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Production and Consumption of Spelter in 1906

The Production of Spelter Was 225,494 Tons. The Consumption Was 225,500. The Production of Zinc Ore Was 905,175 Tons

BY WALTER RENTON INGALLS

The production of virgin spelter in the United States in 1906 was 225,494 short tons, that figure being the total of reports received from all the producers. The details of the production in 1906, compared with 1905, are as follows:

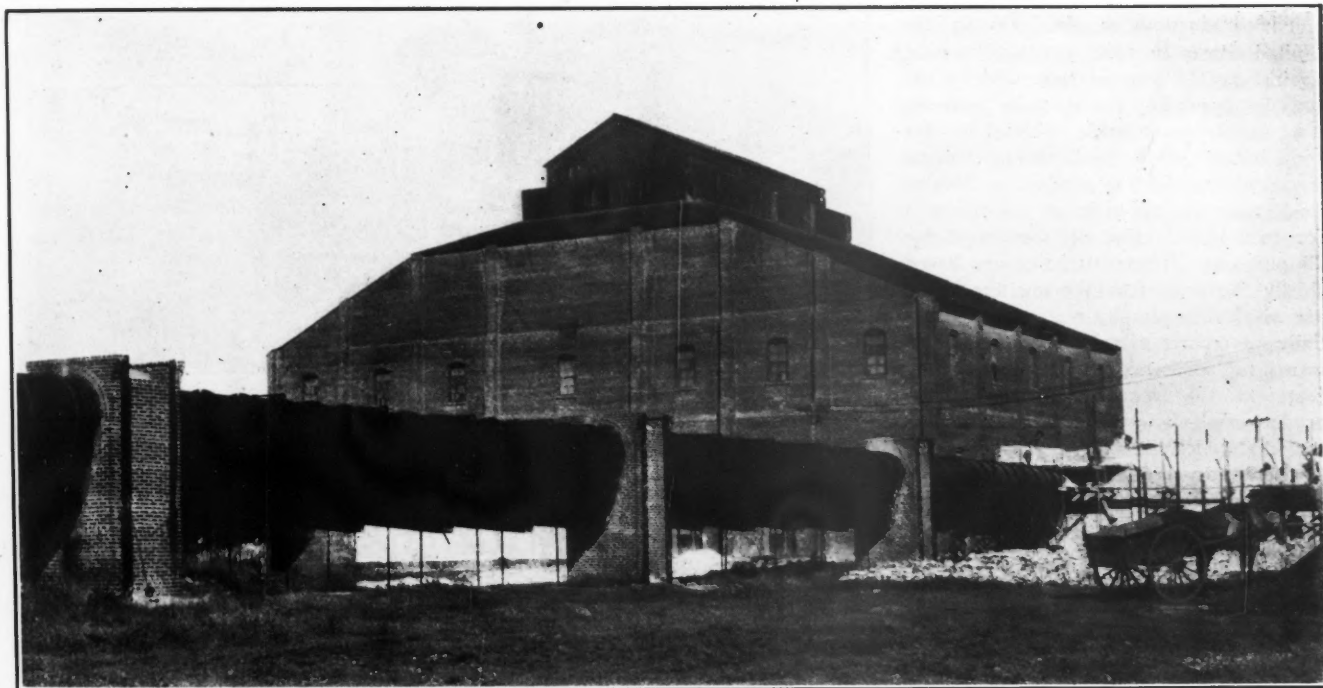
PRODUCTION OF SPELTER IN THE UNITED STATES. (In tons of 2000 lb.)		
States.	1905.	1906.
Colorado	6,599	6,260
Illinois	45,357	48,238
Kansas	114,948	129,741
Missouri	11,800	11,088
South and East.....	23,044	30,167
Total	201,748	225,494

Lanyon-Starr Smelting Company, at Bartlesville, Ind. Ter., and the new works of the Caney Zinc Company, at Deering, Kan., went into operation early in 1907. The works of Hegeler Bros., at Danville, Ill., which have been under construction for a long time, are also to go into operation in 1907. Several other new works are planned for 1907, but none is likely to be in operation before the end of the year. In 1906 another one of the old smelters at Pittsburg, Kan., was put in operation, making two now running at that place.

