work has been resumed on this tunnel, on McClelland mountain. Seventy-six claims and the tunnel-site are included in this property.

*Capital Prize*—It is just reported from Georgetown that a streak of gold ore 2 in. wide, running \$400 to the ton, and ore on each side of it that runs from \$100 to \$150 per ton, has been discovered 1500 ft. below the surface in the Athena lode of the above mine.

*Gunnell*—This celebrated mine has come to life again, this time through the agency of the Newhouse tunnel, and the Polar Star mill is running full capacity on ore from the mine.

## LARAMIE COUNTY

Six miles northwest of Fort Collins, the La Porte Oil and Gas Company, is reported to have struck gas and oil sand at 400 feet.

## LAKE COUNTY—LEADVILLE

Until further corroboration by actual returns, the recently reported discoveries of enormous bodies of zinc ore in Leadville may be taken "*cum grano salis*," as it appears that in many instances, it exists in "nests," as it were, in the oxidized iron ores, both exactly alike in appearance, the difference being ascer-

tained by assay alone. It is therefore quite possible that some of the gentlemen who reported the size and average yield of the zinc orebodies may have unintentionally exaggerated.

*Dunkin*—A cave on this mine, on Fryer hill, has exposed a large body of "lead sand," carrying high silver. It is the same character of ore that made Fryer hill famous in the early days.

## OURAY COUNTY

The Colorado Bureau of Mines, in its report on Ouray county, shows that the production of gold in 1909 was \$3,011,338, exceeded all that county's past performances; in the last 13 years, the county's production has aggregated \$23,675,438. The production of gold, silver, lead, copper and zinc in 1909 was \$3,401,801, and the total for the 13-year period was \$26,516,248.

*San Pedro*—This gold company, owning 50 claims and one-mile tunnel is planning a bond issue of \$150,000 for funds for development. E. F. Terry and Frederick Tench, of New York, are on the directorate.

## SAN JUAN DISTRICT

T. Craise and J. A. Johnson, leasing on the Queen City, in Ohio gulch, San Juan county, have received \$4443 net from their first car of silver ore.

Gold bullion worth \$1700 was brought down from the mill of the Junta company, San Miguel county, being the result of an 8-day run of its mill.

*Grizzley Bear*—This mine, on Bear creek, and the Micky Breen mine, in Poughkeepsie gulch, have been acquired by the Anderson-Halter Mines Company, of Denver, capitalized at \$250,000. Both mines will be actively worked this winter. Lars Pilker is superintendent of the Grizzley Bear, and O. Haagsma, of the Micky Breen. J. H. Anderson, of Chicago, is named as the chief individual purchaser.

## TELLER COUNTY—CRIPPLE CREEK

*Isabella*—Dewar & Nicholson, lessees on the Orphan claim on Bull hill, have opened a vein of shipping ore in an abandoned shaft. Fifteen cars, average \$35 per ton have been shipped from the Empire State shaft since September.

*Blue Flag*—This company has leased two claims on Raven hill, and will sink the shaft from 300 to 500 ft. and do drifting. C. McGrew is superintendent.

*El Paso Consolidated*—The Little May, on Beacon hill, belonging to this company, closed for some weeks, and will be re-opened by D. J. Burke, lessee.

## Idaho

*Oregon*—This gold mine, between the Ten-Mile and Oro Grande camps, Idaho county, is reported sold for \$150,000 to J. Leslie Baylor, of Spokane. Operations will not be started until June, 1911.

## Indiana

## CLAY COUNTY

*Bee Ridge Coal Mining Company*—This company, of which Spears Brothers, of Brazil, are the owners, is installing steam-hoisting equipment and other improvements and will begin laying a switch from the Chicago & Eastern Illinois to the mine for the purpose of shipping to the Chicago and other markets.

## DAVISS COUNTY

*Jennings Oil and Gas Company*—This company has made a paying strike in oil in the southeastern part of this county at 1025 ft. The drill has penetrated the producing sand 25 ft. Other wells in the same field sunk to the same depth are fine producers.

## GREEN COUNTY

The tippie at the Black Creek mine, belonging to the United Fourth Vein Coal Company, of Linton, was burned Oct. 30. The fire originated from a spark from an engine. The burning timbers fell into the pit, burned out the woodwork and ignited the coal at the bottom of the shaft. Mules were lowered into the mine through the Dickason shaft a mile away and were used in pulling away the burning timbers and hauling water to put out the fire below. The mine employs 200 men. The tippie will be rebuilt at once.

## VIGO COUNTY

The supply of cars for local mines has been better thus far this week, but the demand for coal increased in greater ratio. The Lake shipments have stopped for the season.

## Kentucky

*Eastern Kentucky Coal Lands Corporation*—Arguments were concluded this week before the United States Supreme Court at Washington in the suit involving title to a large amount of land, reported as about 500,000 acres, originally included in the so called blanket grants under which ownership is claimed by this company. The Northern Coal and Coke Company on the other hand, claims title to the lands as against the Eastern Coal Lands Corporation, by virtue of sales to it by those asserting ownership through alleged occupation, but termed squatters by the grantees or the successors of the grantees under the blanket grants. The Northern Coal and Coke Company, of which C. W. Watson is president, has, it is stated, sold its holdings to the Consolidation Coal Company.

## Maryland

*Consolidation Coal Company*—This company will issue \$3,500,000 new stock to pay for 100,000 acres of coal in the Elkhorn coalfield of Kentucky, on which it has taken options. It has also authorized a mortgage to secure \$40,000,000 in

5 per cent. bonds, of which \$9,000,000 are to issued at once, the rest being held for future use. The present issue will be used to retire the outstanding Somerset and Kentucky division bonds, and some small issues; and to pay for opening new mines in Kentucky.

## Minnesota

The Duluth Diamond Drilling Company has a contract from the M. H. Alworth interests to do extensive exploration on the Vermilion iron range this winter. Work will be begun in Sec. 5-62-12 near the Lucky Boy and White Iron Lake properties.

Pickands, Mather & Co. are opening a new open-pit property near Marble.

*Commodore*—Fire destroyed the warehouse, roundhouse and blacksmith shop at this Mesabi mine. Loss, \$30,000.

*Virginia*—A night shift was recently put on at this Mesabi mine to fill contracts before navigation closes.

*Carison*—This Cuyuna range iron property has been acquired by the Inland Steel Company, of Chicago, under royalty lease of 50c. per ton. It is in section 17-46-29 and includes 120 acres.

## Michigan

## COPPER

*Michigan*—The company continues its drill cross-section from the Butler lode to the sandstone formation, a distance of nearly 9000 ft. several holes have been completed and three cores taken from the Ogema lode showed it to be from 12 to 15 ft. wide and apparently carrying copper in commercial quantities. At the Bee tract a small amount of work is being done between the adit and the first level with good copper in evidence. At the adit level 800 ft. of drifting has been done and at the first level, 180-ft. level about 1000 ft.. Bunches of copper were encountered in both drifts.

*Quincy*—This company's No. 9 or Pontiac shaft is down 1050 ft. and at a depth of 750 ft. several hundred feet of drifting has been done with average showing in a copper.

*Winona*—The first head of the new mill will be ready Dec. 15. No. 4 shaft is down to the 15th level and it is claimed that the mine has reserved ground opened sufficient to keep one head in the mill operating for four or five years. It is estimated that the rock will yield from 16 to 18 lb. to the ton.

*New Baltic*—The shaft is down 125 ft. sinking in the footwall of the formation about 35 ft. behind it. A small compressor has been put in commission. It is planned to start the first level at 200 feet.

*Oneca*—The directors are considering the advisability of deepening the shaft on the Oneco lode and exploring this formation at a greater depth. This shaft

has been bottomed at 500 ft. for a number of years and a drillcore taken for this lode at a greater depth showed it well mineralized.

*Algoma*—It has been decided to start drifting on the formation at 104 ft. The crosscut at this point shows the same high-grade ore across its entire face. The second drill hole to determine the pitch of the lode has been completed and is being moved near the northern boundary on the supposed trend of the Lake lode. The pitch of the formation as determined by the two drill holes is about 60 degrees.

*Indiana*—A railway spur is being laid into the property and preparations are being made to begin shaft sinking soon. No. 9 drill hole continues driving in a felsite formation carrying commercial copper.

## Montana

The United States Assay office at Helena reports the receipt of \$155,048 in precious metals for October. Fergus county led, with \$52,921 and Madison county was second with \$48,334.

The lumber mill of the Anaconda Copper Mining Company at Hamilton has recently been closed down and it is presumed that it will not be reopened until spring. The crews in the woods are still at work, however. There is an unusually large stock on hand and this, together with the dullness of the lumber market, is the probable cause of the shutdown.

