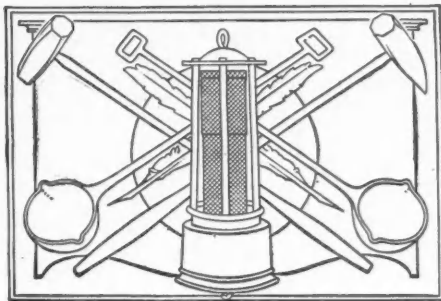


# THE ENGINEERING AND MINING JOURNAL

PUBLISHED WEEKLY

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### CIRCULATION STATEMENT

During 1909 we printed and circulated 534,500 copies of THE ENGINEERING AND MINING JOURNAL. Our circulation for April, 1910, was 49,000 copies.

May 7.....	11,000
May 14.....	9,500
May 21.....	9,500
May 28.....	9,500

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

### The Outlook for Spelter

The price for spelter has recovered a little from its slump in the early part of this month, but it does not appear as if any great thing in the way of a rise were to be expected in the near future. In 1909 the smelters made a production that was far in excess of actual consumption, the eager buying that occurred in the second half of the year and the sharp rise in price being due to misconception of the conditions. For this error the penalty had to be paid. It is now known more accurately how the industry stands.

Consumption of spelter is large, but the manufacturers of finished products having been in an overbought condition, they have not lately had to make any urgent purchases. In other words, the demand for spelter has lately been slack. On the other hand, the supply has been abundant.

It does not look as if there would be any dearth in the supply, because with a price for spelter in the neighborhood of 5.50c., St. Louis, all of the older zinc-mining districts of the United States appear to be able to maintain their production and new ones are coming in. Of the latter, the most important is Butte, Mont., which promises in the near future to furnish the ore equivalent of 40,000 tons of spelter per annum, or about 16 per cent. of the present rate of consumption, and there is not much question about the ability of the Butte mines to make that production at the present price for spelter. The smelters of Oklahoma, especially, have been making plans to take this new ore supply. Certain works that

heretofore have bought some calamine are now providing full roasting capacity and will probably retire from the market for oxidized ore.

The spelter market is characterized by sharp ups and downs. If it should settle for a while at 5¼ to 5½c., producers might as well make up their minds to be satisfied. The tariff imposed last year on zinc ore has failed to create a permanent artificial level of prices, chiefly because of the new domestic supply of ore. The tariff is, however, an irritation to those smelters whose roasting capacity is deficient, or whose gas supply is short, inasmuch as there is no longer the old freedom in obtaining calamine ores.

### Arizona-Morenci Copper Company

This company, with a capital of \$10,000,000, divided into 1,000,000 preferred shares of \$5 each, and 1,000,000 common shares of \$5 each, is being promoted in London for sale of 500,000 preferred shares of treasury stock at 21s. per share. Out of the proceeds from these shares, which are being offered by the Clifton-Morenci Syndicate, Ltd., the company will be provided with funds for the construction of the plant referred to in the prospectus and for working capital. The directors of the Arizona-Morenci Copper Company include Ex-Senators J. B. McCreary, J. P. Jones and S. W. Dorsey, besides several former Government officials.

According to the prospectus, the company "owns over 2000 acres in the recognized and proved copper-bearing zone of the Clifton-Morenci district of Ari-

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zona." As to ore developments, it is said: "On the properties belonging to the company, the surface condition, outcrops and geological features are exactly the same as those on the other mines of the district, and the underground workings show similar indications. From most of these claims ore has been taken from near the surface where it was easily obtained. These workings, in conjunction with the later developments, point to the existence of enormous orebodies below. The openings show oxide and carbonate ores at or near the surface, and in the lower levels the underlying sulphides typical of the district. The surface enriched oxidized ores can be relied upon to furnish an average of 7 per cent. copper or better, and the sulphides  $2\frac{1}{2}$  to 4 per cent. Most of the mines were worked only for the high-grade oxides of 10 to 12 per cent. copper, which led to a most irregular development of the orebodies. Consequently, any exact estimate of ore as blocked out is not practicable, but the amount of ore available is estimated, on a most conservative basis, at over 2,000,000 tons at present."

However, the company apparently does not consider it necessary to develop its orebodies so as to make an exact estimate practicable, inasmuch as it proceeds to outline its plans for concentrating mill of 2000 tons daily capacity and smelting works of 1000 tons daily capacity. Prospective investors are then given an estimate that a smeltery of 1000 tons daily capacity should yield conservatively 24,000,000 lb. of copper per annum at a cost of  $8\frac{1}{2}$ c. per lb., delivered at New York. A table beginning at  $13\frac{1}{2}$ c. for copper, and running up to 20c. per lb., shows the average profit to be expected, and it is stated in black letters that "by increasing the daily output to 2000 tons smelted, these earnings would be doubled." Finally, a table shows the beautiful dividends that have been paid by Calumet & Hecla, Boston & Montana, Anaconda, United Verde, *et al.*

It is stated that the properties of the company have been subjected to very careful examinations by four engineers of Clifton, Ariz., and two of New York, but nothing specific as to their reports is repeated in the advertisement before us.

The Arizona-Morenci Copper Company appears to be the successor of the Copper Mines of Arizona, Ltd., which issued

a prospectus in 1909. The earlier prospectus also referred to the reports of a list of engineers, but included only that of J. O. Baylor, of Clifton, Ariz., who is entitled "assistant engineer, the Copper Mines Company of Arizona, Ltd." Mr. Baylor talks about elegant assays, early shipments, shows of copper ore, extension of proved orebodies of which there is no reasonable doubt, admirable tunnel sites, etc., with a cheerful vagueness, but he fails to mention any blocks of ore that may be regarded as proved. Mr. Baylor's report was of July 9, 1909.

### The Cost of Butte Copper

The Anaconda and Boston & Montana companies have made their reports for 1909, which give more information about their operations than for several years previous. It appears that in 1909 the Boston & Montana produced 101,951,350 lb. of copper, 1,882,046 oz. of silver, and 11,769 oz. of gold, at a cost of \$10,778,503. It is not a sound method of figuring to deduct gold and silver proceeds from expense of production as basis for estimating the copper cost; but this method is common, and following it in this case, reckoning the silver at the average price for the year and the gold at \$20.50 per oz., it appears that the copper cost was 9.38c. per pound.

Anaconda produced 76,335,433 lb. of copper, 2,363,184 oz. of silver, and 7466 oz. of gold, at a cost of \$9,820,897. Reckoning in the same way as in the previous case, the copper cost was 11.07c.

Incidentally, it is worth while to remark that the Boston & Montana is the largest single producer of copper in the world. The Anaconda divides honors with the Copper Queen, Calumet & Hecla and Utah, the annual output of each ranging from 75,000,000 to 100,000,000 lb. per annum.

The Boston & Montana and Anaconda reports do not permit any minute analysis. However, we have believed for a long time that these companies report all of their costs, allowing liberally for depreciation of plant and equipment and abstaining from deferring charges on development accounts. In the Anaconda report for 1909, this is certified by the outside auditors. In other words, the figures reported represent the real operating cost, rather than what may be fancied. The only other charge remain-

ing to be considered is that which is due for amortization of capital.

It will be useful if those who are considering that copper may break below 12c. will think of these two great companies, whose combined output of 178,000,000 lb. of copper in 1909 cost upward of 10c. per lb. without regard to the enormous capital invested in them and the necessity for obtaining not only a satisfactory interest upon that capital, but also a redemption of the principle.

### The Director of the Bureau of Mines

Last week, and elsewhere in this issue, our Washington correspondent has referred to the discussion respecting the forthcoming appointment of a director for the new bureau of mines. The names of several candidates have been mentioned. Among these there seems to be one perfectly logical appointment, viz: Dr. J. A. Holmes.

Doctor Holmes is at present the head of the Technologic Branch of the U. S. Geological Survey, which will be the nucleus of the new bureau. The work of the latter for a long time will be chiefly on the present lines, and consequently it is desirable that it should be continued under a head familiar with the plans. The directorship of a bureau like this is something that calls especially for administrative capacity. As chief of the Department of Mining and Metallurgy at the World's Fair, at St. Louis, Doctor Holmes showed that he possessed such capacity to a remarkable degree, and to that capacity and the spirit of diplomacy that beneficially accompanies it were due the absence of friction and general success in the management of that department.

The future of the new bureau of mines will depend greatly upon the formulation of its early policy. As the sapling is bent, so will the tree grow. We believe that Doctor Holmes has sound ideas and that in his hands the bureau will not introduce the dangers that many persons prominent in the mining industry have feared, and that on the contrary the work of the bureau will be developed upon broad, helpful lines.

If the President decides to appoint Doctor Holmes for this position, his choice will meet with the approval of the mining-engineering profession.

# CORRESPONDENCE and DISCUSSION

Views, Suggestions  
and Experiences of Readers

## Single and Five Stamp Batteries

I notice in the *JOURNAL* of May 14, 1910, some comments upon the order of drop for five-stamp batteries and that Mr. Warren considered the five-stamp batteries obsolete. There is no doubt but that the question of the preference of the single or the five-stamp battery is a serious one and cannot be too lightly considered. Few engineers have given the question the consideration it deserves.

### SINGLE UNIT MILLS FOR ORE NOT REQUIRING AMALGAMATION

Surely if there is any advantage to be derived from the single-unit mills, the ores at Cobalt are ideal for this style of mill. The main feature being concentration the single unit will crush a better concentration product, that is, less slimed material and at a less cost per ton than the larger unit. A 1500- or 1600-lb. single-unit mill arranged in series of two or three in a set would be most suitable for that class of ore. Having individual feeders for each stamp, to be able to employ the same help as for the larger-unit mills, advantage should be taken of any appliances where labor can be saved. For this reason the feeders should be worked by a grip feed instead of the usual pawl feed and the guides should be of the removable shell type. Neither this grip feed nor the guides have bolts, which ordinarily take up much of the millman's time.

For any class of ore that does not require amalgamation or cyanidation there is no doubt that the single-unit mills are more economical. When amalgamation becomes important great care must be taken in the choice of batteries; just as great care must be taken in the design of the mortar. For the sake of amalgamation efficiency the California millman prefers the sequence of drop 14235, knowing that this gives a more regular wave but not necessarily as great a crushing capacity as 13524.

The Western States are strewn with wrecks of single-unit mills where it was fondly imagined that amalgamation with these mills would give a result somewhere near that obtained by the usual tests. Those who have tried amalgamating with these mills know the difficulties and seldom care to duplicate the experience. When a cyanide plant follows the mill the preference is one that must be worked out by thorough tests. If the cyanide process includes a slime plant

the single-unit mills with regrinding machinery may be the most economical.

### HISTORY OF MANY MILLS

The operator often finds himself in a position where the scarcity of financial resources is at variance with good engineering practice. He cannot afford a trial mill so takes a mill that crushes at the least expense—the single unit. He now finds a cyanide attachment necessary so he erects a sand plant and allows the slime to go to waste. He now finds the slime must be treated, hence a slime plant. There seems no end to the expenses; his backers object and there the project stands. It might have been better to have erected a couple of five-stamp batteries, amalgamated as closely as possible, and to have allowed the sands to accumulate for future treatment. This is the history of many mills of which I am personally cognizant.

As a rule the ores of California yield an economical percentage of gold by amalgamation and concentration without a cyanide plant and amalgamation being the basis of the process would suffer by the use of the single-unit mills; in fact the policy of their general use would be out of the question. There are a few mills, to my knowledge, in California doing better work with the single-unit type; but there are many that have been discarded for the five-stamp batteries.

The future of the stamp mill appears to be heavy single-unit mills between 1500 and 1800 lb. and moderately heavy five-stamp batteries with stamps weighing about 1050 lb., the former to be used where crushing is the object in view, the latter where crushing and amalgamation go on simultaneously.

ALGERNON DEL MAR.

Los Angeles, May 20, 1910.

## Fifth Annual Report of Utah Copper Company

Referring to the analysis of the fifth annual report of the Utah Copper Company in the *JOURNAL* of May 7, page 949, there is one feature which Mr. Moore neglected to point out, although, doubtless, he was aware of it. In calculating the smelting deduction on copper he shows that it was exactly 5 per cent. of the gross contents, and that the concentrates averaged 26 per cent. copper. From this it appears likely that the deduction was not on the basis of 5 per cent. of the contents, but is the old Welsh allowance of 1.3 units.

It may also be of interest to attempt to split up Mr. Moore's figure for "freight, refining, and selling" of the Utah Copper Company for 1908, viz., 1.328c. per lb. The freight itself was probably about \$10.74 per ton of 2000 lb. on 98.5-per cent. material, or 0.529c. per lb. fine copper. If the selling expenses were 1 per cent. of the returns, on the *JOURNAL* price per lb. for 1909, they would be 0.132c. per lb. fine copper. Deducting the sum of these items from 1.328c. per lb., would give 0.667c. per lb., or on 98.5-per cent. material, \$13.14 per ton. We might surmise then, that the toll for 1908 was about \$13 per ton of bullion, beside which there would probably be some gold allowances. Or, if the selling expenses were only ½ per cent., then the toll was 0.733c. per lb. fine copper, or on 98.5-per cent. material, \$14.48 per ton: In even figures, \$14.50, which appears the more likely supposition.

DONALD M. LIDDELL.

Grasselli, Ind., May 20, 1910.

## Loss of Copper in Slag

I wish to call the attention of the copper smelters to a fact that is frequently overlooked in considering the reasons for the loss of copper in slag. It is generally assumed that the greater the tenor of copper in the matte, the greater will be the tenor in the slag, but this is not the only explanation for slag losses. If we have two furnaces running with the same quantity of coke, and making slags of similar composition and mattes of the same tenor in copper we can have nevertheless, different losses of copper in the slags. I consider that the percentage of copper in the furnace charge causes this. We have, e.g., in Chile two smelteries which are running mattes containing 50 per cent. copper, but one making slags containing 0.3 per cent. copper, and the other 0.6 per cent. The blast-furnace charges at the first contain 3.5 per cent. copper, and at the second 10 per cent. copper. Another smeltery is running 40 per cent. copper mattes and 1 per cent. slags where the blast-furnace charge assays 18 per cent. copper.

I have obtained the following formulas for calculating the percentage of copper lost in slag: Assuming 100 parts of furnace charge, if the weight of slag is  $x$ , then the weight of matte is  $90-x$ , (considering the weight of gases,  $SO_2$ ,  $SO_3$ ,  $CO_2$  and  $H_2O$  to be 10 per cent.). If the percentage of copper in the

charge is  $p_{ch}$ , the per cent. in the matte  $p_m$  and the per cent. in the slag  $p_s$ , we can say that the copper in the charge equals the copper in the matte and slag, dust not being considered. This gives

$$x \cdot \frac{p_s}{100} + (90 - x) \frac{p_m}{100} = 100 \cdot p_{ch}$$

or

$$x = \frac{90 p_m - 100 p_{ch}}{p_m - p_s}$$

and the weight of matte,

$$(90 - x) = \frac{100 p_{ch} - 90 p_s}{p_m - p_s}$$

The efficiency of smelting is,

$$E = \frac{Cu_m}{Cu_{ch}}$$

or

$$E = \frac{p_m}{10 p_{ch}} \cdot \frac{9 p_m - 10 p_{ch}}{p_m - p_s}$$

The loss is,

$$1 - E = L = \frac{p_s}{10 p_{ch}} \cdot \frac{9 p_m - 10 p_{ch}}{p_m - p_s}$$

With the above formula I can determine the percentage of copper loss. I cite the following examples to illustrate the application of the formula:

CALCULATION OF COPPER LOSS.	
	Per Cent. Cu. Lost.
<i>Slag 0.4%, and Matte 50% Cu.</i>	
Furnace charge containing 4% Cu.	8.3
Furnace charge containing 8% Cu.	3.7
Furnace charge containing 20% Cu.	1.0
<i>Slag 0.6%, and Matte 50% Cu.</i>	
Furnace charge containing 4% Cu.	12.4
Furnace charge containing 8% Cu.	5.5
Furnace charge containing 20% Cu.	2.0
<i>Slag 0.4%, and Matte 30% Cu.</i>	
Furnace charge containing 4% Cu.	7.7
Furnace charge containing 8% Cu.	3.2
Furnace charge containing 20% Cu.	0.5
<i>Slag 0.6%, and Matte 30% Cu.</i>	
Furnace charge containing 4% Cu.	11.7
Furnace charge containing 8% Cu.	4.8
Furnace charge containing 20% Cu.	0.7

From the above it is evident that tenor of copper in the matte is not the only factor to be considered in reckoning the percentage of copper lost in slag.

F. A. SUNDT.

Casilla 1807, Santiago, Chile, S. A.  
April 2, 1910.

### More Anaconda Listed

The application of Anaconda for the listing of \$75,500,000 additional stock, issued in connection with the absorption of Amalgamated, was granted May 20 by the New York Stock Exchange. All the subsidiaries of Amalgamated which receive Anaconda shares in exchange for their properties and plants pledged themselves not to dispose of these shares until a distribution is brought about by dissolution proceedings, and Amalgamated agreed not to dispose of 1,425,862 shares out of the 2,425,862 shares it will receive without giving 30 days' notice to the Stock Exchange. This is in compliance with the rule of the Exchange for preventing the officers of a corporation from speculating in the stock of subsidiary companies.

## Johannesburg Notes

SPECIAL CORRESPONDENCE

The work of developing the far-eastern portion of the Witwatersrand goldfield is being taken seriously in hand. In this region, known as the East Rand basin, the beds dip at a very flat angle over an area about 10 miles square. The Geduld Proprietary is mining from shafts from 1000 to 2000 ft. deep. At from 3000 to 4000 ft. the Brakpan mines have to date opened up 900,000 tons of payable ore on a capital expenditure of about £450,000 for mining work. Where the reef lies at a shallower depth and outcrops, it has long been mined in the New Kleinfontein, Van Ryn and New Modderfontein mines: The Van Ryn Reef and Apex mines are now developing on the dip of these mines. Further south the Rand Collieries and Van Dyk mines are also developing and to the East on the Grootvlei, Welgedacht and Springs shaft sinking has been started. In a few years this section will add largely to the output of the Rand.

### MARRIOTT COST SCHEME NOT GENERALLY ADOPTED

Discussion is still active over the merits and demerits of the new scheme of comparing working costs proposed by Mr. Marriott. It is not considered likely that the scheme will be generally adopted outside of the Rand Mines, Ltd., and other mines controlled by Messrs. Eckstein, and even there it will probably be only partially adopted.

### EXTENSIVE DEVELOPMENT FAVORED

The total ore reserves of all the Witwatersrand mines are estimated at about 70,000,000 tons. In this district few drives require timbering and therefore the maintenance of ore reserves and extra development is a trifling matter. It is also considered that the loss of interest on money locked up and spent in excess development is warranted by the continuity of output and ease and cheapness in working thus guaranteed. For these reasons the practice of having large ore reserves is growing in favor on the Rand. The East Rand Proprietary mines are spending nearly a million pounds in excess development to enable the hastening of better schemes of working and ventilation. In many other mining fields, however, excess development becomes unremunerative, owing to the expense and difficulty of keeping development work timbered and secure.

### INVESTIGATION OF IRON RESOURCES

The usual agitation to establish an iron and steel industry in a new country before the time is ripe has lately been in evidence in the Transvaal. Statements were made about enormous bodies of excellent iron ore, fluxes, and coal being

available, but the troubles that have overtaken the attempt to smelt iron ore in New South Wales where conditions are much more favorable to the establishment of the industry, were never mentioned. The Government was induced to call for a report from Mr. Harbord, an English iron expert, and his report is now made public.

The report states that most of the accessible orebodies are silicious and would be expensive to smelt; most of the limestone also carries silica. It has not been proved that high-grade coke can be produced on a large scale cheaply from Transvaal coals or that electric power can be produced at a low enough cost to justify electric smelting. Mr. Harbord therefore recommends that further prospecting of the orebodies be carried out and that experiments be made in the production of high-grade coke. If this work shows favorable results and the government is prepared to take iron and steel for railways at a suitable price, he considers that an industry might be started on a small scale.

## The Bureau of Mines' Head

SPECIAL CORRESPONDENCE

Pressure upon the President in behalf of the appointment of Dr. J. A. Holmes, now head of the Technologic Branch of the Geological Survey as chief of the newly created Bureau of Mines continues to be strong. An influential delegation which recently waited upon the Executive included in its numbers Senator Oliver, of Pennsylvania, Ex-Governor Fleming, of West Virginia, John H. Jones, of Pittsburgh, Hugh Murray, of Illinois, Edward Orton, of Columbus, O., Thomas H. Johnson, consulting engineer of the Pennsylvania Lines west of Pittsburgh, W. J. Richards and P. H. Nelson, of Philadelphia. President Taft has as yet definitely committed himself to no one, but has merely listened to the representations made him. There seems to be very strong indorsement for Doctor Holmes among the coal operators particularly. Some opposition to his appointment has, however, apparently developed in influential quarters in the Administration, and the chances of Doctor Holmes' selection will be improved if this can be definitely overcome or set at rest. Meanwhile, new candidates are developing their claims from day to day. The argument of Doctor Holmes' opponents is that the man to head the new bureau should be one not now in the Government service, preferably a mining engineer of experience, who has had his active career in private employment and is prepared to devote the results of his career to the Government service in developing the new bureau along original lines.

**William Phipps Blake**

Dr. William Phipps Blake, who for years past has been the dean and senior of American geologists, died at Berkeley, Cal., May 22. He had gone there to attend the anniversary exercises of the University of California, and caught a cold, which rapidly developed into pneumonia. He was 84 years old, having been born in New York in 1826, though he came from an old New England family. He graduated in 1852 from the Yale Scientific School, being a member of the first class in that school, then newly established, and since developed into the Sheffield Scientific School. Only two members of the class survive him.

He had devoted himself to the study of geology, and his first appointment after graduation was as geologist and mineralogist attached to the exploring expedition sent out to survey lines for a railroad to the Pacific Coast. After several years' work in the West and in California, he returned to New York and for two years was editor of the old *Mining Magazine*, then published in this city. In 1862 he went to Japan as geologist in the service of the Japanese government and remained there for two years. On his return to this country he was again employed by the United States, this time to make geological explorations in Alaska, then just acquired by the United States from Russia. He made an elaborate report later on the Stickeen river country and adjoining sections.

In 1865 Dr. Blake was made professor of geology and mineralogy in the College of California, now the University, and held that position for several years, still continuing his work of exploration and geological study. He held several other public appointments, being geologist to the Santo Domingo Commission of 1871-2, and later one of the commissioners of the Centennial Exposition of 1876. He was also a member of several important exploring expeditions, and his reputation as a geologist, then well established, brought him constant work. He had made his home in New Haven, Conn., and always retained his residence there, but he spent a large part of his time in the Southwest, especially in Arizona, to which territory he became attached by many ties. In 1894 he was appointed director and professor of geology in the Arizona School of Mines at Tucson, and devoted much time to building up the school. He held the position for 11 years, becoming *emeritus* professor in 1905. In all those years he spent about half the year in Tucson and about half in New Haven, and he was also actively employed in exploration and consulting work. Advancing age seemed to have no effect upon his activity, and he was a student up to the last.

With all his active work, Professor Blake was a constant writer. He published several books, among them "Geological Reconnaissances in California," "Silver Ores and Silver Mines," "Ceramic Art and Glass" and "Mines of Arizona."

His contributions to scientific societies and the scientific press were numerous. He was for many years a frequent contributor to the *ENGINEERING AND MINING JOURNAL*; his last article appeared in the issue of Jan. 8, 1910. His command of geological and mining subjects, and his faculty of clear expression and vigorous writing made him always a welcome contributor. Personally, he had no mercy upon indolence or false pretense; but his genial and unaffected manner and his interest in his own and others' work made him friends everywhere.

He received many honors from colleges and societies, and was member of many associations. He was an active member of the American Institute of Mining Engineers and a frequent contributor to its *Transactions*. He was an active member of the American Philosophical Society and a fellow of the Royal Geographical Society of London.

Professor Blake was married in 1855 to Charlotte H. L. Hayes, of South Berwick, Me. His wife died some years ago. He leaves three sons, Francis H. Blake, of Litchfield, Conn.; Dr. Joseph A. Blake and T. W. Blake, of New York.

**Cement Production in 1909**

The following preliminary estimate of the production of cement in the United States in the year 1909 has been prepared by Ernest F. Burchard, of the United States Geological Survey. As shown by the quantities reported by the various cement plants, the production of portland cement in 1909 was between 61,300,000 and 62,000,000 bbl., which, valued at 85c. per bbl., was worth at the mills between \$52,105,000 and \$52,700,000. This represents an increase in quantity of at least 10,227,000 bbl. over the production in 1908. The increase in quantity was at least 20 per cent. over that of 1908. The reported selling price per barrel averaged the same as in 1908.

The returns for natural cement indicate that the total production in 1909 was not far from 1,500,000 bbl., valued at about \$675,000, an average value of 45c. per bbl. These figures show a slight decrease as compared with those for 1908, when the production was 1,686,000 barrels.

The production of puzzolan cement, as reported, shows a slight increase, about 160,646 bbl., valued at \$99,453, having been produced in 1909, as compared with 151,451 bbl., valued at \$95,468, in 1908.

**Mohawk Mining Company**

The Mohawk Mining Company, Mohawk, Mich., produced its copper at a total cost of 11.207c. per lb. in 1909, of which 10.22c. represented its cost at the mine. The summary of results is given in an accompanying table, and another table gives the segregated mining and treatment costs.

**RESULTS AT MOHAWK IN 1909.**

Rock hoisted.....	902,691 tons.
Rock stamped.....	819,019 tons.
Mineral produced.....	14,690,200 lb.
Yield of fine copper.....	11,248,474 lb.
Yield per ton of rock treated	13.73 lb.
Cost per ton of rock hoisted..	\$1.27
Cost per ton of rock stamped	\$1.40
Cost per lb. refined copper at mine.....	10.22c.
Smelting, freight, marketing, office.....	0.875c.
Total cost per lb., refined copper.....	11.095c.
Total cost per lb., including construction.....	11.207c.
Average selling price per lb..	13.20c.

**COSTS AT MOHAWK.**

Underground expense.....	\$739,994
Superintendence, freight on mineral, mine office and general....	67,246
Rock house.....	53,349
Transportation.....	98,049
Stamping.....	157,401
No. 6 shaft.....	33,639
	<b>\$1,149,678</b>

There were 968 ft. of shaft sinking, 12,723 ft. of drifting and 52,918 cu. fathoms of stoping done during the year. The average new openings showed no improvement in copper content. Under date of March 17, President Joseph E. Gay stated that the new shaft, No. 6, was at that date rapidly approaching the fifth mine level, and that the rock seemed to be above the average in grade. The company closed the year with a surplus of \$508,291 after paying \$300,000 in dividends.

**Smelting in Bond**

**SPECIAL CORRESPONDENCE**

Another delay has occurred in the formulation of the new smelting-in-bond regulations, which have been in course of preparation by the Treasury, and which are designed to carry into effect the smelting provisions of the Payne-Aldrich tariff. The delay has been due to dissatisfaction on the part of the smelting interests, to whom the regulations have been submitted. The smelting people have been able to enlist the powerful aid of Senator Aldrich, who has been frequently at the Treasury Department for the purpose of consulting with the authorities. The fact that the language of the tariff act is ambiguous and crude has hampered the Treasury in its effort to arrive at a decision, and has increased the disposition to listen to the arguments of the interests that will be affected by the regulations. New drafts of the regulations have followed one another in rapid succession. It is admitted that the smelting provisions of the tariff act are in need of drastic revision.

# 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

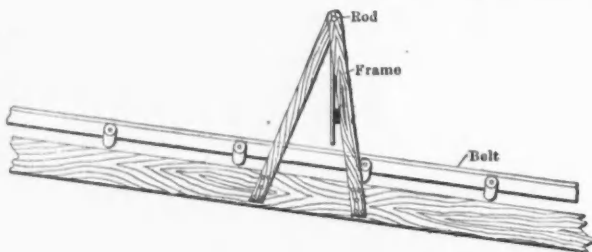
## Safety Device on Dredge Tailings Stacker

Where a long tailings stacker is required and a high bank must be carried, much trouble is caused by large rocks rolling back down the stacker belt. The Folsom No. 6 boat, of the Natomas Consolidated, of California, digs to a depth of 54 ft. below water line and carries a bank 30 ft. high. This necessitates an unusually long tailings stacker (150 ft.), and so much trouble was caused by large rocks rolling back down the stacker that an apparatus had to be devised to intercept them.

Uprights from either side of the stacker frame carry an iron rod on which are suspended a number of iron strips or

ft. 4 in. x 12 ft. and 8 ft. high. It contains 2 cu.yd. of rock and 14 cu.yd. of cement. The weight is approximately 62,000 pounds.

The mortars are held in place by 16 hold-down bolts  $1\frac{1}{2}$  in. x 5 ft., threaded 6 in. from the end and fitted with two nuts. The lower ends of the bolts were forged to take a 12-lb. rail. Four 13-ft. rails pass through the forged eye and connect all of the bolts, not only for the mortar but for the battery posts as well. The battery posts are held down by the bolts passing through special cast-iron angle irons. The upper 18 in. of each bolt is surrounded by  $1\frac{1}{2}$ -in. pipe, which allows a slight springing of the bolts in case they do not line exactly with the holes in the mortar. A piece of soft rubber packing

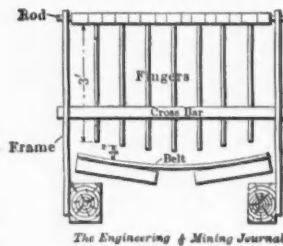


SAFETY DEVICE ON DREDGE TAILINGS STACKER

fingers which are free to swing in the direction of belt travel, but cannot swing back on account of a lower crossbar against which they hang. The supporting frame is built heavy enough to sustain possible shocks. The fingers are made of strips of iron, about  $\frac{1}{2}$ x2 in., bent about the axle rod and also so as to present their narrow faces to rocks. Rocks can pass up the belt under these traps but cannot force through from the upper side. The traps are set sufficiently close together so that rolling rocks will not acquire enough momentum to wreck one upon striking it.

## Cost of Concrete Battery Foundation

The literature on detail costs is scarce enough to warrant the following cost statement and description of a concrete battery foundation that was built for the Tanguay Mining and Milling Company at Idaho Springs, Colo. The foundation supports ten 1000-lb. stamps dropping 5 in., 108 times per minute. The base of the foundation is 5x16 ft. The top is 2



The Engineering & Mining Journal

$\frac{1}{8}$  inch thick was inserted between the mortar and the foundation.

The cost as given by J. H. Haynes (*West. Chem. and Met.*) was as follows: Labor, excavating, \$32.30; labor, foundation, \$68.30; bolts and castings, \$50; cement, \$33.70; lumber, \$10; gravel, \$30; and rock, \$7.25; or \$231.55 for the complete foundation.

## A Blow Pipe Bead without Platinum Wire

A method of obtaining a blow-pipe bead without the use of the platinum wire is described by L. Kopa and B. König, in *Chem. Zeit.*, March 12, 1910. One end of a glass rod is heated in an alcohol flame and dipped into a thorough mixture of two parts by weight of powdered borax and one part of litharge. This end of the rod is then heated again, whereby an easily fusible bead of lead borate is formed. This is cooled off slightly, dipped into the substance to be examined, heated again and after thorough fusion cooled off. The bead will then show the characteristic color.

## Wear of Diamonds in Drilling Various Rocks

The most important consideration affecting the wear of diamonds is the hardness of the minerals composing the rock. The next in importance is the cleavage of the minerals. Some minerals, like mica, are so easily cleaved, that it is difficult to scratch them without splitting off plates. Feldspar and the carbonates possess perfect cleavage, and that of hornblende is easy. Zoisite and epidote present more difficulty, while quartz, magnetite, and pyrite are practically uncleavable, and therefore need more grinding. Quartz is brittle. The commonest rocks in Western Australia are granite, amphibolites, and greenstones. The accompanying table<sup>1</sup> gives the cost of diamonds for drilling in the various rocks based upon the actual wear of the diamond cutting a  $1\frac{1}{16}$ -in. core.

COST OF DIAMONDS PER FOOT DRILLED.	
Granite: Kookynie, Leonora	\$1.45
Amphibolite: Moderate grain: Bellevue	3.65
Amphibolite: Fine grain: Cumberland	1.70
Amphibolite: Very dense: Gwalla, Wiluna	4.37
Quartz-dolerite greenstone (micaceous): Great Fingall and Day Dawn	2.40 to 2.90
Quartz-dolerite greenstone (chloritite): Kalgoorlie	1.20
Quartz-dolerite greenstone (sericitite): Kalgoorlie	0.75

## COARSE GRAINED ROCK EASIEST TO DRILL

Of these rocks, the granite and the quartz-dolorite greenstone contain a notable amount of quartz, and yet the costs for these rocks are exceeded in the case of amphibolites, which contain little or no quartz. The cause of this anomaly is due to the texture and structure of the rock.

Granite is a coarse-grained rock, and the structure is simple. The bounding surfaces between any two minerals are plain or slightly curved and there is little interlocking. The softer and more easily cleavable minerals, mica and feldspar, are easily ground away, and the quartz, becoming isolated, is then broken in large pieces. In the quartz-dolorite greenstone, secondary changes have produced a great deal of chlorite, carbonate and sericite, all soft and easily cleavable minerals, and the quartz, iron ores, or sulphide are practically surrounded by these. In the micaceous quartz dolorite from the Day Dawn, these secondary changes have not proceeded nearly as far as in the Kalgoorlie rock, and the rock, though consisting of similar minerals to granite, has

<sup>1</sup>Monthly Journal of the Chamber of Mines, of Western Australia, Feb. 28, 1910.

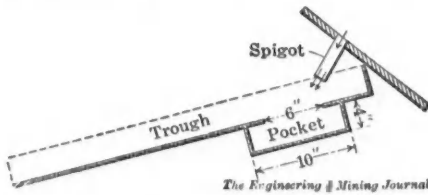
a far more interlocked structure, and consequently needs more grinding down.

**FINE GRAINED DENSE ROCKS PRODUCE EXCESSIVE WEAR**

In amphibolite, hornblende is always a secondary mineral and has a tendency to be fibrous, with interlocking boundaries, so that though an easily cleaved mineral, only small fragments are able to split off at a time. The finer the grain, and the more the amount of interlocking, the more the rock will require grinding away, and the less it will break, thus increasing the cost of drilling. The amphibolite from the Gwalia Consolidated is quite an abnormal rock. The texture is so dense, that the separate minerals can be distinguished with difficulty, under the highest powers of the microscope. It is a rock consisting of two parts, the one green, like the Cumberland rock, and mostly made up of interlaced hornblende, and the other brown-gray, and apparently made up of fibrous zoisite. It is the latter that is responsible for the excessive wear and the polishing of the diamond.

**A Pocket to Prevent Launder Wear**

A launder which conveys products from jig and classifier spigots usually wears through in a short time at a point where



LAUNDER WITH SAND POCKET

the sands from the spigot strike the bottom of the launder. A scheme that is used in some of the Joplin mills for saving this wear consists of a pocket about 4 in. deep, 10 in. square, with an opening about 6 in. square connecting it with the bottom of the trough. Concentrates accumulate in this pocket, thus affording a protection from the abrasive effect of the discharge.

**Laying Mill Dust with Water Sprays**

In the crusher house for the new West mill of the Bunker Hill & Sullivan company, at Kellogg, Ida., the dust is almost entirely eliminated. Ordinary fruit-tree sprayers are directed over all crushers, rolls and at the discharge end of conveyor belts. The fine mist serves to collect and lay nearly all the dust. The only possible objection to the use of the sprayers is from the wetting of the floors and machinery in the plant. This

is, however, not nearly so objectionable or dangerous to health as an atmosphere full of dust particles. Then, too, it is easier to clean up the moistened material than the light, dry, all-pervading dust.

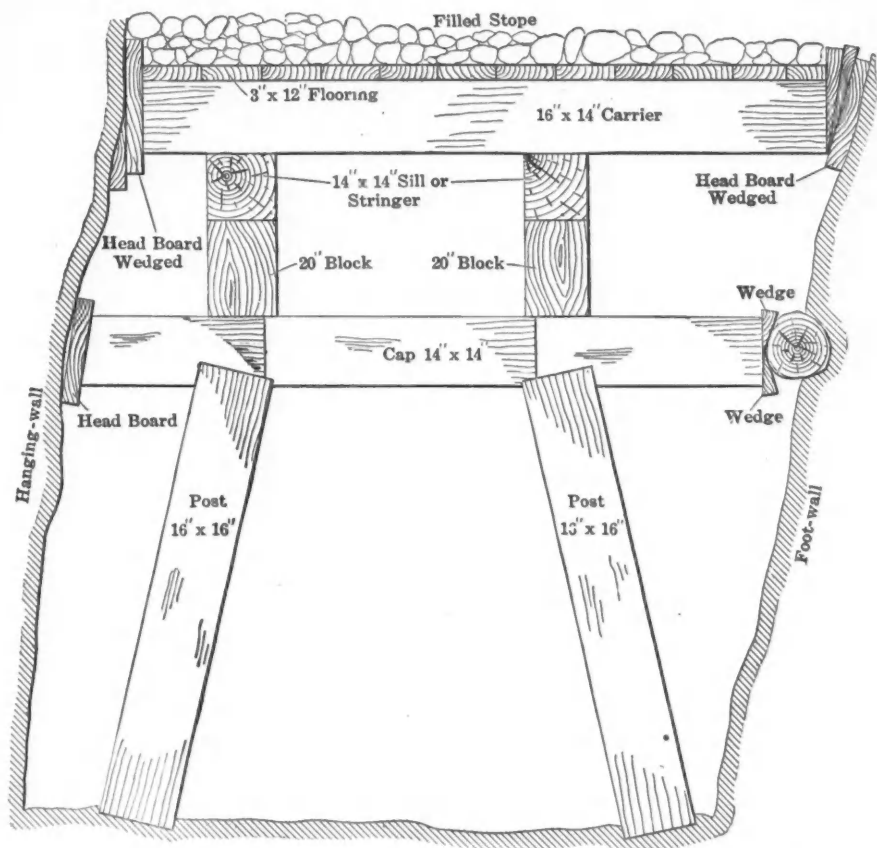
**Drift Timbering for Heavy Ground**

On the Mother Lode of California especially where mining is conducted in the black Mariposa slates, great difficulty is experienced in keeping the drifts open. It is not uncommon to see huge drift timbers crushed and splintered within two weeks' time. Occasionally drift sets require retimbering so often that by the time a stope is worked out the drift be-

or pressure of the walls is sufficient to hold the carriers so firmly that they will support the stope filling during any necessary replacement of drift sets. In this manner the drifts are kept open for their full height and plenty of head room is assured in the main passageways of the mine.