The Mineral Point Zinc Company, of DePue, Ill., started with two furnaces, having an aggregate of 1600 retorts. In the East the New Jersey Zinc Company added to its Palmerton works six new furnaces with a total of 1200 retorts. The total of the additions in 1906 was 4560 retorts and 480 muffles. Consequently there was a large increase in the smelting capacity, although only one new plant went into operation.

MISCELLANEOUS STATISTICS

The production of zinc oxide (including



BAG HOUSE AND FLUE, ZINC OXIDE WORKS, COFFEYVILLE, KANSAS

The above statistics include only virgin spelter, i.e., spelter produced from ore. There is an additional quantity, estimated at 3000 tons, from the marketing of scrap zinc and the resmelting of galvanizers' dross and other waste products. Some of these are converted into spelter of very good quality. Also there is a considerable exportation of dross to the European smelters.

Several new plants were in course of construction in 1906, but the only one to go into operation was the works of the Mineral Point Zinc Company, at DePue, Ill. Among the others, the works of the

NEW SMELTING CAPACITY

Among the older companies, the Caney Zinc Company added a new furnace of 300 retorts to its plant at Caney, Kan. The Cockerill Zinc Company added three blocks of furnaces, with a total of 672 retorts, to its plant at Pittsburg, Kan. The Matthiessen & Hegeler Zinc Company, of LaSalle, Ill., added 300 retorts, while the Illinois Zinc Company, of Peru, Ill., added 40. The United Zinc and Chemical Company, of Iola, Kan., added two furnaces, each having 240 large retorts (muffles). The Sandoval Zinc Company, of Sandoval, Ill., added two fur-

zinc-lead pigment) in the United States in 1906 was 77,800 tons, against 72,603 tons, in 1905. It is no longer possible to report the production of zinc oxide alone, because certain manufacturers now produce both zinc oxide and zinc-lead pigments, and a further analysis of the statistics would disclose individual business. There is a small production of zinc oxide by the combustion of spelter, but the great bulk of the American product is made directly from ore. If the zinc content of this oxide be added to the spelter production, the United States is by far the largest producer of zinc in the world. Early in

1906 the Ozark Smelting and Mining Company completed and put into operation a new oxide plant at Coffeyville, Kan., making a total of six works in the United States engaged in the manufacture of oxide directly from ore and one in the manufacture from spelter.

The exportation of zinc ore from the United States in 1906 was 24,750 long tons, against 27,630 in 1905, and 32,063 in 1904. The exports were chiefly of New Jersey willemite. In addition to the exports of ore, 15,887 short tons of zinc dross (galvanizers' waste) were exported in 1906, against 5318 tons in 1905.

A feature of considerable interest in connection with the American zinc industry is the increasing production of lead obtained as a by-product from the smelting of zinc ore. In 1906 smelters in Colorado produced 542 tons of pig lead from residues received from zinc smelters in Kansas, and I estimate that they must have produced also 600 tons of lead from residues smelted in Colorado. Moreover, one smelter produced 75 tons of pig lead as a by-product in the refining of spelter.

PRODUCTION OF ZINC ORE

The production of zinc ore in the United States in 1906 was 905,175 tons, against 795,698 tons in 1905, and 693,025 tons in 1904. The statistics for 1906 are not strictly comparable with those for 1905, because while the latter omitted the zinc ore used for the production of zinc oxide and zinc-lead pigment, the statistics for 1906 include zinc ore consumed for all purposes. These statistics are based chiefly on reports from the smelters of the ore which they actually received, and partially on reports of miners of their shipments to smelters. Consequently, they represent the concentrated marketable product, and show the actual supplies of raw material that were available to the smelters. In the case of one smelter which operates a concentrating mill in connection with its works a reduction in the figures reported has been made in order to put all the returns upon a uniform basis. Discrepancies among the statistics of zinc ore production reported by various authorities are to be explained by differences in the bases, the production of crude ore (which must be concentrated or separated into zinc ore and lead ore) being frequently confused with the final product of marketable zinc ore, in which only is the smelter interested.