## BUTTE DISTRICT

*East Butte*—What is considered to be the most important discovery ever made in the Pittsmtont mine has recently been made on the 800-ft. level. The new orebody was cut by the south crosscut on that level after it had been driven past a point where the vein was badly faulted. The management states that the orebody is almost 40 ft. wide and that it will average over 10 per cent. copper throughout, with frequent lenses of bornite. The vein has been opened up at intervals for over 900 ft. on the 800-ft. level and a raise has shown its continuity up to the 700-ft. level. Two 250-ton furnaces are being operated at the smeltery and somewhat less than 1,000,000 lb. of copper is being produced monthly, half of which is from customs ore and the rest from the Pittsmtont mine.

*Butte Central*—After considering the report of Engineer W. L. Creden, the directors have decided to let a contract to sink the shaft 500 ft. The report recommends that further experiments be made with the ore before erecting a concentrator and this advice will be followed, the ore being shipped to the East Butte Company smeltery for treatment.

## BROADWATER COUNTY

The Jap Goodwin property, at the head of Weasel gulch, has recently shipped a

car of galena ore to the East Helena smeltery. The East Pacific mine worked by Bell & Adamson, has shipped a carload of concentrates to the East Helena smeltery. The Keating Gold Mining Company is shipping to the East Butte smeltery at the rate of 40 cars per month from its property in the Radersburg district. This ore is all coming from the 400- and 500-ft. levels. The property's vertical shaft is 400 ft. deep, while the incline is 600 feet.

*Toston Copper Mining Company*—E. F. Nave has secured a default judgment against the company for \$600 on a promissory note dated Dec. 1, 1909.

*Ohio-Keating*—A special meeting of stockholders will be held in Butte, Dec. 3, to consider plans for the raising of funds. Several courses are suggested; namely, increasing the capital stock from \$500,000 to \$1,000,000; to authorize a bond issue to take care of the present indebtedness and future operating expenses, to sell all the company's assets, or to consolidate with some other operating companies.

#### CHOUTEAU COUNTY

*Regal*—The management states that a strike has recently been made on the company's property in the Little Rockies district, near Zortman.

#### FERGUS COUNTY

*Kendall Company*—A dividend of 2c. per share was recently declared. This makes a total of \$1,305,000 paid in dividends upon a \$500,000 capitalization.

#### JEFFERSON COUNTY

*Boston & Corbin*—Consulting Engineer Neill has recently submitted a report covering operations since Oct., 1909. The report deals in detail with the development, which was done mainly in sinking the shaft and opening the 700-ft. level, but fails to state any date on which shipments will be begun.

#### LEWIS & CLARK COUNTY

In the Rimini district Ted Swan has recently made a strike on the John Mulgrew property. The Lee Mountain mine, which has not been worked for some time, is now being examined by experts in the employ of prospective Eastern purchasers. The Valley Forge Company has resumed work on its property and is now taking ore out of the upper tunnel and making shipments to East Helena.

### Nevada

#### CHURCHILL COUNTY

*Nevada Wonder*—James S. Austin, M. B. Cutter and C. A. Daniel, of Philadelphia, interested in the property, inspected the mine and mill site last week. Construction is delayed on account of difficulty in freighting.

#### ESMERALDA COUNTY

*Grizzly Bear*—Active mining operations have been resumed on the leased

Consolidated ground south of the Clermont workings. The leasing company has the deepest shaft in the district but, unless an extension has recently been granted, has but 3 months longer in which to operate. It is thought that the recent discoveries of high-grade in the lower workings of the Clermont have encouraged the leasers to make a final attempt to strike a bonanza and recoup.

*Alamo*—A leasing company has acquired the property, together with the Silver Moon ground adjoining, and will have everything in readiness for operations Dec. 1, when the power line is due to reach Lucky Boy.

*Goldfield Consolidated*—Developments on the 1000-ft. level of the Clermont show ore for 60 ft., 20 ft. wide at one place. The ore seems to be of good milling character, consisting largely of free gold and pyrites in quartz, with only a small proportion of sulphides of antimony, bismuth and copper. It is similar to the ore found just above the 600 level of the Mohawk and may be the downward extension of the high-grade shoot known as "403" stope.

#### HUMBOLDT COUNTY

*Radiator Hill*—A winze is being sunk along an 18-inch stringer of quartz encountered 750 ft. from the portal of the main tunnel.

*Laurel*—Teams and scrapers are being used to remove the earth which covers the vein. The vein has already been stripped 400 feet.

#### LINCOLN COUNTY

*Duplex*—A 34-ton lot of ore from the Smith-Fessler lease plated at the rate of \$63 per ton at the Knight custom mill at Searchlight.

*Tonopah Extension*—According to a report just issued, operations on the property for 5 months ended Sept. 1, produced \$208,518. Expenses for the same period amounted to \$132,587, leaving a net profit of nearly \$76,000.

*MacNamara*—The crosscut from raise "57" this week encountered the vein and exposed 6 ft. of milling ore with the hanging wall not yet in sight. It is expected that a continuation of the rich ore-shoot opened above will be found upon reaching the hanging wall.

*Manhattan Mining and Leasing Company*—A new 4-inch water-supply line, Bryan regrinding mills, new classifiers and other mill equipment will materially increase the extraction.

#### STOREY COUNTY

*Belcher*—Operations have been resumed after the disastrous fire which almost totally destroyed the surface plant, ten weeks ago. New machinery and fire-proof buildings have put the property in better condition than ever.

*Comstock*—Output figures for the week show: Ophir, \$4344.55; Con. Virginia,

\$2912.95; Mexican, \$4782.50. No. 2 hydraulic elevator is reported to be working at the 2650-ft. level of the C. & C. shaft and the various stations are being cleaned up ready for development of new orebodies on the 2350-ft. and lower levels.

### Oregon

#### BAKER COUNTY

*Humbolt*—Ten stamps are to be added to the mill of this company, and the plant will be equipped with electrical power at a cost of \$15,000. The offices are at Baker City.

#### JOSEPHINE COUNTY

The motor highway from the Alameda mine to Leland, in the Galice district, is about completed, and will mean much in the way of transportation facilities to the other mines of this district.

*Deep Gravel*—This company is considering the installation of a dredge on its property at Waldo.

### Utah

#### BEAVER COUNTY

A four-mile pipe line has been laid from a point in the valley about 10 miles from Milford, to furnish water for mines in the Star district. The well is down 50 ft., and a good supply of water has been developed. As soon as the pump arrives, the plant will be put in operation. The unusual dryness of the past season has made the present undertaking necessary. The Commonwealth, Red Warrior, Lady Bryan and Manassas will receive water, and other properties will probably be included.

*Red Warrior*—Since this property has been taken over by Duluth people, 98 cars or approximately 4800 tons of ore have been shipped, which averaged 28 per cent. lead and 14 oz. in silver. The ore occurs principally in fissures, and makes off into the limestone bedding. The development consists of a 500-ft. vertical shaft, with levels at the 100-, 200-, 300- and 500-ft. stations. Lucien Merritt is president.

*Cedar-Talisman*—Work is being done on zinc ore from the 125-ft. level. Lot No. 8 of this ore has been shipped and assayed 44.32 per cent. zinc. Drifting is being done on the 235-ft. level, and some lead ore has been found. Development is also being carried on in two places on the 500.

*South Utah*—The mill is being worked into shape on low-grade ore. As soon as the plant has been brought up to 800 tons per day, ore of a better grade will be sent through. The elevator belts have given some trouble, but aside from this the new mill is reported to be doing well.

*North America*—The shaft is down 100 ft., and a crosscut has been started for the vein, which will be reached in 35

or 40 ft. Lead, silver and some gold occurs in stringers, which have been cut.

**Utah United**—Drifting has been started from the bottom of the shaft to cut the main vein. Ore running well in gold, beside carrying silver and copper has been found on the 390-ft. level. A. J. McMullen is manager.

**Michigan Mining and Development**—Drifting on the 200-ft. level has opened a vein carrying lead, silver and copper. The property is in the Beaver Lake district.

**Golden Reef**—This property is five miles north of Frisco. The workings aggregate between 2500 and 3000 ft., and consist largely of tunneling. Ore has been found in several places. It carries principally gold, with some lead, and practically no silver. The company is controlled by Sevier and Sanpete county interests.

**Lower Cave**—D. H. Ferguson, formerly superintendent of the Cedar-Talisman, has taken a bond and lease on this property in the Bradshaw district.

**Horn Silver**—A large amount of low-grade ore has been broken and stored in the mine, from the 1600-ft. level to the surface. Ore of higher grade has been developed on the north end of the 600-ft. level. The question of a mill, or of a suitable process for treating the low-grade ores will probably be brought up at the annual meeting in December. Frederick A. Bishop, 17 Battery place, New York, is secretary.

#### JUAB COUNTY

**Colorado**—Development is being done on the 300-ft. level of the No. 2 shaft, and on the 500-ft. level of shaft No. 1, about 50 tons of ore being mined daily. A face of ore has been opened in a drift near the Sioux line.

**Centennial-Eureka**—The new Swiss pumps are handling 325 gal. of water per min. Only one of the units is being used.

**Black Jack**—The mineralized quartz on the 1000-ft. level is being followed. Small assays are obtained. There was no change in the directorate at the meeting Oct. 15.