**Errors in Testing Cyanide Solutions**

As the effect of potassium iodide in testing cyanide solutions for protective alkalinity described in a paper by Bede Collingridge before the Institution of Mining and Metallurgy, and an abstract of which was published in the JOURNAL



DRIFT TIMBERS AT KENNEDY MINE, CAL.

low, originally 8 ft. high in the clear, will be barely high enough to allow the passage of an ore car. It is usually considered economical to run the drifts in the orebody.

Above the drifts in the Kennedy mine at Jackson, a system of carriers on stringers is used to support the stope filling above. The accompanying sketch shows the usual method of timbering drifts in such heavy ground. The cap of the tunnel set is blocked against the walls and blocks set above the posts carry the stringers, locally termed sills. These in turn support the carrier timbers which extend across the drift and are also blocked against the walls by head boards. The flooring of the stope is laid on these carriers. In most cases the horizontal swell

of March 12, was contradicted in the discussion, H. L. Sulman and Frederick Reade undertook further experiments.<sup>1</sup>

**FINDINGS OF SULMAN AND READE**

They found that the presence of potassium iodide obscured the end point to an extent which may or may not be negligible according to other conditions. They said:

"The facts are these—in presence of silver cyanide and potassium iodide, phenolphthalein does not give a sharp end reaction; the indistinctness is a double one, due, principally, to the constant return of the phenolphthalein color indicating alkalinity after its discharge by standard acid to an apparent neutral

<sup>1</sup>Bull. No. 67, I. M. M., April 14, 1910.

point, and, to a minor extent (owing to the employment of unnecessary amounts of potassium iodide and silver solution), due to the masking of faint alkaline colorations by the iodide of silver suspension."

#### TITRATION ERRORS

When using a strong acid solution, say one-tenth normal, the end point of the reaction is sufficiently sharp to give accurate results, but if one wishes to determine small amounts of protective alkali in small quantities of highly dilute cyanide solutions (such as may be derived from the treatment of slimes by decantation) one is entitled to employ standard acid of a dilution commensurate with requirements, say 0.04 normal. Under such conditions the error becomes noticeable, and is further accentuated by the use of silver nitrate in excess in the first (or cyanide) titration. If, however, no iodide be used, the results with the weak acid are absolutely accurate and the reactions quite normal.

The phenomena are explained as follows: "In the titration for cyanide, with silver, all potassium cyanide (which would otherwise give its full alkali value on titration with acid) must first be converted into the double cyanide  $K_2C_2N_2$ ,  $Ag_2C_2N_2$ , a compound which is not decomposed by dilute acid, in which the combined moiety of  $K_2C_2N_2$  does not therefore show alkalinity on titration with standard acid and an indicator.

"The end point of the cyanide reaction is, however, necessarily marked by the precipitation of silver cyanide as a cloudy suspension. This precipitated silver cyanide now reacts with potassium iodide, forming yellow silver iodide, and free potassium cyanide, of course with its equivalent alkalinity."

#### CONCLUSIONS

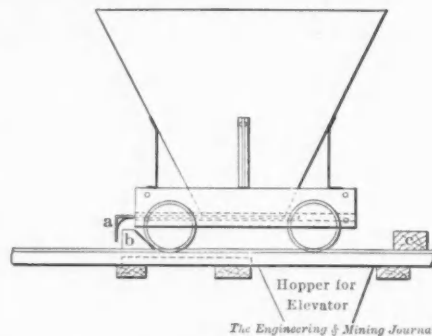
Sulman and Reade conclude by restating Mr. Collingridge's proposition thus: "If small amounts of protective-alkali are required to be measured by dilute standard acid solutions, the use of potassium iodide as an indicator for the cyanide reaction point will give rise to serious error in regard to protective alkalinity present.

"Further, the error will be greater in proportion to the overdoing of the cyanide end reaction with silver-nitrate solution, in presence of an equivalent addition of potassium iodide; this is due to the reaction between argentic cyanide and potassium iodide in producing free potassium cyanide."

At the Ready Bullion mine of the Alaska United Gold Mining Company, Douglas Island, Alaska, there were only four accidents, one of which was fatal, among 489 employees exposed to risk in 1909. At the 700-Ft. Claim mine of the same company there were no accidents to any of the 306 employees.

## Self Dumping Car

The accompanying illustration shows a handy device for a haulage system of small capacity. The car here described has a capacity of 1 cu.yd. and two cars handle 175 tons per shift. The car in question is hopper shaped, is about 4 ft. square at the top and 1 ft. square at the bottom. A sliding door *a*, made of ½-in. steel plate, is placed in the bottom as shown, and as the car approaches the elevator pit the end of the door plate *a* strikes a lug *b*, between the rails, and pulls it open. A bumper *c*, is placed in front of the car to prevent it from going too far and drawing the sliding door out of its place. To close the gate, or door, a 2x6x30-in. plank is fastened at one end to a tie. This plank has one free end, which is moved out to the middle of the track, and as the car is pulled back by



SELF DUMPING CAR USED AT JOPLIN, MO.

hand, the gate strikes it and is pushed back in place. When the gate is closed the free end of the plank is pushed out of the way and the car sent to the stock pile for loading. This car is hauled by one horse, and is used for handling tailings that are being retreated in the Joplin district.

## New Use for Small Hammer Drills

Small hammer drills are used with a chisel bit in the Hecla mine at Burke, Ida., for cutting off the crushed ends of timbers. In the stopes the greatest pressure is from the squeeze of the walls, and as the ends of the stulls and caps become splintered and crushed, it is necessary to cut them off and put in new blocking. It is often difficult to get at the crushed timbers, and, even when accessible, it is not an easy job to chisel or saw the wet and twisted fibers by hand. The cutting of the wood is rendered quite easy with the drills, and by using sufficiently long bits, almost any desired place can be reached. The drills and chisels may also be used to great advantage for chiseling wall plates when an extra shaft compartment must be added, or in cutting off posts to ease up drift sets in heavy ground. In a number of mines, the blocking on drift caps

is shot out when it is necessary to ease up on the sets; this work can much more safely and surely be accomplished with the drill.

## Magnet for Removing Iron from Ore and Pulp\*

The Premier diamond mine handles over 30,000 tons of material per day which contains more or less metallic iron as a waste product from the tools used. The concentration methods are so good that about one ton of concentrates per day contain the entire diamond output.

The concentrates are fed by hand into a hopper which distributes them over a slowly moving canvas belt 4 ft. wide; on this belt they first pass under a narrow magnet placed across the width of the belt, and along the face of this magnet runs a small canvas belt. All metallic iron particles are attracted and lifted up by this magnet and carried and thrown on one side by the small belt. They amount to about 10 per cent. by weight of concentrates.

The remainder is then carried on by the main belt, and allowed to fall between the poles of a pair of powerful magnets, where they are divided by a knife edge; the nonmagnetic particles dropping straight down and the others being deflected. The field which produces second separation is an exceedingly powerful one (B 20,000 per sq.cm. estimated). The pole pieces are about 4 to 5 ft. wide, and are wedge shaped, tapering from 6 to 8 in. to a curve of about ¼-in. radius, at which part, of course, the flux is concentrated. The main coils are four in number, each resembling one of the field coils of a large two-pole dynamo. The current taken by these is about 40 amp. at 500 volts.

## A Timber Skip

At the South Eureka mine, near Sutter creek, Cal., a special skip is used for lowering timbers. The shaft is inclined at angles varying up to about 70 deg. The timber skip is hung below the rock skip from a ring on the bottom of the latter. It is made from an old skip by taking out the top plate and using an extra long bail, hung from the axles of the front wheels. By having the top of the skip open, timbers can be taken out by simply swinging them down, thus obviating the necessity of raising and lowering the skip for jacking. The extra length of bail enables long timbers to be handled.

It is reported that flint pebbles from the Colorado river are being used in the tube mills of the Gold Road and Tom Reed mills in Mohave county, Arizona.

\**Trans.*, South African Inst. Elect. Engr., Feb., 1910.



# Oil Developments in California

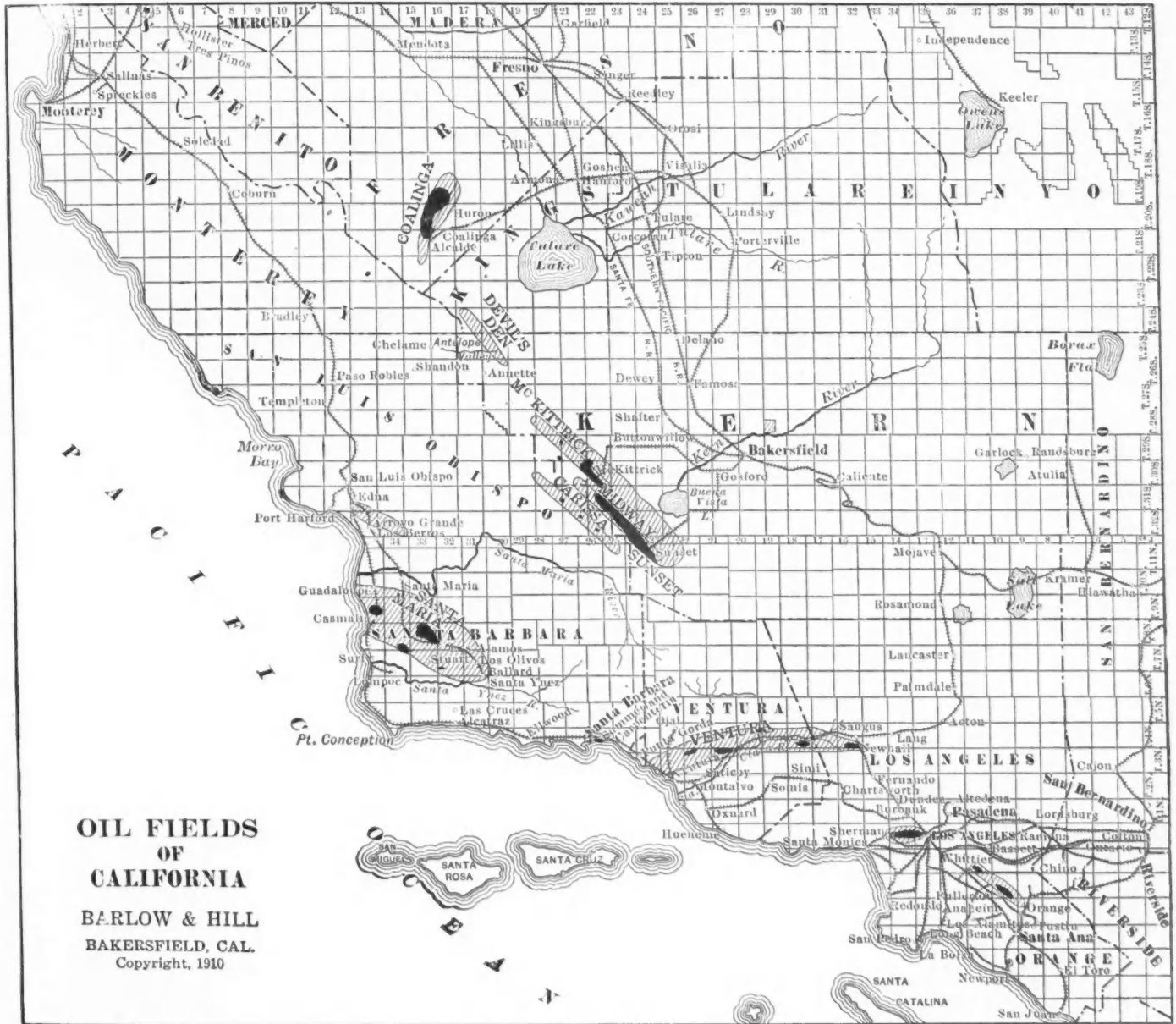
The American National Bank, of San Francisco, in its April financial letter, says: "Most active of all the industries of California is that of oil. The revival of interest stimulated by a few remarkable gushers, is rapidly attaining the proportions of a boom. One collateral result of great importance in this connection is the future effect of cheap

steamers, \$12,250,000; 35 refineries, \$18,000,000; 20,000,000 bbl. of oil in storage, \$10,000,000; field equipment, pumping machinery, etc., \$12,250,000.

### EFFECT OF LAND WITHDRAWALS

Curtis H. Lindley, in an address to the San Francisco Bar Association, April 29, states that there are 2,400,453 acres of

lands adjacent. Thus, the reservations, if long continued, inure to the benefit of the monopolies and in reality do not conserve. Judge Lindley also pointed out the injustice to industries under the present laws, which make permits to operate hydroelectric plants on the government reservations revocable at the will of the Secretary of the Interior instead of be-



and unlimited fuel in the development of manufactures. Possessing great resources of raw material, California is now being supplied with one of the essential factors necessary to the expansion of the creative industries." The amount of capital invested in oil properties exclusive of the lands, is estimated at \$113,000,000, of which the chief items are: 420 wells, \$42,000,000; 2100 miles of pipe lines, \$12,600,000; 35 tank

presumptive oil land withdrawn from entry, and that 70 per cent. of the adjacent lands are owned by the Southern Pacific Company and affiliated companies, and the Standard Oil Company. Since the oil occurs in underground reservoirs of considerable horizontal dimensions, Judge Lindley raises the point that while these lands are being conserved, these corporations are gradually sucking out the oil therefrom, through their wells on

ing granted for a sufficient time to warrant the installation of expensive electric plants.

On April 30, a meeting of oil men was held in Coalinga and resolutions were adopted to be forwarded to Congress calling attention to the injury which would result to vested rights if the Pickett bill now before Congress were passed with the clause that makes invalid claims located prior to the with-

drawal of Sept. 17, 1909, in case oil was not actually known on the claims at that time; and asserting as does Judge Lindley, that wholesale withdrawals are for the benefit of the large corporations as their wells draw on the common reservoirs of reserved and nonreserved lands.

The production of the California fields for March was the greatest in the history of the oil industry in the State, amounting to 5,598,745 bbl. The Sunset-Midway oilfield reached first place in March in production. This practically is due to the big wells brought in in the Midway field, such gushers as the Lakeview and the Standard's well adding tremendously to the output. The March

yield of the Sunset-Midway field was 1,300,000 bbl. The production of the same territory for December was 560,000 bbl. The official figures for March are as follows:

SAN JOAQUIN VALLEY.	
District.	Bbl.
Coalinga	1,125,000
Kern River	1,120,000
Sunset-Midway	1,300,000
McKittrick	430,000
Total	3,975,000
COAST FIELDS.	
Santa Maria	582,000
Lompoc	57,000
Cat Cañon	55,000
Edna (Arroyo-Grande)	2,100
Watsonville	4,500
Summerland	6,400
Total	707,000

SOUTHERN FIELDS.	
Salt Lake-Sherman	280,740
Whittier	80,000
Coyotes	35,000
Los Angeles City	44,000
Newhall	11,005
Ventura county	38,000
Fullerton, Bear Cañon and Puente	427,000
Total	916,745
Total of all fields	5,598,745
Storage in southern fields about	350,000
barrels.	

#### OIL IN OREGON

While there are misleading reports in print as to the oil possibilities of Malheur county, Oregon, it appears that oil mixed with water has actually been found at 1100 ft. in a well near Vale. Drilling is actively going on at a number of points in this county.

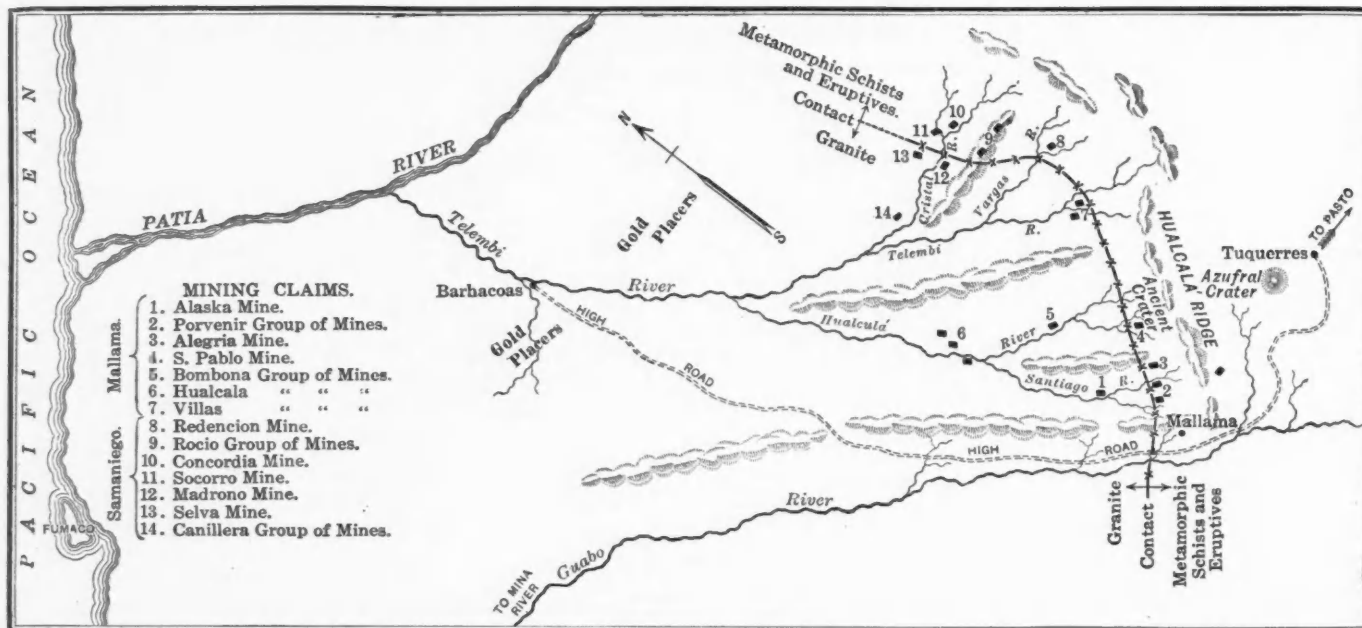
## Mining in the Department of Pasto, Colombia

The mining districts of Mallama and Samaniego are reached from the port of Fumaco, Colombia, via Barbacoas, from which point a wagon road leads to these districts. The accompanying sketch and data contributed by F. P. Gamba, show the general geographical distribution of the mines and the situation of

age value of the ore is \$47 per ton, of which \$22 is gold. An interesting feature here is that true granite is impregnated with ore and will carry \$7 per ton. It is probable that this mine will develop into a large producer.

The Bombona mine is owned by an American company. A large plant is in

A native company owns the Pendencion mine, and a stamp mill is under erection to treat the low-grade, free-milling ores of this property. The ores are aplitic segregations from the granite. Another native company is also erecting a mill to treat the free-milling ores of the Rocio group of mines.



SKETCH MAP OF THE MALLAMA AND SAMANIEGO DISTRICTS, COLOMBIA

the principal ones along the contact between granite and schists.

The Porvenir mine is owned by a native company, and is on the zone of contact between the granite-syenite formation and the metamorphic schists of Hualcalá ridge. Development is going on at the present time, chiefly on the surface, and a great many veins have been discovered in the granite, on the contact and in the metamorphic schists. Large quantities of free gold are found in the outcrops and in the decomposed zone. The aver-

course of erection and will treat the ores by an all-slime cyanide process. This plant is expected to be in running order next summer. The ores are similar to those of the Porvenir mine.

The ores of the Hulcalá group are quite different from those of the Porvenir and Bombona. They carry pyrite, but are also rich in chalcopryite. The ore is of low grade and occurs in thick lodes, one of which is 25 m. in thickness. This group is owned by an Ecuador company and is being developed.

The Concordia mine, the most important in these districts, has been extensively developed and has opened up large bodies of free-milling quartz which carries 1½ to 2 oz. gold per ton. A native 50-stamp mill is on the property, but a large modern plant is in course of erection. The tailings will be treated by cyanide. This property is also owned by a native company.

The Madrono mine is owned by the same company as the Concordia and has a native stamp mill of 20 stamps. This

mine is situated in the granite. The Madrono was the first vein mine worked in this department. The Selva mine is in about the same condition as the Madrono. An American company owns the Canilera group of mines and is developing.

#### PRODUCTION

Outside of these, there are many claims granted and many undergoing preliminary exploration. The yearly production of the lode mines in this depart-

ment is: Concordia, \$234,000; Socorro, \$75,000; all others, \$51,000; total, \$360,000. Gold placers are worked by negroes for a yearly production of \$240,000, making a total yearly production of \$600,000 from the Department of Pasto.

## The Elements of Slime Concentration \*

Considering the progress of concentration methods for the last 30 years, it appears possible to draw certain conclusions which may be considered as elements governing the probable developments in the future. There have been hundreds of inventions, and there have been a few new types which have survived the struggle for existence. The most striking fact is the wide and increasing use of two types of machines, the shaking belt and the jerking tables. Mr. McDermott restricted the discussion to the treatment of material which has passed a screen with apertures of 0.0125 in., in other words, a slime.

#### FIVE CLASSES OF MACHINES

The machines in common use are divided into five types: (1) Fixed inclined tables, including slowly traveling tables; (2) jerking tables, including bumping tables; (3) shaking traveling belts; (4) jerking or bumping traveling belts; (5) shaking side-inclined belts or tables.

Fixed tables include various forms of frames, the old Cornish buddle and various forms of revolving buddles and side-inclined, non-shaking belts. The slow revolution of a buddle or belt and the intermittent automatic discharge of a frame will not affect the action of concentration on the surface, so they may be included in this class. These machines depend simply upon the greater resistance of the heavy minerals to the wash of water down an inclined surface as compared with the resistance of a lighter waste. These machines have to make a middle product in order to yield a clean concentrate. The second class, jerking tables, depends on a combination of greater movement across a table, and greater resistance to wash of water down the table, of the heavy particles as compared to the lighter waste particles. This class, also, for high efficiency must produce a middle product.

The vanning motion of the third class of machines not only settles the heavy minerals on the traveling surface of the belt, but also prevents the larger particles from clinging to its surface. This class makes no middle product. Jerking belts act in the same way as jerking tables. A slowly revolving buddle with a shaking or bumping motion works in ef-

fect the same as does a shaking side-inclined belt. The shaking motion yields some of the advantages of the third class, shaking belts, by assisting the settling of the slime mineral, but a middle product is produced.

#### CLOSEST SAVING MADE BY HAND VANNING

To understand the conditions for a close saving of fine minerals, it is advisable to begin by examining the action of the simplest and at the same time the most perfect appliance in use, and this is the vanning shovel or some equivalent tool in the hands of an experienced man. In this shovel the surface must be smooth and it must be slightly curved in all directions. Its perfect work is shown by the fact that it will always give a definite head of the fine mineral which is going to waste from the most efficient concentrator. The conditions which are essential to good work irrespective of the skill of the operator are as follows: Sufficient time for settling; a smooth surface for final separation; a gentle movement of the washing water; and a motion to assist in differential settling and in separation.

Considering these essentials, the point necessary to insure the commercial success of a concentrating machine may be outlined. It is quite evident from the fact that time must be allowed for the preliminary settling of material on the vanning shovel, that no machine will do close work on slime mineral unless the fine particles are given adequate time to settle from the water in which they are suspended.

#### SMOOTH SURFACE ESSENTIAL

What is well known to be an essential for satisfactory hand vanning—a smooth surface—has been proved by general experience in the use of concentrators for slime mineral to be also the best in mechanical work. It is a constantly recurring fallacy that a rough surface must be good for saving slime mineral. The fact that it is also good for saving fine waste quite annuls the supposed benefit of any roughness. Tables, buddles and belts have been made of wood, glass, slate, marble, cement, rubber, etc., all with a view to getting a necessary degree of smoothness.

The bad effect of an excessive rate of flow of water over the concentrator surface is twofold. A rapid current is, of

course, in the first place unfavorable to the settling of fine mineral, and in the second place it is apt to refloat and carry off some of the particles which by rolling contact with the surface of the concentrator have succeeded in settling. The best motion either in a hand or mechanical concentrator is such as to keep the lighter waste in some semi-suspension in the water, free to move over the clinging, sluggish mineral particles; whereas if both waste and mineral are allowed to once settle fully, the waste cannot be moved except by such a strong wave of motion as is certain to pick up and move much of the fine mineral also.

#### DIRECTION OF PROBABLE IMPROVEMENTS

The design of improved concentrators will doubtless fall within one of the five classes described above, unless it falls into a group of certain well traveled and exhausted lines, such as rate of settling in water, resistance to upward flow of water, centrifugal separation, separation by air, separation by a denser medium than water and flotation processes.

Air separation is unsatisfactory on dust, and is usually inapplicable for commercial reasons. The many attempts to employ centrifugal force in concentrating machines have shown that this principle is impracticable. Flotation processes are not within the scope of this paper. It therefore seems probable that new concentrators which require serious consideration will be modifications of established types, and they may be pretty safely judged by the extent to which they meet the conditions which have been hitherto proved.

It may be mentioned here that on ores from which a single concentrate is required, it is not advisable to make a middle product, for middle products entail an additional loss in the tailing. There are often good reasons in practice for using a middle-product-making machine, but in designing improvements over existing machines this principle should be borne in mind and aimed at.

To sum up the conditions which seem to be the most favorable to any new concentrator which may reasonably be expected to prove an advance over existing machines, it can be said that there must be a large and smooth surface, a regular settling motion which does not jar the finest particles from their contact with the surface when settled, and a delivery of

\*Abstract of a paper by Walter McDermott, *Bull.* No. 67, I. M. M.

clean material without the production of a middle class.

#### CLASSIFICATION NOT ALWAYS ADVISABLE

The necessity for classification before concentration is so marked in some cases and with some machines that it is accepted by many as a comprehensive dogma with full scientific warrant. However, in material finer than 40 mesh, it is a clearly demonstrable fact that the third class of machines, traveling shaking belts, give better results both industrially and theoretically without classification. Concentration on this type of a table depends upon the various functions of specific gravity, inertia, surface resistance, speed of settling, friction of grain, rate of water flow and adhesion to machine surface. These considerations cannot be involved in a mathematical formula. It is known that classification is not necessary for a sample treated on a vanning shovel.

Furthermore, there is a distinct advantage in treating unclassified pulp by machines of this class. The coarser particles form a bed on the belt owing to its upward travel, and the slime, instead of floating down in unchecked waves over the belt surface as it would if treated alone, flows more slowly by a filtering

process in part, and so affords better chance for the settlement of the fine mineral.

In practice, the blind adherence to the belief in classification has led to some curious results. An unsatisfactory method of classification is usually adopted, that of simple pointed boxes. By this system the coarser or bottom discharge is of necessity accompanied by a stream of the finest slime. This last goes to a class of machine not adapted to its treatment in some modern mills, arranged especially with a view of keeping coarse and finer parts separate for treatment. The first step, that of classification, is thus most imperfect.

The experience in some of these mills has led to the supposed discovery that machines of the third class are not proper machines for slime treatment, and they are therefore given an intermediate product of the classification system. This conclusion is quite opposed to general experience, because the machines of this class were originally developed for and are continuously used for the direct treatment of ores, crushed fine in batteries and containing small quantities of finely divided and brittle minerals which are valuable enough to demand a close saving.

The explanation of the error is simply that by working on diluted slime alone, the machines of the third class are not working under the best conditions.

#### AN EFFICIENT RETREATMENT OF SLIME TAILING

It is a usual thing to treat the tailings of one slime machine by another machine of the same or different construction. For example, buddles are often made double, or a convex surface may be followed by a concave one, and frames or canvas tables may be used in a long succession, each saving a little. This double treatment can be used with great effect on machines of the third class, treating unclassified pulp but is seldom attempted.

To get the best results from the second machines it is advisable to use a large pointed box between to get rid of some excess of water introduced by the first machine. An increase in belt surface on the second row will add to the efficiency. By this system the slime mineral has a double chance of being saved, there is no excessive dilution of the slime, clean concentrates can be produced, the losses due to rehandling of middle products are avoided and the whole plant is most automatic in character.

## Electrolytic Process for Low Grade Zinc Ores

BY EDUARDO SANNA\*

During the last 20 years many experiments have been made with electrolytic processes for the extraction of zinc from simple and mixed ores containing zinc, lead and silver. Many new methods for such extraction have been patented in Europe, Australia and America, but none of these methods, known to me, has as yet been accepted for the commercial treatment of such ores. Australia has probably been foremost in such undertakings, but even there they have not succeeded in producing pure spelter in a commercial way by electrolytic methods.

Most of the electrolytic processes for the treatment of the zinc ore are based upon the transformation of the zinc minerals contained to sulphates or chlorides by scorification and lixiviation, and from the solution of these salts the zinc is precipitated by electricity.

#### DIFFICULTIES OF THE USUAL METHODS

The treatment of such solution would be simple, if during the process only zinc salts were dissolved, but the contemporaneous solution of other metallic salts with the zinc prevents the precipitation

of pure zinc by electrical treatment. To separate these other metallic compounds from the zinc solution there are processes more or less efficient, though few have been able to do this economically within commercial limits.

At present the most successful method for treatment of low-grade zinc ores commercially is by producing zinc oxide from them by the Wetherill or some similar process. Two zinc-oxide plants have been installed in Sardinia for treating low-grade calamine ore, though the price of fuel at present is prohibitory for treatment of ores containing less than 15 per cent. zinc, and the market for the oxide is limited in Italy.

#### THE SANNA ELECTROLYTIC PROCESS

The best method of extraction and the one by which the greatest per cent. of recovery is obtained, is by the solution of the zinc mineral by alkaline salts, followed by electrolytic separation. However, the product thus obtained is a metallic-zinc sponge, which turns to oxide as soon as it is exposed to the air and therefore, cannot be used in commerce.

After many years' work I have suc-

ceeded in obtaining compact blocks of zinc commercially by the treatment of the zinc sponge from electrolytic precipitation with pressure and heat combined. I have also found that it is possible to treat a solution of zinc oxide in caustic soda with a current of five volts, and to obtain all of the spongy zinc precipitate without loss of solution of caustic soda, which latter may serve for the same operation for many months.

This discovery will doubtless be found advantageous for the mines which have low-grade zinc ores, as one can treat such ores directly with an economical installation and at a low cost. It will also permit the retreatment of low-grade ore dumps which have long been regarded as valueless.

I estimate that an installation of this process of sufficient capacity to yield 1500 tons of zinc per year would cost 300,000 fr. The cost of treatment is estimated to be 300 fr. per ton of zinc produced, which would be 30 fr. for treatment of ore containing 10 per cent. zinc, the cost being directly proportional to the content of zinc in the mineral treated.

\*Director, Societa di Pertusola Miniere di Gennamari e Ingurtozu, Iglesias, Sardinia, Italy.

# The Bagoslowk Reduction Works in the Urals

The plant of the Bagoslowk Reduction Company in Russia is one of the most modern in the Ural district. The company is treating ores of iron, copper, gold, manganese and chromium and is engaged in the manufacture of steel and the production of sulphuric acid and bichromate.

## ORE SUPPLIES

The iron ore used by the company is mainly magnetite with some hematite coming from the surface of the deposit. The ore is largely mined from surface cuts and costs about \$1 per metric ton, and the yearly output of the mines is from 82,000 to 100,000 metric tons.

The copper ore used at this plant is mostly copper pyrite, with some oxidized ores. It is mined to a depth of 600 ft., and the copper pyrite is associated with various iron minerals. It averages from 6 to 7 per cent. in copper, and the yearly output of the mines is from 65,000 to 82,000 metric tons. The ore is hand sorted and the dump for concentration runs about 0.5 per cent. copper.

The gold ore is obtained from alluvial deposits, either by dredging or by hand

digging; the yearly output of gold is about 11,000 oz., but is decreasing.

The manganese ore runs from 20 to 35 per cent. manganese and 4 to 8 per cent. iron and is mined in a small way to supply the need of the iron furnaces. The chrome-iron ore contains from 40 to 50 per cent. chromic acid. It has been found more profitable to use in the chemical works a richer ore, which runs from 50 to 60 per cent. chromic acid, which is also found in the Urals.

## THE IRON FURNACES

The company operates two iron plants, one at Nadeschdinsker and the other at Soswaer. The former plant has five blast furnaces and a sixth furnace is under construction. The blast is furnished by two blowing engines and heated from 600 to 700 deg. C. in six Cowper stoves. The blast-furnace gases are utilized by means of two gas engines of 500 h.p. each, which are direct coupled to dynamos for light and power; and by two gas engines from 800 to 1000 h.p. which furnish the light and power for the rolling mill. The yearly pig-iron output is about 82,000

metric tons, and the manufacturing cost about \$9.50 per ton. The pig iron is made into steel in six basic-lined open-hearth furnaces, which are heated by gas producers using wood. A rolling mill is also operated in connection with these works.

The Soswaer plant is much smaller. It has only one blast furnace, one open-hearth furnace and a small rolling mill. The yearly output is 13,000 metric tons.

## COPPER PLANT

The company's copper smelting works produce about 4600 metric tons of copper yearly. Until recently the ore was roasted in heaps and stalls and smelted in blast furnaces with charcoal, but more recently pyritic smelting in water-jacketed blast furnaces has been adopted. The matte is converted and the blister copper refined in reverberatory furnaces.

The sulphuric-acid plant has a daily output of 6½ metric tons of chamber acid of 53 deg. B. The bichromate plant has a yearly production of 734 metric tons of potassium and sodium bichromate, which is about one-third of the total yearly consumption of this article in Russia.

# Mining in Amador County, California

Mining in Amador county is in a satisfactory condition at the present time. For several miles along the great Lode, the deep mines are producing steadily and the fact that the Kenned mine at Jackson is operating a large shoot of ore with good profit at a vertical depth of 3300 ft. counts for a great deal in the minds of those who have had an abiding faith in the Mother Lode and its possibilities. Adjoining the Kennedy on the south, the Argonaut mine is working a vein, stated to be 27 ft. in width, and of good grade, at a depth of 3300 ft. on the incline. To the south of Argonaut is the property of the Kennedy Extension Mining Company, locally known as the Muldoon mine. This property has only lately been reopened, after an idleness of several years. It has never been a producer. The shaft is down 800 ft., from the bottom of which a crosscut has recently been run easterly several hundred feet, intersecting three veins, on one of which a drift is being driven. At the point where this latter vein was cut, the quartz was of low grade, showing little mineral other than pyrrhotite, but in drifting the vein has shown a decided improvement and some pay ore is being found in the drift.

## KENNEDY EXTENSION VS. ARGONAUT FOR TRESPASS

The Kennedy Extension company is suing the Argonaut company for an alleged trespass in the lower levels of the latter mine: The former company claims that the Argonaut company has been mining beneath the surface of ground owned by the latter, and on a vein that apexes within the surface boundaries of the Kennedy Extension's ground. This suit, which is the most important since the famous suit between the Argonaut and Kennedy, is now pending, and as it involves some nice points at law, its progress will be watched by mining men with unusual interest.

South of Jackson there is considerable work in progress in a comparatively small way, and some rich ore is being found in association with arsenical sulphide ores. The high-grade ore seems to occur in pockets.

The Kennedy Mining Company has purchased the Bellwether mine situated on the hillside east of the town of Jackson, paying for it about \$30,000. It is stated to be the intention of the new owners to sink a shaft on the Bellwether and to develop it in depth. The Bellwether differs from the other mines in

this county. It has a large outcrop which consists principally of ankerite, with an abundance of scales of mariposite, the entire mass being filled with reticulated quartz veins, large and small. It is stated that in the early days this mine produced a number of large pockets of gold, but its chief value now lies in the large tonnage of mill rock said to exist there.

## SUTTER CREEK MINES

In the neighborhood of Sutter creek, the South Eureka mine continues to furnish the anomaly of a great mine being developed from great depth upward. The vein which has made this mine famous, after years of disappointing development, was discovered in a crosscut driven westward into the foot-wall country of the old workings on the 2800 level. Crosscuts have been driven in this foot-wall ground on the levels between the 2800 and 2100, and the ore found in each instance. So far there is no indication of the vein getting poorer in the upper levels. Adjoining the South Eureka on the north, the Central Eureka is continuing the sinking of its shaft for the purpose of reopening the mine in great depth. Indications are that the Central Eureka is a mine with a promising future.

Steps are being taken toward the re-opening of the old Lincoln mine at Sutter creek, which has been closed for several years. The Lincoln was an important and valuable mine in the early days of mining on the Lode, having produced over \$2,500,000 down to a depth of 350 ft., at which level the orebody is faulted. Subsequently a great deal of exploratory work has been done, but the pay vein has not as yet been discovered.

#### AMADOR CITY MINES

At Amador City, the California Consolidated Mines Company is in trouble, the Amador Keystone Mining Company having brought suit to recover \$112,946, being a portion of the amount claimed by the plaintiff corporation as due from defendant. This simply means that the California Consolidated Mines Company, which in April, 1909, bought the Keystone mine for \$200,000 from M. Jasper McDonald, who controls the Amador Keystone Mining Company, has failed to pay up on its promissory notes given in security of deferred payments. These notes were secured by shares of the defendant corporation to the amount of \$300,000. The California company has been operating the Keystone mine since April, 1909, presumably at a loss, as pay days have been irregular and attachments frequent. The mine has been put in good condition, the stamp mill and works around the shaft having received much needed repairs. It is currently reported that if the California Consolidated Mines Company is unable to take up its notes to the Amador Keystone company there are several other men who stand ready to take the property as soon as it reverts to Mr. McDonald.

Immediately adjoining the Keystone on the north is the property of the Original Amador Mining Company, which has been reopened within the last two years. The shaft is down about 800 ft. and the 20-stamp mill is operating on good ore. Two dividends have recently been paid by this company. North of the Amador the Bunker Hill continues to run steadily, the lowest level being the 1950, where the vein is said to be larger than at any level above, and quite as good. This is another of Amador's great mines that has made wonderful development after many years of unsuccessful operation. The Treasure, to the north of the Bunker Hill, is being developed with a small plant. The shaft is down several hundred feet; the property has no mill as yet.

The Fremont Consolidated joins the Treasure on the north and is one of the large mines of the Lode. It has been in continuous and successful operation for many years, and has ore reserves which insure many more years of operation. Northward from the Fremont there is nothing of importance being done in Amador county, though it is said opera-

tions are soon to be resumed at the Rhetta Consolidated, north of Plymouth.