It will be observed from the table that a large part of the production of ore in 1906 was due to New Jersey, of which the product is used to only a small extent for making spelter in the United States, the bulk of it being employed for the manufacture of oxide and for export to Europe as a spelter ore. Omitting the New Jersey production it appears that the Western spelter and oxide manufacturers received 590,000 tons of ore in 1906. The

production of the Joplin district accounts for about 137,000 tons of spelter, against 124,000 tons in 1905. Consequently that district more than held its own in so far as percentage of the production of Western spelter is concerned.

PRODUCTION OF ZINC ORE IN THE UNITED STATES.
(In tons of 2000 lb.)

State.	1904.	1905.	1906.
Arkansas.....	g	g	4,200
Colorado.....	a 94,000	105,500	114,000
Idaho.....	Nil.	1,700	2,150
Kentucky.....	d 958	d 414	975
Missouri-Kansas...	b 273,238	b 258,500	b 283,500
Montana.....	Nil.	2,000	4,900
Nevada.....	Nil.	Nil.	7,080
New Mexico.....	c 21,000	17,800	30,000
New Jersey.....	d 280,029	d 361,829	404,690
Utah.....	Nil.	9,265	10,700
Wisconsin.....	c 19,300	32,690	42,130
Other States.....	a 4,500	e f 6,600	h 850
Totals.....	693,025	795,698	905,175

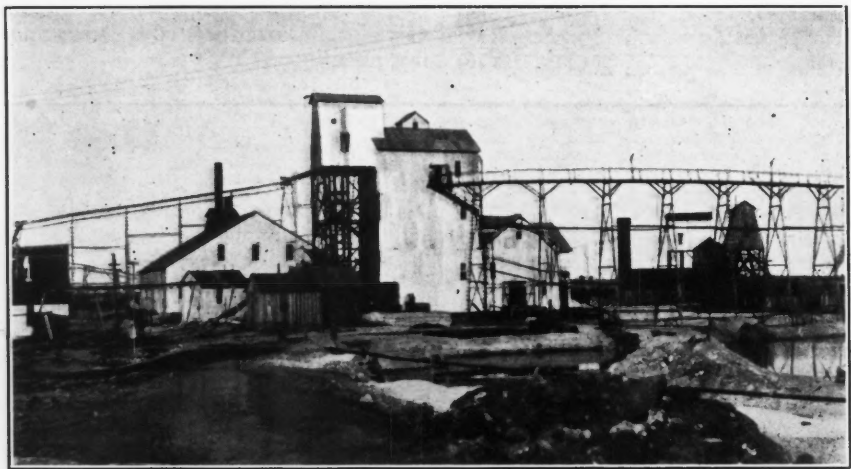
a, Estimated. b, Production of Joplin district, plus output of southeastern Missouri. c, According to H. F. Bain, "Contributions to Economic Geology," 1904. d, Report of State geologist. e, Partly estimated. f, Arizona, Nevada, Arkansas, Illinois, Iowa, Tennessee and Virginia. g, Included in "other States." h, Indian Territory, Tennessee, Arizona and California.

on the production of zinc oxide from the mixed sulphide ore, which is mined and smelted there primarily for copper. The mines of Shasta county, especially the Bully Hill mine, contain large bodies of zinky ore of similar character. The association of the sulphides is extremely intimate, rendering mechanical separation highly difficult, if not impossible.

A little development work was done on a zinc prospect near Wawona at the western side of Yosemite park, but the deposit is not now available on account of lack of transportation facilities, which, however, will probably be supplied in the near future. The ore at this place is a sulphide. A small amount of development work was done on some zinc prospects, near Victorville, San Bernardino county, but no shipments were made. The ore is said to be of good quality, but of small development.

COLORADO

As a producer of zinc ore, this State



MINE AT ORONO, JOPLIN DISTRICT, MO.

IMPORTS OF ZINC ORE INTO THE UNITED STATES.