**King William**—Development is being done 300 ft. from the Eagle & Blue Bell line on the 1000-ft. level. Two shifts are at work.

**Bradley**—The compressor has been installed. The hoist and compressor are run by gasoline. A depth of 325 ft. has been reached by the shaft.

**Clipper**—Assessment is being done on this group about a mile north of Eureka. The tunnel is in 160 ft., and is being extended.

**Tintic Standard**—A second hole will be started with the diamond drill from the 1000-ft. level. The first hole did not justify drifting in the ground drilled. Work is being done along the contact of

limestone and quartzite on the 700-ft. level. The drifts cut a fissure, which was followed a short distance, and opened into 2 ft. of lead-silver ore. This is said to run 49 per cent. lead, 5 oz. silver, and 60c. gold per ton.

**Opex**—Work on the 2147-ft level has been stopped and development transferred to the 1900 level.

**Swansea**—The report that the water in this mine will be needed in case the Iron Blossom builds a mill has revived interest in the property. The lower levels have long been under water.

**Scranton**—A strike of zinc carbonate ore has been made recently. About 600 tons of zinc ore a month is shipped east. T. G. Wolf, of Scranton, Penn., president of the company, has been visiting the property.

**Sioux Consolidated**—A financial statement of Oct. 1 shows that 53 cars of ore settled for during September brought \$26,477 which, with \$84,648, cash on hand Sept. 1, made a total of \$111,125. Bills paid in September amounted to \$14,453, leaving a balance Oct. 1 of \$96,672. A dividend of 4c. a share, amounting to \$30,000, was paid Oct. 20. Foreman George Parker has been appointed superintendent of the Iron King. Mr. Parker's place has been taken by Sidney Harding.

**Mammoth**—The new cable was strung Oct. 27, and the hoist put in operation. In removing the old cable from the bottom of the shaft it was necessary to cut it into lengths of 300 ft. The working force will be increased and operations brought up to normal again.

**Iron Blossom**—Silver-lead ore has been developed in the No. 3 shaft on the 450-ft. level. On the 500 level of the South shaft the silicious gold-silver ore has been opened for about 1100 ft., and connections have been made in ore with the 600 level. There has been some doubt as to whether the ore carries too high a percentage of copper to allow satisfactory cyaniding and tests are being made. The copper occurs principally along the walls of the orebody, and it is thought this can be mined separately. Water was encountered in the shaft at about the 1900-ft. level Oct. 22. About two cars of ore a day are shipped.

**Uncle Sam**—The new orebody has been raised on for 200 ft., and is said to be 60 ft. wide. It is thought to be a continuation of the Richmond-Anaconda orebody, which was lost several years ago through faulting. Over a car of ore daily is shipped.

**Victoria**—The shaft on the Eureka side of the mountain is down 495 ft. It has been connected with the old workings by a drift at about the 900 level. The shaft is being sunk by contract, and when completed on the 1000-ft. level will handle the work now carried on through the Grand Central on the Mammoth side.

**Richmond-Anaconda**—This mine has not been operated for some time. Recent developments in the Uncle Sam indicate that ore will be followed in the neighborhood of the company's lines. The control is held by the Uncle Sam company.

#### SUMMIT COUNTY

A stipulation was filed Oct. 31 in the U. S. district court in the case of the Uintah Treasure Hill Coalition Company vs. the Silver King Coalition Mines Company for the sale of the claims involved in the suit in equity. The claims include the Kentucky Nos. 1-8 inclusive and four other claims in the Uintah mining district, Park City. By order of the court, these 12 claims are to be sold individually at public auction, and a division of the money accruing will be made, when the case has been decided by Judge John A. Marshall. The Uintah Treasure Hill claims an undivided two-thirds interest in the property. It also claims to have expended \$28,700 on development, and asks that the defendant company be compelled to pay its portion of the expense.

**Thompson-Quincy**—Special stockholders' meetings of the Thompson and West Quincy companies have been called for Nov. 30, at which the sale of each to the new company will be proposed for ratification. The West Quincy will receive 285,890 shares in the new company for its stock, while the Thompson company will receive 238,600 shares. The Daly and Ontario companies each receive 75,000 shares, and the Daly West, 50,000 shares in payment for working rights and tunnel privileges.

#### SALT LAKE COUNTY

**Bingham Mines**—Work of sinking the old Yosemite shaft from the 800-ft. level has been started. The 800 level has been under water over 10 years, and has only recently been unwatered by a drift from the Mascot tunnel. An electric hoist has been installed.

**Utah Copper**—The September production is given at 7,077,035 lb., which is the smallest since February. The total production for the first nine months of the year was 66,932,162 lb. Work of remodeling the former Boston Consolidated mill will be started soon.

**Utah Mines Coalition**—The new orebody has been developed for about 60 ft. on the strike, and averages about 5 ft. in thickness. It carries lead, silver and copper in both sulphide and oxidized form. Two feet is said to average about \$60 per ton gross, and 3 ft. about \$25 per ton. Preparations are being made for shipping.

**Mountain Lake**—The annual report has been sent to stockholders. This shows an overdraft of \$1770 on Oct. 1. The company owns 53 patented claims in Wasatch, Utah, and Salt Lake counties.



A tunnel has been driven 5400 ft. This is being extended, and if it does not reach the contact of limestone and granite under the present contact, another contract for 300 ft. will be given during the coming summer. No ore has yet been found. The Knight board of directors has been reelected.

*Cardiff*—The company has hauled in its supplies, and developing will be carried on during the winter.

#### Washington FERRY COUNTY

*Little Fittsburg*—A contract has been let for driving another tunnel on this property, which adjoins the New Republic. D. A. Mills, Republic, is manager.

*Beecher*—This property, at Orient, which has been closed for two years owing to litigation, will be reopened at once.

#### PIERCE COUNTY

*Coast Coal*—This company is installing new machinery and will erect additional bunkers at Pittsburg.

#### Wyoming

*Williams-Luman*—In this mine at Deposs, a rich body of copper ore has been opened in the 300-ft. level.

#### Canada

##### BRITISH COLUMBIA

*Granby*—This company has purchased for \$400,000 four-fifths of the capital stock of the Hidden Creek Mining Company, of which the remaining one-fifth is owned by M. K. Rogers. The Hidden Creek Company owns a mine at Goose Bay, near the Alaska boundary, which is claimed to have 400,000 tons of ore in sight, averaging 3½ per cent. copper. It is proposed to erect a furnace at Goose Bay and ship the matte to the Granby works for converting.

##### ONTARIO

The shipments from Cobalt for the week ended Oct. 28 were: Kerr Lake, 280,643 lb.; Nipissing, 251,680; Crown Reserve, 196,240; La Rose, 170,570; Townsite, 82,880; Little Nipissing, 65,000; Hudson Bay, 63,290; Chambers-Ferland, 63,400; Hargraves, 60,600; Trethewey, 45,040; McKinley-Darragh, 43,760; total, 1,323,103 lb. Bullion shipments. Colonial, 1008 oz.; O'Brien, 16,716; Temiskaming, 15,744; total, 33,468 ounces.

A new smeltery that will handle Cobalt-silver ore, has commenced operations at Swansea, Ontario.

*Wettlaufer*—This South Lorrain property has made a shipment of one car of high- and two of low-grade ore.

*Moose Mountain*—This company, which owns extensive iron-ore deposits at Sellwood, north of Sudbury, has decided to supplement the process of magnetic separa-

tion now used in refining the ore by the Grondal process, which it is expected will enable them largely to increase the output. When the new Grondal plant is installed it is estimated that from 800 to 1000 tons per day of the refined ore can be produced through the coming winter and 100,000 tons stacked for shipment by the spring.

*Dominion Steel Corporation*—The output for October in tons was as follows: pig iron, 22,058; steel ingots, 27,034; blooms, 26,113; rails, 15,375; wire rods, 4743; coal 329,000. The corporation has sold \$1,500,000 of 5-year notes to the Dominion Securities Corporation to provide for the \$4 cash dividend declared on the shares of the Coal and Steel companies at the time of the merger. President Plummer explains that the \$1,500,000 will not be permanently added to capital as it is intended to pay back the sum out of earnings.

*Canadian Copper Company*—This company is constructing at Copper Cliff a complete reverberatory-furnace plant, consisting of McDougall roasters, reverberatory-smelting furnaces, a coal-drying and pulverizing plant, a concrete dust chamber and a 250-ft. brick chimney.

#### Mexico

##### CHIHUAHUA

The recently effective 5-peso per car switching charge on the lines of the National Railways of Mexico, has been made inoperative pending further investigation of its equity by the Government, and it is believed that it will be rescinded.

##### AGUASCALIENTES

The Aguascalientes smeltery has blown in its lead furnace, which has been shut down for several months. Four of its nine copper furnaces are in operation.

The Guggenheim mines, at Tepazala, increased shipments to Aguascalientes 4000 tons monthly.