### The Galena District, Kansas

The mining operations of the Galena district, Kansas, are usually conducted on small tracts of land ranging in size from a few acres to possibly 40 or 60. Lead ore was first discovered on Short creek in 1877 and practically all the mining has been comparatively shallow. There are many open cuts as shown in the accompanying illustration and the larger part of the surface of the ground is covered with waste dirt. In many places the ground has caved so that the surface is not only uneven, but actually dangerous to walk over.

#### BOSTON MINING COMPANY'S OPERATIONS

The Boston Mining Company owns 400 acres of mineral land in the Galena district. This is an exceptionally large acre-



OPEN PIT IN SHALLOW LEAD-ZINC DEPOSITS, GALENA, KANSAS

age for this district and the result of a consolidation of a number of the smaller tracts worked in the early days. There are 20 or more shafts on this ground which have encountered ore. In addition to this, the company has a 10 per cent. lease on a fully developed 40-acre tract, where the ore can be mined from open cuts with steam shovels. The prospecting done by shafts and drill holes indicates that the orebodies run 4 per cent. zinc and 1 per cent. lead. Several months ago an option was taken on this lease and a number of drill holes put down in the vicinity of the open cut, proving the existence of a large body of ore which can be worked cheaply.

A 300-ton mill (10 hours) will be ready for operation in June. In addition to the erection and equipment of this mill, the plans provide for a fund to start drill and development work on the 400 acres owned in fee simple.

In this district the ore is found from the grass roots down. Up to this time

all the work has been done at a depth not exceeding 100 ft. Much of the work was carried on when prices for lead and zinc were low, and hence only the richer parts of the deposits have been mined. With present prices, large areas of low-grade ore, which in earlier days were left untouched, can be worked profitably.

#### SHEET GROUND

Recent work, both north and south of Galena, has developed a lower formation of ore at a depth of 200 to 250 ft. This is now being worked at the Herald mine, north of Galena, and at the Fallenback mine south of Galena, and recent drilling would seem to indicate that there is a large territory in this camp with the deeper formation of low-grade ore. This sheet ground level is not the same as the one worked so extensively in the Webb City district, but is considered of a deeper geological horizon.

### The Highland Boy Tramway

The aerial tramway of the Bleichert type connecting the Highland Boy mines at Bingham, Utah, with the new smeltery of the International Smelting and Refining Company at Tooele is rapidly nearing completion. This tramway is approximately four miles long and has a capacity of 100 tons per hour. The ore is placed in buckets which weigh 525 lb. unloaded, and 1800 lb. with load. These buckets are spaced 200 ft. apart on the line and run at a normal speed of 600 ft. per min., being attached to a traction rope of 1 1/16-in. diameter and running on a standing rope of 1 1/2-in. diameter on the loaded side and 1-in. on the light side.

Power will be required in starting up the line to haul the loaded buckets over the summit of the mountains. Thence onward the tram will be run by gravity and will develop from 50 to 100 h.p. Two electric motors will be used, one at the summit of the mountains to start the tram in motion, and when the line has been loaded this motor will be cut out and the other, at No. 2 control station, will be put into use. The latter motor is of the induction type and will perform a double service, acting as a brake or controller and as a generator, thus conserving the power developed by the tramline and returning the same over the transmission line to the mine for use. It is estimated that the cost of transporting ore over this line for the first year will be 15c. per ton. However, this cost should be reduced after the line has been thoroughly adjusted.

The San Domingos mine, Portugal, shipped 264,914 tons of copper and sulphur ore in 1909, making a net working profit of £18,582 for the year. It is owned by Mason & Barry, Ltd., of London.

### The Anaconda Report

The output of the Anaconda Copper Mining Company during 1909, though greater than that of 1908, was still appreciably below normal. This was due partly to climatic conditions in January, when the railroad was unable to deliver sufficient coke to the Washoe smeltery, and partly to the fact that the Anaconda shaft was practically out of commission for the greater part of the year, on account of the fire in the Anaconda workings.

#### THE MINES

At the Anaconda mine, the gas from the fire had cleared sufficiently to permit repairs to be made down to the 800 level, from which a small amount of ore was

#### ANACONDA BALANCE SHEET, DEC. 31, 1909.

ASSETS:	
Fixed:	
Mines and lands.....	\$20,699,957
Buildings and machinery.....	3,027,888
Investments.....	534,088
Total fixed.....	\$24,261,934
Deferred:	
Insurance unexpired.....	43,138
Materials and supplies.....	2,138,530
Total deferred.....	\$2,181,668
Current:	
Merchandise held for sale.....	\$554,622
Copper, silver and gold on hand.....	5,986,963
Loans and accounts receivable and cash.....	3,934,402
Total current.....	\$10,475,988
Grand total.....	\$36,919,591
LIABILITIES:	
Capital:	
Capital stock authorized and issued	\$30,000,000
Current:	
Accounts payable.....	\$1,633,030
Dividend warrants not presented.....	7,345
Dividend No. 37, payable Jan. 19, 1910.....	600,000
Total current.....	\$2,240,375
Surplus:	
Balance Dec. 31, 1908.....	\$4,944,442
Add profit from profit and loss.....	2,134,773
Total surplus.....	\$7,079,216
Deduct dividends.....	\$2,400,000
Grand total.....	\$36,919,591

raised. No effort has been made to re-open the shaft below this depth, but an auxiliary air shaft which has reached a depth of 1100 ft. is now being sunk to the 1200-ft. level. After this connection is made, the main shaft will be repaired down to the 1200-ft. level; it is expected that the mine will then be put into full operation, as the shaft is practically uninjured below that depth. What little development work was done is said to have been quite satisfactory, and connections have been made with the Belmont shaft at the 1400, 1600 and 1800 levels.

Extra development was done through the St. Lawrence shaft, and a nominal amount at the Neversweat. In the St. Lawrence, high-grade ore was discovered in the South veins. A successful effort

was made to recover ores which were known to exist in the fire zone and a fair tonnage is being mined at the 700-ft. level. A large amount of ore remains in the upper levels in the Anaconda and St. Lawrence mines, which it is thought can be recovered as the fire subsides.

In April, a crosscut on the 1400-ft. level of the High Ore shaft penetrated a large and rich body of ore, the existence

#### ANACONDA PROFIT AND LOSS ACCOUNT, FOR 1909.

RECEIPTS.	
Sales of copper, silver and gold.....	\$11,591,844
Royalties and precipitates.....	46,582
Dividends on investments.....	32,147
Rental of water rights.....	50,000
Miscellaneous.....	11,732
Net profit of subsidiary departments, after deducting depletion of coal and timber lands and depreciation of plants and equipment.....	280,813
Copper, silver and gold on hand.....	5,986,963
Total receipts.....	\$18,000,084
DISBURSEMENTS.	
Copper, silver and gold on hand at beginning of year.....	\$6,169,244
Mining expenses, including development and depreciation.....	5,511,820
Ore and scrap copper purchases.....	105,489
Transportation to reduction works.....	160,932
Reduction expenses at Anaconda, including depreciation.....	2,819,021
Transportation, refining and selling.....	1,163,306
Administration.....	60,326
Total disbursements.....	\$15,990,142
Profit.....	2,009,942
Add interest.....	124,830
Profit to balance sheet.....	\$2,134,773

of which had never been indicated by workings of the shallower levels of the mines. Since that time this ore has been opened on the 1200- 1600-, and 1800-ft. levels and is being searched for on the 2200-ft. level.

The Diamond shaft is now 2956 ft. deep, and from it the South vein has been developed on the 700-, 1000-, 1200-, 1300-, 1500-, 1600-, 1800-, and 2000-ft. level, showing excellent bodies at each point.

A total of 10.11 miles of development work were done in the mines of the company during 1909, and the company claims that a heavy tonnage in excess of that extracted, has been added to the reserves. A total of 1,327,291 wet tons of ore were produced during the year.

#### REDUCTION WORKS

The reduction works treated 3,517,386 dry tons of ore and other copper-bearing material during the year. Of this, 1,282,681 dry tons of ore from the company's mines, 139 tons of precipitates and 15,062 tons of slimes from the old works were treated for the Anaconda company, from which were produced 75,860,194 lb. of fine copper, 2,363,184 oz. of silver, and 7,466 oz. of gold. In addition, 475,239 lb. of copper were produced from precipitates, etc., which were treated at Great Falls. An effort has been made by the management to find out what disposition could be made of acid phosphate, if produced at the Washoe smeltery, but thus far without encouraging results. Con-

stant endeavors have been made at the laboratories and at the plant generally to evolve some method whereby the injurious gases in the fumes might be eliminated, but no success has as yet been met with in these experiments.

#### SUBSIDIARY DEPARTMENTS

The coal mines at Belt produced 147,263 tons of coal, of which 108,600 tons were sold to outside consumers. The saw mills at Hamilton cut about 25,000,000 ft. of lumber, of which nearly 23,000,000 ft. were sold. The Butte, Anaconda & Pacific Railway paid a 6-per cent. dividend (\$60,000) on its capital stock, in addition to carrying forward surplus profits of \$183,878, for the year.

### Zinc Corporation, Ltd.

The Zinc Corporation, working on Broken Hill tailings, treated 227,502 tons during the year 1909, which yielded 84,698 tons of zinc concentrates, containing 46.02 per cent. zinc, 15.08 oz. silver per ton, and 7.3 per cent. lead; and 6411 tons of lead concentrates, containing 56.98 per cent. lead and 38.49 oz. silver per ton.

The tailings are subjected to a double concentration, the second or retreatment process with Wilfleys raising the value of the concentrates of the first concentration from 48s. 1d. per ton of original concentrates to 57s. 6d. The net profit secured by retreating the concentrates amounted to £20,749. The extractions obtained during the year in the two products combined were 86.3 per cent. of the zinc, 74.7 per cent. of the lead and 75.9 per cent. of the silver, which is an improvement over the previous year.

Working costs ranged from 9s. (\$2.19) to 9s. 6d. (\$2.31) per ton of tailings. The report states that on account of an insufficient number of Wilfley tables in the retreatment plant, the grade of the zinc concentrates fell off during the period under review from over 47 per cent. zinc to about 45 per cent. zinc. At the close of 1909, the installation of additional tables again raised the grade to over 47 per cent., with a corresponding increase in the production of lead concentrates. A further improvement is anticipated.

The corporation has made a provisional contract for a further purchase of 500,000 tons of Broken Hill residues.

### Cadmium

The production of cadmium in the United States in 1909 was 5300 lb., compared with 10,000 lb. in 1908. The price for the metal ranged from 60 to 75c. per pound in lots of 200 lb. and over.

## Mineral Output of New York in 1909

BY D. H. NEWLAND\*

The output of the mines and quarries of New York in 1909, as tabulated by the State Geological Survey, was valued at \$34,914,034, or about \$5,000,000 more than in 1908. No metallurgical materials have been included in the statistics and the valuations have been based for the most part on the products in their first marketable forms.

### INCREASE IN IRON ORE

Among the prominent features of the year's record was a large gain in the iron-ore production which amounted to 991,008 long tons. The increase came chiefly from the Adirondack mines, though there was a substantial increase also in the output of Clinton hematite. A dull market in the early months curtailed activity, or the production would have been considerably larger.

### GYPSUM AND CEMENT

The gypsum and salt industries have grown steadily and both returned record figures for 1909. The output of gypsum reached 378,232 short tons valued at \$907,601. The salt production was 9,880,618 bbl. with a valuation of \$2,298,652, showing an increase in both brine and rock salt.

The cement plants reported an output of 2,610,383 bbl., valued at \$2,122,902, or about the same as in 1908. A gain in portland-cement manufacture was counterbalanced by a falling off in the natural product which has trended steadily downward in late years. With the recent completion of the plant of the New York-New England Cement and Lime Company at Greenport, Columbia county, there is prospect of a large gain in portland cement during the current year.

### GARNET AND GRAPHITE

The Adirondack garnet mines experienced a better season than in 1908, although the demand was still below normal. The output of 3802 short tons, valued at \$119,190 represented an increase of about 50 per cent., but was nearly 2000 tons less than the 1907 figures.

The production of crystalline graphite amounted to 2,342,000 lb. valued at \$140,140, most of it from the American mine at Graphite.

### TALC, CLAY AND STONE

About the usual amount of talc was produced by the St. Lawrence county mines, the average varying little from year to year. The industry is now controlled mainly by the International Pulp Company, which has recently acquired

the Union Talc Company and the United States Talc Company, so that the only independent producer last year was the Ontario Talc Company. A new enterprise, the Uniform Fiber Talc Company, expects to begin operations this season. A deposit of talc near Natural Bridge, Lewis county, has been under development by the St. Lawrence Talc and Asbestos Company.

The largest items in the production of the State are clay materials and stone. The total value of the former for 1909

MINERAL PRODUCTION OF NEW YORK IN 1909.

Product.		Quantity.	Value.
Portland cement	Bbl.	2,061,019	\$1,761,297
Natural rock cement	Bbl.	549,364	361,605
Building brick	M.	1,518,023	8,159,096
Pottery			1,827,193
Other clay products			2,365,193
Crude clay	Sh. tons	12,174	11,585
Emery	Sh. tons	892	10,780
Feldspar and quartz	Sh. tons	16,111	52,444
Garnet	Sh. tons	3,802	119,190
Graphite	Lb.	2,342,000	140,140
Gypsum	Sh. tons	378,232	907,601
Iron ore	Lg. tons	991,008	3,179,358
Millstones			19,247
Metallic paint	Sh. tons	6,560	65,600
Slate pigment	Sh. tons	1,155	9,130
Mineral waters	Gal.	9,019,490	857,342
Natural gas	Cu. Ft.	3,825,215	1,045,693
Petroleum	Bbl.	1,160,402	1,914,663
Salt	Bbl.	9,880,618	2,298,652
Molding sand	Sh. tons	468,609	437,402
Sand lime brick	M.	12,683	81,693
Roofing slate	Squares	21,187	126,170
Slate manufactures			880
Granite			479,955
Limestone			3,300,383
Marble			380,016
Sandstone			1,839,798
Trap			1,061,428
Talc	Sh. tons	65,000	617,500
Other materials <sup>a</sup>			1,483,000
Total			\$34,914,034

<sup>a</sup>Includes apatite, carbon dioxide, diatomaceous earth, marl, pyrite, sand and gravel, exclusive of molding sand.

was \$12,363,067. The quarry products, exclusive of millstones and limestone used in cement manufacture, were valued at \$7,188,630.

## Railroad Rates on Iron and Steel

SPECIAL CORRESPONDENCE

Active work is being done by shippers of many classes for the purpose of preventing, if possible, the further increase of freight rates by the railroads. The principal roads operating to Middle Western territory have already filed a large number of advances in rates effective June 1, but it is believed that many others are in process of preparation. Among the advances already filed are many on iron and steel to Western points.

The shippers are expected to unite in complaints to be filed with the Interstate Commerce Commission and meanwhile threaten retaliation through demands for the enforcement of the anti-trust act and of certain provisions in the interstate-commerce act against the roads.

\*Assistant State geologist, Albany, N. Y.

## Lead Smelting Notes from Germany

SPECIAL CORRESPONDENCE

The Aktien Gesellschaft für Bergbau Blei-Zinkfabrikation zu Stolberg und in Westfalen contracted in January for several thousand tons of lead concentrates, which will keep the company's lead smeltery at Stolberg-Munsterbusch in operation until about the middle of 1911. The Rhein-Nassauisch Bergwerks und Hutten Aktien Gesellschaft, of Stolberg, Westfalen, has at its lead smelting plant a patented mechanical sinter furnace, with a capacity of 50 tons of roasted material for 24 hours of continuous operation. This furnace replaces part of the Huntington-Heberlein roasting furnaces. The lead concentrates, mixed with lime and sand, are first subject to a desulphurizing roast. The sinter furnace is an improved Dwight & Lloyd mechanical furnace and it allows the separation of diluted and concentrated roast gases.

The Chemische Fabrik Rhenania contemplates erecting a sulphuric plant at its own cost to utilize the concentrated gas of this and another sinter furnace of the same size, which is in course of construction. The European patents of this furnace, as well as those of Dwight & Lloyd, are assigned to the Metallgesellschaft in Frankfurt-am-Main.

## Oil on Public Lands

SPECIAL CORRESPONDENCE

Interests concerned in the exploitation of oil lands have offered opposition to some of the provisions of the Mondell bill, permitting the President to withdraw from entry such lands of specified classes as he may deem best. The bill in question passed the House some time ago and is pending in the Senate. The oil men desire that beside providing for the protection of interests already acquired in public lands through the exploitation of mineral deposits, there shall also be provision for recognizing the equities created through the expenditure of money in prospecting for oil, even though no definite result shall have been obtained. A delegation representing California oil interests has appeared before the House public-lands committee for the purpose of representing the case in order that such changes as may be made in the Senate on this topic shall receive due consideration when the bill is returned to the Lower House with amendments. President Taft is desirous that the bill shall be passed, but that it shall be put into such form as will protect all actual rights heretofore acquired on lands that are to be withdrawn for any purpose.



# Lead and Zinc Smelting in Upper Silesia

Review of 20 Years' Progress. Sulphur Utilized for Acid. Development of the Huntington-Heberlein Process. Smelters Controlled by State

BY O. H. H. A. H. N.\*

The Prussian province of Silesia comprises in its southeastern corner, an elevated tableland known as Upper Silesia, not only the most extensive coal measures on the European continent, but also rich treasures of iron, lead and zinc ores, besides vast forests of pine, spruce and white birch. The coal measures cover an area of about 500 square miles, outcropping in some places and covered in others by Triassic sandstone strata. They continue to the east and south into Russian and Austrian territory. The workable iron ore, limonite, occurs principally in the Trias, the zinc and lead ores more particularly in the dolomite of the Trias. The scope of greatest industrial activity seems to circle around Beuthen, a town of 66,000 inhabitants. The surrounding country is thickly covered with hoisting, dressing and iron works and factories of all kinds. Nearby we have the great smithsonite deposit of Scharley described by Von Cotta in his treatise on ore deposits, and to the northwest the Friedrichsgrube near the mining town of Tarnowitz, the most important lead mine of Silesia.

Although there are as many as 11 coal seams known in Upper Silesia, there is not much coking coal, and that seems to be confined to the western part as most of the coke ovens are near the town of Zaborze, southwest from Beuthen. The coke is rather friable, which is a detriment to the ironmasters, as it reduces the capacity of the furnaces. However, the coal has one virtue which makes it especially fit for domestic and furnace use, and that is its low ash content, and the fact that the ash does not clinker. There is also a large portion of noncoking gas coal which finds a ready market in the gas works of the adjoining Russian territory.

## EARLY ATTEMPTS TO RECOVER FLUE DUST

About 20 years ago while attending an exposition at Berlin, illustrating the means for the prevention of accidents in industrial enterprises, my attention was attracted by an exhibit of models, drawings and tabulated statements from the Royal Friedrichshütte near Tarnowitz. As I was much interested in appliances for the saving of flue dust, the Rösing lead pump and a number of minor matters, I procured a permit to visit the works and started for Tarnowitz, which is about 300 miles southeast of Berlin and

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may be reached from there in about 12 hours.

The Friedrichshütte, named after Frederick II, of Prussia, the conqueror of Silesia, is  $3\frac{3}{4}$  miles northwest of Tarnowitz on the line of the State railways, while the mine from which it draws its main supply of ore, the Friedrichsgrube, is about one mile south of it and connected with the reduction works by a narrow-gauge railroad. At the mine are also the dressing works for separating the galena from the accompanying zinc ore and gangue, and concentrating the galena to 75 per cent. lead. The reason for placing the reduction works away from the mine was probably the more favorable site, which is quite level, and the proximity of a creek, the Stola, which furnishes the water supply.

At the time of my visit the chief aim of the government officials was directed to the saving of the flue dust from the blast and roasting furnaces and the condensation of the fumes from the reverberatories and the refinery. For this purpose intricate cooling towers were connected with the blast furnaces (11 in number) through which the fumes were conducted into dust chambers, underneath, and into flues with wires suspended from their roofs (Rösing's friction wires); finally the purified gases entered into a smokestack,  $170\frac{1}{2}$  ft. high, to be discharged into the atmosphere. Thus the largest portion of the solid matter suspended in the furnace gases was recovered. In a similar manner the gases from the reverberatory and refining furnaces were cleaned. As the draft of the chimneys was liable to be weakened through the cooling towers, fans had to be installed between the wire chambers and the chimneys to help out whenever necessary.

## POISONOUS LEAD FUMES

Efforts as to sanitation were noticeable in all parts of the works, especially about the slag discharge and at the tunnel heads of the blast furnaces, at the drawing doors of the reverberatory smelting furnaces and the cupeling furnaces, but they did not avail much considering the defects of the system in vogue. There were 15 reverberatory smelting furnaces in operation, running on apparently the same kind of ore as the blast furnaces. The capacity of such a furnace is small enough and the yield in metal only about 65 per cent. Besides, the residues have to be passed through the blast furnace to

complete the recovery of the metal. But the worst feature is the poisonous fumes escaping from these furnaces while tapping them and raking out the residues. What wonder, then, that the men would shun them! Seeing these furnaces in operation prevented me from building one in my later practice. In the refinery where the Cordurié modification of the Parkes desilverizing process was used, I saw 15 cast-steel pots of 12 tons capacity each, all in a row and on the same level. This explains the timeliness of the invention of the Rösing lead pump, of which there were five in use. Without it a good deal of human muscle must have been wasted.

## CHARACTER OF ORE AND PRODUCTS

As the ores treated at the works are remarkably free from impurities, especially bismuth, the lead produced contains only 0.6 per cent. of antimony and some zinc. It is, therefore, well adapted for corroding and the rolling mill. The ore must be low in silver as the furnace bullion runs only from 11.67 to 14.58 oz. in silver per ton. The first rich lead from retorting the dried alloy is not rich enough to go to the refining furnace. It is, therefore, desilverized again by zinc, whereby the resulting rich lead is brought up to form 1500 to 1700 oz. This is cupeled to 998 fine. The litharge from the refining furnace is passed through the blast furnaces again on account of its silver contents. If, however, there is a good market for litharge, this is made from commercial lead in special cupeling furnaces of larger size than the refining furnace. The same plan was carried out in the manufacture of hard lead, which was made by adding refined antimony to molten commercial lead.

## ZINC REDUCTION PLANT

An anomaly of the works was the presence of a zinc-dressing plant and a zinc-reduction furnace. The manager explained to me, however, that a portion of the *Schlichs* (fines) from the dressing works at the mine was not sufficiently freed from blende to undergo the smelting process and had, therefore, to be jigged over again. The blende from this operation was roasted in a long-hearth roasting furnace (*Fortschaufelungsofen*) and then retorted in the zinc distillation furnace. The resulting zinc supplied the needs of the desilverization plant.

The processes in use and the sanitary

arrangements made to within a few years ago have been elaborately described<sup>1</sup> by Mr. Seager, formerly a manager of Friedrichshütte and now in charge of the technical management of the Societät Georg von Giesches Erben, one of the foremost mining companies in Upper Silesia.

#### IMPORTANT CHANGES

The sight, during a recent visit, of new smokestacks discharging light curls of hardly visible smoke, of new and lofty buildings constructed of structural steel and brick, told me that a new era had broken in upon Friedrichshütte. The change was indeed a radical one. The cooling towers, the death-dealing reverberatory smelting furnaces, the zinc-reduction plant and the blende washery had disappeared; the old refinery was mostly dismantled to give room for a new and more economical one built on the gravitation plan and equipped with 60-ton cast-steel pots for zinking and 50-ton market pots. Cast steel has been used

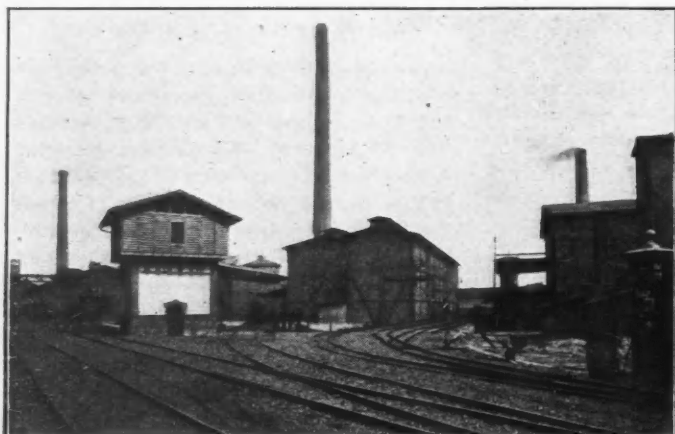
from the Friedrichsgrube, which is owned by the State, but part of it comes from mines owned by private individuals and corporations, who have to sell their lead ores to the Government at a fixed rate by the right of eminent domain. How the Societät Georg von Giesche's Erben came to be an exception I did not learn. That company has a lead smeltery of its own, the Walther-Croneck Hütte, near Klein Dombrowka, close to the Russian line, where it treats the lead ores from its mines. Its production cannot be large, as the Friedrichshütte produced 30,000 tons of lead, during 1909, out of a total of 37,360 tons produced by the whole district of Upper Silesia.

#### IMPROVEMENTS IN BLAST FURNACES

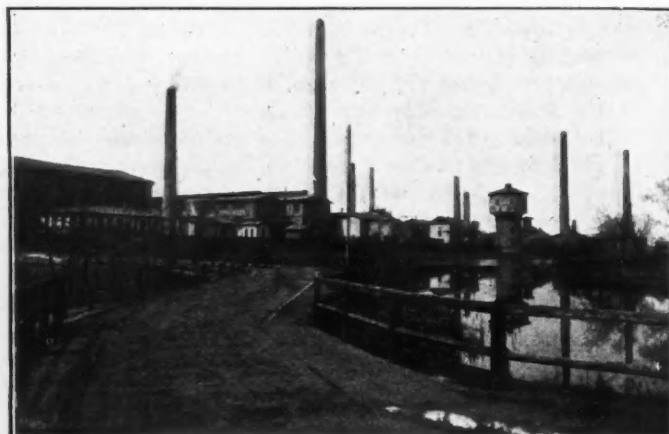
In the blast-furnace department I was shown a new, large, circular, water-jacketed blast furnace, with three rows of tuyeres which were arranged in zigzag fashion around the furnace. Its height from smelting to charge floor was stated to be about 50 ft. It was making bul-

#### WORKMEN PROTECTED FROM FUMES

The arrangements for protecting the workmen from fumes are about the same as formerly. Hoods over the slag tap and the lead well extend into tubes that are connected with the downtakes from the charge floor. No smoke was noticeable on the tapping floor nor on the charge floor. The furnace is open at the top. A tube suspended in its center carries the smoke through a downtake into a dust chamber. Here the solid matter is precipitated by a spray of water introduced through Körting injectors, and the sulphurous acid is absorbed by milk of lime. The chamber is connected with a high stack through which the waste gases pass into the atmosphere. The waste gases are said to contain only three grams of sulphurous acid per cubic meter, while the law protecting the farmers allows five grams. Besides this large furnace a smaller one of the same style with two rows of tuyeres was running on byproducts. There are eight blast furnaces in all, but whether they have



FRIEDRICH ZINC AND LEAD SMELTERY



ZINC AND LEAD SMELTERY AT TARNOWITZ

in these works for many years and proves that castings made of that material can be made without air holes. They are made at Witten-on-the-Ruhr, Rhenish Prussia.

#### EXTENSIVE USE OF HUNTINGTON-HEBERLEIN PROCESS

What characterizes the works at the present time is the extensive application of the Huntington-Heberlein process, which has been developed here to perfection; the aim of replacing manual labor by electric power wherever it is possible, and last, but not least, the utilization of the sulphur in the ore for the manufacture of sulphuric acid. A circular narrow-gage steam railroad connects distant parts of the works.

In the ore yard I saw immense quantities of lump ore and *Schlich* piled up under the railroad trestles that was said to assay 75 per cent. in lead, enough to make an American smelter's mouth water. The ore does not all originate

lion at the rate of 150 tons a day, but I suppose this was only temporary, as the general manager told me that it was not the intention of the administration to turn out more than 30,000 tons a year. There was a constant stream of lead flowing from the lead well of the furnace into a receptacle connected with a gutter, pivoted at one end while the other could be swung around in a half circle to fill molds set up for that purpose. The unavoidable dross was, of course, skimmed off previously.

The slag is tapped periodically and removed in conical pots to the dump, where it is broken up to separate the small cakes of matte, the formation of which is due to a small amount of sulphur remaining in the ore after it has gone through the Huntington-Heberlein process. The matte is at present calcined in stalls and smelted with other byproducts in the blast furnace. The slag is used as ballast on the railways. The fluxes I saw used were sand, mill cinder, scale and limestone.

been reconstructed or are going to be retained, I did not learn.

#### POWER PLANT

The engine room, and for that matter everything else, is fitted up not only in elegant style, but in the most systematic manner and with a view to economy. Being barred from making any close inspection, I can only say that I saw a 750-kw. dynamo coupled to a steam turbine, which furnished the power to the different motors scattered about the works. The blast required for the furnaces is supplied by five Enke blowers, a German pattern, and a number of Roots blowers of ancient make, none of which were running. The Enke blower is a positive blower like the Roots and in its outward appearance resembles the latter; its interior arrangement is different. It runs smoothly, makes no noise and gives good results.

The pressure of the blast is regulated by a magneto-electric device, which presumably changes the speed of the blow-

<sup>1</sup>Preuss. Zeit. f. B., H. u. S., vol. 41.

er automatically. In this connection mention might be made that the furnace bul- lion and lead are weighed on automatic self-registering platform scales, thus preventing fraud or error. They are man- ufactured by a firm at Düsseldorf.

#### CHEMICAL LABORATORY

The laboratory is fitted up on the principle that "cleanliness is next to god- liness." On the lower floor there is a room for moisture determinations, for a laboratory crusher, ball mill, grinder, all driven by an electric motor; a furnace room with the Freiberg movable-muffle furnaces; a store room, etc.; the upper floor is occupied by the chemical depart- ment with weighing and writing rooms for the chemists.

#### UTILIZATION OF FURNACE GASES

The gases from the Huntington-Heber- lein process are utilized for the manu- facture of sulphuric acid. Several sys- tems are in operation side by side; the old one of oblong lead chambers with Gay Lussac and Glover towers; the Gail- lard tower, and the tangential chamber system of Dr. Theodor Meyer, who credits Friedrichshütte, in his pamphlet on the process, with two of his plants. In the United States the Mountain Copper Com- pany, at Martinez, Contra Costa county, Cal., and others are using this system. At Friedrichshütte it has not been decided what system will be finally adopted. Af- ter Friedrichshütte has received its fin- ishing touches I expect it will be the model works of the continent.

#### SOCIAL FEATURES

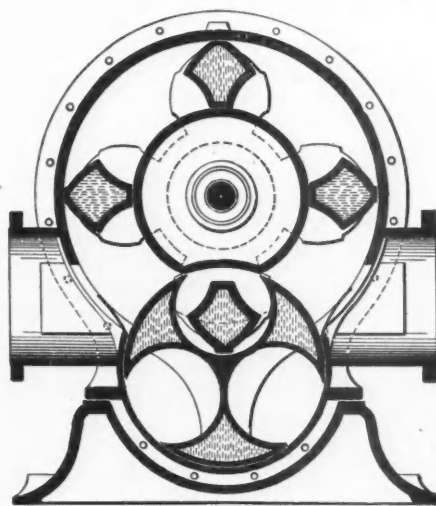
An especially pleasing feature of these works is the paternal benevolence with which the government is taking care of its employees. It has established a rig- orous system of sanitation by providing ample opportunities for washing, bath- ing and other necessities previous to eat- ing or leaving off work; it provides meals at the nominal price of 7½c., to those who have no families; it gives milk free of charge to those liable to be poisoned by lead.

It sells fish fresh from the sea at cost price; it has set apart rooms where the men can take their meals, the largest one being provided with a ros- trum for theatricals or other entertain- ments during the inclement season; it has fitted up a park within the precinct of the works which contains bowling al- leys, a music pavilion, stage for sum- mer theater, platform for dancing, and a booth for dispensing beverages other than whisky.

For the convenience of the officials there is a clubhouse partitioned off into three divisions: One for the aca- demically educated class; one for the mercantile department; and one for the foremen and master mechanics.

#### PRIVATE SMELTERIES

The only lead-smelting works of Upper Silesia in private hands is the Walther- Croneck Hütte, already mentioned. It is not open to inspection by outsiders. An effort was made to gain admittance to one of the zinc works of the most progressive company, the Georg von Giesche's Erben, at Schoppnitz, but without avail. The doors of its works are hermetically sealed to outsiders. Through technical papers I learn, however, that it is extensively engaged in the manufac- ture of sulphuric acid from its blende ores. The company had much litigation with neighboring land owners and had to buy a number of estates and small farms to keep out of the courts. But to stop all further annoyance, it had to adopt a different style of roasting furnace, pre- sumably the Liebig-Eichhorn, and convert the escaping sulphurous-acid gas in lead chambers into sulphuric acid. Lately it



SECTION OF ENKE'S POSITIVE BLOWER

was proposed to change over to the man- ufacture of sulphuric anhydride. As the market for sulphuric acid is limited, the company had to go into the manufacture of fertilizers and of alum and aluminum sulphate. This involved the importation of phosphate rock from America, and of bauxite from southern France.

#### SMELTING ZINC ORE

The zinc ores are treated in the well known Silesian muffle furnaces for the extraction of the metal. The smithsonite and roasted blende are mixed in the pro- portion in which they arrive at the re- duction works with assorted retort breakings and "cinder" (that is, fine coal deprived of its gas, or coke slack manu- factured for that purpose) and retorted for 24 hours in muffles of refractory ma- terial. The muffles are about six feet long and two feet high, of oblong cross- section with rounded corners. As the length of the muffles is limited by the difficulty of charging and discharging

them, Mr. Saeger has constructed ma- chines<sup>2</sup> for doing away with manual labor. These have been introduced at the Giesche works and are going to be tried at other works.

#### HOHENLOHE SMELTERY

Through the influence of a friend, I was allowed to go through one section of the Hohenlohehütte near Kattowitz. The principal ore treated there is blende from the company's dressing works near Scharley. Smithsonite forms only 25 per cent. of the ore. The blende is roasted for 12 hours in two-story, long-hearth furnaces with plain fire grates. The roast- ing gases are discharged into the air. The company has, however, works con- nected with the manufacture of sulphur- ic acid in other localities.

The furnaces in which the distillation of the zinc is effected are set up in pairs, back to back. They are of one story and contain 72 muffles each. As there were 12 furnaces in the section visited, this makes 864 muffles in all. The furnaces are provided below the working floor with gas producers and step grates and re- ceive an under-grate, low-pressure blast from a large fan set up in a central part of the yard. As the zinc contains from 2 to 3 per cent. lead, it has to be re- melted at a low temperature in a so called refining furnace where the lead separates from the zinc by means of its higher specific gravity. As soon as suf- ficient lead has accumulated in the cavity of the refining furnace it is tapped into a tap-hearth and ladled into molds. It is remelted in a large kettle and molded again when it is ready for the market. The zinc is ladled from the surface of the lead and poured into flat molds forming the well known slabs in which it enters the market. The separation of lead and zinc is, however, incomplete and a repe- tition, of the remelting operation may sometimes become necessary. The muffles are made from plastic fire clay and ground clay shale, one man being occupied all the year round in molding them by hand. The material is prepared by women. It was a novel sight to see two women feed a jaw crusher while others were engaged in bringing the shale in clumsy wooden barrows to the crusher platform, and others mixing, watering and tempering the material. Yet they seemed to be a happy lot with all their hard work.

#### LEAD AND ZINC PRODUCTION, 1909

From mercantile papers I gather the following statistics on Upper Silesia for the year 1909: Zinc-reduction works in operation 15, of which 11 were equipped with blende-roasting appliances and pro- duced 154,332 tons sulphuric acid of 50 deg. B; production of spelter, 139,255 tons; zinc dust, 5490 tons; lead, 1231 tons, and cadmium, 37,187 kilograms.

<sup>2</sup>ENG. AND MIN. JOURN., Apr. 9, 1910.

The two Upper Silesian silver-lead reduction works had nine blast furnaces, five reverberatory, nine roasting, four cupeling and two silver-refining furnaces. They produced: Lead, 37,360 tons; litharge, 2295 tons, and 11,833 kg. of silver.

Twenty-three zinc and lead mines were in operation. They produced 195,235 tons of smithsonite, 402,582 tons of blende, 58,568 tons of lead ores, and 7817 tons of iron pyrites.

#### PRODUCTION OF COAL, COKE AND IRON

Coke and coke slack (*Zünder*) factories in operation, 14 (one of which

manufactures coke slack), with 2157 coke ovens, all of which are arranged for the saving of byproducts. They produced: 1,358,227 tons lump coke; 134,943 tons small coke; 102,739 tons coke slack; 106,819 tons of tar pitch, etc.; 21,780 tons of ammonium sulphate, and about 10,000 tons of benzole.

Fifty-seven collieries were operated, employing 116,593 workmen and producing 34,660,000 tons of coal. The coal trade is depressed on account of the mild winter, the invasion of English coal into the Berlin trade, unfavorable railroad rates and for other reasons.

Eleven iron mines in operation pro-

duced 233,368 tons of iron ore with 1290 workmen. Of 36 blast furnaces, 27 were in operation, turning out 849,776 tons of pig iron, with a consumption of 1.184 ton coke per ton of pig iron.

The whole mining industry employed 189,305 workmen, who earned in wages, \$47,283,333. The traffic on the Upper Silesian railways is shipped through the port of Kosel on the river Oder. The distance to the seaboard on the Baltic by this river route is about 400 miles. The tonnage in round numbers was about 2,000,000 in 1908. The principal goods shipped are coal, iron and zinc ores, pyrites, phosphates, pig iron and timber.

# Rapid Analysis of Commercial Cyanide

BY RALSTON BELL \*

A method for the rapid determination of the approximate composition of cyanide for gold extraction consists in converting the metals into chlorides by evaporation with hydrochloric acid, neglecting the effect of the small quantities of impurities usually present, weighing the mixed chlorides and titrating their chlorine content, from which the proportions of sodium and potassium are calculated.

Cyanogen is determined in the usual way by Liebig's titration with silver nitrate. Chlorine is determined by Vielhaber's titration with silver nitrate, deducting the cyanide precipitation value, but it is not considered essential to estimate chlorides as they are a neutral diluent and might almost as well be returned as carbonates. Moisture is estimated as the loss on fusion. A qualitative analysis should be made to insure that silica, heavy metals, earth metals and sulphates are not present in such quantity as to interfere with the results.