Source.	1904.	1905.	1906.
British Columbia.....	2,100	8,561	600
Mexico.....	?	a 32,164	a 88,900
Totals.....	?	40,725	89,500

a, The actual tonnage of ore imported was somewhat greater than this figure, but it included some mixed ore, which for statistical purposes has been reduced to the zinc ore equivalent.

CALIFORNIA

This State appeared in 1906 for the first time as a producer of zinc ore, the Western Zinc Company, of San Francisco, having operated the Silverado mine in Orange county. The company has works at San Francisco, at which it manufactures the sulphate and chloride of zinc, and contemplates the production of spelter. In the meanwhile it is planned to export the surplus of ore to Europe. The company has a concentrating mill at the mine. The ore is blende and pyrites, the latter mineral being gold-bearing.

At the Afterthought mine, in Shasta county, some experimental work was done

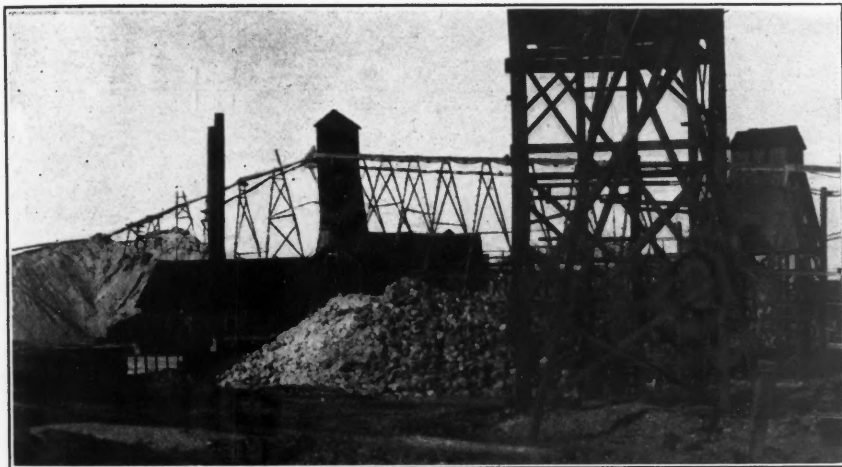
ranks third. Its importance as compared with New Jersey is much greater than appears from the statistics of ore production, because the ore of Colorado assays nearly twice as high in zinc as the New Jersey ore. And in previous years, the largest part of the output of Colorado was obtained from Leadville. According to the Leadville *Herald-Democrat*, the production of that district in 1906 was 228,565 tons, of which the Iron Silver Mining Company produced 111,500 tons, the Western Mining Company, 51,170 tons, and the Ibex Mining Company, 24,870 tons. These figures refer to the production of crude blende-galena-pyrites ore before concentration or separation.

Besides Leadville, zinc ore was produced at Georgetown, Red Cliff, Creede, Rico and Kokomo, and at several places in Chaffee and Pitkin counties, but their total was comparatively small. According to the State commissioner of mines the zinc content of the ore produced in Colorado in 1906 was 42,744 tons, of which the Leadville ore contained 35,100 tons.

The United Rico Mines Company is now engaged on plans to develop the extensive deposits of mixed sulphide ore at Rico, where the Stallman-Germer process of separation—a species of flotation process—is to be introduced.

MISSOURI AND KANSAS

With the exception of a small quantity of calamine mined in southeastern Missouri, the entire production of these States is obtained from the Joplin district, which showed a great increase in 1906. Activity was naturally stimulated by the high price for ore prevailing throughout the year, but the increase in production is largely attributable to the improvements in the method of milling. Whereas, only a year or two ago, the average extraction of mineral from the crude ore was probably not more than 67 per cent., at present it is probably in the neighborhood of 75 per cent. This alone is sufficient to account for a large part of the increase in production in 1906.



MINE AT ORONO, JOPLIN DISTRICT, MO.