*Nepensada*—These mines, belonging to the Asientos Mining Company, and under lease to S. Rapp, have started shipments of copper ore to Aguascalientes.

*Tepozan*—Enrique Becker has resumed work after two years shut down.

*El Patricio*—This mine, formerly owned by George Crowder, has been sold to Joseph Pepperd, who will begin work.

*Lead's Queen*—These mines, under rental to R. A. Towne interests, have made their first shipment of good lead-gold-silver ore to the San Luis Potosi.

*Santa Francisca*—Three diamond drills are now at work at the mines, in charge of J. Eggleston.

*La Fe*—M. W. Lafayette and associates have placed a small cyanide mill in operation at this mine in the Guadalupe y Calvo section. A larger milling plant is under consideration.

*Palmilla*—The Palmilla Milling Company expects to have the first 250-ton unit of its cyanide plant in commission by Dec. 1. In the meantime improvements at the mine include the installation of several large pumps in the lower levels, double tracking of the main tunnel level to the ore bins and grading for the towers of the aerial tram to be used for conveying ore from the old dumps to the mill.

*Candelaria*—This company, with property near Santa Barbara, has completed its concentrating mill and is planning on the early addition of a 50-ton cyanide plant. George C. Hackstaff is the manager.

*Volcan*—Compañia Minera de Volcan, with holdings in the vicinity of Parral, has increased its capitalization from 15,000 to 40,000 pesos to enable the securing of funds for machinery and development. Paul Gerhardt is the president-manager and Alberto Stallforth is secretary-treasurer.

*Santa Gertrudis*—This mine, in the Minas Nuevas camp is outputting at the rate of about five cars weekly. The ore is low grade and silicious.

*Sierra Plata*—The discovery of shipping quantities of 22-kg. silver ore in this Minas Nuevas mine is reported. The property has been shipping 2 cars daily. Roy H. Allen is manager.

*Virginia Consolidated*—A shipment of four cars gave returns of about 30 per cent. copper, \$7 gold and 12 oz. silver. The property is 50 miles west of Miñaca and under the management of J. W. Clayton.

##### GUANAJUATO

*San Cayetano*—The property has been inspected by Louis Wright and Charles W. Botsford. Plans for a mill are being considered. It is controlled by the Lewishohn interests, of New York.

##### SONORA

*Santa Rosalia*—Sufficient funds are in the treasury of this company to erect the 100-ton mill, for which plans have been drawn for more than a year.

*San Feliz*—This mine, a former silver producer, has been bonded by W. S. Sturgis to a British company for \$300,000.

*Neuvo Promontorio*—A two-compartment shaft is being lowered at this property, in the Altar district.

*Cananea-Boston*—A hoisting apparatus has recently been placed at this company's initial shaft, west of Cananea.

*Moctezuna Copper Company*—This company's big concentrator is running to its full capacity again. During the summer months half of it was closed down on account of a scarcity of water.

*Sonora Copper Smelting Company*—This company's 100-ton smelting plant is finished.



# THE MARKETS

Current Prices of Metal, Minerals, Coal and  
Stocks, Conditions and Commercial Statistics

## Coal Trade Review

*New York, Nov. 9*—The coal situation in the West is up to the railroads. Mines are busy and ready to ship coal as fast as cars are provided; but the universal complaint is that cars are not to be had in sufficient number. At nearly all the distributing centers coal comes in slowly, and most consumers have only light stocks. The fault is not with the mines, but with the railroads. It is true that in many cases local reports of "impending coal famine" are exaggerated and sensational. Nevertheless it is a fact that coal is not moved as fast as it is wanted, and a heavy storm might cause a serious situation. Local prices have advanced at many points. At others, however, the car situation has depressed them, owing to the preference given by the railroads to deliveries on their own lines, where they can keep their cars under their own control.

In the East the anthracite trade is quiet and steady. The Seaboard trade is suffering from car shortage, but not to anything like the extent reported from the West. Apart from the car question the trade is in good shape.

*Ohio Coal Suits*—The Federal grand jury at Columbus, O., has found a number of indictments against the Hocking Valley Railroad Company, charging discrimination in rates and in granting facilities to the Sunday Creek Coal Company, to the exclusion of other coal companies on its line.

### COAL TRAFFIC NOTES

The following statement of tonnage carried over the Virginian railway for the three months of its fiscal year from July 1 to Sept. 30 is given by the *Coal Trade Journal*: Commercial coal, 380,405; company coal, 27,597; total coal, 408,002; coke, 7591; total, 415,593 tons. The total for the corresponding period in 1909, when the road was only partly open, was 194,117.

Shipments of Broad Top coal over the Huntingdon & Broad Top railroad, 10 months ended Oct. 30, were 365,412 tons in 1909, and 569,773 in 1910; increase, 204,361 tons.

### New York

#### ANTHRACITE

*Nov. 9*—Cold weather has stimulated local trade, and business seems to be in good shape.

Schedule prices for large sizes are

\$4.75 for broken and \$5 for egg, stove and chestnut, f.o.b. New York harbor. For steam sizes, current quotations are: Pea, \$2.95@3.25; buckwheat, \$1.15@2.50; No. 2 buckwheat, or rice, \$1.65@2; barley, \$1.35@1.50; all according to quality, f.o.b. New York harbor.

#### BITUMINOUS

The market continues in good shape. Seaboard orders are coming in well, and there is no accumulation of coal at tide. Some coal is still going to the West.

Car supply is beginning to cause some anxiety. It is getting worse, and the complaints are increasing from all quarters. All-rail trade is suffering more than tidewater business from this cause. The railroads complain that connecting lines are very slow in returning cars delivered to them. Transportation is generally good.

Prices are well held. Gas coals are selling at tide at prices which realize \$1.05@1.10 at mine for  $\frac{3}{4}$ -in., 95c.@\$1 for run-of-mine and 70c. for slack. Low-volatile steam coals bring \$2.70@2.75, New York harbor, for the lower grades, and up to \$2.90@3 for better qualities.

In the Coastwise vessel market there is no material change. Rates are held on a basis of 70@80c. from Philadelphia to Boston and Portland; 60@65c. from New York to points around Cape Cod. The tendency is toward an advance.

### Birmingham

*Nov. 7*—Coal operations in Alabama are active. The railroads are unable to furnish all the cars that are needed. The home consumption is not as strong as the outside demand, which means that the railroads are being called on to furnish many cars for the trade. The railroads still decline to furnish cars for coal that is going out of this territory; railroads will accept business which they can handle on their own lines, but are not willing to let cars go to other lines. Better prices obtain for coal in this State.

A warning was sent out by Chief Mine Inspector James Hillhouse, the past week, because of the cold weather setting in. The warning was out but two days when a pocket of gas exploded in the mines at Yolande and five men were killed.

There is a strong demand for coke, not only from furnaces but from other concerns.

### Chicago

*Nov. 8*—As a result of continued cold weather all domestic coal has strengthened, while the steam coal market con-

tinues quiet and firm. Buying for winter storage has been heavy, by many consumers. Stocks of all kinds of coal are low and the market is growing stronger every day. A week of mild weather, if it comes, may change all this; with continued cold large receipts can be disposed of profitably.

Illinois and Indiana bring on cars \$2.10@3 for lump, \$2@2.20 for run-of-mine and \$1.30@1.75, for screenings. Hocking, very firm and with demand pressing visible supply, brings \$3.40; smokeless, in good demand for both sizes, sells \$3.30 for run-of-mine and \$3.95 for lump. No prospect seems to exist of forced lower prices to escape demurrage charges, on any kind of coal. Anthracite sales are large in both city and country.

### Cleveland

*Nov. 7*—Local trade is pressing, both in steam and domestic coals, but supplies are short. Car supply is short everywhere, and it is a question of getting coal. Dealers' yards are bare, and receipts are below the sales.

Prices are nominally unchanged, but in many cases premiums are paid to get coal that is needed. Pocahontas is especially scarce.

The Lake trade is beginning to fall off, and a couple of weeks will see its end for the season.

### Indianapolis

*Nov. 5*—Conditions point to a coal famine. There are no reserve stocks of coal in the cities of the State, and only immediate needs can be supplied. The city dealers say that they could not stand more than two weeks' cold weather with exhausting the present supply of coal.

There is plenty of coal in the Indiana mines. The cars to move it are nearly all in the South, West and Northwest, delivering coal. The threatened coal famine thus resolves itself not into a question of how much coal can be produced, but how much of the product can be delivered. The big factories and other large consumers, the traction companies and public-service corporations, have on hand not more than two weeks' supply of coal; many have not that much. Dealers and large consumers that buy direct from the mines report it next to impossible to get coal. During the summer months when the mines of neighboring States were closed the railroads ran their cars into the Indiana fields and drained out the supply as fast as it was produced. Unless

the car shortage is relieved, which is not probable, coal prices will go higher than ever before. Chicago depends largely on Indiana for coal and is reported short 50 cars a day on ordinary orders.