It is proposed to assume that potassium has the first claim on cyanogen and to return all the potassium found as cyanide if there is sufficient cyanogen for the purpose. Any cyanogen remaining after satisfying the potassium is to be assigned to sodium, and the remaining sodium is to be calculated to carbonate, unless determined as chloride. If chlorine is determined, it is calculated as sodium chloride, and enough of the sodium is assigned to satisfy the chlorine and the remainder is returned as carbonate. If the cyanogen found should not be enough to satisfy the potassium, it is all calculated as potassium cyanide and the balance of the potassium and all the sodium are returned as carbonates, or chlorides if determined.

#### EFFECT OF IMPURITIES

The effect of such impurities as might be occasionally met with would be as follows: Silica or sulphates of sodium or potassium would increase the weight of the mixed chlorides, decreasing the per cent. of chlorine and increasing the proportion of potassium found; iron or aluminum would be found as chlorides and would increase the per cent. of chlorine, increasing the proportion of sodium found; sodium chloride has no effect, except that if returned as carbonate instead of as chloride there will be a deficiency in the proportion as 106:117; cyanates have little effect, as the alkali metal is returned as carbonate which is but little less than the corresponding cyanate; isocyanates would be estimated with and returned as chlorides, which weigh almost the same as the corresponding isocyanates. The whole process can be carried out in one hour, but the calculations, though simple, are rather tedious and may take another hour.

#### OPERATION OF ANALYSIS

The following standard solution is required: Standard nitrate of silver,  $\frac{N}{10}$ , 17 grams per l., 1 c.c. = 0.0052 gram CN (Liebig's titration), = 0.0026 gram CN (Vielhaber's titration), = 0.00355 gram Cl. If the usual cyanide-plant solution of 13 grams per l. be used, 1 c.c. = 0.004 gram CN (Liebig), = 0.002 gram CN (Vielhaber), = 0.00272 gram Cl.

**Sodium-Potassium Determination**—Weigh out 0.25 gram in a weighed basin, dissolve in 10 c.c. water, add 5 c.c. strong HCl and evaporate to dryness. When dry, cover the basin to avoid loss by decrepitation and heat evenly till there is no more decrepitation. Remove the cover and heat over a large burner or in the

muffle, or by holding in the tongs and moving about over the lamp to just below redness. Incipient redness will not do any harm. This is to insure driving off free HCl and ammonium salts. Cool and weigh as KCl + NaCl. Dissolve in water, transfer to a flask with about 100 c.c. water, add four or five drops of potassic chromate solution and titrate with standard silver nitrate till the chlorides are completely precipitated, and one drop gives the brick-red color of silver chromate which is the end point. When the end point is approaching, which is known by the silver chloride beginning to coagulate, add a few drops more of the chromate first added, or the chromate need not be added till the end point is approached.

**Cyanogen Determination**—Take 0.25 gram, dissolve in about 100 c.c. water and titrate with the silver nitrate to first turbidity (Liebig's titration). Potassic iodide indicator may be used or not as preferred, it makes no difference on a moderately pure cyanide solution.

**Cyanogen Determination**—Take 0.25 gram, dissolve in 100 c.c. water, add potassic chromate indicator and titrate as in the sodium-potassium determination to complete precipitation and brick-red end point (Vielhaber's titration). Cyanogen requires 2 c.c. by this method for every 1 c.c. which it requires by Liebig's titration, therefore, multiply the cubic centimeters used in Liebig's titration by 2, and deduct from the amount used in Vielhaber's. The remainder equals the cubic centimeters required by chlorine, which multiplied by the proper factor gives grams Cl in the sample. The effect of any ferro- or sulphocyanides or isocyanates is neglected.

**Moisture Determination**—Weigh out two or three grams in a weighed porcelain crucible and heat over the burner

\*Mining engineer, 10 March Hall Crescent, Edinburgh, Scotland.

to a low red heat till all is melted and no longer, as it soon begins to increase in weight. If any ammonia should come off, let it go and let it be included in the moisture returned; cool and weigh. This method gives identical results with drying at 110 deg. C. for an hour, and is more expeditious.

EXAMPLES OF ANALYSES

The analyses of three samples by this method were as follows: Sample A, sold as "c.p. potassium cyanide"; sample B sold as "gold cyanide testing 98 to 100 per cent."; sample C, sold as "lump cyanide, 40 per cent." A was not of a good color and did not look like a c.p. article; its nominal KCN test was 95.7; it dissolved readily. B was of a clean and white appearance, crystalline, pulverized, easily dissolved and readily tested 96.7 KCN. C was fairly white, hard to pulverize, dissolved slowly and evidently contained carbonates as its solution effervesced freely on addition of acid; it tested 46.3 nominal KCN.

The analysis of sample B is given (B 1), with all the sodium other than cyanide calculated as carbonate, and (B 2) with the sodium chloride as determined. The samples were put through a complete qualitative analysis, which proved the absence of any estimable quantity of silica, heavy metals, earth metals or sulphuric acid.

ANALYSES OF COMMERCIAL CYANIDES.

	A.	B 1.	B 2.	C.
KCN.....	95.7	12.0	12.0	38.7
NaCN.....	nil	63.9	63.9	5.6
K <sub>2</sub> CO <sub>3</sub> .....	0.9	nil	nil	nil
Na <sub>2</sub> CO <sub>3</sub> .....	1.5	12.0	1.6	45.9
NaCl.....	nil	..	11.4	0.2
Moisture.....	1.0	3.5	3.5	0.6
	99.1	91.4	92.4	91.0

CALCULATION

The calculation of B 2 is given in full as an example. Weight taken, 0.25 grams; weight of KCl + NaCl, 0.26. AgNO<sub>3</sub> (N/10) 43.3 cc. (× 0.00355) = 0.153 Cl = 58.86 per cent. Cl (on 0.26). Now, 58.86 - 47.6 = 11.26, and 11.26 × 7.69 = 86.59 per cent. NaCl, and (100 - 86.59) = 13.41 per cent. KCl in the mixed chlorides.<sup>1</sup>

Potassium—13.41 per cent. (on 0.26) = 0.035 gram KCl = 0.018 gram K = 7.2 per cent. K (on 0.25).

Sodium—86.59 per cent. (on 0.26) = 0.225 gram NaCl = 0.088 gram Na = 35.2 per cent. Na (on 0.25).

Chlorine—Took 0.25 gram; used 42.1 cc. AgNO<sub>3</sub>; 42.1 - (18.6 × 2) = 4.9 cc. 4.9 × 0.00355 = 0.017 Cl = 6.9 per cent. (on 0.25).

<sup>1</sup>Lowest possible chlorine is 47.6, corresponding to 100 per cent. KCl; highest possible is 60.6, corresponding to 100 per cent. NaCl. Therefore, 13 per cent. in excess of 47.6 = 100 per cent. NaCl, and every 1 per cent. in excess of 47.6 = 100 ÷ 13 = 7.69 per cent. NaCl. Therefore, subtract 47.6 from the per cent. of chlorine found, and multiply remainder by 7.69, result = per cent. NaCl in the mixed chlorides, and 100 - per cent. NaCl = per cent. KCl. This part of the calculation may be eliminated by using a dia-

Cyanogen—Took 0.25 gram; used 18.6 cc. AgNO<sub>3</sub> (× 0.0052) = 0.0967 gram CN = 38.7 per cent. (on 0.25), of which 7.2 K takes 4.8, making 12 per cent. KCN and leaving 33.9 CN which takes 30 Na, making 63.9 per cent. NaCN and leaving 5.2 Na, of which 6.9 Cl takes 4.5, making 11.4 per cent. NaCl and leaving 0.7 Na = 1.6 per cent. Na<sub>2</sub>CO<sub>3</sub>.

THE MISSING PORTION OF THE ANALYSES

The question now arises, what is the missing 7 to 9 per cent. in analyses B and C? Assuming that the analyses are correct as far as they go, which there is no reason to doubt, the missing percentage cannot be any heavy or earth-metal salt, silica, or sulphate, as these were found to be absent. It cannot be water or an ammonium salt, as these were determined by fusion at a red heat. It cannot be any salt of sodium or potassium, for these were determined quantitatively, and, as the analysis of the c.p. cyanide seems to show, with a sufficient degree of accuracy. Any alkali metal not otherwise accounted for has been returned as carbonate, and, in the case of sample B at least, even if it were assumed that the surplus alkali metal were present as some organic salt having a much higher molecular weight than Na<sub>2</sub>CO<sub>3</sub>, it would not nearly account for the discrepancy.

It was thought that the missing percentage must necessarily be organic matter, and as from the conditions of the case it must be white in color, easily soluble in water, and decomposed on boiling with the stronger acids, the presence of a considerable percentage of urea was suspected and some experiments were made, of which the following may be quoted:

TESTS INDICATE PRESENCE OF UREA

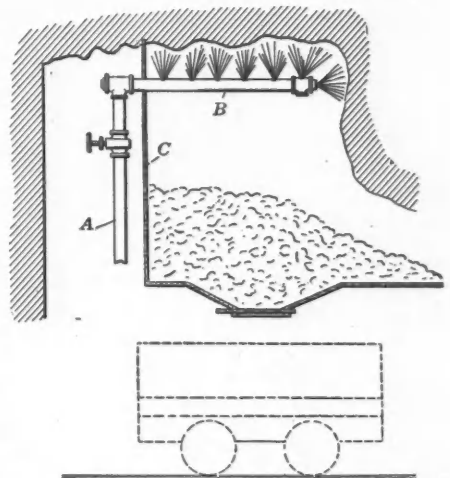
Took 2 grams of sample B, finely pulverized; extracted with 20 cc. absolute alcohol; withdrew 10 cc. (= 1 gram of sample); evaporated to dryness; weighed; ignited gently and weighed again. On ignition there were evolved copious white fumes, slightly ammoniacal. The material turned black, then melted, and the black color disappeared; on cooling, the color became yellow. Loss = 2 per cent. of the amount of sample taken. Another portion of the alcoholic extract was evaporated to dryness and the residue tested for ammonia by heating with caustic soda. Result, no ammonia.

This experiment points rather strongly to the presence of urea to the extent of perhaps 2 or 3 per cent., but still leaves several per cent. not accounted for. I would suggest that possibly the differences in solvent power, which are sometimes met with, may be due to the presence of urea, as it seems likely that soluble organic matter of this kind would be a destroyer of dissolved oxygen, and therefore deleterious.

Method of Mining Gilsonite

T. W. Blake, of Dragon, Utah, recently patented (U. S. Pat. 950,363, Feb. 22, 1910) a method for mining gilsonite and other substances which when heated to a certain temperature flake or break down without melting. Referring to the accompanying drawing, A is the steam or hot-air pipe, B the distributing nozzle provided with a number of orifices through which the steam or air is directed against the roof of the mine and also horizontally. A casing C is fitted, serving as a receptacle to receive the gilsonite as it drops from the roof, and discharging it into a car below.

In raising, the nozzle consists of a pipe with the orifices spaced both circum-



STEAM JET FOR MINING GILSONITE

ferentially and axially, those at the bottom being arranged closer together than at the top. While hot air may be used advantageously, steam, however, is preferable, owing to the facility in generating it, and to the fact that the moisture in the steam prevents any dust exploding.

Copper Production in Siberia

In the last two years two copper smelters were at work in Siberia—the Spasky-English at Akmolinsk, and the Yuli-English at Minusinsk. According to the Tomsk Mining District report, the quantity of bar copper produced at the Spasky works was 106,286 poods, against 97,546 poods in 1908; and in the Yuli works, 40,073 poods against 50,528 poods. Besides the foregoing, the Dzhiltav electrolytic factory (Warter & Co.), in the Karkuralinsk district of Sempalatinsk, has been at work since Oct. 14, 1908, up to the end of which year it produced 2247 poods, followed by 3857 poods in 1909. Thus, the total Siberian metallic-copper production in 1908 and 1909 was 150,321 poods (2424 tons) and 150,216 poods (2423 tons) respectively.

# Smeltery Smoke as a Source of Sulphuric Acid

Plant at Ducktown, Tenn., Utilizing Blast Furnace Gas. Capacity 160 Tons Acid Daily. Chamber Process Employed with Pyritic Smelting

BY W. H. FREELAND\* AND C. W. RENWICK†

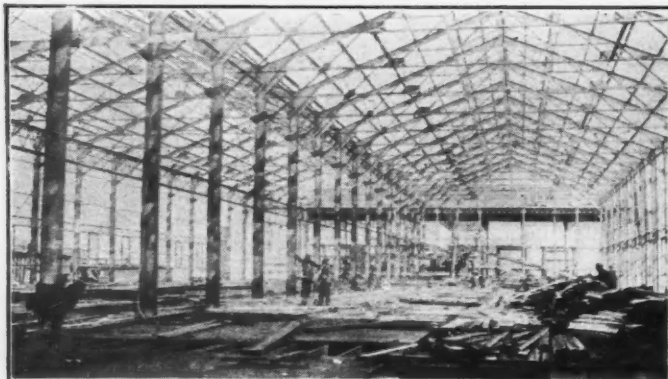
The conflict between copper smelters and adjacent land owners, growing out of the injurious effect of sulphurous acid on vegetation, is almost as old as the copper industry itself. For many years the world's copper ores were shipped to England or Germany, when Swansea and Freiberg monopolized the smelting industry. It is, therefore, natural that the problem of "smeltery smoke" should have had its first serious consideration in Europe. In the cruder pioneer smelting days little attention was paid to the chemistry of copper metallurgy. In fact, it is still in its infancy as compared with the metallurgy of iron. The effect of the smoke nuisance, however, was only too apparent. Royal commissions were appointed to investigate, experiments

after great preliminary expenditure, has been abandoned, rather than face prospective trouble. It is not the purpose of this article to incite sympathy for the copper smelter, but to tell how some of them have overcome their difficulties.

## GEORGIA VS. TENNESSEE COPPER COMPANIES

The State of Georgia sought to enjoin the operations of two copper companies operating in Tennessee near the Georgia-Tennessee boundary line. Proceedings for that purpose were instituted in the Supreme Court of the United States, and in due time that court handed down an opinion that Georgia was entitled to the injunction prayed for, if insisted upon, after allowing the copper companies a

the sulphur contained in the ore, so long as that element was eliminated by open-air heap roasting, conducted by the very nature of the process over an area of many acres. The sulphur must be eliminated within a narrow compass. Pyritic smelting promised the only means of so doing. But pyritic smelting was still largely a matter of theoretical possibilities and disappointing experiments. That, however, is another story, and has been told elsewhere. Suffice to say that the process was developed to successful commercial practice by the Ducktown Sulphur, Copper and Iron Company, Ltd. Under the conditions of the new smelting practice, the escaping sulphurous-acid gas was confined within the furnace smoke stack and thus offered conditions



INTERIOR VIEW OF CHAMBER BUILDING AT ISABELLA, TENN.



CHAMBER AND TOWER BUILDINGS DURING CONSTRUCTION

were made, time, money and talent were lavishly expended in a search for the means of abating a nuisance that was daily wasting an element known to be of immense commercial value. Sulphur, in the form of sulphurous-acid gas, was well known to be the injurious ingredient of the smoke, but no practical process for its recovery was found.

Failing to find a remedy, the governments of both countries resorted to the restriction of the industry to certain prescribed territory, and its regulation within certain limits of practice. This is the only measure of relief yet afforded German and English land owners.

Within recent years the "smeltery smoke" problem has become acute in the United States. Various States and the Federal Government have taken it up. Vast plants have been closed, or are threatened with closure, by injunction. At least one large Californian project,

reasonable time to carry out their intention of making sulphuric acid from their furnace gases. To the lasting honor and credit of Georgia and her attorney general, Hon. John C. Hart, this State has exemplified the motto "Wisdom, Justice, Moderation," which adorns her seal, and has assisted in successfully solving the smeltery-smoke problem.

## PYRITIC SMELTING

Of the two copper companies operating at Ducktown, Tenn., the Ducktown Sulphur, Copper and Iron Company, Ltd., a British corporation, is the pioneer. As implied by its name, the conception of utilizing the sulphur in its ores dates from its organization (1891). During the long interval between that conception and its realization, the steadfast purpose of Managing Director Joseph G. Gordon, of London, was being worked out step by step at Ducktown. It was early apparent that nothing could be accomplished toward the recovery and utilization of

favorable to its further treatment and recovery as sulphuric acid.

From the advent of pyritic smelting, laboratory investigations and experiments were conducted over an extended period by the company's chemist, with a view to adapting one of the well known acid processes to copper-blast-furnace conditions. That known as the ferric oxide contact process was selected and a 10-ton unit was installed, to try out that process on a commercial scale. The results obtained from this experimental plant clearly demonstrated that the process had not yet reached a stage commending it to copper-furnace conditions. An enlightening review<sup>1</sup> of the obstacles to that process was contributed by Thorn Smith, late chief chemist.

## THE CHAMBER PROCESS ADOPTED

Attention was next directed to the possibilities of the chamber process, which, under the able direction of N. L. Heinz,

\*Retired general manager.

†General manager, Ducktown Sulphur, Copper and Iron Company, Ltd., Isabella, Tenn.

<sup>1</sup>Trans. A. I. Chem. Eng., Dec. 28, 1908.

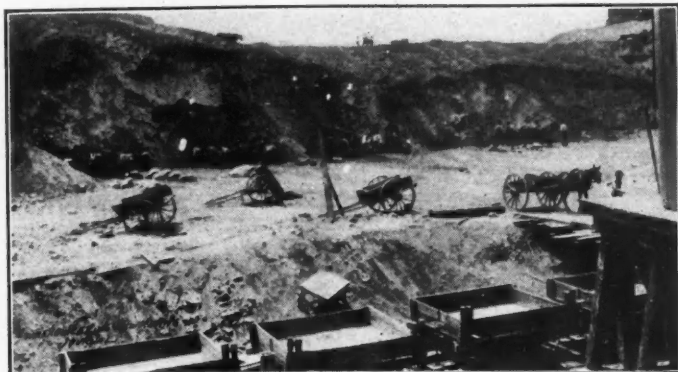
chemical engineer and acid expert, was destined to solve the problem. A contract was made with Mr. Heinz, June 1, 1908, to design, superintend erection, and put into operation a chamber plant of the capacity of 160 tons 60 deg. B. sulphuric acid per day. Mr. Heinz arrived at Ducktown, June 23, 1908. On July 14 ground was broken for a plant covering an area of approximately 2½ acres. It may be stated in passing that this is the greatest area covered by any single undertaking of the kind in existence.

On the morning of June 11, 1909, the fans of the completed system were

photographs, and proved by the numerous engineers and technical men who, during erection, came from all parts of the country to study the design and structure, and are still constant visitors since actual operation was commenced. Some idea of the magnitude of the undertaking may be gathered from the fact that it entailed the excavating of 30,000 cu.yd. of earth; the placing of 6040 cu.yd. of concrete; and the erection of 1000 tons of structural steel, over 1,000,000 ft. of lumber 1,000,000 bricks and 2,750,000 lb. of lead. It may be a matter of further interest to many to know that with the exception of the structural-steel

temperature and in composition of the gases; the presence of carbon dioxide from combustion of coke (which, unfortunately, cannot be entirely dispensed with even in pyritic smelting), and further increased by an appreciable quantity from calcium carbonate in the ore, which at furnace temperature yields lime and carbon dioxide.

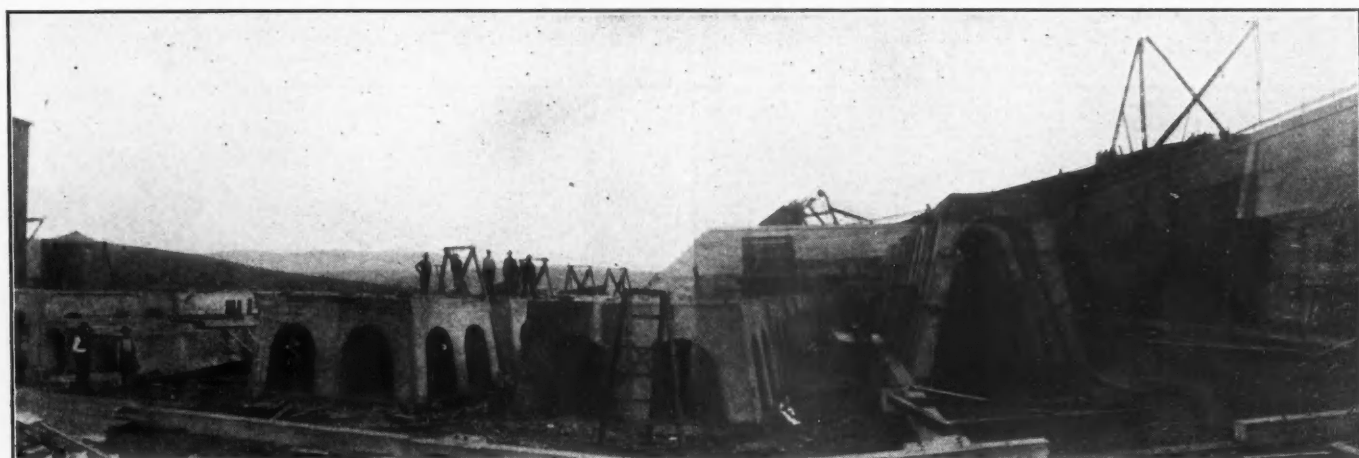
Owing to the fluctuations in composition of gas an average analysis would convey little idea of conditions to be met and provided for. Under fairly normal conditions the gases delivered to the chambers are approximately as follows: SO<sub>2</sub>, 3½ per cent.; CO<sub>2</sub>, 3½; and SO<sub>3</sub>,



EXCAVATING FOR SULPHURIC ACID PLANT



PLACING OF CONCRETE FOUNDATIONS



READING FROM LEFT, FOUNDATIONS FOR GLOVER TOWERS, COOLERS, GAY LUSSAC TOWERS, FAN WITH ACID EGG PIT UNDERNEATH; RETAINING WALL 32 FT. HIGH

started up; four hours later the chamber drips were running freely, and a yield equivalent to 83 tons 60 deg. B. acid was recorded for the first 24 hours.

RECORD OF CONSTRUCTION

It is doubtful if such an achievement in construction could be surpassed in the great industrial districts of the east, in the midst of manufacturing and transportation facilities. To have made such a record so far from industrial centers is indeed an achievement and might suggest that excellence of design and thorough workmanship must have been sacrificed to time. But such is not the case, as may be seen by the accompanying

erection, the entire work was done by native labor and local artisans, under the immediate direction of Mr. Heinz. An exception to the local artisans is that of the skilled lead burners, who were brought together from various parts of the country.

THE SOLUTION OF A COMPLEX PROBLEM

The problem presented to the acid expert was a novel and complex one. It imposed many conditions foreign to the usual sulphuric-acid manufacturer, such as the contamination of the gases (smoke) by flue dust, unavoidable in blast furnaces; irregularities in furnace conditions and consequent fluctuations in

trace. The temperature of the gases in the furnace flues frequently records a range of over 200 deg. C. in every eight or 10 minutes.

Anyone conversant with the reactions of the process will readily understand that a chamber acid plant of ordinary design would be wholly inadequate to meet such variable conditions. The flue dust calls for special consideration since it carries a large percentage of zinc in the form of impalpable sulphates and oxides, that are prone to be carried into the system, clogging the gas passages and flues, and even the circulating acid pipes. Moreover, zinc in itself is an important by-product to be recovered.

It is in the special provisions, designed to meet these exceptional conditions, that this plant chiefly differs from the ordinary chamber plant.

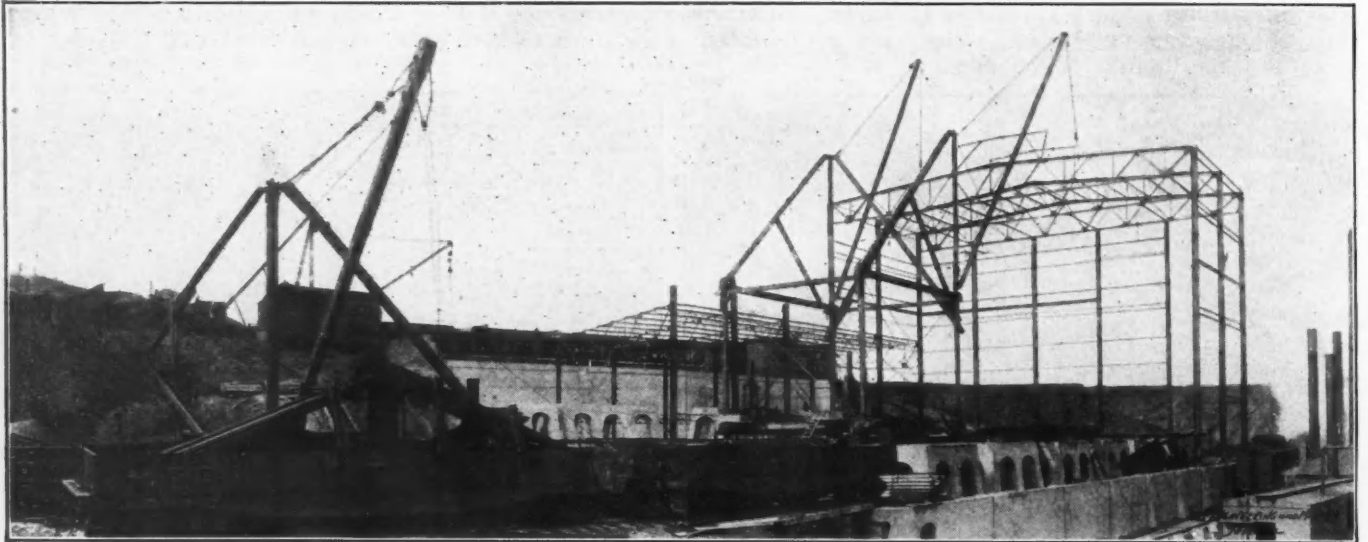
#### OPERATIONS OF THE PLANT.

The course of the gases may be traced on the accompanying outline plan and elevation. The original smelting plant, before the manufacture of sulphuric acid was commenced, consisted of two furnaces of the usual water-jacketed type, each with an independent brick flue lead-

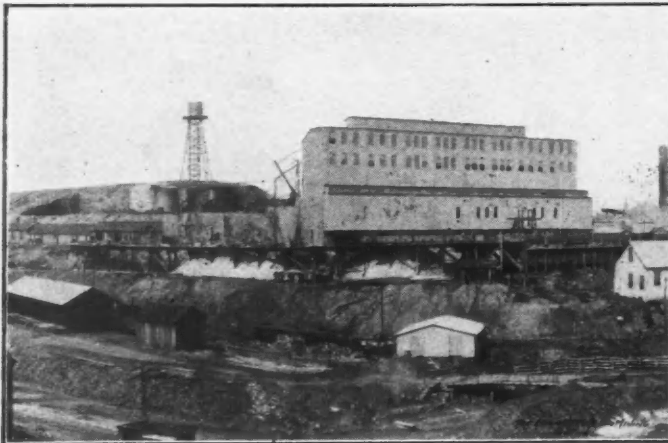
Each channel is held in place by trunnions resting in the walls. On one side the trunnions extend through the side wall, the ends being squared to take a wrench, by which means they can be revolved and their accumulated contents periodically dumped to the floor and later withdrawn through appropriate openings underneath. The coarser particles of flue dust readily come to rest in the anterior flues and furnace-dust chamber. The impalpable metallic oxides and sulphates respond but slowly to gravity at high

of entrance is seen at its posterior end. By a simple system of dampers the gases may be admitted at any or all these entrances, in any desired proportion. On high temperatures, caused by exceptional conditions of the furnace, the gases are cooled by passing them through the whole course of the kite-shaped flue. On lower temperatures the whole or part may be admitted at any earlier point or points.

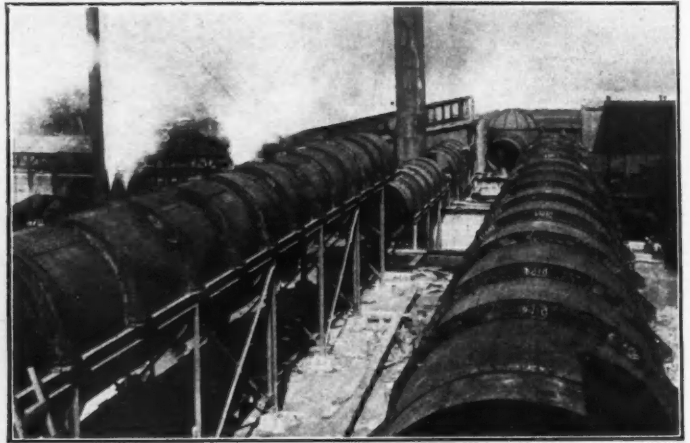
From the dust catcher a brick flue runs the full length of the tower building with



FOUNDATION AND PORTION OF STEEL FRAME FOR TOWER BUILDING



TOWER BUILDING AND STORAGE TANKS



KITE SHAPED FLUE

ing to a common brick dust chamber, at one end of which stands the old smoke stack, now cut off by a damper. From the furnace-dust chamber the gases now pass into and rise through a cylindrical tower, thence through a kite-shaped flue to the special dust catcher on a somewhat higher level. This dust catcher, with its connecting and extension flues, claims particular attention, as these control and regulate the temperature of the gases delivered to the Glover towers, as well as eliminate the zinc and other light dusts. The dust catcher proper consists of a rectangular brick chamber containing a system of channel irons.

temperatures, even at the slow speed attained in the flues and dust chamber, hence the introduction of the channel irons offering surfaces of repose at all points between the floor and roof of the dust catcher.

#### TEMPERATURE AND DUST ELIMINATION

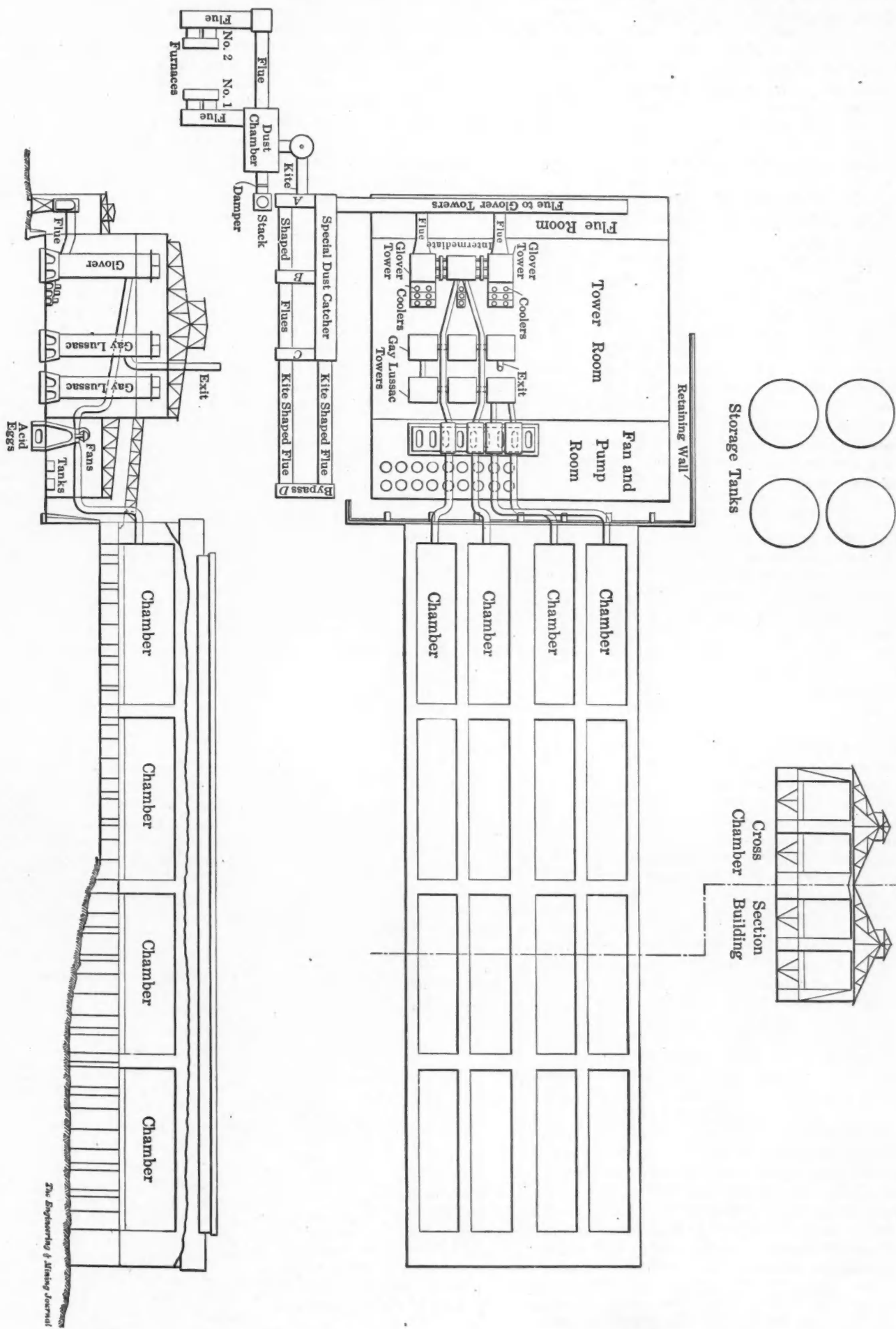
The control and regulation of the temperature of the gases is accomplished by directing their flow through a greater or lesser distance of the kite-shaped iron flue leading into the dust catcher. Referring to the plan, *A B* and *C*, the tower-like extensions of the dust catcher afford entrances thereto, while a fourth point

separate off-takes to each Glover tower. In each of these off-takes are placed niter boxes for the decomposition of the sodium nitrate. There is also an auxiliary set of similar niter boxes at the end of the dust catcher for use in emergencies. In addition to these, a special and original method of dealing with the valuable nitrous compounds has been worked out and put into successful operation.

#### GLOVER TOWERS

The gases having been cleansed of dust and brought to the proper degree of temperature are now ready for the first step of the process, viz., the two





GENERAL PLAN AND SECTION OF THE SULPHURIC ACID PLANT OF THE DUCKTOWN SULPHUR, COPPER AND IRON COMPANY, LTD., ISABELLA, TENN.

The Engineering & Mining Journal

Glover towers, each 12 ft. square and 45 ft. high, filled with checkered layers of a patent chemical brick. Entering at the bottom of these towers the gases ascend to the top, whence they are led downward again through a system of external pipes to enter the bottom of a special tower through which they again ascend, and pass on their way to the chambers through two lead flues, each 42 in. in diameter. Special mention should be made of the extremely high oxidation of the sulphur dioxide. In these towers fully 40 per cent. of this gas is converted into SO<sub>2</sub>. The concentration of the chamber acid is accomplished without any external aid from cast-iron pans, etc., generally used in the ordinary chamber process. While this plant has a normal rated capacity of 160 tons 60 deg. B. acid per day, it has been demonstrated that this quantity does not represent the maximum tonnage that can be produced, and furthermore a concentrating capacity of over 200 tons 60 deg. B. acid per day has been attained when actually needed.

#### ACID CHAMBERS

Situated between the towers and the chambers are four powerful fans to force the gases through the system. These consist of similar units, two forcing the gases into the front chambers, and two withdrawing them from the rear. These fans are made of hard lead (10 per cent. antimony and 90 per cent. lead) and are of special design.

Next in train are the 16 chambers, comprising two sets of eight each. Each chamber is 96 ft. long, 22 ft. 8 in. wide, and 30 ft. high. The total volume of the chambers is 1,050,000 cu. ft. It is at this point in the process that the contaminating influence of the carbon dioxide is felt, and where special and novel features are successfully introduced to overcome its pernicious effects. As these features are of a proprietary nature, I regret that I am not at liberty to describe them.

#### GAY LUSSAC TOWERS

From the chambers the gases pass into the six Gay Lussac towers, where the nitrogen compounds are recovered in the same manner as in all modern and well regulated chamber plants. It has been the belief of many acid manufacturers that only a "sludge" acid could be produced in a chamber acid plant, utilizing the waste sulphur gases from a pyrite smelting furnace. That such is not the case in this instance has been readily acknowledged by several well known experts, who, after having seen the manufactured product delivered from the Glover towers to the storage tanks, have expressed surprise at the purity and clearness of this acid.

#### FURNACE OPERATIONS

In order to comply with the requirements of the State of Georgia, through

Attorney General Hart, smelting operations were reduced to a one-furnace basis to meet the capacity of the acid plant. This furnace smelts pyrrhotite ore six days in each week, the seventh day being devoted to the concentration of the low-grade matte produced during the ore-smelting period. The ore treated varies almost daily from 14 to 19 per cent. S., and averages about 16 per cent. S., and the low-grade matte about 25 per cent. S. The problem of utilizing the gases from the matte concentration proved a simple one and considerably more acid is produced on this one day than on any of the ore-smelting days.

Due to the irregularity of the gases produced from only one furnace, it might give rise to the suspicion that conditions deleterious to the lead chambers and towers would arise. After more than nine months' operation, large samples of lead were removed from the chambers and towers, cut into squares 12x12 in. and carefully weighed without discovering any perceptible loss in weight.

In conclusion it may be stated that the manufacture of sulphuric acid from "smeltery smoke" is far beyond the experience of most copper smelters. The present achievements and future promise of further acid development by the Ducktown Sulphur, Copper and Iron Company are entirely due to N. L. Heinz, who has worked out the problem to its present commercial success at this plant.

### Possible Substitutes for Tree Rubber

BY WILLIAM WESTON\*

Commercial rubber is a valuable adjunct in the running of machinery, and its use has increased rapidly during the last 15 years, due largely to the advent of the automobile. Rubber stocks are just now having a tremendous boom in the London market, and for the time it is almost impossible to get a hearing on any other enterprise. It would seem that they are getting near the danger line, for the supply of tree rubber having become insufficient to meet the demand, active minds are at work looking for a substitute for rubber, and now apparently with some chance of success.

Among the many materials of an asphaltic nature, classed as hydrocarbons, and which are found in Routt county, Colo., and Uinta county, Utah, are gilsonite, grahamite, ozocerite or mineral wax, and what has been called, and I think erroneously, elaterite or mineral rubber, but which is in reality wurtzilite. Dana describes elaterite as mineral caoutchouc or elastic bitumen, which is found in soft, flexible masses, and was

\*Denver, Colo.

discovered in a lead mine in Derbyshire, a coal mine at Montrelais, France, and in bituminous limestone at Woodbury, Conn. The elaterite of Indian and Sam cañons, owned and worked by the Raven Mining Company, of Chicago, is hard and bright, but not elastic in its crude state, and is manufactured into "kapak," which is used chiefly for waterproof roofing.