Another important factor in increasing the production in the Joplin district is the recent erection of mills of much larger capacity than formerly. Whereas the standard mill used to be of 10 tons nominal capacity per hour, mills of 20 to 30 tons capacity are now becoming common. The new mills are equipped with rolls of larger size (up to 42 in. diameter) and have in addition to the jigs, slime tables of the Wilfley, Standard and Neosho patterns. By virtue of these improvements, the tailings now contain less than 1 per cent. of mineral, which accounts for the higher extraction noted above. The improvements in these particulars have been made possible by the mining of the "sheet" ground, which comprises extensive orebodies, justifying the installation of larger and more expensive plants than formerly. In other words, mining in the Joplin district is being put upon a more permanent basis than ever before in its history. It is estimated that approximately 40 per cent. of the present output is obtained from sheet ground,

some of the latter being mined which yields as little as 3 per cent. of mineral

The mining of such low-grade ore, of course, has been rendered possible only by the high prices obtained for the product. Although the introduction of improved mining and milling machinery, and the prosecution of operations on a larger scale than formerly, have led to many economies, which have been helped also by the piping of natural gas into the district and the general use of the latter, either under the boilers or in gas engines, the advantages gained in those respects have been largely offset by the increased cost of labor. Drill runners now receive \$3 per 8 hours, while muckers get \$2.50 per 8 hours. Jig-men obtain \$3.50 to \$4 per 10 hours, while surface laborers in general receive \$2.50 per 10 hours. These are heavy increases over the rate of a few years ago, and even under the present conditions, labor in the district is scarce. Steel and other mining supplies also commanded advanced prices in 1906.

only other production was in the Wood River district, where the output was insignificant.

Kentucky—The output of this State showed a good increase in 1906, although the total is still small. However, a further increase is to be expected, inasmuch as a successful method of separating the mixed blende-galena-fluorspar ore has been developed by W. M. Sanders, who has organized the Sanders Separating Company, which has a small plant at Marion. The system of separation is a form of flotation process, which differs from that in use at Broken Hill in that no acid is employed in the bath, the agent in the latter being aluminum sulphate. Moreover, instead of effecting the separation in a deep pointed vat, a shallow pan, with stirrers, is employed.

Montana—The production of zinc ore in this State showed an increase in 1906, but not so much as was expected, because the separating works of the Montana Zinc Company, at Butte, were destroyed by fire in June, after which no zinkiferous ores were treated in the State, except at Corbin, where an experimental plant was put in commission in October to test the Baker-Burwell process.

Nevada—This State appeared in 1906 for the first time as a producer of zinc ore, its output being chiefly calamine from the Potosi mine in the southwestern part of the State. It is testimony to the remarkable development of the zinc industry west of the Rocky Mountains that it is possible to work a mine of comparatively low-grade ore at so remote a place. Zinc ore was also produced by the Nevada Commonwealth Mining and Milling Company, of Washoe, Washoe county, which has a mixed sulphide ore carrying lead, zinc, copper, arsenic and gold. A mill of 150 tons capacity per day was erected, but no shipments of zinc ore were made in 1906; they were begun in 1907, the ore going to Iola, Kan.

New Jersey—The entire output of zinc ore credited to this State is from the Franklin mine of the New Jersey Zinc Company. The statistics represent the production of crude ore. It is, however, utilized entirely for one purpose or another, there being no waste except an insignificant proportion of calcite tailing, but even that is a marketable product. The ore is separated magnetically into a franklinite product which is employed for the manufacture of zinc oxide and spiegeleisen, and a willemite product, which is used for the production of spelter, a portion of this ore being exported to Europe.

New Mexico—The increase in the production of this Territory was due chiefly to the more extensive exploitation of the Kelly and the Graphic mines, at Magdalena. The successful manufacture of zinc-lead pigment at Coffeyville, Kan., led to a greater demand for ore from the Graphic mine, and some was taken also from the

The only supplies which did not increase in cost were coal, which was obtainable at \$1.75 per 2000 lb. of mine run; and dynamite which cost \$4.25 per box of 40 per cent. grade. The cost of delivering ore to the railway cars was somewhat reduced, because of the further extension of railway switches to the mines. On the other hand, royalties are somewhat higher than a little while ago, the present terms to first lessee being 10 to 15 per cent. on blende, probably averaging more nearly the latter figure than the former. The miner is assisted, however, by a somewhat larger yield of lead ore from the sheet ground, the ratio of lead ore to zinc ore being in the neighborhood of 1 to 6.