The only way a famine can be avoided in case of a long blizzard, say the dealers, would be for the railroads to suspend other traffic and haul nothing but coal.

**Pittsburg**

Nov. 8—The Lake coal movement is about over, and coal is more plentiful in consequence, with slightly more shading in prices from the regular level, which we continue to quote as follows: Mine-run and nut, \$1.20@1.22½; ¾-in., \$1.30@1.32½; 1¼-in., \$1.45@1.47½ and slack, 75@82½c. per ton.

**Connellsville Coke**—The market has been quite upset by the offering of several large tonnages of prompt furnace coke at extreme concessions, down to \$1.30, which is 25c. under the recognized market of a fortnight ago. Some of these offerings are by a coke interest having a customer on contract for this half year who refuses to take deliveries, the customer being a middleman who claims the furnaces to which he sold will not take the coke. The offerings by the coke operator are said to be for account of the buyer, who will be charged the difference. Other offerings are by coke interests having surplus coke on account of the blowing out of furnaces, particularly by reason of the Cambria Steel Company blowing out three stacks. There have been many offerings at \$1.40 and \$1.35, and one lot of 5000 tons is said to have gone at \$1.35. The contract market for next year, which was opening up rather slowly, has become absolutely stagnant by reason of this development in the spot market. Offerings of prompt foundry coke are also made at new low levels. We quote: Prompt furnace, \$1.30@1.35; contract furnace (nominal), \$1.75; prompt foundry, \$1.75@2.10; contract foundry, \$2.25@2.50 per ton at ovens.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ending Oct. 29, at 347,896 tons, a decrease of 3000 tons, and shipments at 3475 cars to Pittsburg, 5672 cars to points west and 873 cars to points east, a total of 10,020 cars.

**St. Louis**

Nov. 7—The market this week has shown considerable improvement along domestic lines. The weather has been brisker and there has been a heavy demand for all sizes of domestic coal locally and from the country districts. Dealers are all extremely busy.

The embargoes on the various railroads are still keeping the price of coal down locally. The Louisville & Nashville

has raised the embargo as far as restricting the movement of cars in St. Louis and will let its cars go practically to any points in the switching limits. The Illinois Central on the other hand shows no inclination to raise any of its embargoes and operators on the road are beginning to get discouraged.

The tremendous production of lump coal has finally forced the market on fine coal down to the lowest point it has reached in the last year. Screenings are offered as low as 15c. per ton at mines, while nut and pea coal are as low as 60c. per ton at mines. Even this is a great improvement over the market two years ago, as screenings were then given away and nut and pea coal were sold for as little as 25c. per ton at mines. The screening market has been getting better every year, owing to the increased use of automatic stokers.

Quite a little smokeless coal has moved this week and it seems to be coming into great favor for domestic and apartment-house use here. Smokeless appears on this market at a most opportune time, owing to the withdrawal of the Arkansas anthracite from this market this year.

Current prices on the St. Louis market are as follows:

	Mine.	St. Louis.
<b>Illinois, Standard:</b>		
6-in. lump and egg.....	\$1.60	\$2.12
2-in. lump.....	1.20	1.60
Mine-run.....	1.00	1.52
Screenings.....	0.50	1.02
<b>Trenton:</b>		
6-in. lump and egg.....	2.50	3.02
3-in. nut.....	2.00	2.52
<b>Staunton or Mt. Olive:</b>		
6-in. lump.....	1.80	1.32
2-in. lump.....	1.75	2.27
Mine-run.....	1.20	1.72
Screenings.....	0.60	1.12
<b>Carterville:</b>		
6-in. lump or egg.....	2.00	2.67
3-in. nut.....	2.00	2.67
Mine-run.....	1.25	1.92
Screenings.....	0.75	1.42
<b>Pocahontas and New River:</b>		
Lump or egg.....	2.25	4.75
Mine-run.....	1.25	3.75
<b>Pennsylvania Anthracite:</b>		
Nut, stove or egg.....	.....	6.95
Grate.....	.....	6.70
<b>Arkansas Anthracite:</b>		
Egg or Grate.....	2.35	5.35
<b>Coke:</b>		
Connellsville foundry.....	.....	5.40
Gas house.....	.....	4.90
Smithing.....	.....	4.15

Prices at East St. Louis are 20c. below St. Louis quotations.

**Anthracite**—The market has been very good and dealers have been buying freely. Jobbers and wholesalers report that they are a little behind on orders now for all sizes.

**FOREIGN COAL TRADE**

**Chinese Coal**—The report of the Chinese Engineering and Mining Company for the year ended March last shows a total production of coal from its Kai-Ping and Linsi mines of 1,369,501 long tons; an increase over 1908-9 of 133,432 tons.

**United States Coal Exports**—Exports of coal and coke from the United States, with coal furnished to steamships in foreign trade, nine months ended Sept. 30, long tons:

	1909.	1910.	Changes.
Anthracite.....	2,104,526	2,199,220	I. 94,694
Bituminous.....	7,094,754	8,133,788	I. 1,039,034
<b>Total exports..</b>	<b>9,199,280</b>	<b>10,333,008</b>	<b>I. 1,133,728</b>
Steamer coal.....	4,588,477	4,904,249	I. 315,772
<b>Total.....</b>	<b>13,787,757</b>	<b>15,237,257</b>	<b>I. 1,449,500</b>
Coke.....	667,451	648,061	D. 19,390

Canada took this year 7,763,603 tons of coal, or 75.1 per cent. of the total exports. Cuba took 637,465 tons of coal. The coke went chiefly to Mexico and Canada.

**United States Coal Imports**—Imports of coal and coke into the United States, nine months ended Sept. 30, long tons:

	1909.	1910.	Changes.
Anthracite.....	2,125	162	D. 1,963
Bituminous.....	862,914	1,416,944	I. 554,030
<b>Total coal.....</b>	<b>865,039</b>	<b>1,417,106</b>	<b>I. 552,067</b>
Coke.....	131,269	96,819	D. 34,450

Canada furnished this year 1,205,800 tons of coal and nearly all the coke; Australia, 149,648 tons of coal; Japan, 51,484 tons of coal. Imports are chiefly on the Pacific Coast and in the far north-western States.

**Welsh Coal Trade**—Messrs. Hull, Blythe & Co., London and Cardiff, report prices of coal as follows on Oct. 29: Best Welsh steam coal, \$3.90 seconds, \$3.66; thirds, \$3.48; dry coals, \$3.60; best Monmouthshire, \$3.48; seconds, \$3.30; best steam smalls, \$2.04; seconds, \$1.80. All prices are per long ton, f.o.b. shipping port, less 2½ per cent. discount.

**IRON TRADE REVIEW**

**New York, Nov. 9**—The iron and steel markets still incline to the waiting condition, but there are signs of improvement. Much depends on the price question and the extent to which the more important independents follow the leading interest.

In finished material business in the lighter lines continues good. Bars, plates, pipe and other articles are reported active, while jobbing business is good. Structural orders are falling off, but that is rather to be expected at this time of year. There are, moreover, some heavy contracts under discussion, and in several of these the price question will be an important one. There are some signs of the railroads coming into the market sooner than has been expected. A number of inquiries for steel cars are out, and orders for rails from several large roads are expected to materialize soon.

In pig iron buying has been rather better. Foundry iron is being taken more freely in Eastern territory, and orders are beginning to run over into first-quarter deliveries. Most of these are taken at current prices. Basic is being

bought also, but there is more difficulty over prices.

An estimate of pig-iron stocks made in these columns two or three months ago was much criticized. That estimate put unsold and unused stocks at 1,900,000 tons. Since then there have been some curtailment of production and more sales. Now an estimate of stocks from a very conservative authority puts the total at 1,600,000 tons. Allowing for the changes made, this seems to be a fair corroboration of our earlier estimate.

**Lake Superior Iron Ore**—October shipments of iron ore down the Lakes amounted to 4,877,441 tons. The total to Nov. 1 is 39,978,308 tons. November is not likely to show over 2,000,000 tons.

**Steel Rail Prices**—The steel rail makers with the coming year will make a change in the method of quoting steel rails, though it will involve no change in the prices. The new quotations will be made per pound, instead of per long ton. Bessemer rails are now quoted at 1.25c. per lb., which is exactly the equivalent of \$28 per ton of 2240 lb. For open-hearth rails, heretofore \$30 per ton, the market price is now 1.34c. per lb. The old extras are retained. For lots less than 500 tons and more than 20 tons, bessemer rails are quoted at 1.34c. (formerly \$30) and open-hearth rails at 1.43c. (formerly \$32). For lots less than 20 tons, bessemer rails are quoted at 1.43c. (formerly \$32) and open-hearth rails at 1.52c. (formerly \$34). Prices per pound will also apply in the case of light rails, or rails weighing less than 50 lb. per yard, these corresponding in the same way as indicated above, to the prevailing prices per gross ton for the respective weights.

#### Baltimore

Nov. 8—Imports for the week included 1333 tons ferromanganese and 25 tons silicospiegel from Liverpool; 9410 tons cupreous pyrites from Huelva, Spain; 21,300 tons iron ore from Cuba.