Quoting from the Government report on the asphalt and bituminous-rock deposits of the United States: "The relations, chemical and other, between the hydrocarbons show the utmost complexity, for complexity exists in the substances themselves, nearly all of which are separable by the action of solvents, or by fractional distillation into two or more components, that are in turn divisible into series of hydrocarbons, in many instances of great extent."

In the Uinta county region, all these substances seem to differ in character in the different veins found, and now the discovery of a 5-ft. vein is just reported, and from the appearance and action of the mineral under a flame, it is probably wurtzilite, but which when melted in conjunction with a light oil and poured over canvas, makes a good rubber sheet. A mass of the same when cooled is similar to true rubber in appearance, but not quite equal as yet in resiliency or elasticity. The discovery has been made only recently and while patents are being obtained for its manufacture, no information is being given out. As wurtzilite is worth about \$50 per ton f.o.b. cars, the value of such a discovery would be great.

#### A RUBBER PLANT IN COLORADO

About four years ago it was discovered that a plant which grows in arid regions all over the State of Colorado, at elevations of 5000 to 8000 ft., contained considerable quantities of rubber in its roots. By plainsmen it was known as "rabbit brush," but Professor Cockerell, of Colorado College, identified it as "a *Picradenia* closely allied to a *P. Floribunda*." Many tons of this were gathered, and a company formed, which erected some simple wet-grinding machinery, and produced rubber, from which rubber bands, erasers, auto tires, horseshoe pads, shoe heels, etc., were made, all of which appeared and were pronounced to be equal in resiliency and elasticity to tree rubber.

The patents are now in the hands of a company in which Myron Brownell, manager of Mining Science Publishing Company, is one of the chief owners. The cost of gathering and manufacture did not exceed \$15 per ton of shrub, and it produced from 5 to 16 per cent. of rubber, which was worth 80c. per lb. when rubber was about half the price it is now.

Mineral rubber, if proved available for use, of course has its limits, and will eventually be worked out, while the vegetable rubber can be cultivated indefinitely.

# Burro Mountain Mining District, New Mexico

Burro Mountain and Chemung Mines Each Report over 2,000,000 Tons Blocked Out; Savanna Has Large Acreage; Railroad Connection Soon

## LOW GRADE COPPER ORES

The Burro Mountain mining district, in Grant county, N. M., was first prospected for silver and later, in 1880, for copper. The ores occur as a disseminated chalcocite through shear zones in a porphyry country. In the early days the production of the district was from rich deposits of carbonate ores at the surface, but latterly the enriched sulphide zone has been sought. Sulphide ores have been found at the surface, and leached areas encountered in the deepest workings (800 ft.). The present water level is at 300 ft.

### LOW-GRADE ORES DEVELOPED

The principal companies in the district are the Chemung, Burro Mountain and

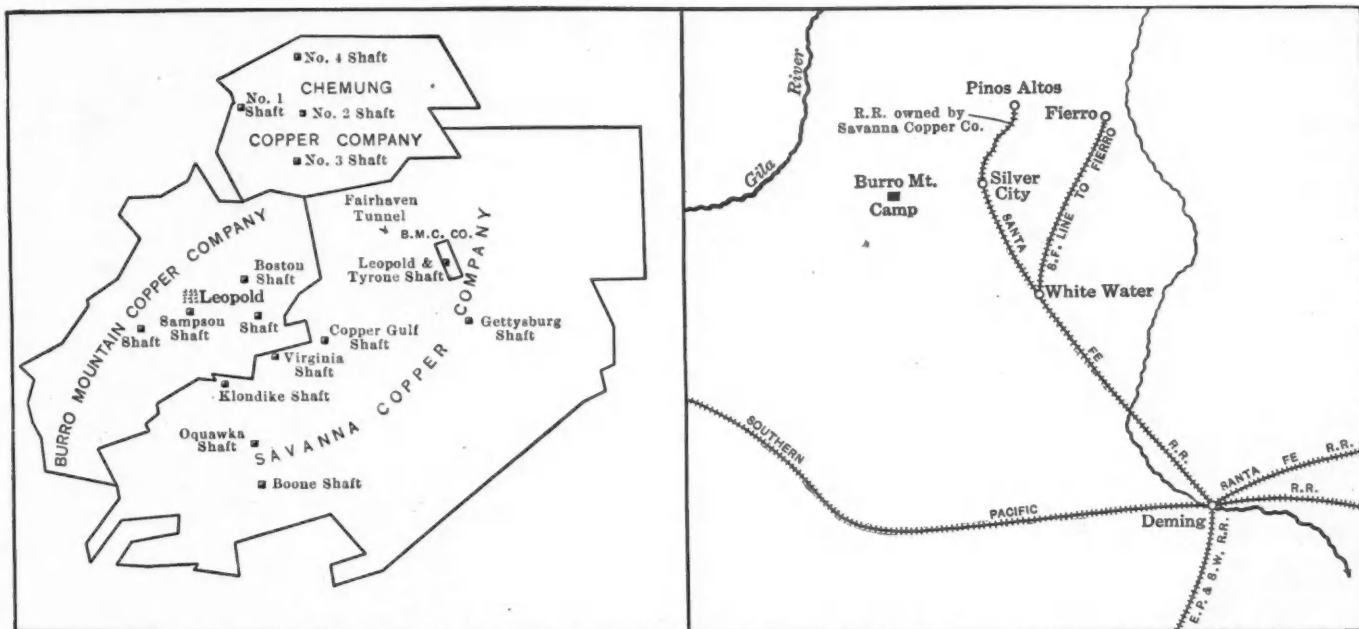
trators. The Burro Mountain has a 250-ton mill which has been operating for several years, concentrating 9½:1 and saving 75 per cent. Phelps, Dodge & Co. recently acquired the complete ownership of the Burro Mountain, and will close down the mill, holding the property merely as a reserve. The Chemung property has one shaft (No. 2) to a depth of 800 ft., but the bulk of the development is at a depth of from 250 to 300 feet.

The Savanna company owns the Comanche and Copper Gulf groups, contiguous to each other and forming an area of 2577 acres in the Burro Mountain district. Such development as has been

### OPERATIONS AWAIT THE RAILROAD

The mines in this district have been experimenting and working the ores for many years. Several smelteries have at one time or another been built in the vicinity, but high prices for material together with a long wagon haul to the railroad rendered these enterprises unprofitable and they were abandoned.

The smeltery of the Savanna company is on the Santa Fe railway, south of Silver City and was built to trate the lead-silver ores from Silver City at the Pinos Altos district. It contains one 200- and one 300-ton water-jacketed copper furnace. The



PRINCIPAL MINES AND SITUATION OF BURRO MOUNTAIN DISTRICT

Savanna. Two Star drilling outfits are now at work on the Savanna, developing the disseminated ores believed to exist. The Mangus Development Company plans to prospect its ground west of the Chemung and north of the Burro Mountain by churn drills; the Azure mine, north of the Mangus, has a turquoise mine along an altered zone in the granite.

The Burro Mountain and Chemung properties have each about 6 miles of workings, and each reports over 2,000,000 tons of 2½ to 3 per cent. ore in sight. The ores are not uniform, masses usually carrying 1 to 3 per cent., and occasional bunches running as high as 20 per cent. copper. Ore about 2½ per cent. is classed as commercial for the concen-

done on the Comanche group has been for the most part at two of the shafts which are connected on the 300-ft. level, and which have disclosed about 50,000 tons of ore. The other shafts and workings are confined to the surface. The engineer for this company, I. J. Stauber, says this group lies within the mineralized area and contains three large fractured zones, averaging 250 to 300 ft. in width.

The Copper Gulf group comprises 1440 acres and is opened by five shafts, all about 300 ft. deep. The Old Virginia shipped several thousand tons of 10 per cent. copper ore in 1907, but the principal ore developed on the group carries 3 to 3½ per cent.

company also owns a concentrating mill at this point, which with a little remodeling can handle 300 tons of Burro Mountain sulphide ore per day. Iron flux and lime are quarried along the company's railroad near Silver City.

Work is in progress on a railroad to connect the Burro Mountain district with the Santa Fe railroad. This road should do away with the chief reasons given for the failures of the smelting works of this camp, and should pave the way toward the further development of the resources of the district. Upon the completion of this road the Savanna company promises to commence shipments and inaugurate a vigorous campaign of development.

# The Northern Appalachian Coalfield

Detailed Study of Various Seams Occurring in First Bituminous Basin.  
Desirable Tracts of Coal Available and Present Favorable Conditions

BY RUSH N. HOSLER\*

The structure of the greatest coalfield of the world, which geologists have named the "Appalachian," is simple, consisting in a general way, of a broad canoe-shaped trough. Beginning near the northern line of Pennsylvania, about latitude 42 north, longitude 77 west, it extends southwestward through West Virginia, western Maryland and Virginia, southeastern Ohio, eastern Kentucky, central Tennessee and ending in Alabama about latitude 33 and longitude 88. The deepest part of this canoe-shaped trough lies in a line extended southwestward from Pittsburg across West Virginia.

While the general character of this rudely shaped canoe is easily understood, the eastern prow is crumbled into a number of nearly parallel folds or troughs, from which complications often arise in making a detailed study. Close observation, however, shows that from the Allegheny front, westward, each succeeding trough is deeper than the one on its east side, and that the arches are correspondingly lower until beds that have an altitude of more than 2000 ft. on its front, extend way below sea level in the center of this great canoe-shaped basin. The upward-bending arches that divide these troughs are called anticlines and the downward-bending troughs are called synclines. The axis of a fold is a line, which at every point, occupies the highest part of the anticline or the lowest part of the syncline; and the part lying between two anticlines, which are separated by one syncline is called a basin.

## FIVE GROUPS OF COALS

We find, in this greatest of coalfields, five well defined "series" or "groups" of coals. From the top downward they are as follows:

1. Upper barrier measures, or Dunkard series.
2. Upper productive measures, or Monongahela river series.
3. Lower barrier measures, or Cono-maugh series.
4. Lower productive measures, or Allegheny River series.
5. Pottsville measures, or Conglomerate series.

The Lower productive, or Allegheny River series takes its name from the fact

that it was first well developed and studied along the Allegheny river and its tributaries, prior to the discovery of coal beds in the Conglomerate series, and was then supposed to be the lowest coal measures.

This group, as now limited by geologists, is found between the two well known rock formations—the Mahoning sandstone above, and the Pottsville conglomerate below. Beginning on the top of the conglomerate and coming up, we find the following well known beds of coal in this series:

Brookville coal, or bed.....	"A"
Clarion coal, or bed.....	"A'"
Lower Kittanning coal, or bed.....	"B"
Middle Kittanning coal, or bed.....	"C"
Upper Kittanning coal, or bed.....	"C'"
Lower Freeport coal, or bed.....	"D"
Upper Freeport coal, or bed.....	"E"

The scheme for designating the principal seams of coal in the Allegheny River series, as now used by the letters A, B, C, etc., was modified from the one adopted by Hodge and Leslie in studying this "series" in 1840, and also from the scheme first used in the fifth annual report of the first geological survey of Pennsylvania, in 1841.

The bituminous coal measures of Pennsylvania are divided into six principal basins, separated by well defined anticlines. I think it was J. D. Hodge, in the first geological survey of Pennsylvania, who first numbered these basins. He starts just back of the crest of the Allegheny mountains, sometimes spoken of as the "Allegheny front," calling it by the first basin and the anticline next west, the first axis. The second basin and second axis, third basin and third axis, etc., following in regular order going westward; the fifth axis crossing the Allegheny river near the mouth of the Red Bank and the Ohio river just below Pittsburg; placing all west of this axis in the sixth basin, which is again subdivided into several basins, extending into Ohio and West Virginia.

This first basin in Clearfield county has always been a large producer of one of our best "steam coals." The coal from this basin, which has made the region famous, has long been one of the standard coals for comparisons throughout the whole Appalachian region. Generally speaking, the first basin carries all of the "lower productive measures."

## FEATURES OF THE FIRST BASIN

Structurally, the pronounced features of this basin are: The tendency to preserve large areas of the lower produc-

tive measures; the quantity of coal preserved in the Freeport group, found here from about 30 to 45 ft. apart, and the Kittanning group occupying a space of from 75 to 90 ft.; the nonpersistence of the limestones that are usually found in these measures, yet they are found locally, but in thin beds; and the presence of the best of fire-clay beds, for which the region is also noted, lying directly under the coal measures and on top of the conglomerate, this is especially true near or on the anticlines.

The Mahoning sandstone is rarely found in its massive form within this basin, yet the upper Freeport coal is one of the most persistent and regular beds. It averages from 2 to 3 ft. thick (sometimes reaching nearly 4 ft.) wherever the hills are high enough to carry it. Mostly shales and sandstone from 40 to 50 ft. thick separate the lower Freeport from the upper Freeport.

The Lower Freeport (D), or the "famous Moshannon" is the coal that gave this region its name and has for many years, until quite recently, been the main producer of the district and the standard of comparison. It yields from 4 to 5 ft. of coal, varying locally from 3 to 8 ft. in thickness. In the northeastern part of the basin, it carries a slate parting from 1 to 2 in. thick, from 9 to 14 in. from the bottom, but in the Houtzdale region there is a clean bed without any partings, but sometimes carrying about 6 in. of boney coal on top.

The Upper Kittanning (C') lies about 40 ft. below the D, and generally speaking, is not of workable thickness.

The geological reports have erred in calling the Middle Kittanning (C) coal a worthless bed in this basin. It is found about 30 ft. below the C' bed, and in some places is one of the best coals in the basin.

The Lower Kittanning bed (B) about 40 ft. below the C bed, is usually found throughout the entire basin and is worked extensively in most places. There are large areas of this coal undeveloped, and from this bed the region can hope to maintain its reputation as a producer of a number one steam coal.

## THE CLARION SEAM

The Clarion bed (A') and Brookville bed (A), found respectively from 50 to 70 ft. and 75 to 100 ft. under bed B, are being worked at a few places, and the future may expect much from these two seams of coal as they cover large areas;

NOTE—Abstract of paper read before the Coal Mining Institute of America, Dec. 17, 1909.

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however, more thorough development of this group of coals may prove them workable only locally.

In mining the B seam in the Winburne district, only the upper and middle benches are shipped, as the lower bench is not a clean merchantable coal. The Clarion, or A' coal, is being developed in this section and the driller's records show about a 5-ft. seam, not all clean coal, however. There is a coal found some places in this community about 160 ft. below bed B, reported to be about 5 ft., but I have not studied this coal and will not attempt to identify it.

The principal operators in this vicinity are the Clearfield Bituminous Corporation, Penna. Coal and Coke Company, and Peale, Peacock & Kerr, Inc., with several smaller operators.

More can probably be said of the Philipsburg-Morrisdale district of this basin, than any other, for the reason that every one of the seams of coal is found here of workable thickness and nearly all are being developed to a greater or less degree.

The Upper Freeport coal is found about 55 ft. above the Lower Freeport, and is very persistent wherever the hills are high enough to preserve it. It carries a thickness of 2 ft. 6 in. to 3 ft. 6 in. and is usually a brilliant black, light-bodied coal. An average of several analyses of this seam of coal shows as follows:

ANALYSIS OF FREEPORT COAL.

Moisture .....	0.675
Volatile matter .....	23.930
Fixed carbon .....	69.375
Ash .....	4.750
Sulphur .....	1.270
With a B.t.u. value of .....	14.238

The Lower Freeport, the "famous Moshannon," or D bed of coal, is nearly a thing of the past in this part of the basin. It is now being worked only by small operations, and these almost exclusively confined to outcrops left from the original mining of this coal by the larger operators in the past. In this particular region, this coal is found with a thin slate parting from 1 to 2 in. thick, about 15 in. from its floor.

The Kittanning Upper coal (C'), found from 33 to 40 ft. below the "Moshannon" bed, is for the most part worthless. It runs from 2 ft. to 2 ft. 8 in., with a slate parting near the middle from 3 in. to 9 in. thick. In the Morrisdale Coal Company's No. 2 shaft it shows coal 1 ft. thick, slate 7 in., coal 1 ft. It is worked some few places as "country banks."

GEOLOGICAL REPORTS SEEM TO HAVE ERRED

It is relative to the Middle Kittanning coal (C) that the geological reports seem to have erred, especially in the Philipsburg-Morrisdale region. These reports speak of the abnormal minimum interval between bed D and bed B in this particular place.

Coal found many years ago in the bottom of an old trial shaft at Morrisdale, was erroneously called the B-seam, and nearly all coal mined as the B-bed in this community was so named because the coal in the bottom of this trial shaft was supposed to be the B-seam; in reality, this seam is the Middle Kittanning bed (C), which subsequent development has proved beyond any question of doubt. This C coal has been worked for many years through shafts by the Morrisdale Coal Company, and through its par-excellence has earned for itself a reputation second only to the "famous Moshannon," which latter seam has been practically exhausted.

This coal at Morrisdale is found from 3 ft. 10 in. to 6 ft. clean coal with an average of 4 ft. 6 in. to 4 ft. 9 in. and sometimes carrying a boney coal about 4 in. thick on top and a coaley slate about 3 in. thick on the bottom. This is a hard, firm, cubical fractured, light-colored coal, capable of much handling without destroying its lumpy character in which it appears on the railroad cars.

An analysis of this coal made by a large consumer in a test with other coals, showed as follows:

ANALYSIS OF MIDDLE KITTANNING SEAM.

Moisture .....	0.86
Volatile matter .....	15.08
Fixed carbon .....	76.30
Ash .....	8.25
Sulphur (included in ash) .....	2.01

Coke was manufactured from this coal at Morrisdale for many years.

At Graham Station, about three miles west of Philipsburg, this coal is also being worked and has been for some years and as at Morrisdale was also called by some the B seam of coal. It shows here from 2 ft. 6 in. to 4 ft. and sometimes 5 ft. thick.

It is gratifying, after having supposedly worked out such a large area of the B coal, to find this same area overlaid with the B seam, about 40 ft. under the C, which is so rapidly being exhausted. This fact means much to the commercial stability of the community.

THE LOWER KITTANNING BED

The Lower Kittanning, or B bed of coal is a typical seam throughout the entire first basin. It is being worked extensively. In developing this seam, the lower bench is not mined for it carries a large percentage of sulphur and ash and in most mines is not taken up at all. The bone separating the upper from the middle bench of coal becomes a rock in some places and has a tendency to thicken and split the vein. The average analysis of five samples from three different mines shows the following:

Moisture .....	0.95
Volatile matter .....	21.81
Fixed carbon .....	70.86
Ash .....	4.736
Sulphur .....	1.650

There are remaining several large areas of this coal in this region that have not been developed, but which invite further prospecting to determine their real value.

The Clarion coal (A') is being worked on One Mile Run, about 1 1/2 miles east of Philipsburg. There is a large area of this coal above water level on this run, and if prepared carefully, makes a good steam coal. The following analysis was furnished by one of the operators:

Moisture .....	1.64
Volatile matter .....	20.70
Fixed carbon .....	69.45
Ash .....	6.41
Sulphur .....	2.00
B.t.u. .....	14.328

The seam shows up better here than at most any other place in the Philipsburg-Morrisdale region, but further development may prove its value to the community in the future.

THE BROOKVILLE COAL

The Brookville coal (A) is not worked at all in this region, but drillings at Morrisdale and Philipsburg show it to lie from 90 to 125 ft. below bed B. It varies in thickness from 3 ft. 9 in. to 4 ft. 6 in. with small partings showing in one or two places. From the large areas of this coal here, it should invite more thorough prospecting. The largest operators are the Morrisdale Coal Company, Irish Brothers, Atherton & Barnes, T. J. Lee, Ashman Coal Company, Graham Company, Monarch Coal Company, and many small operators.

In the Osceola-Houtzdale district, most of the coals have been, or are being worked. The feature of this district is a series of faults running nearly at right angles to the general direction of the basin, throwing the measures down as they go southwesterly, thereby keeping the coals in the hills. These faults range from 15 to 150 ft., and are nearly square cut-offs, increasing in height to the southeast and decreasing to the northwest.

There is no E coal between Osceola and Houtzdale, but west of the latter place this coal comes into the hilltops and is worked on a small scale. It runs from 2 ft. 4 in. to 3 ft. 2 in. and is a brilliant black, light-bodied coal, analyzing as follows:

Moisture .....	0.80
Volatile matter .....	22.25
Fixed carbon .....	70.35
Ash .....	5.58
Sulphur .....	1.02

THE MOSHANNON COAL

Houtzdale, Penn., may be termed the home of the Moshannon coal, as it is here that it is found at its best, sometimes reaching the height of 8 ft., with only a parting as thick as a pencil, and this parting a soft streak of mineral charcoal, or "mother coal." For the most part, this seam is exhausted and only the outcrops are left. There are, however, a few hundred acres of this coal still existing in its virgin state, but in most

places it is in small patches, or the larger areas lie under water and have to be sloped or shafted.

This "famous Moshannon" has been the mainstay of the whole Clearfield region, and its purity and excellence have made it a standard which has caused it to be mined with great rapidity to supply the constant demand for such a high grade of bituminous coal. An average of many analyses shows as follows:

#### ANALYSIS OF MOSHANNON COAL.

Moisture .....	0.801
Volatile matter.....	21.715
Fixed carbon.....	73.238
Ash .....	3.673
Sulphur .....	0.573

The Kittanning Upper coal (C'), usually found about 45 ft. below the D coal, generally speaking is a worthless bed in this district and shows about the same structure as mentioned in the Philipsburg-Morrisdale region.

The Kittanning Middle coal (C) is being worked on a small scale on Coal Run between Osceola and Houtzdale, and is from 2 ft. 6 in. to 2 ft. 10 in. thick. It is opened in a few other places, but only for "country banks," and the probabilities are that it will never be worked so extensively as the same bed was in the Philipsburg-Morrisdale district. It is light in color and weight with a high percentage of ash.

The Osceola-Houtzdale district of the first basin has largely developed the Lower Kittanning (B) coal. It is found in its characteristic three benches throughout. An average of 8 samples shows as follows:

#### ANALYSIS OF LOWER KITTANNING COAL.

Moisture .....	6.330
Volatile matter.....	20.400
Fixed carbon.....	72.340
Ash .....	6.930
Sulphur (in ash).....	0.976
B.t.u. ....	14.325

There are large areas of this coal that are now being opened up and many more that could be developed into very large producing collieries.

The Clarion (A') coal is being worked at Osceola by drifts, and has been opened opposite Retort. With a hard slate and rock floor, this coal is accompanied with many knife-blade partings in it and carries a high percentage of ash and sulphur.

The Brookville coal (A) is unreliable in this district, and perhaps more so than any of the other beds, ranging from about 1 ft. up to nearly 4 ft., and sometimes more. Where it is thick it is slaty and dirty, and where very thin it is usually good, so far as observed, and its future commercial stability has hardly been proved.

#### MOST PROMISING PART OF THE FIRST BASIN

The Muddy-Run-Madera-Coalport region probably presents greater opportunities for future development than any other part of the first basin. This is especially true in relation to the lower

beds of the measures, but with the building of a branch of the New York Central & Hudson River Railroad up Clearfield creek from the town of Clearfield, in the past three or four years a great deal of available territory has been taken up which is reported to have good showings of the different coals; with renewed activity in the coal business throughout the country, we may expect to hear of large operations being planned for this region.

#### FREEPORT COAL

The Upper Freeport coal (E) does not carry throughout this entire district, but where it is found you will see the same brilliant-colored coal, characteristic of this seam, from 2 ft. 4 in. to 3 ft. 2 in. thick.

The Lower Freeport coal (D) in the Madera region is found near the tops of the hills and has been largely removed. This coal is characterized by its splitting into two benches in the Muddy-Run basin. This splitting starts in old Mt. Vernon shaft, between Houtzdale and Ramey and continues southwestward to the Coalport region. From a pencil mark at the start, this parting increases to near 25 ft. around Ramey and this interval increases to 50 or 60 ft. along the lower portion of Big-Muddy run. The upper split of this seam is thin and worthless at nearly all places and the lower split thins from its regular thickness to 3 ft. 6 in. on Smoke run and 2 ft. 4 in. to 2 ft. 10 in. at Bacaria and Jonesville. At Coalport and Irvona, this coal is of little importance, maintaining its split condition from the northeast.

The openings on this coal where it is separated by this large rock interval are in the lower bench and it yields one of the best coals in the basin.

#### UPPER AND LOWER KITTANNING

The Middle Upper Kittanning coals (C) and (C') respectively, are of little value through here, yet they are reported in the vicinity of Glen Hope from 3 ft. to 3 ft. 6 in. thick; however, the extent of this coal at this reported thickness is a question that further prospecting will have to answer.

The Lower Kittanning coal (B) is the one coal above all others that much can be expected from here. This coal is opened and worked at Coalport about 100 ft. above water level. In the Madera region it is above water. On the waters of Muddy run and in the Janesville district it is shafted.

At Madera there seems to be some question as to the identity of the (B) coal and if the coal being generally worked there and showing from 3 ft. to 4 ft. 5 in. thick is not the (B) seam, then its value here is of little importance. There are large areas of this coal undeveloped, and we may expect to see up-to-date mining plants operating here in the future.

#### THE CLARION COAL SEAM

The Clarion coal (A') carries all the way from Osceola southwestward beyond Janesville where it is lost track of from lack of definite prospecting, as it is there below water level. It is characterized by its two partings, a ½-in. to 1-in.-mother coal parting about 1 ft. from the top, and 1-in. slate parting about 1 ft. from its floor. The seam is about 3 ft. 5 in. thick and is of a black nature with a diagonal fracture. Like in other parts of this basin, the development of this coal is being retarded owing to the presence of so much (B) coal of a superior quality.

Little definite is known of the Brookville coal (A), in this section owing to lack of development and prospecting, and it is a question if much can be expected from it. The largest operators in this part of the basin are Berwind & White Coal Mining Company, H. B. Swope, Irvona Coal and Coke Company, Cambria Coal Mining Company, The Blythe Coal Company and many smaller operators.

In conclusion: This first bituminous basin is producing between 6,000,000 and 7,000,000 tons of coal each year finding its way to market over the Pennsylvania and the New York Central & Hudson River railroads, and it will be many years before this basin will cease to be an important factor in the production of high-grade bituminous coal. Prospective coal operators may do worse than locating in this basin for there are many desirable tracts of coal that present favorable conditions for economical mining.

In preparing this paper, I have confined myself as nearly as possible to accurate data and information at hand, in the hope of presenting something more reliable than is found in our geological reports on this basin. I wish to express my appreciation to all who have so kindly contributed data.

#### Coal and Lignite Production in Texas during 1909

The production of bituminous coal in Texas in the year 1909 was 1,144,108 short tons, valued at \$2,714,630. This is the largest production in the history of coal mining in Texas. In 1895, the coal was valued at \$2.22 per ton while in 1909 the value per ton was \$2.37. The production of lignite in 1909 was 715,151 tons. The lignite had an average value of 82.8c. per ton. The latest estimates of the coal in lignite areas in Texas show 8200 sq.m. of coal area, and 5300 sq.m. in addition that may contain workable seams. It is estimated that there are 2000 sq.m. of lignite seams, while, in addition to the known lignite area, there are about 50,000 sq.m. of territory that may contain workable lignite seams.

## A Model Coke Plant

The Phillips plant of the H. C. Frick Coke Company, a few miles northwest of Uniontown, Penn., is rated by many engineers as the model plant of the coke region. There are four blocks of ovens in this plant, three double and one single. All these ovens are drawn by modern coke-drawing machines, there being no hand-drawn ovens in the entire plant. There are seven coke-drawing machines in operation at Phillips, the yard being laid out for this purpose, and in case one of the machines gets out of order a machine from one of the other blocks can be transferred to replace the "disabled" machine by a special arrangement of the track at the end of the ovens.

### THE LEVELING MACHINE

One overhead electric leveling machine levels all the ovens in the plant. To all appearance the leveler resembles a rock-drilling machine. The leveler is "set" on the oven and two arms are extended which level the coal in the neatest manner.

At one end of the yard an ash sifter operated by electricity is located and all the ashes are brought here and sifted, both the coarse and the fine ashes being sold and shipped away for various purposes. This is an appliance of the coke-manufacturing industry that all the newly erected plants are taking up, it being one of the most resourceful conservation devices in connection with using ashes as fuel.

### ELECTRICITY IS USED EXTENSIVELY

Electricity is used extensively in the operation of this plant. It is being used to run the drawing machines, larries, sifter, for lighting, etc., and is generated in a modern electrical plant just opposite the boiler house. The heat from the entire block of ovens adjacent to the boiler house is used to assist in firing the furnaces and has proved to be wonderfully successful.

Large tubes from these ovens lead into a main tube which runs to the boiler house. The draft from the smokestack in the boiler house assists these ovens to burn and when they are being watered the tube from the oven that leads to the main tube is shut off and no steam goes into the main tube.

The electrical plant, compressor, fan, boiler house and machine shop are all apart from each other and equipped with all the modern labor-saving machinery.

The Canadian government has appropriated \$50,000 for experiments and research work calculated to stimulate the development of the zinc industry. Dr. Eugene Haanel, Director of Mines, Department of the Interior, will be in charge of the work.

## Coal Dust and Its Treatment with Calcium Chloride

Following the reading of a paper before an English Mining Institute on the treatment of dust with calcium chloride, several engineers entered into an interesting discussion. Mr. Thomson stated that he did not think that calcium chloride was of any use in preventing an explosion. He said that a superintendent might have the floor of his entries wet with calcium chloride, but this would not prevent the coal dust which came from the cars from getting on to the roof and sides. It is this latter dust with which the mine officials have to contend. Mr. Beveridge said that about a year ago, calcium chloride had been used on dusty parts of roadways in one of his mines. At the beginning, the salt was mixed with water, and the liquid sprinkled on the roof and sides, but difficulty was experienced in the deep roadways. Later, the salt was ground and conveyed in bags underground, where it was sprinkled on the floor and on the timbers of the roadways. The roadways thus sprinkled kept damp for about six weeks, whereas the same roadways, when watered, had to be sprinkled every three days.

One dusty part of a roadway, 150 ft. long, 9 ft. wide and 5 ft. high, had 1½ cwt. of the ground salt sprinkled over it, and it had remained damp for six weeks. Mr. Beveridge further stated that there had not been sufficient time nor experiments made to enable him to speak definitely as to the full results; but this he could say, that calcium chloride kept the air cooler, enabled a clean road to be kept where haulers had their cars, and was better than water for laying the dust. In speaking of stone dust, Mr. Masterson said he was afraid that stone dust would not do much good, for the reason that stone dust was slightly heavier than coal dust. If stone dust were spread tomorrow, would it not be found as the days passed that it gradually settled to the bottom and left the coal dust on the top as explosive as ever?

## Explosives in Coal Mines

### SPECIAL CORRESPONDENCE

Captain Desborough, government inspector of explosives at Woolwich, England, in his evidence before the departmental committee on use of explosives in mines, said:

"It is very unfortunate that the prefix safety has been applied to permitted explosives, and it cannot be too strongly impressed on the users of these explosives that all that can really be claimed for them is that they are less dangerous than gunpowder, so far as the ignition of

firedamp and coal dust is concerned. This misnomer seems to have caused some users to imagine that these explosives are safe under all conditions, in total opposition to what are the true facts of the case, that they are absolutely dangerous unless used with certain definite precautions. That this is not an overstatement is obvious from the number of actual ignitions which have occurred in practical use, and, moreover, it is confirmed experimentally by the fact that ignitions have been obtained at Woolwich with practically all the explosives which have been tested there, when comparatively small alterations have been made in the conditions under which the firing takes place. It cannot, therefore, be too emphatically urged on the users of these explosives that it is most desirable to reduce the number of shots fired to a minimum."

### COLLIERY NOTES

It is generally advisable to have two handles fitted on each end of every mine car. This scheme enables the haulers to grip and guide the cars around the turns, beside saving the fingers of these men from being jammed against the roof or its supports.

In some collieries where fast haulage is employed, the full cars often move against a high air-current velocity, which sweeps the fine dust from the cars to the sides, floor and roof. To avoid this, many engineers advocate having the direction of the air current coincide with that of the full trips.

The effect of high temperature and humidity on men working underground should be carefully studied by all mine superintendents. At a high temperature in saturated air, it becomes difficult for miners to remain, even without working. A temperature of 90 deg. in saturated air is a practical limit above which no work can be done. On the other hand, it is a fact that if the air is dry, much higher temperatures can be borne with comfort. In many coal mines, where the air is dry and in motion, men can work in a temperature ranging from 100 to 120 degrees.

Coke operators have found that the ashes drawn from the ovens each day will generate considerable heat when utilized in firing the boilers at their power plants. The only objection is that the ashes require a force blast. The 72-hour ashes are somewhat inferior to those coming from the 48-hour ovens. The reason for this is that the 72-hour ashes are finer, and consequently more difficult to fire with. In some instances, the ashes are mixed with fine coal or coal dirt, and it has been found that when this mixture is burned under force blast, the heat produced is about equal to that resulting when coal is burned.

# MINING AND METALLURGICAL PATENTS

## A CLASSIFIED LIST OF NEW INVENTIONS

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

### COAL AND COKE

**COAL CUTTING**—Improvements in or in Connection with Air Compressors for Use Particularly with Coal-cutting Machines. Ingersoll-Rand Co., New York, N. Y. (Brit. No. 6987 of 1909.)

**COAL-MINING MACHINE.** Jacob Kurtz, Darragh, and Theodore Hochriter, Greensburg, Penn. (U. S. No. 957,510; May 10, 1910.)

**COKE**—Apparatus for Leveling the Coal in Horizontal Coke Ovens. Bochumer Eisenhütte, Heintzmann and Dreyer of Bochum, Germany. (Brit. No. 25,268 of 1909.)

**COKE**—Machine for Quenching Coke. Thomas J. Mitchell and James A. McCreary, Uniontown, Penn. (U. S. No. 956,397; April 26, 1910.)

**COKE**—Method of Distilling Coal. Heinrich Koppers, Essen-on-the-Ruhr, Germany. (U. S. No. 956,371; April 26, 1910.)

**COKE**—Process of Charging Upright Gas-Retorts. Ernst G. B. Körting, Mariendorf, near Berlin, Germany. (U. S. No. 955,970; April 26, 1910.)

**CONVEYERS**—Improvements in or Connected with Conveyers for Use in Mining Minerals, Particularly Adapted for Use in Mining Coal and the Like. Mayor & Coulson, Ltd., Glasgow, Scotland. (Brit. No. 7151 of 1909.)

**SEPARATORS**—Improvements in Centrifugal Separators for Dry Coal and Other Substances. Coal and Coke By-Products Co., of Pittsburg, Penn. (Brit. No. 23,313 of 1909.)

**WASHING**—Coal-Washing Machine. James A. Montgomery, Birmingham, Ala. (U. S. No. 954,986; April 12, 1910.)

**WASHING**—Improvements in and Relating to Washers for Coal or Other Like Materials. Horace J. Greaves, Crofton, near Wakefield, Eng. (Brit. No. 1563 of 1909.)

### COPPER

**AGGLOMERATING** or Briquetting Copper-Ore Concentrates Preparatory to Smelting. Thomas Rouse, London, England. (U. S. No. 955,909; April 26, 1910.)

**CONVERTING**—Process of Treating Impure Copper Matte and Ores. Hermann Maschmeyer, Hoboken, near Antwerp, Belgium, assignor to the Corporation of Usini de Desargementation Société Anonyme, Hoboken, near Antwerp, Belgium. (U. S. No. 957,231; May 10, 1910.)

**SLIMES TREATMENT**—Process for Treating Metallic Slimes. James Dunstone, Dollar Bay, Mich. (U. S. No. 956,800; May 3, 1910.)

### GOLD AND SILVER

**FILTERING APPARATUS.** David J. Kelly, Salt Lake City, Utah, assignor to Kelly Filter Press Company, Salt Lake City, Utah, a Corporation. (U. S. No. 957,467; May 10, 1910.)

**SEPARATION**—Means for Separating Water or Solution from Solids, such as Slimy Ores, Pulp, and the Like. William L. Holms, Guadalajara, Mexico, Leonard M. Green, London, England, and John S. Pattinson, Zacatecas, Mexico. (U. S. No. 957,775; May 10, 1910.)

**TUBE MILL.** Byron L. Morrison, Colorado Springs, Colo., assignor of one-third to Joseph W. Ady, Colorado Springs, Colo. (U. S. No. 957,436; May 10, 1910.)

### IRON AND STEEL

**BLAST-FURNACE CHARGING APPARATUS.** Walter Kennedy, Bellevue, Penn. (U. S. No. 955,885; April 26, 1910.)

**BLAST-FURNACE OPERATION**—A New and Improved Method of Operating Blast Furnaces, Converters and the Like. James Gayley, New York. (Brit. No. 13,552 of 1909.)

**HARDENED STEEL**—Process of Making Hardened Steel. Hector de Nolly, St. Chamond, France, assignor to Compagnie des Forges et Acleries de la Marine et d'Honre-court, St. Chamond, France. (U. S. No. 957,706; May 10, 1910.)

**ORE TREATMENT**—Process for Cleaning Iron Ores. Edward F. Goltra, St. Louis, Mo. (U. S. No. 957,157; May 3, 1910.)

**PURIFYING**—Process for Purifying Steel. Reginald H. Bulley, Syracuse, N. Y., assignor to Halcomb Steel Co., Syracuse, N. Y. (U. S. No. 955,378; April 19, 1910.)

**REFINING**—Process for Melting and Refining Iron. Henry Johnson, Saxilby, England. (U. S. No. 952,260; March 15, 1910.)

### LEAD, ZINC AND OTHER METALS

**NICKEL**—Process of Separating Metals in Solution. Walter S. Gates and Herbert H. Dow, Midland, Mich., assignors, by mesne assignments, to the Ontario Nickel Co., Ltd., Worthington, Canada. (U. S. No. 956,763; May 3, 1910.)

**ZINC**—Electric Furnace. Hiram W. Hixon, Philadelphia, Penn. (U. S. No. 957,058; May 3, 1910, and 957,337; May 10, 1910.)

### NONMETALLIC MINERALS

**PETROLEUM**—Apparatus for Use in Obtaining Petroleum Products. Herman Frasch, New York, N. Y., assignor to Standard Oil Co., Bayonne, N. J. (U. S. No. 951,729; March 8, 1910.)