#### Birmingham

Nov. 7—Inquiries for Southern pig iron are of such a nature as to indicate that business is meant. The manufacturers are looking forward to a general resumption of buying and it is believed that immediately after the elections there will be a better feeling in the market. The sales so far this month have been in small lots; the aggregate is not very extensive. There is a little accumulation of iron noted again. There is, however, a firmer tone to the quotations, No. 2 foundry being sold at \$11.50 per ton as the minimum price. Some furnace companies are now declining to sell iron under \$11.50 for immediate delivery and will hardly accept that price for iron to be delivered during the coming year.

There is no cessation of operations at the cast-iron pipe plants in Southern ter-

ritory and a good demand. There is a slight improvement in steel conditions.

The scrap-iron market continues dull in the South.

#### Chicago

Nov. 8—Buying of pig iron continues to be in small lots widely distributed. There is a disposition apparent, on the part of many melters, to buy more closely to their apparent needs of the first quarter, a normal tendency as the calendar year draws to a close. Inquiries are still being made, however, on a liberal tonnage for the first half. The feeling seems to exist pretty generally among users of pig iron that prices are not soon to advance with production so capable of expansion beyond its present curtailed total. Prices of No. 2 pig iron hold to \$15.35 @ 15.85 for Southern (\$11 @ 11.50 Birmingham) and \$16 @ 16.50 for Northern, with 25c. @ 50c. more obtained on general first-half deliveries than on deliveries within the next 30 to 90 days. There is little demand for quick-delivery iron except in very small lots.

Iron and steel products are in steady but rather light demand generally, with the tendency toward less purchasing. Coke is in less demand with the supply large but the best Connellsville holding to \$4.90, Chicago.

#### Cleveland

Nov. 7—Iron-ore movement continues to slow down. The October statement is not yet at hand.

**Pig Iron**—Inquiries are in for some good lots of foundry and basic pig for first-quarter delivery. There has been a fair run of short orders, mostly small lots. Quotations show little change, bessemer pig being \$15.65 @ 15.90; basic, \$14 @ 14.15; No. 2 foundry, \$14.25; forge, \$14; all Cleveland delivery.

**Finished Material**—Business is better, especially for bars and small material. Machine shops are buying more stock than for some time past.

The Carnegie people, it is said, are meeting jobbers' quotations, making deliveries from their Pittsburg warehouses.

#### Philadelphia

Nov. 9—A round dozen sales of foundry and malleable pig iron have been made to New Jersey, New York and New England buyers, aggregated an encouraging volume of business. These sales will be followed next week or soon by additional orders. The stipulation made by some of the buyers is that additional orders could be placed before the end of this month at the same terms. Makers of forge are endeavoring to close business for next quarter's delivery and in a few cases covering second quarter. Scarcely any business of this kind has been closed. Foundry consumers are generally short of iron and must be heard

from before long. Offerings of Southern iron are more frequent but the sales are unimportant. Quotations are \$16 for No. 2; \$15 for basic; \$14.50 for northern and Southern gray forge.

**Steel Billets**—Contracts for billets for first-quarter delivery have been closed at 50c. over prices named two weeks ago.

**Bars**—Bars are dull for future delivery and even the very low quotations of two weeks ago were shaded in two or three cases. Local agents claim the outlook is better.

**Sheets**—The only encouragement for the week has been the placing of one or two good-sized contracts by users of sheet iron who place their orders during December. Mill representatives report very little inquiry outside of these transactions.

**Pipes and Tubes**—Nothing of moment has transpired in merchant pipe or in tubes and agents report nothing in sight. Cast pipe conditions continue favorable.

**Plates**—Interests which made a show of contracting for supplies early in October, but who withdrew their inquiries, have reappeared, placing small orders to piece out work during the early part of the winter. Mill owners know of no large orders for immediate consideration.

**Structural Material**—Current orders are chiefly for winter building requirements in New England and middle States. Bridge material for spring delivery will be wanted in case the present intentions of some of the eastern railway systems meet with no further setback.

**Scrap**—Dealers are not loading up with more material, and prefer to hold what they have indefinitely rather than to crowd it upon a poor market at present prices.

#### Pittsburg

Nov. 8—Business has been lighter the past week in both crude and finished products, the quietness being due probably to the election. In crude products some producers have been less anxious to sell, evidently expecting higher prices after the election, while buyers have not been willing to discount any improvement. In finished products there has been no important change, but the mills are feeling more seriously the playing out of accumulations of business on books.

In most quarters predictions are made that with the election out of the way and a respite from political uncertainties business will be better, and the purchases of rails, cars, etc., recently made by two or three railroads are expected to be followed by more general buying. No heavy railroad buying, however, is expected in any quarter before the new year is well under way.

**Pig Iron**—The Pennsylvania General Electric Company, the branch of the General Electric Company which is building

a large plant in Erie, Penn., has bought a few hundred tons of bessemer iron for November-December delivery at \$15, Valley, or \$15.90, delivered Erie, the regular market, while it is asking prices on 6000 tons of Nos. 1 and 2 foundry for first-quarter delivery. The Westinghouse Air Brake Company yesterday afternoon bought 7500 tons, about equally divided between gray forge, 0.07 or under in sulphur and 1.50 or over in silicon, and an iron of 1 to 1.35 silicon, under 0.20 phosphorus and under 0.04 sulphur. The latter iron may be called malleable, basic or off-basic, according to choice. Prices paid are not known, except that they must have been rather favorable to the buyer, as upon the first submission of quotations it was given out that no iron would be bought at this time. Low prices on basic iron have been withdrawn, furnaces quoting nominally \$13.50, Valley, but last sales were at \$13 and it remains for actual inquiries to develop whether the market has scored an advance. We quote basic nominal at \$13@13.50, bessemer at \$15, malleable at \$13.25@13.75, No. 2 foundry at \$13.75@14 and forge at \$13.50@13.75, Valley furnace, freight to Pittsburg being 90c. The disposition to exact a higher price for first-quarter delivery than for prompt has largely disappeared.

**Ferromanganese**—The increased firmness reported a week ago proves to have been only in nominal quotations, for upon actual business developing sales for first-half delivery have been made at about \$38.75, Baltimore, while prompt can be had at \$38.50. We quote the market at this range, 25c. less than last week. Freight to Pittsburg is \$1.95 per ton.

**Steel**—The market has been almost stagnant, and not enough business has been done to develop clear prices. It is evident, however, that bessemer billets can be done at 50c. less than the \$23.50 given a week ago. We quote, Pittsburg: Bessemer billets, \$23; sheet bars, \$24.50 @25; open-hearth billets, \$24.50@25; sheet bars, \$25@25.50; rods, \$28.50@29 per ton.

**Sheets**—There has been a fairly good volume of business and some mills are completely filled up for a short time. There is scarcely any shading from the prices which were formerly largely nominal: Black sheets, 28 gage, 2.20c.; galvanized, 3.20c.; blue annealed, 10 gage, 1.65c.; painted corrugated roofing, \$1.60; corrugated, \$2.80 per square.

**St. Louis**

Nov. 7—The market for pig iron has improved a little and there is some activity in first-quarter stuff. The spot market is quiet with a few orders trickling in here and there. The current prices, also the prices for first-quarter delivery, remain at \$11.50 per ton, Birmingham, and \$15.25, St. Louis.

**Foreign Trade of the United States**

**Iron and Steel**—Exports and imports of iron and steel in the United States for the nine months ended Sept. 30 are valued as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1909.	1910.	Changes.
Exports.....	\$113,920,860	\$146,924,302	I. \$33,003,442
Imports.....	20,879,982	30,439,708	I. 9,559,721
Excess, exp.	\$93,040,878	\$116,484,599	I. \$23,443,721

Increase in exports, 29 per cent.; in imports, 45.8 per cent. The leading items of exports and imports were, in long tons:

	Exports		Imports	
	1909.	1910.	1909.	1910.
Pig iron.....	40,847	83,862	99,823	176,615
Scrap.....	23,487	16,867	14,263	65,457
Billets, blooms, etc.	94,594	14,162	11,844	36,026
Bars.....	61,093	93,862	11,662	31,212
Rails.....	189,784	263,782	.....	.....
Sheets and plates..	124,826	204,056	2,657	5,490
Structural steel....	68,433	114,552	.....	.....
Wire-rods.....	10,671	15,469	8,548	15,780
Wire.....	109,194	122,385	.....	.....
Nails and spikes..	33,842	45,062	.....	.....
Timplates.....	6,825	8,395	44,388	53,802
Pipe and fittings..	112,955	118,101	.....	.....

Imports of wire not reported in quantities; the values were \$1,496,935 in 1909, and \$1,425,872 in 1910. Imports of structural steel and rails not reported this year.

**Iron and Manganese Ore**—Imports and exports of iron ore in the United States nine months ended Sept. 30, long tons:

	1909.	1910.	Changes.
Imports.....	1,119,331	1,999,917	I. 880,586
Exports.....	390,373	545,282	I. 154,909

Of the imports this year 1,114,710 tons were from Cuba, 395,362 from Spain, 172,840 from Sweden and 120,311 tons from Canada.

Imports of manganese ore for nine months were 169,905 tons in 1909, and 183,315 in 1910; increase, 13,410 tons.

**METAL MARKETS**

New York, Nov. 9—The metal markets may be reported this week as showing an improving tendency; though there are still weak spots here and there.

**Gold, Silver and Platinum**

**UNITED STATES GOLD AND SILVER MOVEMENT**

Metal.	Exports.	Imports.	Excess.
<b>Gold:</b>			
Sept. 1910..	\$1,822,476	\$ 3,481,718	Imp. \$ 1,659,242
" 1909..	7,546,442	2,351,158	Exp. 5,195,284
Year 1910..	55,318,081	45,971,504	" 9,346,577
" 1909..	97,272,834	31,105,393	" 66,167,441
<b>Silver:</b>			
Sept. 1910..	4,830,346	3,152,117	Exp. 1,678,229
" 1909..	4,385,532	3,261,397	" 1,124,135
Year 1910..	41,764,743	32,967,887	" 8,796,856
" 1909..	43,289,116	33,240,530	" 10,048,586

Exports from the port of New York, week ended Nov. 5: Gold, \$2400; silver, \$688,970, chiefly to London. Imports: Gold, \$128,015; silver, \$114,485, from Australia, South America and Mexico.

**Gold**—Prices of gold on the open market in London were unchanged at 77s.

9d. per oz. for bars and 76s. 5d. per oz. for American coin. The Bank of England is taking less gold, but there is a demand from Germany and Egypt.

**Platinum**—Business continues good and prices are firm on the recent advance. Dealers ask \$38.75@39.25 per oz. for refined platinum; \$44@44.50 per oz. for hard metal.

Our Russian correspondent writes, under date of Oct. 27, that the market is strong and prices have again advanced. The reports of smaller production have been confirmed, and it is known that the large producers have only light stocks on hand. At Ekaterinburg crude metal—83 per cent. platinum—is quoted at 8.30 rubles per zolotnik; at St. Petersburg, 32,000@32,200 rubles per pood. These prices are equivalent to \$31.21 and \$31.48 per oz., respectively.

**Silver**—Silver has been fairly steady for the past few days with very little fluctuation. Owing to the dearth of money, spot silver is at a discount of 1/8 to 1/4d. per oz. from two months delivery.

**SILVER AND STERLING EXCHANGE**

Nov.	3	4	5	7	8	9
New York....	56 1/2	55 3/4	56	56 1/2	.....	55 1/2
London .....	25 1/2	25 3/4	25 1/2	25 1/2	25 1/2	25 1/2
Sterling Ex..	4.8590	4.8590	4.8590	4.8550	.....	4.8565

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

Owing to an oversight in proofreading, the price of silver in London on Oct. 29 was given in our last issue at 26 11/16d. It should have been 25 11/16d., the same as the preceding day.

**Copper, Tin, Lead and Zinc**

**NEW YORK**

Nov.	Copper.		Tin.	Lead.		Zinc.	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.		New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
3	12 3/4	12.65	36 3/4	4.40	4.25	5.92 1/2	5.77 1/2
	@12 1/2	@12.75			@4.30	@5.95	@5.80
4	12 3/4	12.70	36 3/4	4.40	4.25	5.92 1/2	5.77 1/2
	@12 1/2	@12.75			@4.30	@5.97 1/2	@5.82 1/2
5	12 3/4	12.70	36 3/4	4.40	4.25	5.92 1/2	5.77 1/2
	@13	@12.75			@4.30	@5.97 1/2	@5.82 1/2
7	12 3/4	12.75	36 3/4	4.40	4.25	5.95	5.80
	@13	@12.80			@4.30	@6.00	@5.85
8	.....	.....	.....	.....	4.25	.....	5.80
					@4.30	.....	@5.85
9	12 3/4	12.75	36 3/4	4.40	4.25	5.97 1/2	5.82 1/2
	@13	@12.80			@4.30	@6.00	@5.85

The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON							
Nov.	Copper.			Tin.		Lead, Spanish.	Zinc, Ordinaries.
	Spot.	3 Mos.	Best Sel'td	Spot.	3 Mos.		
3	57 <sup>7</sup> / <sub>8</sub>	58 <sup>7</sup> / <sub>8</sub>	61 <sup>1</sup> / <sub>2</sub>	166 <sup>1</sup> / <sub>2</sub>	166 <sup>1</sup> / <sub>2</sub>	13 <sup>3</sup> / <sub>4</sub>	24
4	57 <sup>1</sup> / <sub>2</sub>	58 <sup>1</sup> / <sub>2</sub>	61 <sup>1</sup> / <sub>2</sub>	165 <sup>1</sup> / <sub>2</sub>	165 <sup>1</sup> / <sub>2</sub>	13 <sup>1</sup> / <sub>2</sub>	24
5	.....	.....	.....	.....	.....	.....	.....
7	58 <sup>3</sup> / <sub>8</sub>	59 <sup>1</sup> / <sub>2</sub>	61 <sup>1</sup> / <sub>2</sub>	166 <sup>1</sup> / <sub>2</sub>	166 <sup>1</sup> / <sub>2</sub>	13 <sup>1</sup> / <sub>2</sub>	24
8	.....	.....	.....	.....	.....	.....	.....
9	57 <sup>1</sup> / <sub>2</sub>	58 <sup>1</sup> / <sub>2</sub>	61 <sup>1</sup> / <sub>2</sub>	165 <sup>1</sup> / <sub>2</sub>	166 <sup>1</sup> / <sub>2</sub>	13 <sup>3</sup> / <sub>4</sub>	24 <sup>1</sup> / <sub>2</sub>

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 1/2 c.; £12 = 2.61 c.; £23 = 5c.; £60 = 13.04c. ± £1 = ± 0.21 1/2 c.

**Copper**—At the beginning of the week of Nov. 3-9 there were some arbitrage transactions in electrolytic copper by speculators who took advantage of the position of the London standard market, which amounted to a fairly large volume. These transactions, along with rather large buying by consumers, both domestic and European, advanced the market, and on Nov. 4 the leading interest raised its price to 13c., delivered, usual terms, which price has since been asked by most of the agencies, with transactions effected at concessions of a few points. After the publication of the statistics on Nov. 7 there was a resumption in the demand from manufacturers, both domestic and foreign, but the tone of the market became quieter, there being evidently an uncertainty as to the statistics. The latter are reviewed editorially elsewhere in this issue. In the aggregate the business of the week has been large. Lake copper has also moved more freely than for several weeks previously and transactions in this kind of metal have been made at an advance, but the differential with respect to electrolytic copper continues to be smaller than usual. At the close Lake copper is quoted at 12 7/8 @ 13c., and electrolytic in cakes, wirebars and ingots at 12.75 @ 12.80c. Casting copper is quoted nominally at 12 1/2 @ 12 5/8 c. as the average for the week.

Copper sheets are 18 @ 19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire has been advanced 1/4 c. and is now 14 1/4 c. base, carload lots at mill.

The standard market in London showed a great deal of buoyancy up to Monday. The figures of the Producers' Association made an unfavorable impression and a slight reaction set in on Tuesday, from which the market recovered, the close being cabled at £57 15s. for spot, and £58 13s. 9d. for three months.

Exports of copper from New York for

the week were 5050 long tons. Our special correspondent reports exports from Baltimore for the week at 80 tons.

**Tin**—The London market did not display any special feature during the past week. Transactions decreased in volume and fluctuations in violence. The close is quiet but firm at £165 15s. for spot, and £166 5s. for three months.

Outside of a few small transactions on the New York Metal Exchange; trade in this metal has been *nil* so far as this market is concerned. Consumers are not willing to stock up at the present high level, and buy only when they are forced to do so by their necessities. At the close, November tin can be bought at about 36 1/4 cents.

**Lead**—The market is unchanged at 4.40c. New York, and 4.25 @ 4.30c. St. Louis.

Business abroad is not quite as heavy as it has been, but prices so far have been well maintained, the close being steady at £13 3s. 9d. for Spanish lead, and £13 6s. 3d. for English.

**Spelter**—In view of the singular position in which this metal finds itself, producers take a very independent attitude and refuse to sell but moderate quantities at any one price. There is enough business to satisfy everybody and as a result there has again been a steady advance throughout the week, the close being strong at 5.80 @ 5.85c. St. Louis, and 5.95 @ 6c. New York.

The London market is unchanged at £24 2s. 6d. for good ordinaries, and £24 7s. 6d. for specials.

Zinc dust is quoted at 6 3/8 c. per pound. Base price of zinc sheets is \$7.75 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Zinc smelters in Kansas and Oklahoma are beginning to receive trial lots of the recently discovered Leadville calamine. This ore appears to run 30-40 per cent. zinc and to be of fair smelting quality.