**PETROLEUM**—Obtaining Petroleum Products. Herman Frasch, New York, N. Y., assignor to Standard Oil Company, Bayonne, N. J., a Corporation of New Jersey. (U. S. No. 951,272; March 8, 1910.)

**SALT**—Process of Refining Salt and Recovering Its Impurities as By-Products. Charles Glaser and George J. Muller, Baltimore, Md. (U. S. No. 957,416; May 10, 1910.)

### MINING—GENERAL

**BLASTING**—Miner's Fuse-Cap. Charles F. Sperry, Chicago, Ill. (U. S. No. 954,595; April 12, 1910.)

**DRILLING**—Spraying Device for Rock Drills. William J. Barnett, Germiston, Transvaal. (U. S. No. 956,026; April 26, 1910.)

**DRILL**—Electric Rock Drill. Olin S. Proctor, Denver, Colo. (U. S. No. 955,899; April 26, 1910.)

**DUST**—An Improved Dust-Allaying Apparatus for Use in Mines. James M. Holman and John Leonard Holman, Camborne, Cornwall. (Brit. No. 6416 of 1909.)

**HAULAGE**—An Eccentric Lever Clip to Attach to Tubs and Bogies used in Hauling Minerals or Other Substances by Ropes in Mines or Quarries. Adam Miller, Cumberland, England. (Brit. No. 9109 of 1909.)

**HOISTING**—Safety Mechanism for Mine Skips and Cages. Henry E. Hyde, Johannesburg, Transvaal. (U. S. No. 956,707; May 3, 1910.)

**MINE-CAR COUPLING.** James S. Paxton, Luzerne, Ky. (U. S. No. 953,706; April 5, 1910.)

**PROPS**—Improvements in Mining Props. Emanuel Schafer, Düsseldorf, Germany. (Brit. No. 3433 of 1910.)

**RESCUE WORK**—System for Ventilating and Rendering First Aid to Entombed Miners. Robert C. Dawson, Wampum, Penn., assignor of one-half to Harry Bartow, Seanor, Penn. (U. S. No. 956,306; April 26, 1910.)

**ROCK DRILLS**—Improvements in Valve Mechanism for Rock Drills and Other Reciprocating Engines. W. C. Stephens. (Brit. No. 14,255 of 1909.)

**TUNNELING MACHINE.** William F. Wittich, Erie, Penn., assignor to the Wittich Success Shaft Sinking and Tunneling Machine Co., Erie, Penn. (U. S. No. 956,463; April 26, 1910.)

**TUNNELING MACHINE STRUCTURE.** John P. Karns, Boulder, Colo., assignor to J. P. Karns Tunneling Machine Co., Boulder, Colo. (U. S. No. 957,687; May 10, 1910.)

### ORE DRESSING—GENERAL

**CLASSIFIERS**—Improvements in or Connected with Hydraulic Classifiers for Metalliferous Slimes. James M. Holman, and John L. Holman, Camborne, Cornwall. (Brit. No. 8060 of 1909.)

**CONCENTRATION**—Apparatus for Concentrating Solutions by Freezing. Eudo Monti, Turin, Italy. (U. S. No. 955,659; April 19, 1910.)

**CONCENTRATION**—Improvements in or Relating to the Concentration of Ores. Arthur H. Higgins, Broken Hill, N. S. W. (Brit. No. 26,852 of 1908.)

**CONCENTRATION**—Ore-Concentrating and Separating Apparatus. Francois Dallemagne, Irun, Spain. (U. S. No. 953,900; April 5, 1910.)

**CRUSHING ROLL.** Richard Bernhard, Milwaukee, Wis., assignor to Power and Mining Machinery Co., Cudahy, Wis. (U. S. No. 956,878; May 3, 1910.)

**DEWATERING**—Means for Handling and Distributing Dewatered Crushed Ore Products, etc. Hans C. Behr, Johannesburg, Transvaal. (U. S. No. 956,669; May 3, 1910.)

**FLOTATION PROCESS**—Process of Treating Ores and Carboniferous Earths. Alfred A. Lockwood, London, England. (U. S. No. 956,773; May 3, 1910.)

**ORE CRUSHING**—Improvements in or Connected with Pneumatic Stamps for Ore Crushing and the Like. H. C. Embleton, Leeds, England. (Brit. No. 10,618 of 1909.)

**ORE-CRUSHING MACHINERY.** Ely C. Hutchinson, Oakland, Cal. (U. S. No. 954,295; April 5, 1910.)

**SCREEN**—Rotary Screen. Samuel W. Traylor, Allentown, Penn. (U. S. No. 957,818; May 10, 1910.)

**SEPARATION**—An Improved Method for the Separation of Metals or Minerals from their Gangues and Apparatus for Use Therewith. Alfred Simon, London. (Brit. No. 10,381 of 1909.)

**SEPARATION**—Apparatus for Separating Metals and the Like from Extraneous Matter. Richard M. Simpson, Wellington, New Zealand. (U. S. No. 957,478; May 10, 1910.)

**SLIMES SEPARATOR**—Centrifugal Slime-Separator. John T. Lindahl, Stockholm, Sweden, assignor of one-half to Göteborgs Nya Vrekstadsaktiebolag, Gottenborg, Sweden. (U. S. No. 954,528; April 12, 1910.)

**SULPHIDE-ORE TREATMENT**—Process of Treating Ores. Alfred A. Lockwood and Marcus R. A. Samuel, London, England. (U. S. No. 956,381; April 26, 1910.)

### METALLURGY—GENERAL

**BLAST FURNACE**—Smelting Furnace. James Grogan, Prescott, Ariz. (U. S. No. 957,554; May 10, 1910.)

**DESULPHURIZING**—A New or Improved Apparatus for Desulphurizing or Otherwise Treating Ore. Robert Hürner, New York, N. Y. (Brit. No. 14,541 of 1909.)

**ELECTRIC FURNACE**—Combined Electric Arc or Resistance and Induction Furnace. James H. Reid, Newark, N. J. (U. S. No. 956,544; May 3, 1910.)

**EXTRACTION**—Improvements in Processes for Extracting Metal from Ore. C. A. Stevens, New York, N. Y. (Brit. No. 7519 of 1909.)

**ROASTER FOR ORES.** Allen J. Garver, Clarkston, Wash. (U. S. No. 954,729; April 12, 1910.)

**ROASTING**—Ore-roasting Furnace. Charlie E. Mark, Chicago, Ill. (U. S. No. 952,680; March 22, 1910.)

**SMELTING**—Process for the Smelting of Silver-Nickel-Cobalt-Arsenic Ores. Camillo C. Otto, Irvington, N. J. (U. S. Nos. 949,058, 949,059 and 946,261; Feb. 15, 1910.)

**SMELTING FURNACE.** Charles A. Wetengel, Caney, Kan., assignor to American Zinc, Lead and Smelting Co., Boston, Mass. (U. S. No. 953,405; March 29, 1910.)



## i PERSONAL i

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

B. B. Lawrence has returned from a western trip.

R. M. Atwater, Jr., of Butte, has been visiting New York.

E. G. Spilsbury has gone to Arizona on professional business.

Dr. R. A. F. Penrose has returned from an European trip.

Edwin E. Chase, of Denver, Colo., has gone to South Dakota on professional business.

E. T. Wright, president of the National Ore Concentration Company, of Chicago, is in Joplin, Mo.

E. E. White is now chief geologist for the Cleveland-Cliffs Iron Company, at Ishpeming, Mich.

Francis O'Hara, of Boston and Charles W. Hopkins, of Winchester, Mass., have been visiting Salt Lake City.

George S. Rice, mining engineer for the United States Geological Survey, was a visitor in New York this week.

W. E. H. Carter and Prof. H. E. T. Haultain, are making an inspection of the Porcupine gold area, Northern Ontario.

Marion L. Thomas has been making some mine examinations in Guerrero, and will return to the City of Mexico in June.

B. K. Blair, of Carthage, Mo., has been chosen secretary of the Zinc Ore Producers' Association, of the Joplin district.

L. A. Friedman, manager of the Seven Troughs Coalition Mining Company, of Nevada, has gone to Hot Springs, Arkansas.

H. K. Slater, of the Mysore, India, Geological Survey is investigating the mineral formations of the Lake of the Woods district, Ontario.

Duncan McDonald, of Springfield, has been appointed a member of the Illinois mining investigation committee, in place of Charles Burch, resigned.

Edmund Shaw, of El Paso, Texas, has been placed in charge of the mill of the Picacho Basin Mining Company at Picacho, San Diego county, California.

Dr. J. Bonsall Porter, of Montreal, professor of mining engineering in McGill University, is taking this year's McGill summer mining school to British Columbia.

Hon. William Templeman, minister of mines of the Dominion of Canada, and R. W. Brock, director of the Geological Survey, made a brief visit to New York this week.

R. J. H. Bradley is on his way to examine a placer property in the Cook In-

let section of southeastern Alaska and expects to return to New York about the middle of August.

H. M. Wolflin, of the technological branch of the United States Geological Survey, is in charge of the mine rescue training station recently established at Seattle, Washington.

Quincy A. Shaw, president, and Rudolph L. Agassiz, vice-president of the Calumet & Hecla and subsidiary companies, are visitors at the mines on their semiannual tour of inspection.

H. W. Hardinge is making a professional trip to the silver camp of Cobalt, Ontario, and will also make investigations in Colorado and mines further west before returning to New York.

R. G. McConnell has received instructions from the director of the Canadian Geological Survey to examine and report upon the mineral country in the Portland Canal district of British Columbia.

J. W. Carlton, formerly of Montana, has returned to the United States after a number of years spent in South Africa and New Zealand as mine manager, and will make his home at Salt Lake City, Utah.

C. E. Campbell, consulting mining engineer of Johannesburg, Transvaal, was in New York last week, on his way to Cobalt, Ont. He intends to spend six or eight months in the United States and Canada.

J. J. Beringer, for a number of years principal of the old Cambourne School of Mining, in Cornwall, will join the staff of the new School of Metalliferous Mining, as head of the department of metallurgy.

W. W. Leach, of the Geological Survey, of Canada, left Ottawa early in the month for the Pacific Coast. This will be his third field-work season spent in geologic work in the Skeena district, of British Columbia.

C. W. Purington, who has been in New York during the last month contracting for machinery for his placer mining operations in Siberia, left New York on his way west on May 21, and expects to sail for Siberia from San Francisco the last of May.

Robert H. Chapman, of the United States Geological Survey, who was last year permitted to do topographical work on Vancouver island, B. C., for the Canadian Geological Survey, will this season continue mapping the topography of that island.

Fritz Thyssen, F. Dahl and F. Funke, of Germany, are visiting prominent iron and steel works in the United States. Mr. Thyssen is a director in the Deutscher Kaiser Works and Messrs. Dahl and Funke are general manager and chief engineer, respectively.

## + OBITUARY +

Arthur F. Braun died in the City of Mexico, May 16, from an overdose of morphine. He went to Mexico two years ago from Toledo, O., and has been employed in El Oro district as a mining engineer.

Mark McDonough died at Carnegie, Penn., May 19, aged 46 years. He was born at McKeesport, Penn., and received his early training in the steel mills at that place, gradually rising until he became assistant superintendent of the Chartiers Iron and Steel Company, in 1887. When that concern was absorbed by the Steel Corporation, he retained his position, but was later made superintendent of the corporation's plant at Muncie, Indiana.

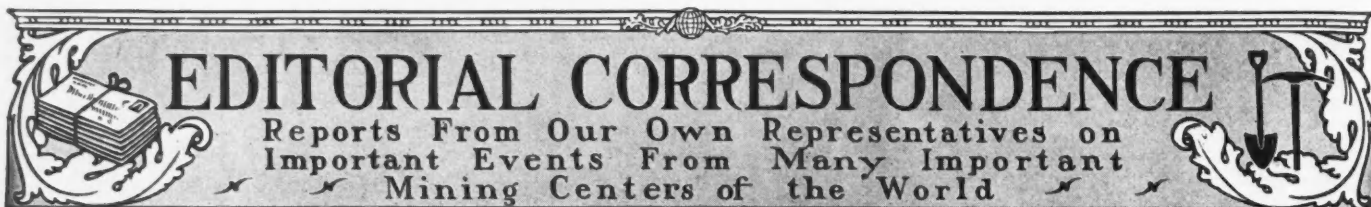
## SOCIETIES and TECHNICAL SCHOOLS

*Mexican Institute of Mining and Metallurgy*—Instead of holding the session on May 26, the Institute will make an excursion to the drainage works of the Valley of Mexico, on June 4. The Minister of Communications and Public Works put a special train at the disposal of the institute for the occasion.

*Missouri School of Mines*—Owing to the continued demand from mining students, mine managers and superintendents, graduates and undergraduates of engineering schools, and science teachers, the School of Mines and Metallurgy announces a six-weeks summer school beginning June 6. All of the courses will be given in the laboratories at Rolla.

*Harvard Mining Club*—On May 20, the club held its eighth annual dinner at the Harvard Union. The following were elected officers for the coming year: Ransom Everts Somers, 1908, Waltham, Mass., president; Ray Potter Dunning, 1911, Springfield, Mass., secretary; Arthur Mason Van Rensselaer, 1911, New York, treasurer. One of the most important events of the evening was the discussion of a plan for the erection of a permanent club house for the organization.

*American Institute of Chemical Engineers*—Papers on the following subjects have been promised for the Niagara Falls meeting, to begin June 22: A new Product for Use in the Arts; Arrangement of Filter Presses for Bleaching Oils with Fullers Earth; Corrosion of Steel; Design of Plants for Chemical Engineering Work; Loss in Coal Due to Storage; The Manufacture and Industrial Application of Ozone; Development of Water Power; Recent Development in the Use of Metallic Filament for Incandescent Lamps; Vacuum Distillation; Manufacture of Nitric and Mixed Acids; Materials for Chemical Engineering Construction.



## EDITORIAL CORRESPONDENCE

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

### San Francisco

May 21—One of the large dredging companies has obtained control of gravel mining ground in Tuolumne county, not far from Table mountain, and will exploit it. This will be the first dredging done in that county. There are tracts of low-lying gravel in Tuolumne like the one in question, which have not been worked, owing to lack of fall, and excess of water to be handled. None of them are of great extent, however, but in this instance the unusual richness of the gravel, according to the sampling, will admit of a dredge being installed on a smaller tract than is usual.

A matter of interest in gravel mining is the fact that "Swiftwater Bill" Gates, of Klondike fame, has recently purchased in San Francisco a large hydraulic-mine equipment made expressly for him by a local firm to be shipped to Peru. Gates has obtained control in South America of an extensive tract of auriferous gravel, said by him to extend for 90 miles in length, and five or six miles in width. He thinks it is one of the great placer fields of the world and says the gravel will run in value from 60c. to \$1.50 per cu.yd. At all events, he had no trouble in organizing a syndicate to take the property, and has paid cash for his expensive purchases of equipment. Little has been made public of this new enterprise.

Kern county is showing activity in developing its old gold mines and opening new ones. At Caliente, some old mines are being opened and a 30-stamp mill is promised on the Ferris mine. The Cowboy is held under bond, and high-grade silver ore has been taken out lately. At the Gwynne, new owners have 30 men at work. The Kern-Piute Company, working the old Borrman mine, is sacking the ore being taken out, awaiting the erection of a mill. Near Amalie, the Barbarossa mine is showing some of its old-time richness. The larger part of Kern county consists of flat valley lands where the wonderfully productive oil wells are, but the mountains back of the valley have gold and in times gone by a very large gold output has annually been made. Even now, when gold mining has been to some extent neglected, except at a few points, the county is yielding nearly a million dollars yearly in gold and silver. Its most productive mine is the Yellow Aster at Randsburg.

Rich strikes have lately been made near Dobbins, in Yuba county, on quartz found in old prospect holes.

A miner named Bell found some good indications and sold a third interest to Duttra & Brown for a small sum. In sinking a few feet, the new men took out \$35,000 from a small surface stringer. The vein is decomposed and the gold found is coarse. Since this strike, a number of prospect holes sunk years ago but finally abandoned are being reopened, giving renewed activity to that section of the county. The recent finds are on Indiana ranch.

The extensive oil refinery of the Sunset Monarch Company, at Maricopa, was destroyed by fire with a loss of nearly a quarter of a million dollars. All the machinery was ruined and the laboratory destroyed. The refinery had a capacity of 1500 bbl. of asphalt per day. The plant will be rebuilt.

The mythical Peg-leg mine, which has been sought for many times in the last 50 years, is again to be the object of an expedition. Mrs. R. S. Dillman, of Victorville, San Bernardino county, claims to have data by which she can locate the place from which numerous gold nuggets were said to have been taken by a pioneer prospector. It is reported that Mrs. Dillman is about to start in the search accompanied by J. Rockefeller and Matt Thompson.

Captain John E. Carter is making a collection of the representative gold ores of Nevada county to be placed on exhibition in the Chamber of Commerce building in Los Angeles.

### Denver

May 23—The North American smeltery at Golden is turning out copper matte, and will blow in its second furnace of 500 tons capacity at once, making a total capacity of 750 tons per diem. This plant is getting custom ores from Gilpin and Clear Creek counties, and has mines of its own as well. This plant has taken over the ores and ore contracts of the Modern smeltery, at Utah Junction, which, after a fitful existence, has "blown out."

The coal operators in the field north of Denver state their intention to reopen all of the 30 mines of that district at once, and if necessary will bring in miners from other States to replace the men who left their employ. They have notified present and former employees, however, that the mines will be operated on the basis of an eight-hour day and on the scale of wages in effect prior to

April 1, and former employees are invited to make early application if they want to go to work.

The Cripple Creek deep drainage tunnel, it is stated, is now beginning to lower perceptibly the water in the mines of Beacon hill.

The main unit of the Portland Gold Mining Company mill on Battle mountain, near Victor, which was built at the mine to treat the low grade and dump ores of the mine, is now ready to run. The dumps are estimated to contain 3,500,000 tons of ore, which can be treated at a profit.

The Elkton mine, on Raven hill, Cripple Creek, is credited with a total production of ore to the value of \$9,650,000, and has paid \$2,554,460 in dividends. The present lowest level shows the ore-shoot to be over 1000 ft. in length, and it is estimated that when the deep drainage tunnel is completed, the mine can be worked 750 ft. deeper, a total of 1600 ft. below the surface.

The interest in the rich gold ore produced by the St. Louis tunnel at Leadville continues unabated, and work will soon be commenced in the endeavor to find the extensions of the vein beyond the limits of the property.

### Butte

May 23—Confirming the sale of the Clark properties, Mr. Clark said: "I received no Anaconda stock for my Butte mines. The transaction is strictly for cash. The deal has nothing to do with the reported impending copper merger, and I am not interested in the merger in any way." A. H. Wethey, manager of the Clark properties, states that Mr. Clark intends to begin work at several of his claims in the Butte district, which have long laid idle. With this last acquisition, the Anaconda company controls practically all the well paying copper properties in the district.

In the Carter district, Missoula county, the King and Queen mines have been making regular shipments for six months. A 200-ton concentrator will be built shortly. An 1800-ft. crosscut tunnel, now in 700 ft., is being driven and will give an additional depth of 400 ft. The Oregon Railway and Navigation mines are employing a number of men. Adjoining the Oregon Railway and Navigation mine is the Iron Mask, in which a large body of milling ore has been exposed in the upper tunnel. The construction of a concentrator is planned.

At the Hamilton-Cœur d'Alene property a lower tunnel, now in 250 ft., will be driven another 250 ft. to cut the oreshoot. The Glenn Metal Mining Company has recently encountered good ore in the lower tunnel at a vertical depth of 100 feet.

In Lewis and Clark county, the shaft of the East London mine, south of Helena, operated by Thomas Cruse, is down 50 ft. and a new hoist has been installed. At Clark's creek, five miles south of Helena, George H. Rogers is building a 5-stamp mill on a developing property. In the Park mining district, the Caroline lead is being worked. A steam pump and hoist have been installed and a shaft is being sunk. Near the Caroline, the Souvenir Gold Mining Company is running a 10-stamp mill.

In Granite county, the Cable-Ontario company recently incorporated for \$500,000 by J. M. Merrill, of Oakland, Cal., A. S. Huffman, of Philipsburg, and John P. Reins, Glenn L. Thompson, J. A. Poore and Charles Mattison, of Butte, has acquired five quartz claims adjoining the Southern Cross mine on the south. The Hidden Lake company is making preparations to begin work under the direction of W. A. Law. Upon the arrival of the plates for the 3-stamp mill, mining will be begun. The company owns 16 claims in which the lode is 25 ft. wide.

Corporations owned by Senator W. A. Clark have recently filed annual reports as follows: Moulten Mining Company, assets, \$500,000 and liabilities *nil*; Original Consolidated Mining Company, assets \$10,000,000 and liabilities *nil*; Colusa-Parrot Mining and Smelting Company, assets, \$100,000 and liabilities *nil*; Western Lumber Company, assets, \$850,000 and liabilities *nil*.

In Madison county, the Metzler placer claim at Barton gulch is being worked by E. C. Hosner, who is also working the Copperville group of quartz claims in the same locality. At the Atlas Extension, near Spring gulch, a tunnel is being run on a 6-ft. vein, 3 ft. of which carries free gold. Work has been resumed on the Mohawk group, situated in the Summit district and comprising the Mohawk Extension, Florence and Eureka quartz claims. The Apex company has decided to build an electrically equipped stamp mill on its property at Summit, and work on the power line has been begun. The ores have been treated at the Shafter mill, but the long haulage of coal from Alder has rendered this method too expensive.

#### Salt Lake City

May 21—A decision adverse to the Government was given in the case of the United States *vs.* the Castle Grand Placer Claims Company. The decision given by the register and receiver of the local land office orders that the case be dismissed, and that the mineral claimants

be allowed to make final entry on the land, or patent it, if they so desire. The land in question consists of about 40 acres near Moab, Grand county. The claimants filed on the land under placer rights, but the Government charged that the ground was taken for speculative rather than for placer purposes, that is for a mill site, and for town-site purposes. The Government also claimed that the land was not mineral in character. The Castle Grand Placer Claims Company maintained that it had taken up the ground solely for mineral purposes.

Progress is being made on the construction of the International smeltery at Tooele. The work was delayed for a time by the slowness of steel to arrive, but no trouble has been experienced recently on this score. At the present time there are between 500 and 600 men employed on construction. The power-house machinery is installed. The dust chamber and flues to the stack are finished, the stack itself is done and the dampers are placed. All of the water and air lines are completed, while the main flue and ash and slag tunnel will be completed soon. The railroad trackage in the yard is laid. The roasters are nearly finished. The converter building and casting shed has been erected, and the converters have been installed. The reverberatory building is under way and is being rushed with all speed possible.

In addition to its weather bureau, which is keeping records, the International company has taken steps to investigate farming conditions as they now exist in the neighborhood of the smeltery, or within reach of the fumes. Representatives of the company are at present in the field making a careful examination of the agricultural conditions, regarding crops and soil, growth, production, etc., also in reference to livestock. A study of the farming conditions before and after the smeltery starts will be of value to the company in preparing for possible damage suits.

The Silver King Coalition Mines Company is the defendant in a suit brought for the alleged extraction of ore from the Captain lodes claim in the Park City district. The suit was originally filed by the late James P. Cassidy.

The Gold Springs Mining and Power Company has completed the installation of the machinery for the power plant at Modena, Iron county. The plant consists of gas producers, which operate gas engines, and these in turn drive electric generators. About 300 h.p. will be developed. Electric power will be furnished to the Jennie mine, controlled by this company, and to other properties in the Gold Springs district. The Jennie mine and mill are being equipped with motors to replace the gasolene engines formerly used. The current will be delivered to the mine through a transmission line 10½ miles long.

#### Goldfield

May 24—J. W. Hutchinson, mill superintendent of the Goldfield Consolidated, is making a trip through the East, visiting various metallurgical plants in connection with the investigation of certain technical problems.

An action entitled the Round Mountain Mining Company *vs.* the Round Mountain-Sphinx Mining Company, and J. F. Davidson, involving \$850,000, on trial in the district court, will decide an interesting question in extra-lateral rights. The five claims of the Round Mountain Mining Company are the Sunnyside 1, 2 and 3, the Sunnyside Fraction and the Gazabo. The Sunnyside claims were located Feb. 20, 1906, and the Gazabo, March 3, 1906. The Gazabo runs within and at right angle to the Sunnyside claims. The vein runs with the length of the Gazabo, therefore the Round Mountain claims extra-lateral rights. In case the Gazabo claim is given extra-lateral rights, it would seem that the location of claims lapping over and at right angles to each other gives locators extra-lateral rights in all directions, instead of merely beyond the sidelines of a claim.

#### Wallace, Idaho

May 23—Sluicing done by the Chicago, Milwaukee & Puget Sound railway has uncovered a 20-ft. copper lode on the Big Elk property, the lode lying parallel to and 200 ft. from the main vein. Copper ore is strewn along the surface of the newly found vein which is apparently rich. The main vein has been worked on several levels and shipping ore is being opened.

The Snow Storm copper mine paid \$22,500 to the stockholders for May, the company having paid a similar amount every 30 days since October. The No. 4 tunnel, the lowest workings in the property, has cut the lode 3350 ft. in. A drift was run 600 ft. to the west, exposing no ore of importance but showing the formation in place and the Revett quartzite extending below that level, both of which conditions geologists declared would not be found. The company then drifted 400 ft. to the east, a drift being run on the north side of the vein and another on the south side. Copper ore was found. A continuation of these easterly drifts for 600 ft. will take the face of the tunnels under the main ore-body exposed in No. 3 level.

The Cœur d'Alene Mining Company owns 2000 acres of placer at Murray. The ground has not been worked for six years, owing to drainage difficulties which the Boston owners were not willing to cope with. Prospectors never panned this land to any extent because of the lack of water, and it is estimated that much gold lies in the ground. Bulkley Wells, of Telluride, Colo., vice-president

and manager of the New England Exploration company in which Benjamin F. Wells, of Boston, and other Massachusetts men are interested, is here with a party of experienced placer miners from northern California. The ground is being tested and if it is decided it can be mined with success, plans will be formulated for special machinery for dredging. The placer ground is peculiar because of the gold beneath and in the bedrock.

#### Birmingham, Ala.

May 21—State Mine Inspector James Hillhouse, on the explosion in Mine No. 3, of the Palos Coal and Coke Company at Palos, in his report says the explosion was caused by firedamp. Gas was produced in quantity in the sixth right heading in the mines and considerable dust was allowed to collect. The report also shows that shooting in the mines had been done from the solid, when specific instructions had been given from the inspector's office previously that undercutting had to be done before the shooting. Another statement in the report in regard to a disregard of instructions is that the superintendent had allowed the use of dynamite in the mines, which was strictly forbidden. The fan used at this mine is declared not to be of sufficient size. Sprinklers have been ordered installed before the place can be operated again. No clay or sand had been used, according to the investigations, in tamping shots and this was another error. The company operating the mines had been warned also in making a change of mine foreman to be careful, because the local conditions required a man who was acquainted with them.

As an outcome of the two explosions in the mines in this State, the first one at Mulga, where 40 men lost their lives, and the second at Palos, where 84 men were killed, a thorough inspection is now going on at all mines in the State.

Twenty-six convicts employed in the mines at Lucile, Bibb county, were burned to death last week and one was shot to death, following a fire that was started in the stockade next to the mines. A convict started the fire in the hope of making an escape. The unfortunate negroes could not be reached and were roasted to death. In all, 128 convicts were saved from the burning building, though 21 were more or less burned and bruised.

Harrison Stuart Matthews, vice-president, is in charge of the affairs in the Birmingham district of the Alabama Consolidated Coal and Iron Company. Joseph H. Hoadley, of New York, continues in the position of president.

The Alabama Coal Operators' Association has a subcommittee at work on suggestions for mining laws to be enacted at the next session of the legislature, early next year. Both the operators and the

miners are anxious to see some amendments, covering both the operating and the mining. In many accidents, carelessness is charged to both the operators and miners. Efforts will be made also to have a law enacted that will prohibit men from mining coal without experience.

Contracts are being let by the American Steel and Wire Company for the concrete work and superstructures for the new plant near Ensley. The tracks are being laid to the site and by June 1 material will be arriving.

#### Cobalt

May 23—Engineers for the Dominion Government are in the Cobalt district measuring up the water supply with a view to building dams to regulate the flow in the lower Ottawa river. It is proposed to build several dams on Lake Temiskaming and other places to conserve the supply. These dams will offer practically unlimited possibilities for the generation of power.

The condition of the La Rose mine is improving, the latest favorable development being the finding of very high-grade ore in the drift at the 50-ft. level of the No. 11 shaft of the Lawson. There is about 10 in. of vein matter that will assay very high. The talk of a merger still continues without, however, any positive action being taken.

The plant of the Cobalt Hydraulic Company at Ragged Chutes is at last completed, and the air has been turned into the whole system of pipes. Several companies are using this power and report a steady pressure and clean, dry air. This plant is the largest "natural" air compressor in the world and has a capacity of 5000 h.p. The pressure at the plant is about 125 lb., and air will be delivered to the mines at 100 lb. The Mines Power Company expects to have the generators repaired and working again soon. The electric service has not been interrupted. The Cobalt Power Company has been delivering electric power for some time and will shortly have the rest of the plant installed. When these three companies are regularly operating Cobalt will be most advantageously situated as regards power, with two plants supplying air and two electricity. The combined capacity of the three companies is approximately 18,000 horsepower.

Porcupine is likely to suffer from a shortage of supplies, and owing to the high cost of transportation these conditions will not improve much as the summer goes by. This shortage is partly due to the early break-up, which left several companies with supplies at the railroad, and partly due to the fact that a much larger number of men are employed than was first thought necessary. A small 15-ton amalgamation and cyanide plant is being erected on the Timmins property. It is stated that the Timmins interests

have made the third payment on the six Hollinger and McMahon claims on which they have an option for about \$300,000. On the whole, engineers are expressing more and more favorable opinions on the district. The boundaries of the district are being widened as new finds are reported.

#### Vancouver

May 20—Canadian officials with their parties, which are to continue the survey of the International boundary between Alaska and Canada, have gone north. J. D. Craig, of Ottawa, will cooperate with United States officials in defining the 141st meridian in Porcupine river district, below Dawson. N. J. Ogilvie will do topographical and triangulation work between Chilcoot pass and Chilkat river, about 20 miles from Skagway. Herbert S. Russell will work on Taku river and tributaries, on the western boundary of Atlin mining division, British Columbia. F. H. Mackie has been assigned work in the Portland Canal district. The marking out of the boundary of the last-named district is of especial present importance owing to the fact that many prospectors are going in and there will be numerous locations of mineral claims made this year.

The breaking up of ice on Klondike river resulted in an ice block at the Ogilvie steel bridge near Dawson and caused the waters to flood the flat on which are the big machine shops of the Yukon Gold company. In the shops the water was two feet deep.

#### London

May 20—A new company is being formed under the title of the Trinidad Oil and Fuel Company, Ltd., to work on an estate at Williamsville, Ward of Montserrat, Trinidad. The nominal capacity of the company is £100,000, and a working capital of £35,000 is to be provided. The property has been examined by Professor Vivian B. Lewes, who reports that the presence of oil is undoubted, but that the proof of volume, rate of flow, etc., can only be ascertained by putting down a boring.

As regards coal, he reports that a 2-ft. seam of Tertiary coal has been exposed and that there is ample evidence of the existence below this seam of a 4-ft. and a 6-ft. seam. The demand for fuel in the sugar mills is greater than it has ever been, as the megass, which previously had been burnt for fuel, is now being utilized for paper making, and it is expected that this coal will be bought at 20 per cent. less than the American or English coal with which the Trinidad market is now supplied, and this would leave a handsome profit on the working. Boring for oil will be commenced at once, and it is expected to meet with oil in commercial quantities at 800 feet.



# THE MINING NEWS

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

## Alaska

*Alaska-Perseverance*—The company will erect a 100-stamp mill in Silver Bow basin five miles from Juneau, and drive the Alexandra tunnel from tidewater to the mine, a distance of three miles.

*Watson & Snow*—This gold quartz property in the Moose Pass district on Kenai peninsula has been bonded to the Tye Smelter Company, of Vancouver.

*Alaska Dredging and Hydraulic Company*—The company has taken a bond on the Cappell & Burr placer in the Sunrise district, and will spend a large amount in development work this season.

## Arizona

### COCHISE COUNTY

Hayden, Stone & Co. say: "The assertion is made in well informed quarters that the trend of affairs in Calumet & Arizona and Superior & Pittsburg is such as will surely lead to their ultimate consolidation. The Calumet & Arizona has practically discontinued work on outside properties, due to which its costs per pound of copper produced are now well within 9c., while current earnings are at the rate of about \$6.50 per share per annum. The Superior & Pittsburg has shown substantial progress during the last year. In the event of such a merger, the building of additional furnaces is understood to be contemplated, to be followed by increased production. The Calumet & Arizona has opened a sulphide body at 1450 ft. in the Oliver shaft under the orebodies on the 1300 level."

### GILA COUNTY

*Old Dominion*—Recent monthly net earnings of the United Globe have reached \$15,000.

## California

### INYO COUNTY

*Casa Diablo*—The mill has started on ore from the upper Dry Bone stope and the west stope of the Dawn of Hope vein. Changes are planned to increase the plant to 100 tons per day capacity. The tunnel is being advanced toward the Granite Mountain vein.

### MARIPOSA COUNTY

*Ferguson*—This quartz property on the Merced river has been bonded by G. S. Barker and will be developed.

*Penon Blanco*—This Mother Lode quartz vein has been bonded by J. C. Wilson and will be developed.

*Bismarck*—Development is in progress under superintendent W. W. Dunlap. A

good shoot of ore has been found on the 50-ft. level.

*Hill*—This mine, eight miles northeast of Coulterville, is now owned by the Superior Chemical Reduction Company which proposes to develop and to put in a reduction plant.

*Champion*—The mill at Coulterville is being put in shape for operation.

### NEVADA COUNTY

*Union and Union Extension*—These mines at Banner hill have been bonded by E. M. Parrish. There is a 274-ft. shaft. Machinery is on the ground for sinking.

*Posey Cañon*—Harry Skewes has leased this gravel mine on a 20 per cent. royalty and is developing.

*Fairview*—G. A. Nihel is building a mill on this claim at Relief hill.

*Black Swan*—Work has been resumed on this property at Moore Flat.

*Metropolitan Consolidated*—Forty gold claims have been bonded by this company at Moore Flat.

*Eclipse*—This quartz claim, adjoining the Allison Ranch mine at Grass Valley, is being developed through a tunnel. Daniel Hurley is one of the owners.

*Norambuga*—Development has been in progress for some time and the showing warrants continuing the operation.

*Benton G.*—A shaft was sunk to the channel and the gravel found sufficiently rich to warrant the sinking of a double-compartment shaft, on which work will be begun at once. Harry Gray is manager.

*Northon*—These claims in Willow valley have been acquired by a Montana company. J. M. Fly is in charge. The Northon vein parallels the Lecompton. A compressor has been installed and a hoist is arranged for.

*Fruitvale*—This vein at Moore Flat shows 6 in. of arsenical ore high in gold and the pay shoot has been opened 30 ft.

*Montana*—The iron work of the 5-stamp mill has been delivered to the Montana mine, Willow valley.

*Ancho*—The mill near Graniteville will be started at once. George Mainhart is manager.

### PLACER COUNTY

*Rawhide*—This quartz mine on the north fork of the American river near Towle has a tunnel in 1500 ft., giving 900 ft. of backs. Ten stamps are dropping.

*Pioneer*—This quartz property on the

American river is being reopened with Harry Morris in charge. The mill is being repaired.

### SHASTA COUNTY

*Pittsburg & Mount Shasta*—This Pittsburg company has property near the Iron Mountain covering the Little Nellie lode. A tunnel is being driven. W. H. S. Scherman is secretary.

### TUOLUMNE COUNTY

*Republican*—Superintendent Lewis reports that good ore has been encountered. The company has a 20-stamp mill.

*Eagle-Shawmut*—The work of putting the shaft in shape is still in progress and it is expected that the mill will be in operation this summer. The mine has a good grade of sulphide ore on the lower levels.

*Jumper*—A lease has been taken of a part of the Jumper ground by W. E. Booker and L. L. Cooper.

*Providence*—Capt. C. H. Thomas has put men to work preparatory to unwatering the 1300-ft. shaft.

*Albany-Grizzly*—Supt. W. Elmer has closed down on account of nonarrival of funds for the payroll.

*Riverside*—E. V. Burke has filed suit for \$6464, due for labor and supplies.

*App*—A strike of more than ordinary importance was made on the 1300 level. Good ore is still being extracted from the 1200 level.

## Colorado

### BOULDER COUNTY

*Logan*—Recent shipments of ore from the mine, at Crisman, operated under lease, yielded satisfactory returns, some of the exceptionally high-grade gold ore yielding as high as 50c. per pound.

### GUNNISON COUNTY

*Dupont*—The company is driving a tunnel in Galena and Treasury mountains and has decided to erect a water-driven mill for custom work and its own ores from the tunnel.

*Hard Cash*—This property, on the north side of Galena mountain, will install a compressor and a pyritic smelting plant.

*North Pole*—This property, in Crystal basin, is planning to resume and install a matting furnace.

### MESA COUNTY

The slags of the old Grand Junction smeltery are being profitably reworked by S. T. McKinney, of Albuquerque.

## LAKE COUNTY—LEADVILLE

*A. Y. & Minnie*—The surface plant has been burned. The origin of the fire is unknown. Work on the mine will be resumed at once, and the plant rebuilt.

*Colonel Sellers*—Shipments are being made regularly from the new shaft and the old workings are soon to be attacked through this shaft.

*Garbutt*—The machinery of the Delaware, on Rock hill will be placed at the Garbutt, on Breece hill.

*Garibaldi*—Regular shipments of about 25 tons per day continue to be made from this property.

*Luema*—A strike of gold ore is reported in the Valley shaft by W. F. Page. The vein was encountered at 400 ft. in porphyry. The property is in South Evans gulch.

*Yankee Doodle*—This mine, on Carbonate hill, is outputting from 25 to 30 tons per day of lead ore of good grade.

## SUMMIT COUNTY

*King Solomon*—A strike of high-grade lead ore is reported in the tunnel at Frisco, at 3600 ft. from the portal, and 2000 ft. below the surface.