The number of retorts now in operation at Iola is 7236 out of the total of 25,524.

### Other Metals

**Aluminum**—Early in the week sales were made at 22 1/2 c., but the market has since strengthened in sympathy with advances abroad, and today no aluminum is available at less than 23c. per lb. for No. 1 ingots. There is a rumor that some sort of understanding has been established between the American producer and some leading foreign concerns.

**Antimony**—Business is still light, Cookson's is quoted at 8 @ 8 1/2 c. per lb.; while 7 1/2 @ 7 3/4 c. is asked for U. S., and 7 1/8 @ 7 3/8 c. for outside brands.

**Quicksilver**—The market shows a good demand. New York quotations are \$45 per flask of 75 lb. for large lots, \$46 @ 47 for jobbing orders. San Francisco,

\$45 for domestic orders and \$2 less for export. The London price is lower, at £8, with £7 15s. asked by jobbers.

### Imports and Exports of Metals

Exports and imports of metals in the United States, nine months ended Sept. 31, are reported as follows, in the measures usual in the trade:

Metals:	Exports.	Imports.	Excess.
Copper, long tons	221,452	111,644	Exp. 109,808
Copper, 1909....	234,098	99,909	Exp. 134,189
Tin, long tons....	549	35,082	Imp. 35,133
Tin, 1909.....	329	32,717	Imp. 32,388
Lead, short tons.	48,534	80,947	Imp. 32,213
Lead, 1909.....	70,273	82,728	Imp. 12,455
Spelter, sh. tons.	1,494	2,739	Imp. 1,245
Spelter, 1909....	2,279	7,437	Imp. 5,158
Nickel, lb.....	10,247,359	24,182,720	Imp. 13,935,361
Nickel, 1909....	8,500,328	14,477,581	Imp. 5,977,253
Antimony, lb....	2,726	8,007,372	Imp. 8,004,646
Antimony, 1909.	6,648	7,252,480	Imp. 7,245,832
Platinum, oz....	.....	87,621	Imp. 87,621
Platinum, 1909.	.....	83,177	Imp. 83,177
Aluminum, value	\$574,144	.....	Exp. \$574,144
Aluminum, 1909	373,821	.....	Exp. 373,821
Ores, etc.:			
Zinc oxide, lb....	19,978,402	.....	Exp. 19,978,402
Zinc oxide, '09....	21,303,659	.....	Exp. 21,303,659
Zinc dross, lb....	7,750,239	.....	Exp. 7,750,239
Zinc dross, '09....	12,658,424	.....	Exp. 12,658,424
Zinc ores, lg. tons	13,528	52,178	Imp. 38,650
Zinc ores, 1909.	9,092	80,105	Imp. 71,013
Antim' ores, lb....	.....	.....	.....
Ant. ores, 1909.	504	3,386,708	Imp. 3,386,204
Chrome ore, tons	30	32,250	Imp. 32,220
Chrome ore, '09	30	29,182	Imp. 29,152

Copper, lead and nickel (and antimony from Aug. 5, 1909) include the metal contents of ores, matte, bullion, etc. The exports given include reexports of foreign material. Zinc contents of ore imported in 1910 were 37,805,159 lb.; not reported prior to date of new tariff. Quantity of antimony ore is not reported from Aug. 5, 1909, only metal contents being given. Imports of aluminum are not reported.

### Zinc and Lead Ore Markets

**Platteville, Wis., Nov. 5**—The base price paid this week for 60 per cent. zinc ore was \$44.50 @ 45 per ton; no premium paid over the base. The base price paid for lead ore was \$52 per ton.

#### SHIPMENTS, WEEK ENDED NOV. 5.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point.....	1,792,040	.....	.....
Platteville.....	543,030	.....	485,400
Benton.....	484,110	.....	.....
Galena.....	411,300	.....	.....
Cuba City.....	344,980	66,500	.....
Harker.....	231,855	.....	.....
Highland.....	192,200	.....	.....
Linden.....	59,290	.....	76,610
Livingston.....	.....	80,000	.....
Shullsburg.....	.....	88,000	.....
Total.....	4,058,805	234,500	562,010
Year to date.....	95,357,759	8,510,484	22,779,510

Shipped during week to separating plants, 3,106,145 lb. zinc ore.

**Joplin, Mo., Nov. 5**—The highest price paid for zinc sulphide ore this week was \$49, the base, \$44 @ 46.50 per ton of 60 per cent. inc. Zinc silicate ore sold on a base of \$24 @ 26 per ton of 40 per cent. zinc. Zinc silicate ore sold on grades of zinc ore was \$42.48. The highest price paid for lead ore was \$53 and the average price of all grades was \$52.54 per ton.

The zinc market was stronger this week than the base price really shows, as there was very little ore sold under a \$45 base, whereas the high base for the week only shows an increase of 50c. over last week. There was another shortage of cars this week or the shipment would have been considerably larger.

SHIPMENTS, WEEK ENDED NOV. 5.

Table with 4 columns: Location, Zinc lb., Lead lb., Value. Lists various locations like Webb City-Carterville, Joplin, Galena, etc., with their respective shipment amounts and values.

45 weeks..... 504,755,690 72,090,400 \$11,844,791
Zinc value, the week, \$269,511; 45 weeks, \$9,977,961
Lead value, the week, 25,674; 45 weeks, 1,867,830

MONTHLY AVERAGE PRICES.

Table with columns for Month, Base Price, All Ores, and Lead Ore. Lists monthly price fluctuations for zinc ore and lead ore from January to December.

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.



New York, Nov. 9—The general market shows no great change, but the tendency appears to be toward greater firmness.

Copper Sulphate—Business continues steady, but not specially active. Prices are unchanged, at \$4 per 100 lb. for car-load lots and \$4.25 per 100 lb. for smaller orders.

Arsenic—Business has been fair and prices are unchanged, \$2.25@2.50 per 100 lb. being asked for white arsenic.

Potash Salts—Reports from Washington are that the German government has rejected all the proposals made by the American representatives, and insists that the new law regulating production of potash salts and taxing exports must be enforced.

Nitrate of Soda—Trade continues fair and prices are steady, at 2.12 1/2c. per lb. for spot, and 2.15c. for futures.

Messrs. Mortimer & Wisner, New York, report the position of nitrate in the United States on Nov. 1 as follows, in long tons:

Table with 4 columns: Item, 1909, 1910, Changes. Shows stocks, imports, total supplies, and deliveries for nitrate.

Quantities reported afloat include all cargoes due to arrive at United States ports before Feb. 15 next.

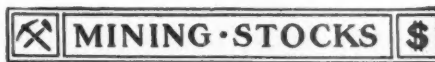
Imports and Exports—Imports and exports of chemicals and raw materials in the United States, nine months ended Sept. 30:

Table with 4 columns: Item, Imports, Exports, Excess. Lists various chemical and raw material items and their trade figures.

Exports include reexports of foreign material. Figures for magnesite not reported prior to July 1, 1909; imports above for 1909 are for two months only. Estimating sulphur contents of pyrites, the total imports of sulphur in 1910 were 268,682 tons.

Petroleum

Burma Petroleum—The production of petroleum in Burma, which began with 4,641,308 gal. in 1890, rose to 49,441,734 gal. in 1900; to 173,402,790 gal. in 1908, and to 230,396,617 gal. last year.



New York, Nov. 9—The general stock markets have shown no decided tendency and the professional operators who have made most of the trading seem to have been waiting for election results. Advances were recorded in a few specialties like Reading and United States Steel; but other changes were small.

On the Curb the copper shares were favored by the decrease in stocks in October, but did not respond to any great extent. Nevada gold stocks were rather heavy. The Cobalts were active and rather strong, Cobalt Central leading with large sales.

A small sale of Homestake was recorded during the week, at \$85 per share.

Boston, Nov. 8—Copper stocks continue to hold a strong tone, although the market has been a preëlection one for

the past few days. Public interest in mining shares is increasing as the larger volume of trading on the Exchange attests. Commission houses have been doing a fair amount of business and report good buying orders just under the market.

The Cole-Ryan stocks such as North Butte and Calumet & Arizona are materially higher for the week as are the

COPPER PRODUCTION REPORTS. Copper contents of blister copper, in pounds.

Table with 4 columns: Company, August, September, October. Lists production figures for various copper companies like Anaconda, Arizona, etc.

Butte district and Lake Superior figures are estimated; others are reports received from companies. Imports duplicate production of Cananea, and that part of Copper Queen production which comes from Nacoziari. Boleo copper does not come to American refiners. Utah Copper report includes the output of the Boston mill. Butte district production for September is given under Anaconda and East Butte.

STATISTICS OF COPPER.

Table with 4 columns: Month, United States Product'n., Deliveries, Domestic., Deliveries for Export. Shows monthly production and delivery statistics.

VISIBLE STOCKS.

Table with 4 columns: Month, United States, Europe, Total. Shows visible stock levels for copper.

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