## TELLER COUNTY—CRIPPLE CREEK

*Victor*—This mine on Bull hill, one of the early day producers, now operated under lease by the Roscoe Leasing Company, is reported as being the scene of a strike, assaying as high as 72 oz. gold per ton. The vein is said to be from 3 to 4 ft. wide, and was encountered 430 ft. below the surface.

*Jo Dandy*—Lessees are reported as having shipped two cars of high-grade ore, together with a five-ton sacked shipment of ore estimated to carry \$1000 per ton.

*Anchoria-Leland*—This Gold Hill mine is being operated by 12 sets of lessees, and producing about 600 tons per month of \$20 ore.

*El Paso*—Thirty-four out of the 38 sets of lessees on this property are said to be in ore, and so far this month 60 cars of ore have been shipped, averaging \$25 per ton.

*Henry Adney*—This Beacon Hill mine is producing from three to six cars per week of ore yielding from 1½ to 2 oz. gold per ton.

*Doctor-Jack Pot*—The report of A. E. Carlton, president, shows that during the last quarter the royalties paid by the lessees amounted to \$5750, and the average yield of the ore was \$24.40 per ton. Lessees on the Ingham mine of this company are reported to have opened a large body of \$18 ore.

*Gold Dollar*—The annual meeting will be held at Cheyenne, Wyo., June 8. Twenty-one sets of lessees are operating the property, and royalties paid since the last meeting amount to \$20,870. Cash balance in the treasury, \$19,000.

## Idaho

## COEUR D'ALENE DISTRICT

*Cœur d'Alene Mining Company*—California placer miners are drilling the 2000-acre placer field of the company. The gold lies beneath bedrock. The ground requires dredging with special machinery.

*Stewart*—Two hundred tons of lead-silver ore is handled daily in the Federal mill, turning out about 30 tons of concentrates. Half the capacity of the mill is in use and the other half will be worked continuously soon.

*Reindeer*—To test the ore preparatory to installing a mill, the company has shipped in three hand jigs.

## IDAHO COUNTY

*Harmon-Morrow*—This group at Elk City is under bond to F. W. Bradley, of San Francisco.

*Elk City Mines Corporation*—This company has acquired the South Fork mine and will develop and equip. Robert Koontz is in charge.

## Indiana

## BLACKFORD COUNTY

An increase in completed wells and new production is shown in the Indiana oilfields. What looks like a new and productive Trenton rock pool has been opened near the Blackford, Union and Randolph county lines. A number of wells have been brought in in this territory and while none of them are gushers they are sufficiently large to attract attention. During the last week 11 new wells were completed, four being nonproducers. During the month of April, 781,824 bbl. of crude oil were shipped from the Indiana field.

## VANDERBURG COUNTY

William O. Ferguson, receiver of the Chandler Coal Company, has petitioned the court to compel Joseph A. Bryan, former manager of the company, to turn over the records of the company to him. The receivership grew out of a complaint of one of the stockholders alleging that the affairs of the company were entangled. The company's mines are near Chandler and are good producers.

## VERMILION COUNTY

The Zeller-McClelland Coal Mining Company, of Brazil, has been taking options on coal lands lying on the Evansville & Terre Haute coal switch south of Clinton. Among these tracts is one of 450 acres belonging to W. L. Morey. Two new shafts will be sunk in this territory.

An effort is being made by the mine operators to bring in more American miners and displace the foreigners in the Clinton district. A group of Italian miners were refused admission to mine No. 2 of the Brazil Block Coal Company and were told that their places were for-

feited under the clause in the contract which provides for only two days' absence from duty without good excuse. These foreigners refused to resume work at once when the suspension was declared at an end.

Michigan  
COPPER

*Isle Royale*—In trenching 1200 ft. east of "A" shaft a copper-bearing lode about 20 ft. wide was exposed. The identity of this formation is not established but it resembles the Baltic. At "A" shaft drifting continues.

*Houghton*—A formation believed to be the Baltic lode has been exposed by No. 2 hole. This lode was reached at 85 ft. below the copper formation that was cut a couple of weeks ago.

*Algolah*—An unusual discovery was recently made at this property, adjoining the Lake. In trenching, a deposit of ore high in copper glance was exposed. Sulphide ore has been found in the district but only in limited quantities.

*Oneco*—No. 7 hole has passed through the Oneco lode and core shows a small quantity of copper. No. 8 hole is in the lode in the eastern portion of the tract and is sinking vertical to reach the formation disclosed by the New Baltic Company.

*South Lake*—No. 1 drill has been discontinued and moved to No. 3 hole. No. 2 hole continues sinking below 2300 ft. without results.

## Missouri

*West Twenty*—This company has completed its mill at Porto Rico. C. D. Smith is superintendent. The mine will work a deposit in soft ground on the upper levels before working the lower sheet-ground.

*Oronogo Circle*—This company has been meeting with success in underground drilling at Oronogo. The drilling from the 230-ft. level showed ore to 385 ft., the deepest in the district.

## Montana

## BUTTE DISTRICT

*North Butte*—The contract for treatment of ores at the Washoe smeltery will shortly be renewed at a saving of \$20,000 per month to the North Butte company.

*Butte & Ballaklava*—President H. P. Nelson states that the ore shipped to the Pittsmont smeltery is averaging 9½ per cent. copper and 16 oz. silver to the ton.

*Amalgamated*—The Neversweat mine has resumed after a shut down of two months, necessitated by the wrecking of the hoisting engine.

*Carlisle and Protection*—These two quartz claims, between the North Butte and Butte & Superior, have been bonded

to Pittsburg men for \$400,000, by the owners, George Casey, P. J. Brophy, Charles Mattison, Mrs. Martha Fisk and W. O. Speer.

#### BROADWATER COUNTY

*Edward F.*—The property is near Hassel in the Radersburg district. At 150 ft. the main vein is 65 ft. wide. A 20-stamp mill is being operated and a 60-ton cyanide plant will be erected. The shaft, down 260 ft., will be sunk to 600 ft. when crosscuts will be run.

#### FERGUS COUNTY

*Ryegate*—The company has recently been organized with a capital of \$250,000. The coal property is a mile north-west of Ryegate.

### Nevada

#### ESMERALDA COUNTY

*Goldfield Consolidated*—On the 600-ft level of the Clermont a 20-ft. vein breaking more than \$50 per ton has been exposed for 100 ft. in virgin ground west of the shaft in the neighborhood of the Gold Wedge Fraction. At 1000 ft. a crosscut for ventilation and prospecting is being driven 2500 ft. to connect with the Grizzly Bear workings.

*Nevada Eagles*—A vein of shipping ore, discovered recently, is developing well. The property is in the west portion of the Goldfield district, heretofore thought to be unproductive.

*Combination Fraction*—The Mohawk vein has been picked up on the 500-ft. level and extensive stoping operations commenced preparatory to starting the 90-ton mill of the Nevada Reduction works on June 1.

*Black Butte*—The Campbell lease continues its regular semimonthly shipments. A new lease has been granted to a Goldfield syndicate and work will be started at once.

*Merger*—On the Codd lease the old gasolene hoist has been replaced by a 50-h.p. electric. The shaft is to be deepened from 400 to 1500 feet.

*Florence*—The mill is handling 170 tons daily. With this increased tonnage an extraction of 95 per cent. is being maintained.

*Bonnie Clare*—Machinery and equipment for the 100-ton mill are being installed.

#### ELKO COUNTY

The Rex and Hartley mills, at Gold Circle, have been actively engaged in working the ores of the camp. A Lane mill is soon to be erected on the Sleeping Beauty group.

#### LINCOLN COUNTY

*Pioche Metals*—An assessment of 1c. per share has been levied. The installation of a compressor and other improvements are under way. Ore stored in the mine will be shipped as soon as the railroad reaches the camp.

#### NYE COUNTY

Tonopah shipments are: Tonopah, 3350 tons; Belmont, 1200; Montana-Tonopah, 945; MacNamara, 175; West End, 160; Tonopah Extension, 800; Midway, 100; total, 6730 tons.

*Tonopah Belmont*—The ore bins at the cyanide plant at Millers have been filled and everything is ready to commence operations with 60 stamps. A 2200-ft. pipe line is being laid to the new Belmont shaft, where an entirely new surface plant is being installed.

*Montana-Tonopah*—The Martha and Triangle veins continue to supply the greater part of the 950 tons being milled weekly.

*Tonopah*—In the mine extensive operations beneath the Mizpah fault are developing a good grade of ore.

*Keane Wonder*—Bullion worth \$20,000 was taken to Rhyolite by Manager Homer Wilson, the result of the April cleanup.

*Eclipse Development*—The new cyanide department is producing tailings as low as \$1.30 on a good grade of ore.

*Round Mountain*—A dozen leasers are panning gravel to good advantage on Blue Jacket ground.

#### WHITE PINE COUNTY

*Chainman*—This mill now owned by the Coppermines company and under lease to Willoughby & McGill, has been remodeled and will be put in operation.

*Mecca Mining and Smelting Company*—This company has been incorporated to operate in the Duck Creek district. The incorporators are H. McIntire, S. H. Burrus and J. T. Meyer.

### New Mexico

#### SOCORRO COUNTY

*Mogollon*—Fire on May 12 destroyed the mill, shaft house and a portion of the shaft timbering, the loss being only partially covered by insurance. The plans for extensive development of the mine will be delayed.

#### Oklahoma

The Choctaw Coal Company has been organized to develop the Thomason tract of 3500 acres of coal land near Wilburton.

#### Oregon

#### BAKER COUNTY

*Buckeye*—Operations have been resumed. W. H. Gleason has charge.

*Mountain View Extension*—Frank Johnson, of Sumpter, will operate this property this summer.

#### CLACKAMAS COUNTY

*Amalgamated Nevada*—A 10-stamp mill and other machinery has arrived at Blackhorse. James H. Marriot is manager.

#### GRANT COUNTY

*Gold Bug*—Arrangements are being made for the installation of new machinery. W. H. Turner, of Spokane, Wash., has a lease on this property, and the work is under the direction of William Kinear, of Susanville.

*Zenith*—Operations at this mine are to be resumed after having been closed for two years. D. L. Willard is manager.

#### South Dakota

*Pactola Dredging Company*—This company will operate on Rapid Creek. Pittsburg capital is interested largely.

*Alder Creek*—John A. Sandholm, of Des Moines, Iowa, will build a 200-ton mill at this Deadwood property.

#### Utah

#### BEAVER COUNTY

*Moscow*—At the annual meeting, the old officers of the company were re-elected.

*Cedar Talisman*—Another strike of lead-silver ore has been made on the 125-ft. level. There are said to be 3 ft. of shipping ore, on top of which occur about 2 ft. of zinc ore with the boundary well defined. The orebody on the 500-ft. level is being further developed. Hauling to Milford for shipment has started.

*Hub*—Ore has been developed on the Lady Bryan group, which is said to be of shipping grade. There is about 200 ft. of stoping ground above the crosscut where the ore was discovered.

*Wild Bill*—Four feet of ore, carrying lead, silver and copper, and an excess of iron, are reported on the 300-ft. level.

#### IRON COUNTY

*Gold Springs Consolidated*—This company was recently incorporated to acquire the Imperial group, adjoining the Jennie mine. The company has options on 12 adjoining claims, including the Snowflake, Buck and Charlie Ross properties. Development will be undertaken.

#### JUAB COUNTY

Tintic ore shipments in carload lots for the week ended May 13 are: Eureka, 2; Iron King, 5; Eagle & Blue Bell, 4; Gemini, 4; Scranton, 4; Cliff, 1; Colorado, 11; Opohongo, 3; Grand Central, 9; Lower Mammoth, 5; Mammoth, 4; Black Jack, 2; Carisa, 1; Dragon Iron, 31; Sioux Consolidated, 15; Iron Blossom, 21; Yankee, 3; Uncle Sam, 3; May Day, 2; Ridge & Valley, 3; Chief Consolidated, 2; Centennial-Eureka, 34; total, 167 carloads.

*Chief Consolidated*—Ore has been found in a raise from the 1600-ft. level. The raise is 90 ft. and will be continued to the 1400. The shaft is down 1775 ft. and work has been discontinued to allow development on the 1400- and 1600-

ft. levels. During the time that the mine has been in operation, a little over a year, the ore mined is reported to have given returns of \$62,000.

*East Tintic Development*—Sinking in the shaft will be continued from 550 ft. The company is shipping four cars a month.

*Opex*—Ore carrying copper is reported to have been found in the second diamond-drill hole driven from the 2147-ft. level.

*Sioux Consolidated*—Work is being done on the 450 level, and ore is being shipped from this part of the mine. Development near the north line of the property has been unproductive.

*Victoria*—The company will sink its shaft to connect with lower workings. Operations are now being carried on through the Grand Central shaft.

#### SALT LAKE COUNTY

*North Utah*—A crosscut on the lowest level of the Butler-Liberal section of the property has reached the ore-bearing limestone which is found to be wider here than on the upper levels. Heavy pyrite carrying specks of galena has been found in the lower workings of the Redwing section. This is thought to be on the Erie fissure which produced ore 600 ft. above.

*Utah Copper*—An amendment to the articles has been filed with the Secretary of State, increasing the capital stock from \$7,500,000 to \$25,000,000. The fee for filing the amendment was \$4375.

*North Bingham*—This property in Barney's cañon, controlled by the Knights, has recently levied an assessment of 1/2c. a share. A contract has been given for 200 ft. of sinking. The company has driven a tunnel several hundred feet from the bottom of the cañon, and sunk a shaft 220 ft. from the tunnel. Some ore has been found, oxidized and leached and carried little copper.

*Columbus Consolidated*—At the delinquent sale, May 11, 5700 shares remained to be sold. This brought an average price of 51c. a share. The mill is running three shifts daily on ore from the 400 level. Fifteen teams are hauling ore and concentrates down the cañon. About 800 tons have accumulated.

#### SUMMIT COUNTY

Park City ore shipments for the week ended May 13 are as follows: Silver King Coalition, 739,620 lb.; Daly-West, 1,300,000; Daly-Judge, 888,000; Daly-Judge (zinc), 939,830; total, 3,867,450 pounds.

*Daly-Judge*—At the meeting held in Jersey City, the old directors and officers were reelected.

*Silver King Coalition*—At the annual meeting, May 16 the officers of the previous year were reelected. M. C. Daly,

mine superintendent, and Frank Daly, foreman, have resigned. George D. Blood will succeed superintendent Daly on July 1, and M. F. Sammon is now foreman.

#### Washington

##### FERRY COUNTY

*Globe*—Work is progressing under the direction of J. D. Brekenridge. Construction will soon be started on an aerial tramway.

*Chicamun*—The tunnel on this property, controlled by the Michigan Mining Company, is in 180 ft. W. C. Moore, of Orient, has charge of the work.

*Orient Gold*—Machinery has been purchased for this mine and a large force will be put to work.

*Mountain Lion*—This mine will be reopened.

*Belcher*—A smeltery will be built at Belcher Junction to treat the ore formerly sent to Trail. Meanwhile, the mine is closed.

##### KITTITAS COUNTY

*Black Hawk*—Development is progressing, and the orebody was opened up in the 1400-ft. tunnel.

##### STEVENS COUNTY

*Bornite*—A. Hohnack, president, is planning to have a power line from Newport to the mine. The new tunnel is in 300 feet.

#### Wyoming

*Bear Lodge*—Platinum is reported in the ore from this property near Sundance.

#### Canada

##### BRITISH COLUMBIA

*Consolidated*—This company has acquired the silver-lead mine of the La Plata Mines, Ltd., in Nelson mining division. The mine, formerly known as the Molly Gibson, was a producer for years of ore averaging 12 per cent. zinc, 8 per cent. lead, and 47 oz. silver per ton. There is a concentrating mill on the property.

*Le Roi, No. 2*—The Josie shaft house and electric hoisting plant has been destroyed by fire. Loss is estimated at about \$10,000.

*Northern Texada Mines*—Another shoot of bornite has been found on the 360-ft. level of the Cornell mine. It is estimated to contain ore to the value of \$160,000.

*Rambler-Cariboo*—Developments on the 900 and 1000 levels are most satisfactory for several years. New shoots of silver-lead ore have been opened on both levels so the output of mine will be larger.

*Lucky Jim*—Shipment of zinc ore has

been resumed. The April output was 600 tons running 48 per cent. zinc. The erection of a concentrating mill at Kaslo is planned.

*Tyee*—Returns for April are: One furnace was in blast 28 2/3 days and smelted 7492 tons, producing 625 tons of matte, valued at \$71,000.

*St. Eugene*—On this property at Moyie, there is a large crew at work. About 800 tons of concentrates are shipped each month.

*Blue Bell*—This zinc-lead property has been closed. The outcome of the forthcoming government experiments in zinc smelting will have largely to do with the future of this mine.

*Engineer*—A strike of rich quartz at this mine, Atlin district, is reported. One shipment is en route to Tacoma, and others will follow.

#### ONTARIO

Cobalt shipments for the week ended May 13 were: Beaver, 60,100 lb.; City-of-Cobalt, 63,390; Crown Reserve, 289,100; E. T. Corkill, 65,000; Kerr Lake, 114,500; La Rose, 265,180; McKinley-Darragh, 76,950; Nipissing, 192,411; total, 1,126,631 lb. The shipment by E. T. Corkill was of ore extracted from the Provincial mine prior to its sale by the Ontario Government.

*O'Brien*—Another shipment comprising 17,116 oz. of bullion has been sent to the Bank of England.

*Nova Scotia*—The new concentrator, having a capacity of 100 tons a day, is now running. Underground development has proved a new orebody carrying exceptionally high-grade ore.

*Standard Cobalt*—This company, operating for the Cobalt Central Mines of New York, is in the hands of a receiver. The liabilities amount to about \$50,000.

*Temiskaming*—A report for the quarter ended April 30 shows cash liabilities \$190,820, cash assets \$180,188. The profits for the quarter were \$96,684. The concentrator ran 17 days before April 30, treating an average of 92 tons per day. No. 2 vein at the 400-ft. level averages 8 in. and assays 4000 oz. No. 1 vein is in good ore at 350 ft. and No. 3 has 6 in. of high-grade at 390 ft.

*Cobalt Lake*—In the drift on the lower level, 15 ft. from the McKinley-Darragh some rich finds have been made. There are now 13 stringers of ore in the face of the drift, two of them 3 in. wide. Assays of the smaltite in these stringers run between 2000 and 3000 oz. Three cars of screenings are ready for shipment.

#### YUKON TERRITORY

*Yukon-Pueblo Mining Company*—This property at White Horse has been sold to the Atlas Mining Company, of which Wilbur D. Greenough is manager. New machinery will be purchased.



## Mexico

## CHIHUAHUA

*Compañia Minera Ignacio Rodriguez Ramos*—The company has voted for a consolidation with the Almoloya Mining Company. The properties at Almoloya are adjoining and are extensively operated.

*La Fortuna*—B. H. Dudley has decided upon the erection of a 100-ton cyanide plant at this property, Neuvas Casas Grandes section, on the Mexico Northwestern Railway.

## GUANAJUATO

The Guanajuato Power and Electric Company has started the construction of a transmission line from Guanajuato to San Luis Potosi, 87 miles. The San Luis Potosi plant has been purchased. Power will be supplied the San Luis Potosi smeltery and the San Pedro mining district. It is also planned to place power in the Pinos district in the State of Zacatecas.

*Guanajuato Reduction and Mines Company*—Plans are being made for extensive development of the old Rayas mine. The mill is now running exclusively on dump ore, much of it from the Rayas. An electric line was recently built to deliver the Rayas ore.

## JALISCO

*Lawson-Mexican Development Company*—As the result of an attachment by creditors, the custom reduction plant and several silver-gold mines of the company, Mascota district, are advertised for sale. The appraised value is 85,761 pesos. The claims amount to about 40,000 pesos. The company was organized by Thomas W. Lawson several years ago, with a capital of \$5,000,000.

*Santa Rosa*—Machinery for enlarging the reduction plant at the Santa Rosa, or Chinos, mines in the Ayutla district, has reached the properties. It consists of a No. 5 Huntington mill, Overstrom and Woodbury tables, Richards classifiers and Callow settling tanks. The plant has 10 stamps, concentrators and amalgamating equipment. Much development is in progress.

*Santo Domingo*—Work has been resumed on this mine on the Santiago river, after a long idleness. It is now controlled by the Redeemable Investment Company, of Boston.

*Magistral-Ameca*—The 100-ton concentrating plant is about completed. It is the first plant in Mexico using the Elmore process for copper ores.

## MEXICO

*Esperanza*—Report for April is as follows: Crushed, 13,128 tons; yield, \$175,216; working expenses, \$93,605; profit, estimated, \$16,572.

## SONORA

*Creston de Cobre*—New pumping

equipment is installed at the properties of this company, Magdalena district, and the mines are being unwatered preparatory to extensive work.

*Zubiana*—E. A. Fisher and Los Angeles associates have taken over this *antigua*, in the Hermosillo district, and will erect a concentrator.

*Sante Fe*—A drift on the 100-ft. level of the Montoya mine has disclosed a full face of good silver-lead ore. Preparations for the erection of a mill are being made.

*Mexican Mining Company*—About 40 men are working at the Veta Grande mine of the company.

*Mary*—The operating force at this property in the Alamos district, has been increased and a 20-stamp mill is nearing completion.

*El Temblor*—A pipe line has been laid from this mine to Elisa creek, 4 miles away. Several thousand tons of ore is blocked out, though no definite plans for shipping or treating has been decided upon. H. C. Carr and New York parties are the owners.

*Badger*—This company recently made a shipment of 20 tons of gold ore from near Bariyon.

*Greene-Cananea*—Minority stockholders in the Greene Consolidated company have brought suit against the Greene-Cananea company and its officers alleging fraud in connection with the consolidation with the Cananea companies. Secretary J. W. Allen, in an interview, specifically denies the charges. L. H. Newkirk, 60 Wall street, New York, represents the complainants.

*Chispas*—This claim, 10 miles north of Nacozari, has developed a high-grade vein 38 in. wide.

*Montenegro*—Forty men are employed at this property, Moctezuma district, and 4000 ft. of development has been accomplished.

## Australia

## NEW SOUTH WALES

Gold production in the State for the four months ended April 30 is reported at 63,522 oz. in 1909, and 66,560 oz.—or \$1,375,795—in 1910; an increase of 3038 oz. this year.

## QUEENSLAND

The gold production for the three months ended March 31 was 92,722 oz. in 1909, and 101,234 oz.—or \$2,092,507—in 1910; an increase of 8712 oz. this year.

## VICTORIA

The output of gold in this State in March was 53,118 oz. For the three months ended March 31 it was 141,804 oz. in 1909, and 140,386 oz.—or \$2,901,778—in 1910; a decrease of 1418 oz. this year.

## Africa

The Transvaal Chamber of Mines reports the gold production in April at 619,045 oz., of which 594,339 oz. came from the Witwatersrand and 24,706 oz. from the outside districts. The total is 11,926 oz. more than in March, and 11,944 oz. more than in April, 1909. For the four months ended April 30, the total was 2,403,154 oz., or \$49,673,193; showing an increase of 8222 oz., or \$16,949, over last year.

The number of negro laborers reported on April 30 was: Coal mines, 9300; diamond mines, 13,566; gold mines, 183,814; total, 206,680, an increase of 7131 during the month. No Chinese have been reported since January.

## Dutch East Indies

At the annual meeting of the Madjan Company, in Batavia, Java, the engineer reported that extensive tests showed an average over 200 acres of the concession of 22.5c. gold per cubic meter, and recommended the purchase of a dredge. It was voted to buy a dredge at an estimated cost of \$50,000. This will be the first dredge in the Dutch East Indies.

The Siam-Keedah Exploration Company has secured a concession on the southeast coast of Sumatra, where prospecting has shown some promising gold deposits. Exploration work has been begun at two points.

## New Zealand

Gold exports for the four months ended April 30 are reported at 136,014 oz. in 1909, and 145,759 oz.—or, \$3,012,838—in 1910; an increase of 9745 oz. Silver exports were 550,675 oz. in 1909, and 536,178 oz. in 1910; a decrease of 14,497 oz. this year.

## Philippine Islands

## BENGUET

The report of the Bua Mining Company for the year 1909 states that operations were confined chiefly to the Gomok mine. Stoping was continued and exploration was carried on by two crosscuts and by drifts, with promising results. The mill was in operation 9½ months, treating 4509 tons of ore. Receipts from gold and cyanide bullion sold were 64,941 pesos—14.39 pesos per ton. Expenses were 52,021 pesos, including 8316 pesos for depreciation, and 3550 pesos for flood and storm damages; leaving 12,920 pesos net earnings. The proportion of assay values recovered in the mill and cyanide works was 90 per cent.

## MANCAYAN

The Lepanto Mining Company has given an option on its copper prospects to the Tellus Company, of Frankfurt, Germany. Engineers have completed an examination of the property and sent in their report.

# THE MARKETS

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

## Coal Trade Review

*New York, May 25*—The coal trade in the East is in fair condition, with no special changes to be reported.

In the West the trade is still irregular and interest is centered on the wage question and the suspension. The situation in the various districts is summarized below.

The Iowa miners are returning to work this week, the wage scale having been signed by both parties. In Indiana, work is active, while Ohio and the Pittsburg district are gradually settling down to steady operations.

The recalcitrant sections are the Southwest, the State of Illinois and the Irwin field in Pennsylvania. The Irwin field, like Westmoreland county, has been non-union, and the fight there is over the recognition of the union, which has recently organized the miners of the district. A committee of the national board of the United Mine Workers is endeavoring to settle the question.

Representatives of the mine workers and operators of districts 14, 25 and 21, in the Southwest, held a meeting in Indianapolis, May 17 and 18. The difficulties which have confronted the miners in Kansas, Missouri, Oklahoma and Arkansas were considered with a view to effecting a settlement in the wage scale. No agreement has been reached. The operators refused to meet the demand for an increase. This is the only point at issue on which an agreement could not be reached. It is believed another conference between miners and operators will be arranged.

In Illinois, the conference at Peoria took a serious turn last week when the joint committee of nine finally disagreed and the miners decided to call a general strike. Many were of the opinion that when the market was actually suffering for coal the miners and operators would have no difficulty in getting together. However, both sides seem determined to hold out as a matter of principle, and are not inclined to make any concessions. The operators are firm in their demand that the differential between the southern and northern districts be abolished and that the expense of the shot-firers be borne by the miners. These seem to be the chief points of contention, though there is a host of minor ones also, which have, as yet, to be settled. There seems to be very little chance of a settlement for several weeks.

## COAL TRAFFIC NOTES

Coal and coke tonnage originating on all lines of the Pennsylvania Railroad Company east of Pittsburg and Erie, four months ended April 30, short tons:

	1909.	1910.	Changes.
Anthracite .....	4,100,868	3,929,146	D. 171,722
Bituminous .....	12,109,819	13,720,319	I. 1,610,500
Coke.....	3,336,540	5,143,636	I. 1,807,096

Total..... 19,547,227 22,793,101 I. 3,245,874

Total increase this year, 16.6 per cent. Bituminous tonnage in April was affected by suspensions in the Pittsburg and Central districts.

Coal tonnage reported by the 10 roads in the Ohio Coal Traffic Association for the three months ended March 31, was 3,356,421 in 1909, and 5,752,065 in 1910; increase, 2,395,644 short tons. Tonnage of individual roads not published this year.

Coal receipts at St. Louis, three months ended March 31, were 1,774,835 short tons in 1909, and 2,978,674 in 1910; increase, 1,203,839 tons.

Coal passing through locks on Monongahela river above Pittsburg, three months ended March 31, was 2,371,240 short tons in 1909, and 2,683,820 in 1910; increase, 312,580 tons.

Coal passing Davis Island dam on the Ohio, three months ended March 31, was 1,335,445 short tons in 1909, and 835,180 in 1910; decrease, 500,265 tons.

Receipts of domestic coal at San Francisco, three months ended March 31, were 95,032 tons in 1909, and 77,344 in 1910; decrease, 17,688 tons.

Coastwise shipments of coal from chief Atlantic ports, three months ended March 31, long tons:

	Anthracite.	Bitum.	Total.	PerCt.
New York....	3,672,163	2,799,444	6,471,607	62.0
Philadelphia	420,420	1,166,581	1,587,001	15.2
Baltimore....	51,689	880,300	931,989	8.9
Newp't News .....	.....	782,663	782,663	7.5
Norfolk.....	.....	660,852	660,852	6.4
Total.....	4,144,272	6,289,840	10,434,112	100.0
Total, 1909.	4,412,913	5,435,540	9,848,453	.....

Total increase this year, 585,659 tons, or 5.9 per cent. New York includes all the harbor shipping points.

Coal tonnage originating on lines of the Southern Railway, two months ended Feb. 28, was: Tennessee district, 228,359; Alabama district, 491,297; total, 719,656 short tons, an increase of 109,543, or 18 per cent., over last year.

Anthracite tonnage of Baltimore & Ohio railroad three months ended March 31, was 242,249 tons in 1909, and 258,493 in 1910; increase, 16,244 tons.

Shipments of Broad Top coal over the Huntingdon & Broad Top Railroad for the four months ended April 30, were

231,473 tons, an increase of 86,420 tons over last year.

## New York

### ANTHRACITE

*May 25*—About the usual spring business is being transacted, and there is no special incident in the trade. Shipments to New England points are beginning to be of interest, and some coal is going to Buffalo for the Lake trade.

Schedule prices of domestic sizes are \$4.35 for broken, and \$4.60 for egg, stove and chestnut, all f.o.b. New York harbor points. For steam sizes current quotations are: Pea, \$3@3.25; buckwheat, \$2.20@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. The lower prices are usually for washery coals.

### BITUMINOUS

The seaboard bituminous-coal trade is irregular. A large business is being done, but it is inclined to come in bunches, and orders are variable. There is still a strong tendency toward the lower-priced coals, and producers of the higher grades find them selling slowly. Pocahontas and New River have pressed on the market, especially in New England territory, and are keeping other sorts back. There is no doubt, however, that total sales are improving.

Eastern territory is still rather slow. New York harbor trade is better, but prices are, if anything, lower. With good West Virginia coal quoted around \$2.40, it is difficult to get a higher price for Pennsylvania coal. Gas coal is selling at prices which realize about 70c. for slack and 85@90c. for run-of-mine at the mines.

Strike difficulties are about over. The Lake trade has been slow so far and is taking little coal from the seaboard trade yet. Car supply is rather irregular and mines are beginning to have trouble in getting as many cars as they need. Otherwise coal is coming this way quite freely. Consumers are generally low in stocks, and orders ought to be coming in soon on a larger scale.

In the coastwise market vessels are becoming scarce, and rates are higher. Boats now command 70c. from New York to points around Cape Cod, and nothing can be done below that rate.

## Birmingham

*May 23*—Recent explosions in coal mines in Alabama have unsettled labor

a little and the coal production has been off. However, the fear is subsiding, the men are getting back to work and the output of the mines in this State is increasing. There is a good demand for coal and much of the product is being shipped from this district into adjoining States.

The coke production is holding up well. There is a fair demand for coke but the price is not as strong as it has been.

**Chicago**

May 23—The coal market is yet without notable scarcity of steam supplies, notwithstanding the protracted lack of shipments from Illinois mines. Sales of coals from States east of Illinois are heavy and at prices satisfactory to wholesalers. Indiana coals, particularly, as coming nearest to the usual supply, find a large sale, while smokeless and Hocking have a better market than for many months past. Some of the larger users of coal have yet storage supplies, but the increasing general demand indicates that these are exceptional and Eastern mines must be drawn upon more and more with each new customer in the market. The chief requirements of coal users are screenings and run-of-mine. For screenings the price holds up to the high level established several months ago, though showing no signs of rising higher. To all appearances fine coals can be disposed of profitably for several weeks at least, from whatever source.

For Indiana lump, in fair but not active demand, car prices are \$2.30@2.50. Run-of-mine from the same State brings \$2.30@2.40. Screenings hold to \$2.15@2.35. West Virginia smokeless coal of all names sells for \$3.55 lump and \$3.15 run-of-mine, circular prices. Hocking—in very good demand—remains at \$3.15 for 1¼-in. There is practically no selling at sacrifice prices.

**Cleveland**

May 23—Notwithstanding the settlement of the wage question, Ohio mines are still working irregularly, and there are many local differences to be settled. Coal supply is irregular, and slack has been scarce. Lake trade is slow, supplies of coal are short, and buyers in the Northwest are holding back. Prices are nominally about the same, but are irregular, like the supply.

The leading firms in the trade have agreed on the following prices for Lake steamer supply: ¾-in., \$2.65; run-of-mine, \$2.55; nut, \$2.45; slack, \$2.10. These prices are at car dump; 5c. additional is charged where coal has to be loaded on lighters.

**Indianapolis**

May 24—The general coal market in Indiana is good. That prices are going to be considerably increased from various

causes is now generally predicted. This is due to the increased wages granted to miners and the increased freight rate. Activity in the mines was augmented during the past week because of the strike in Illinois. The Southern Indiana is at present doing some of the heaviest hauling the road has ever had. The railroad is working all its crews and rolling stock to the limit, hauling Indiana coal to St. Louis. Other coal-carrying roads are doing a big business.

The general conclusion reached by the Indiana operators from the situation is that the market is rapidly getting into shape where it is going to be permanently strong, unless the output is increased all out of proportion.

**Pittsburg**

May 24—Lake shipments are being made at the full rate, and demand from local manufacturers is very good, but relaxation from the pressure caused by the mining suspension has produced a slight easing off in prices, and the minimum of the market may be quoted 5c. lower than formerly, although all producers will not meet the lower figures: Mine-run and nut, \$1.20@1.25; ¾-in., \$1.30@1.35; domestic 1½-in., \$1.45@1.50; slack, 80@85c. The car supply is adequate at present but experienced shippers are looking for a decided shortage later and are pushing Lake shipments so as to be in comfortable position when the shortage develops.

Connellsville Coke—The market has developed farther since our last report, noting that a trading basis had been found by operators making concessions. That report noted three contracts placed totaling 26,000 tons monthly, at \$1.75, \$1.80 and \$1.85, the two lower prices being for second half and the highest for the twelvemonth beginning July. Since that report we note a contract for approximately 11,000 tons monthly for second half, at \$1.80, and another contract for 12,000 tons monthly for the twelvemonth beginning July 1, on a scale basis, relative to the monthly average price of pig iron. An inquiry has just been put out for 25,000 tons monthly for second half. The inquiring interest states it is willing to do \$1.55, and while operators would hardly accept this figure, it is probable they will make a material cut from \$1.80, the business being attractive as the interest is almost certain to run its furnaces. We quote contract furnace coke 5c. lower than last week, other prices unchanged: Prompt furnace, \$1.65@1.70; contract furnace, \$1.70@1.85; prompt foundry, \$2.25@2.35; contract foundry, \$2.35@2.50 per ton.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ended May 14 at 396,777 tons, an increase of 2000 tons and shipments at 4256 cars to Pittsburg, 6296 cars to points west of Pittsburg and 986

cars to points east of the region, a total of 11,538 cars.

**St. Louis**

May 23—The Illinois differences have culminated in the declaration of a strike, as noted elsewhere.

Coal is beginning to be extremely scarce and the demand is strong. A great deal of coal is now coming in from Kentucky and Indiana, and prices have advanced considerably. Mine-run is the principal sort being dealt in and \$2.60 f.o.b. East St. Louis is the prevailing price for nearly all grades. Screenings are in great demand and are bringing practically the same price as mine-run. In fact, very little screenings are being made, and nearly all plants burning them are crushing mine-run.

The weather has eased up a great deal and is now seasonable, consequently the demand for retail coal is not pressing. The retail coal men are concentrating their attention on collections, which have been lagging, and on the anthracite business.

Anthracite coal is moving very well, and trade conditions are more satisfactory than for some years. While the circular is somewhat lower, yet it is being rigidly maintained. In the wholesale market anthracite is moving very well and the tonnage will be quite large for May. All of the large sizes are in very good demand, though chestnut is a little slow as country dealers, as a rule, are not buying yet. Circular is being maintained.

Current prices are quoted as follows:

	F.o.b.	Mine.	St. Louis.
Illinois:			
Lump.....	\$2.50		\$3.02
Mine-run.....	2.25		2.77
Kentucky or Indiana:			
Mine-run.....	2.60		.....
Lump.....	2.80		.....
Pocahontas and New River:			
Lump or egg.....	1.50		4.00
Mine-run.....	1.10		3.65
Pennsylvania anthracite:			
Chestnut, stove or egg....	.....		6.55
Grate.....	.....		6.30
Arkansas anthracite.....	3.35		5.35
Coke:			
Connellsville foundry.....	.....		5.40
Gas house.....	.....		4.50
Smithing coal.....	.....		4.15

Illinois quotations are largely nominal, as none is coming in.

**FOREIGN-COAL-TRADE**

British Coal Trade—Exports of fuel from Great Britain, with coal sent abroad for use of steamships in foreign trade, four months ended April 30, long tons:

	1909.	1910.	Changes.
Coal.....	19,066,314	18,583,007	D. 483,307
Coke.....	353,624	302,918	D. 50,706
Briquets.....	470,957	485,876	I. 14,919
Total exports....	19,890,895	19,371,801	D. 519,094
Steamer coal.....	6,035,543	6,044,888	I. 9,345
Total.....	25,926,438	25,416,689	D. 509,749

Imports of coal are very small; they were only 874 tons in 1909, but increased to 12,253 tons this year.

## IRON TRADE REVIEW

*New York, May 25*—The iron and steel markets, from all appearances, are beginning to wake up, and there are signs of increased activity, which are very welcome to the trade.

In pig iron the reported curtailment of production seems to have stirred up buyers, and more new business is reported this week than for some time past. There have been some good-sized sales and many small ones; while inquiries have come in from large buyers, who believe that prices are near the bottom. Eastern territory is calling for more foundry iron, while the Central West is taking basic pig. The business is rather sensitive, and does not stand any hint of higher prices.

In finished material there is an increased call for structural steel, and many small contracts are being placed. Here also, hints of any advance in prices are resented. Sheets are in better demand, and the market for bars is active, both East and West. Jobbers everywhere report good sales of small material, and it is evident that much building work is going on, almost everywhere. Roofing sheets and tinplate are strong.

Some export business is noted, including rails and locomotives for China, equipment for Cuba and Mexico. The home railroads are buying equipment more freely, but are doing little on rails or bridges.

*Lake Superior Iron Ore*—Iron ore shipments from the Lake Superior region in April are reported by the *Cleveland Iron Trade Review* as below:

	1909.	1910.	Changes.
Escanaba.....	47,123	223,025	I. 175,902
Marquette.....	.....	135,559	I. 135,559
Ashland.....	8,671	218,703	I. 210,032
Superior.....	.....	355,307	I. 355,307
Duluth.....	.....	309,427	I. 309,427
Two Harbors.....	.....	278,284	I. 278,284
Total.....	55,794	1,520,305	I. 1,464,511

This year shows the record for April, which has been approached but once, when 1,447,386 tons were moved, in April, 1906. Last year, during April, the mines were not prepared to ship. Of the shipments this year, 179,911 tons were for Lake Michigan ports.

### Baltimore

*May 24*—Exports for the week included 166,574 lb. spelter to Antwerp; 6177 tons steel rails to South Australia; 2,157,024 lb. miscellaneous iron and steel to Panama. Imports included 1604 tons ferromanganese and 353 tons silicospiegel from Liverpool; 355 tons copper ore and 5403 tons cupreous pyrites from Huelva, Spain; 6000 tons manganese ore from Poti, Russia; 11,500 tons iron ore from Cuba.

### Birmingham

*May 23*—Continued improvement is to be noted in the pig-iron market. The improvement is of small proportions and

is coming slowly. There is no iron going to the yards now, the curtailment of production being effective. Some of the larger consumers of iron have been nibbling a little in the Southern market, and the belief is expressed that within a few weeks there will be orders placed for the balance of the year. Quotations for iron in this section are still \$12 per ton, No. 2 foundry. This price will hardly be bettered during the balance of the year, though some of the furnace companies expect an advancement of 50c. and more. While the curtailment is on furnace repairing will be rushed. Basic and charcoal irons still hold well, several sales of some quantity having been consummated. The sales of foundry iron recently made were in small lots, but the aggregate is good. The time of delivery is extended to the last of the year. There is no verification of iron being sold in this territory under \$12 per ton.

No change is noted in steel activities in this section and the steel plants are doing well.

### Chicago

*May 23*—Sales of pig iron are increasing, the feeling being apparent among melters that further reductions in price are not likely to be generally made. Some lots, on the most favorable terms to sellers, are said to have changed hands at \$11.50 Birmingham, which means \$15.85 Chicago for No. 2. Most of the Southern iron sold, however, is at \$12 Birmingham, the price that has been standard for several weeks. Foundry requirements are being more generally contracted for to cover the last quarter, and the volume of inquiries for that period is such as to make it seem certain that most melters are about ready to buy liberally. For early-delivery iron—30 to 90 days—there is still much demand, but the increase is noticeable for more distant deliveries. Some furnace agents, indeed, are offering special inducements to get early-delivery lots placed. Northern iron remains at \$17 and has a steady sale that is indicative of a large business on the part of the melters and of fairly close regulation of output. The trade in iron and steel products, while not heavy, is general and indicates no falling off. The tone of the whole market, indeed, may be called firm, quiet and promising. Coke sells well at \$5 for the best Connellsville.

### Cleveland

*May 23*—Ore receipts since the first rush are rather slow, and vessels are not getting quick despatch at the upper ports.

*Pig Iron*—Small sales make up the business reported this week in foundry iron, and there seems to be little disposition to order ahead to any large extent. Bessemer pig is nominally unchanged, with no sales. No. 2 foundry is quoted \$16.50@16.75, Cleveland, and No. 2

Southern \$16.10@16.35. Some southern has been offered at 25c. less, \$15.85 Cleveland.

*Finished Material*—Quite a number of small structural orders are coming in. Iron bars are being shaded from recent prices to catch orders. Jobbers still report very good trade in bars and pipe.

### Philadelphia

*May 25*—New business has been transacted this week in basic pig for two reasons; stocks among consumers were pretty well exhausted, and prices had receded to a point which in view of curtailment in other markets warranted buying. There has been little important business in other lines. Inquiries are scattering and consumers are showing indifference. Foundry irons have been dragging and Southern makes are offered at \$16 for No. 2. A few Northern makes are offered at \$17.25, but business has been done at less. Bar mill interests are purchasing in a small way, and some Southern forge has been bought at less than \$15.

*Steel Billets*—Several small sales have been made this week in billets for prompt delivery at recent quotations.

*Bars*—Bars are commanding more attention at mills than for some time, and refined iron is more in request among small consumers.

*Sheets*—The sheet mills report further large orders within a few days for all products in which galvanized figures prominently.

*Pipes and Tubes*—There is no difficulty in keeping business ahead on cast pipe. Merchant pipe is dull and tubes are strong in price.

*Plates*—The rush of orders is taxing the capacity of the plate mills in this territory. Much new business has been figured upon this week.

*Structural Material*—The business of the past week included mostly unimportant orders for requirements in this immediate territory.

*Scrap*—The small consumers of scrap have been more active this week than for some time in picking up small lots for immediate use. Prices are rather weak and a few dealers have shaded quotations on heavy melting steel and No. 1 yard scrap, while railroad scraps which is plenty, is held at the very highest figures.

### Pittsburg

*May 24*—There are cross currents, the market as a whole showing no decisive trend either way. In some quarters sentiment is distinctly less favorable, while in others the outlook is regarded as brighter. Steel bars, hitherto maintaining a strong position, have improved and there has been a slight improvement in bookings of pipe, both merchant and line.

The agricultural-implement makers have placed about 60 per cent. of their steel-bar tonnage for the year beginning July 1, amounting to about 150,000 tons, and paid the full market price of 1.45c., Pittsburg, on soft-steel bars, this being the first year in which they did not obtain a concession. A portion of the tonnage was in hard-steel bars, upon which the regular steel mills met the price of the rerolling mills, using old rail stock, and this was the only semblance of concession given. The implement makers usually order at this time, or earlier, and did not delay further in hopes of getting concessions, because they wished to specify at once on a tonnage of special shapes, upon which they have received very poor deliveries the past season. On regular sections deliveries have been fairly good the past few weeks.

The Harriman orders for 12,440 cars, about 10,000 to the American Car and Foundry Company and the balance distributed among several other interests, constitute the largest batch placed this year. The car shops have business on books to maintain the present full operations for from three to four months.

**Pig Iron**—Prices are quotably lower on pig iron, and the market is unsettled at the new figures, there being rumors of still lower prices done. The shaking up in the market has brought out more inquiry, but buyers are slow in closing. The Follansbee Brothers Company, after picking up several odd lots of speculative basic iron at very low figures, bought 5000 tons at about \$15.10, Midland furnace, equal to \$15.70, delivered Follansbee, or a basis of \$14.75, Valley, which price, however, the Valley furnaces would not do. The American Steel Foundries has practically closed for 5000 tons at \$15, Valley, for delivery over the last five months of the year, and is negotiating for more tonnage at this figure. The business represents a recession in furnace views, since hitherto they would do \$15 only on early delivery. Bessemer iron has moved in a limited way and sufficient is known to warrant dropping \$1 from the previous nominal quotation of \$17, Valley, making the iron quotable at \$16, Valley. Reports of foundry-iron sales at far below \$15, Valley, are not generally credited, and \$15 is probably the market, with malleable at \$15.50 and forge at \$14.50. Prices delivered Pittsburg are 90c. advance over these prices.

**Ferromanganese**—The market is quiet and remains quotable at \$40@40.50 for prompt, and \$40.50@41 for forward delivery, Baltimore, freight to Pittsburg being \$1.95 per ton.

**Steel**—It is reported, but not officially confirmed, that the Pittsburg Steel Company a fortnight ago sold the Jones & Laughlin Steel Company 5000 tons a month of small open-hearth billets for a period of several months, and that this

was the chief cause of its starting its steel plant at Monessen last week after an idleness of five weeks. Open-hearth steel continues scarce, although 50c. lower than formerly could probably be done. The market is quotable as follows: Bessemer billets, \$25.50@26; sheet bars, \$26.50@27; open-hearth billets, \$28@28.50; sheet bars, \$29@29.50; rods, \$32 per ton.

**Sheets**—It is between seasons and demand is only moderate, although, on the whole, tonnage is large. While a few plants are not running full, the current sheet production is easily ahead of any rate prior to this year, since many new mills were completed and put in operation last year, others following in the past five months. A few producers continue to shade black sheets \$1 or \$2 a ton, and galvanized sheets \$2 or \$3 a ton, regular prices being 2.40c. on black and 3.50c. on galvanized, with painted corrugated roofing at \$1.70 and galvanized at \$3. Blue annealed sheets command the regular 1.75c. price for late delivery, but 1.85@1.90c. is obtained for any early delivery.

St. Louis

May 23—There has been very little change in the market and practically no business has been closed. A number of inquiries were received for third- and fourth-quarter delivery. Southern iron seems to be on the market in great abundance and some producers would evidently like to have some orders for immediate shipment. The price of \$12.50 f.o.b. Birmingham, or \$16.25 St. Louis, remains unchanged with the 50c. advance asked for third- and fourth-quarter delivery.

METAL MARKETS

New York, May 25—The metal markets show a slight improvement on some lines, but no marked changes can be noted.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
April 1910..	\$36,283,625	\$ 2,100,918	Exp. \$34,182,707
" 1909..	6,337,994	3,345,861	" 2,992,133
Year 1910..	47,199,706	11,669,276	" 35,530,430
" 1909..	44,316,626	15,504,136	" 28,812,490
Silver:			
April 1910..	4,696,534	3,840,495	Exp. 856,039
" 1909..	4,952,251	4,222,147	" 730,104
Year 1910..	18,336,081	15,238,634	" 3,097,447
" 1909..	19,426,181	14,675,365	" 4,750,816

Exports from the port of New York, week ended May 21: Gold, \$87,239; silver, \$1,081,054, chiefly to London. Imports: Gold, \$177,477, chiefly from the West Indies; silver, \$127,794, from Mexico and South America.

**Gold**—Prices on the open market in London remain at 77s. 9d. per oz. for bars and 76s. 5d. per oz. for American coin. The Bank of England is again a

buyer. No exports from New York are noted, except \$100,000 to Canada.

**Platinum**—Business is good for the season. The recent advance in prices abroad has been followed here by one of 25 or 50c. Dealers now ask \$30 per oz. for refined platinum and \$35.50@36 per oz. for hard metal.

Our Russian correspondent writes under date of May 12 that the market and prices remain unchanged both at Ekaterinburg and in St. Petersburg. In St. Petersburg, sales have been made at 24,200@24,300 rubles per pood. Crude metal, 83 per cent. platinum, is generally quoted at Ekaterinburg at 6.30 rubles per zolotnik; in St. Petersburg, at 25,000 rubles per pood—\$23.69 and 24.50 per oz. respectively.

**Silver**—The market has continued fairly steady the past week, closing slightly lower at 24 11/16d. in London, on selling by Chinese banks.

SILVER AND STERLING EXCHANGE

May.	19	20	21	23	24	25
New York....	53 $\frac{3}{4}$	53 $\frac{3}{4}$	53 $\frac{3}{4}$	53 $\frac{3}{4}$	53 $\frac{3}{4}$	53 $\frac{3}{4}$
London.....	24 $\frac{11}{16}$	24 $\frac{11}{16}$	24 $\frac{11}{16}$	24 $\frac{11}{16}$	24 $\frac{11}{16}$	24 $\frac{11}{16}$
Sterling Ex..	4.8710	4.8720	4.8740	4.8755	4.8790	4.8750

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

Exports of silver from London to the East from Jan. 1 to May 12, reported by Messrs. Pixley & Abell:

	1909.	1910.	Changes.
India.....	£1,553,500	£2,627,240	I. £1,073,740
China.....	1,075,100	1,113,500	I. 38,400
Straits.....	82,800	.....	D. 82,800
Total.....	£2,711,400	£3,740,740	I. £1,029,340

Indian Council bills in London brought an average of 16d. per rupee.

Copper, Tin, Lead and Zinc

May.	Copper.			Tin.	Lead.	Zinc.	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	
19	12 $\frac{3}{4}$ @13	12 $\frac{1}{2}$ @12 $\frac{3}{4}$	55 $\frac{7}{8}$	33 $\frac{3}{4}$	4.27 @4.32	4.12 @4.15	5.12 @5.17
20	12 $\frac{3}{4}$ @13	12 $\frac{1}{2}$ @12 $\frac{3}{4}$	.....	33 $\frac{3}{4}$	4.27 @4.32	4.12 @4.15	5.12 @5.17
21	12 $\frac{3}{4}$ @13	12 $\frac{1}{2}$ @12 $\frac{3}{4}$	.....	33 $\frac{3}{4}$	4.27 @4.32	4.12 @4.15	5.12 @5.17
23	12 $\frac{3}{4}$ @13	12 $\frac{1}{2}$ @12 $\frac{3}{4}$	56 $\frac{7}{8}$	33 $\frac{3}{4}$	4.30 @4.35	4.15 @4.17	5.12 @5.17
24	12 $\frac{3}{4}$ @13	12 $\frac{1}{2}$ @12 $\frac{3}{4}$	56 $\frac{7}{8}$	33 $\frac{3}{4}$	4.30 @4.35	4.17 @4.20	5.12 @5.17
25	12 $\frac{3}{4}$ @13	12 $\frac{1}{2}$ @12 $\frac{3}{4}$	56 $\frac{7}{8}$	33 $\frac{3}{4}$	4.30 @4.35	4.17 @4.20	5.12 @5.17

London quotations are per long ton (2240 lb.) standard copper. 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.

**Copper**—A moderate business, both with domestic and foreign manufacturers, was transacted during the week of May 19-25. The market has been quiet, but steady. The leading interests in Lake copper have continued to offer at 13c., and substantial sales have been made at that figure and at a shade lower, while some brands of Lake have been obtainable at 12 $\frac{7}{8}$ c. The sellers of electrolytic in general ask 12 $\frac{7}{8}$ c., delivered, 30 days, but make concessions when business is actually in sight. Sales have been made at 12.80, delivered, both in Europe and America, corresponding to 12.60@12.65, net cash, New York. Sellers demand slightly better terms for September contracts than for June-July. While most of the agencies profess to be well sold for June and July, they seem to be able to scrape up supplies when business for those months is offered. Consumption continues good and manufacturers both in this country and abroad are busy, and the reports, particularly from Europe, are encouraging. While there was not much buying this week, on the other hand there was no pressure to sell. At the close Lake copper is quoted at 12 $\frac{7}{8}$ @13c., and electrolytic copper in cakes, wirebars and ingots at 12 $\frac{1}{2}$ @12 $\frac{3}{4}$ c. Casting copper is quoted nominally at 12 $\frac{1}{4}$ @12 $\frac{1}{2}$ c. as the average for the week.

As the price for copper hovers just under 13c., the market seems to have encountered a freezing point. There is plenty of copper for sale at about 12.85 and everybody knows it. The manufacturers, who are well posted as to the statistical position and have been deluged with prophecies about the new supplies of copper to come, are content to pursue a hand-to-mouth policy. Apart from their contracts with the producers for future delivery, they are not believed to have much supply in their yards, but they feel sure that they will not in the near future have to pay more than the present price and think that they may be able to cover their requirements upon a break to a lower level, and in the meanwhile are staving off purchases, using up all their scrap, etc. The producers, on the other hand, are convinced that copper is cheap at the present price, and knowing that our statistics do not tell the whole story are of the opinion that the present situation is not so bad as it looks, and are firm in holding out for what they ought to get. No one less than a wizard could prophesy successfully what course the market is going to take from the present situation.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 14c. base, carload lots at mill.

The London market for standard copper has fluctuated within narrow limits. There have been some realization of speculative

holdings, which sales were readily absorbed. The market closes at £56 8s. 9d. for spot, and £57 6s. 3d. for three months.

Refined and manufactured sorts we quote: English tough, £59; best selected, £60@60 10s.; strong sheets, £68@69 per ton.

Henry R. Merton & Co., London, under date of May 14, 1910, report active buying of copper by European manufacturers. The National Conduit and Cable Company, New York, under date of May 20, reports continued good consumption in this country, but indicates that manufacturers are holding back in their orders for copper upon the theory that production is in excess of consumption, wherefore copper may yet be obtained more cheaply.

Exports of copper from New York and Philadelphia for the week were 2043 long tons. Our special correspondent gives the exports from Baltimore at 2608 tons.

**Tin**—Transactions in the London market increased throughout the week and reached the large total of 1500 tons on May 24. These transactions may have been brought about to influence the market in view of the Banka sale which took place on May 25; if so, however, without much success, as the close is cabled as firm at £150 15s. for spot and £152 for three months.

A good business was done in the domestic market during the latter part of last week. Since then, however, the market has relapsed into its usual lethargy. Transactions are confined to retail lots, which can be bought at about 33 $\frac{3}{8}$  cents.

Shipments of tin from the Straits in April were 4925 long tons; for the four months ended April 30 they were 16,944 tons, a decrease of 1106 tons, as compared with last year.

**Lead**—The market has been fairly active and the demand, especially for Missouri lead, has been good, and prices have advanced to 4.17 $\frac{1}{2}$ @4.20c. St. Louis, and 4.30@4.35c., New York.

The London market for Spanish lead is cabled at £12 12s. 6d. and £12 15s. for English lead.

**Spelter**—The market is quiet. Manufacturers are busy, but although their stocks of spelter are low, they are not buying largely at the moment. Prices are unchanged at 5.12 $\frac{1}{2}$ @5.17 $\frac{1}{2}$ c., St. Louis, and 5.27 $\frac{1}{2}$ @5.32 $\frac{1}{2}$ c., New York.

The New York quotation for spelter was 5.27 $\frac{1}{2}$ @5.32 $\frac{1}{2}$ c. for May 19-25, inclusive.

The London market for good ordinaries is £22 2s. 6d., and £22 7s. 6d. for specials.

Base price of zinc sheets is \$7.50 per 100-lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

The Bartlesville Zinc Company is building two new blocks, which will make a total of eight.

The smelters at Iola, Cherryvale and

Neodesha are now sucking their gas pools by pumping.

### Other Metals

**Aluminum**—Business continues on a good scale, and prices are strong at 23 $\frac{3}{4}$ @24c. per lb. for No. 1 ingots, New York. The foreign market is also strong and steady.

**Antimony**—The market remains extremely dull, and in the absence of business prices are nominally unchanged. Quotations are 8 $\frac{3}{8}$ @8 $\frac{1}{2}$ c. for Cookson's; 7 $\frac{7}{8}$ @8c. for U. S.; 7 $\frac{3}{8}$ @7 $\frac{1}{2}$ c. for outside brands.

**Quicksilver**—There has been a reduction of \$1 in prices. New York quotations are \$47 per flask of 75 lb. for large orders; \$48@49 for jobbing lots. San Francisco, \$46@46.50 for domestic orders and \$2 less for export. The London price has been reduced to £8 15s., with the same figures quoted by second hands.

**Nickel**—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 500-lb. lots, up to 55c. for 200-lb. lots. The price for electrolytic is 5c. higher.

### Spanish Metal Exports

Exports of metal and mineral from Spain, two months ended Feb. 28, reported by *Revista Minera*, in metric tons:

Metals.	1909.	1910.	Changes.
Pig and manuf. iron	4,325	3,971	D. 354
Copper	2,806	3,124	I. 318
Copper precipitate	2,761	2,474	D. 287
Lead	22,052	25,118	I. 3,066
Zinc	54	238	I. 184
Quicksilver	211	215	I. 4
<b>Minerals.</b>			
Iron ore	1,075,208	1,482,909	I. 407,701
Manganese ore	1,020	416	D. 604
Copper ore	172,575	178,309	I. 5,734
Lead ore	369	678	I. 309
Zinc ore	18,324	22,984	I. 4,660
Pyrites, iron	192,330	203,767	I. 11,437
Salt	89,219	84,262	D. 4,957

Imports of phosphates, 16,692 tons in 1909, and 21,744 in 1910; nitrate of soda, 11,627 tons in 1909, 13,117 tons this year.

### Zinc and Lead Ore Markets

**Platteville, Wis., May 21**—The highest price paid this week for zinc ore was \$43.50; the base price, 60 per cent. zinc, was \$39@42 per ton. The base price paid for 80 per cent. lead ore was \$49@50 per ton.

#### SHIPMENTS, WEEK ENDED MAY 21

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point	624,900		
Platteville	542,550		311,400
Dubuque	216,000		
Highland	198,000	50,000	
Cuba City	82,575	171,120	
Galena	80,000		
Benton	54,100	180,400	
Total	1,798,125	401,520	311,400
Year to date	32,787,551	2,651,689	6,426,890

In addition to the above, there was shipped during the week to the separating plants, 3,206,645 lb. zinc concentrates.

Joplin, Mo., May 21—The highest price paid for sulphide zinc ore was \$46 per ton, the base \$40@43.50 per ton of 60 per cent. zinc. Zinc silicate sold at \$20 @22 per ton of 40 per cent. zinc. Shipments were light, the larger part of this week's purchases being unsettled for, leaving the high price based on last week's bids. The average price, all grades of zinc, was \$38.34. Lead ore continues weak, with light sales, the highest offering being quoted at \$48 for ores of 80 per cent. grade or better, and with the usual deductions of \$1 per ton for each unit below 80 per cent. lead. The average price, all grades of lead, was \$47.94 per ton.

In addition to 25 of the larger producing mines idle on account of the recent drop in the price of zinc ore, a number of small shallow mines were idle a part of this week on account of surface water from the continuous rains; reducing the output, approximately 1500 tons.

SHIPMENTS, WEEK ENDED MAY 21.

	Zinc, lb.	Lead lb.	Value.
Webb City-Carterville	3,716,420	425,150	\$86,131
Joplin	1,895,540	141,000	37,138
Oronogo	980,970	104,030	23,364
Galena	983,040	108,010	21,547
Alba-Neck	616,490	.....	13,253
Duenweg	434,910	54,390	10,003
Badger	333,930	9,320	7,059
Granby	480,490	22,040	6,530
Spurgeon	162,690	49,830	3,721
Carl Junction	137,060	10,580	3,193
Carthage	123,720	.....	2,658
Aurora	192,440	.....	1,924
Sarcoie	62,800	.....	1,256
Totals	10,200,500	924,350	\$217,777

21 weeks.....229,143,060 34,035,210 \$5,537,679  
Zinc value, the week, \$195,620; 21 weeks, \$4,640,620  
Lead value, the week, 22,157; 21 weeks, 897,059

MONTHLY AVERAGE PRICES

Month.	ZINC ORE.				LEAD ORE.	
	Base Price.		All Ores.		All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	\$41.25	\$47.31	\$38.46	\$45.16	\$52.17	\$56.99
February	36.94	40.69	34.37	39.47	50.50	53.64
March	37.40	43.60	34.71	39.71	50.82	51.26
April	38.63	41.00	37.01	39.33	55.63	49.72
May	40.06	.....	37.42	.....	56.59	.....
June	44.15	.....	40.35	.....	57.52	.....
July	43.06	.....	41.11	.....	53.74	.....
August	48.25	.....	44.54	.....	57.60	.....
September	47.70	.....	44.87	.....	56.11	.....
October	49.50	.....	45.75	.....	55.02	.....
November	51.31	.....	48.29	.....	53.94	.....
December	49.45	.....	47.57	.....	55.26	.....
Year	\$43.98	.....	\$41.20	.....	\$54.60	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

CHEMICALS

New York, May 25—The general market is unchanged and business is on a moderate scale only.

The new plant of the General Chemical Company, at Newell, Penn., on the line of the Pittsburg & Lake Erie road, was formally opened May 13. This plant has all the latest improvements. There are

12 buildings already completed with everything arranged for the addition of others, as the development of the plant goes on. All the buildings are of brick, concrete and steel construction, the roof being of tile resting on steel, so that the buildings will be fireproof in every respect. There will be no boilers in the plant, thus lessening the danger of an explosion, or other accidents. All of the machinery of the plant will be run by electricity, which will be generated by gas engines located in a separate powerhouse, removed from the remainder of the plant.

**Copper Sulphate**—No change is reported. On an average business, prices remain at \$4 per 100 lb. for carload lots and \$4.25 per 100 lb. for smaller orders.

**Nitrate of Soda**—Business is good for the season and contract deliveries are steady. Quotations continue at 2.15c. per lb. for spot lots, and 2.05c. for futures.

**Arsenic**—Sales have been light and prices are again a shade lower, at \$2.37½ @2.45 per 100 lb. for white arsenic.

Petroleum

Exports of mineral oils from the United States, four months ended April 30, in gallons:

	1909.	1910.
Crude petroleum	46,916,884	41,335,172
Naphthas	24,003,021	26,158,729
Illuminating oil	336,176,586	295,166,834
Lubricating and paraffin	49,378,906	48,326,448
Residium	32,789,183	34,120,833

Total..... 489,264,580 445,108,016

The total decrease this year was 44,156,564 gal., or 9 per cent.

MINING STOCKS

New York, May 25—The general stock market throughout the week has been almost entirely a professional one and rather dull at that. Movements in price were small and irregular, some stocks advancing, while others declined. There was no general tendency manifest, and the market seems to be simply drifting.

On the Curb, the copper shares were rather sluggish and most of the dealings were small. The exception was Ray Central, which was freely sold at advancing prices. Cobalt stocks, on the other hand, were active and freely dealt in at fair advances in price. The Nevada gold stocks are dead for the present.

At public auction in New York, May 19, Steel Corporation 5 per cent. sinking fund bonds brought 104; 31 shares New Jersey Zinc Company, \$405 per share; 500 shares Columbus & Hocking Coal and Iron, \$7.25 per share; 11,723 shares Predlecta Mining Company, \$1.10 per share; 400 shares Veta Colorado Mining and Smelting, \$55 for the lot; 500 shares Manhattan Ely Copper Company, \$5 for the lot. A lot of miscellaneous securities consisting chiefly of 731 shares Victoria Silver Mining Company, 200

shares New Eureka Silver Mining Company and one-quarter share Baines Sound Coal Company brought \$12 for the lot.

Boston, May 24—The mining-share market is at a standstill. There is an entire lack of business. Specialties have been strong, and the undertone of the whole list has shown undeniable strength. Notable has been the demand for Isle Royale with an advance of \$3.37½ for the week and a high at \$25.37½. Late underground developments at this property would give indications of favorable possibilities.

COPPER PRODUCTION REPORTS.

Copper contents of blister copper, in pounds.

Company.	February.	March.	April.
Arizona, Ltd.	2,658,000	2,886,000	2,340,000
Balaklala	989,102	1,263,733	1,109,311
Boleo (Mexico)	2,331,832	2,148,383	2,777,800
Copper Queen	8,927,203	10,809,488	9,920,000
Calumet & Ariz.	2,024,000	2,820,000	.....
Cananea (Mexico)	3,586,000	3,700,000	4,262,000
Detroit	1,486,400	1,698,975	1,930,000
Imperial	750,000	825,000	800,000
Nevada Con. (Est.)	5,115,723	5,339,466	5,500,000
Old Dominion	2,035,000	2,674,000	2,325,000
Shannon	1,526,000	1,468,000	1,288,000
Superior & Pitts.	1,864,000	2,370,000	.....
Utah Copper Co.	5,913,465	7,853,288	.....
Butte District	13,758,620	24,000,000	25,000,000
Lake Superior	18,250,000	19,250,000	11,250,000
Total production	71,099,622	89,366,867	.....
Imports, bars, etc.	14,083,381	20,178,202	.....
Imp. in ore & matte	6,063,764	6,181,476	.....
Total	91,256,767	115,726,545	.....

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 Nacozari. Boleo copper does not come to American refiners. Utah Copper report from February includes the output of the Boston mill.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
V, 1909	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	117,828,655	69,519,501	59,546,570
Year	1,405,403,056	705,051,591	680,942,620
I, 1910	116,547,287	78,158,387	81,691,672
II	112,712,438	66,618,322	37,369,518
III	120,067,467	62,344,818	40,585,767
IV	117,477,639	67,985,951	31,332,403

VISIBLE STOCKS.

	United States.	Europe.	Total.
V, 1909	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I, 1910	141,766,111	244,204,800	385,970,911
II	98,463,339	248,236,800	346,700,139
III	107,187,992	254,150,400	361,338,392
IV	123,824,874	249,625,600	373,450,474
V	141,984,159	246,870,400	388,854,559

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.

A \$2 advance has been established in Amalgamated Copper and, although the market is largely made in New York, there is a scarcity of the stock in this city. Nipissing has done well by adding \$1 to its market value. Butte-Balaklava has lately attracted attention by a \$5 advance to \$17 per share.

There has been little doing in the newer Lake issues, although their prices have bene well maintained. The Amster stocks have steadied and offerings are in a lessened volume. Atlantic and Mass mining shares both had sharp upward movement without any accompanying explanation. There is a constant absorption of North Butte, and Utah Consolidated has benefited in price value.

The Curb market has been quiet with a tendency for the better grade of stocks to show improved values.

Assessments

Company.	Delinq.	Sale.	Amt.
Andes, Nev.	May 31	June 21	\$0.10
Beck Tunnel, Utah	June 14		0.01
Black Jack, Utah			0.01
Blue Bell, Idaho	Mar. 14	June 1	0.002
Brownstone, Utah	Apr. 15	June 10	0.001
Bullion, Nev.	May 8	June 6	0.05
Con. Imperial, Nev.	Apr. 19	May 12	0.01
Con. Virginia, Nev.	May 9	June 3	0.20
Exchequer, Nev.	Apr. 27	May 18	0.05
First Natl. Copper, Cal.	May 10		1.25
Hector, Idaho	Mar. 28	May 26	0.001
Helvetia, Ariz.			0.50
Mangus Dev., Mich.	May 7		2.50
Mexican, Nev.	May 17	June 9	0.15
Mineral Farm, Idaho	Mar. 12	May 16	0.003
New Arcadian, Mich.	Mar. 10		1.00
Ophir, Nev.	Apr. 22	May 16	0.25
Savage, Nev.	May 2	May 27	0.10
Sierra Nevada, Nev.	Apr. 7	Apr. 27	0.10
South Columbus, Utah	Mar. 30	Apr. 30	0.02
Ton. North Star	Apr. 21		0.03
Utah, Nev.	Apr. 22	May 3	0.05
Utah Con. of Tintic, Utah	May 15		0.01

Monthly Average Prices of Metals SILVER

Month.	New York.		London.	
	1909.	1910.	1909.	1910.
January	51.750	52.375	23.843	24.154
February	51.472	51.534	23.706	23.794
March	50.468	51.454	23.227	23.690
April	51.428	53.221	23.708	24.483
May	52.905		24.343	
June	52.558		24.166	
July	51.043		23.519	
August	51.125		23.588	
September	51.440		23.743	
October	50.923		23.502	
November	50.703		23.351	
December	52.226		24.030	
Total	51.502		23.706	

New York, cents per fine ounce; London, pence per standard ounce.

COPPER.

	NEW YORK.				London.	
	Electrolytic		Lake.		1909.	1910.
	1909.	1910.	1909.	1910.		
January	13.83	13.620	14.280	13.870	61.198	60.923
February	12.949	13.332	13.295	13.719	57.688	59.388
March	12.387	13.255	12.826	13.586	56.231	59.214
April	12.561	12.733	12.931	13.091	57.363	57.238
May	12.893		13.238		59.338	
June	13.214		13.548		59.627	
July	12.880		13.363		58.556	
August	13.007		13.296		59.393	
September	12.870		13.210		59.021	
October	12.700		13.030		57.551	
November	13.125		13.354		58.917	
December	13.298		13.647		59.906	
Year	12.982		13.335		58.732	

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	28.060	32.700	July	29.125	
February	28.290	32.920	August	29.966	
March	28.727	32.463	September	30.293	
April	29.445	32.976	October	30.475	
May	29.225		November	30.859	
June	29.322		December	32.913	
			Av. Year.	29.725	

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	4.175	4.700	4.025	4.582	13.113	13.650
February	4.018	4.613	3.868	4.445	13.313	13.328
March	3.986	4.459	3.835	4.307	13.438	13.063
April	4.168	4.376	4.051	4.225	13.297	12.641
May	4.287		4.214		13.225	
June	4.350		4.291		13.031	
July	4.321		4.188		12.563	
August	4.363		4.227		12.475	
September	4.342		4.215		12.781	
October	4.341		4.215		13.175	
November	4.370		4.252		13.047	
December	4.560		4.459		13.125	
Year	4.273		4.153		13.049	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	5.141	6.101	4.991	5.951	21.425	23.350
February	4.889	5.569	4.739	5.419	21.562	23.188
March	4.757	5.637	4.607	5.487	21.438	23.031
April	4.965	5.439	4.815	5.289	21.531	22.469
May	5.124		4.974		21.975	
June	5.402		5.252		22.000	
July	5.402		5.252		21.969	
August	5.729		5.579		22.125	
September	5.796		5.646		22.906	
October	6.199		6.043		23.200	
November	6.381		6.231		23.188	
December	6.249		6.099		23.094	
Year	5.503		5.352		22.201	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PRICES OF PIG IRON AT PITTSBURG.

Month.	Bessemer.		Basic.		No. 2 Foundry.	
	1909.	1910.	1909.	1910.	1909.	1910.
	January	\$17.18	\$19.90	\$16.40	\$17.98	\$6.26
February	16.73	18.96	16.09	17.21	15.90	17.38
March	16.40	18.53	15.84	16.93	15.62	17.00
April	15.79	18.28	15.05	16.84	15.06	16.75
May	15.77		15.02		15.08	
June	16.13		15.84		15.63	
July	16.40		15.90		15.96	
August	17.16		16.17		16.20	
September	18.44		16.80		17.03	
October	19.75		17.84		18.02	
November	19.90		18.37		18.09	
December	19.90		18.15		17.90	
Year	\$17.46		\$16.46		\$16.40	

STOCK QUOTATIONS

COLO. SPRINGS May 25				SALT LAKE May 25	
Name of Comp.	Bid.	Offer.	Close.	Name of Comp.	Cig.
Listed:					
Acacia	.05			Carisa	.50
Cripple Crk Con.	.02			Colorado Mining	.64
C. K. & N.	.15			Columbus Con.	.48
Doctor Jack Pot.	.08			Daly Judge	39.95
Elkton Con.	.78			Grand Central	1.25
El Paso	.82			Iron Blossom	.94
Fannie Rawlins	.05			Little Bell	1.25
Findlay	.07			Little Chief	.45
Gold Dollar	.13			Lower Mammoth	.50
Gold Sovereign	.03			Mason Valley	6.90
Isabella	.16			Maj. Mines	2.32
Mary McKinney	.57			May Day	.05
Pharmacist	.02			Nevada Hills	.81
Portland	1.12			New York	1.13
Vindicator	.82			Prince Con	.73
Work	.04			Red Warrior	6.00
Unlisted:				Silver King Coal'n	2.40
Golden Cycle	1.92			Sioux Con	.29
United Gold Mines	.07			Uncle Sam	.35
				Victoria	1.07

SAN FRANCISCO.

Name of Comp.	Cig.	Name of Comp.	Cig.
COMSTOCK STOCKS		MISC. NEVADA	
Atlanta	.13	Belmont	4.00
Belcher	1.56	Daisy	.96
Best & Belcher	1.25	Jim Butler	.26
Caledonia	.47	MacNamara	.26
Challenge Con.	.24	Midway	.27
Chollar	.10	North Star	.06
Confidence	.90	West End Con.	.43
Con. Cal. & Va.	.94	Atlanta	.13
Crown Point	.69	Booth	.13
Exchequer	.21	C.O.D. Con.	.07
Gould & Curry	.20	Columbia Mt.	.06
Hale & Norcross	.27	Comb. Frac.	.50
Mexican	.93	Great Bend	.021
Ophir	1.00	Jumbo Extension	.22
Overman	.82	Oro	.06
Potosi	.27	Red Hill	.04
Savage	.26	Sandstorm	.03
Sierra Nevada	.16	Silver Pick	.08
Union	.18	St. Ives	.11
Yellow Jacket	.58	Tramps Con.	.05

N. Y. EXCH. May 25

Name of Comp.	Cig.	Name of Comp.	Cig.
Amalgamated	71	Adventure	6 1/2
Am. Agri. Chem.	46	Allouez	46
Am. Sm. & Ref. com	81 1/2	Am. Zinc	25 1/2
Am. Sm. & Ref. pf.	86 3/4	Arcadian	6
Anaconda	43 1/2	Arizona Com	16 3/4
Bethlehem Steel	30	Atlantic	8
Col. & Hock C. & I.	7 3/8	Boston Con	17
Colo. Fuel & Iron	138	Butte & Balak	17 1/2
Du Pont P'd'r, pf.	287 1/2	Calumet & Ariz.	65
Federal M. & S.	41	Calumet & Hecla	590
Great Nor. oreft.	64 1/2	Centennial	18 1/2
Natl Lead.com	78 1/2	Con. Mercur	10
National Lead, pf.	107 3/4	Copper Range	67 1/2
Nev. Consol.	21	Daly West	8
Pittsburg Coal.	20 3/4	East Butte	9
Republic I & S.com	34 3/8	Franklin	13 3/4
Republic I & S, pf.	98	Granby	41
Sloss Sheffield, pf.	73 1/2	Hancock	21
Tennessee Copper	117 1/2	Helvetia	2 1/2
Utah Copper	127 1/2	Indiana	21 1/2
U. S. Steel, com.	46 1/2	Isle Royale	24 3/8
U. S. Steel, pf.	84 1/2	Keweenaw	3 3/8
Va. Car. Chem.	118 1/2	Lake	15
	61 1/2	La Salle	53

N. Y. CURB May 25

Name of Comp.	Cig.	Name of Comp.	Cig.
Bonanza Creek	13	Nevada	21
Boston Copper	17 1/2	North Butte	34
Braden Copper	3	North Lake	12 1/2
B C Copper	6	Oldway	17 1/2
Buffalo Mines	2 1/2	Old Dominion	38 1/2
Butte Coalition	20 1/2	Oscoda	141
Caledonia	1 1/2	Parrot	16
Chino	13 3/4	Quincy	77 1/2
Cobalt Central	.07	Shannon	11 1/2
Cobalt Prov.	59	Superior	46
Con. Ariz. Sm.	2 1/2	Superior & Bost.	11
Cumberland Ely.	19	Superior & Pitts.	12 1/2
Davis-Daly	2	Tamarack	57
Dominion Cop.	5.7	Trinity	5 1/2
Ely Con.	.56 1/2	U. S. Smg & Ref.	43 1/2
El Rayo	4	U. S. Sm. & Re., pd	49 1/2
Florence	3 1/2	Utah Apex	3 1/2
Gila Copper	6 3/4	Utah Con.	24
Gtroux	8	Victoria	3
Gold Hill	7	Winona	8 1/2
Goldfield Con.	8 1/2	Wolverine	118
Greene Cananea	8 3/4		