OTHER STATES

Arkansas—The production of zinc ore in this State showed a gratifying increase in 1906.

Idaho—The production of zinc ore in this State was made chiefly by the Success mine in the Cœur d'Alene. The

Kelly mine. The ore shipped from the Graphic mine contained from 20 to 25 per cent. zinc, and about 15 per cent. lead. The ore shipped from the Kelly mine consisted of calamine assaying 36 to 37 per cent. zinc, first-class sulphide ore assaying 34 to 35 per cent. zinc, and second-class sulphide ore assaying 30 to 31 per cent. zinc. A considerable tonnage of the second-class sulphide ore was exported to Germany. The Tri-Bullion Smelting and Development Company, which owns the Kelly mine, is now erecting a smeltery and oxide plant at Albuquerque.

Utah—The production of zinc ore in this State was made by the Daly-Judge mine, of Park City, the Scranton mine in the Tintic district, and the Horn Silver mine at Frisco, Beaver county.

Wisconsin—The increase in the production of zinc ore in this State in 1906 was decidedly more important than the statistics show, because the more general introduction of magnetic separating plants resulted in an increase in the average grade of the ore. Consequently while the production of ore increased from 32,690 tons in 1905 to 42,130 tons in 1906, the in-

crease in the total zinc content was in considerably greater ratio. The best ore produced in the Wisconsin field is now on even terms with the average ore of the Joplin district in respect to zinc content and freedom from objectionable impurities.

CONSUMPTION OF SPELTER IN THE UNITED STATES.

(In tons of 2000 lb.)

	1905.	1906.
Stock, Jan. 1.....	6,500	4,000
Production	201,748	225,494
Imports	521	2,203
Total supply.....	208,769	231,697
Exports	5,515	4,670
Stock, Dec. 31.....	4,000	4,550
Consumption	199,254	222,477

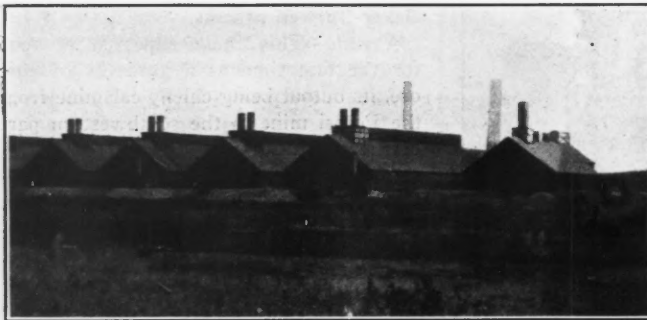
crease in the total zinc content was in considerably greater ratio. The best ore produced in the Wisconsin field is now on even terms with the average ore of the Joplin district in respect to zinc content and freedom from objectionable impurities. In order to distribute the consumption according to the principal purposes, reports were obtained from the consumers. It is never possible to check closely in this way the computed consumption, because there are many small consumers, whose use of metal is nevertheless large in the aggregate, from whom it is impossible to obtain reports. The reports actually received for 1906, including a few trade estimates, which could be safely

together with scrap that is remarketed, is estimated to amount to about 3000 tons per annum. Consequently, the total consumption of spelter in the United States in 1906 may be assumed to have been about 225,500 tons.

Reducing the consumption to a percentage basis, the figures are as follows:

Purpose.	1905.	1906.
Galvanizing	50	55
Brass-making	26	25½
Sheet zinc.....	17	16
Lead desilverization.....	1¼	1
Other purposes.....	5%	2%
Total	100	100

It will be observed that the largest percentage of increase in 1906 was in the galvanizing business. The consumption of spelter for brass-making shows an increase, but the percentage with respect to the total consumption was a little less than in 1905. Incidentally this figure gives a rough idea of the consumption of copper for brass-making. If 57,000 tons of spelter were used for that purpose, there must have been employed at least 114,000 tons of copper for the same purpose. This figure corresponds to about 33¾ per cent. of the domestic consumption of new copper in 1905. The estimated consumption of copper for brass-making in 1905 was 104,000 tons, which was 34 per cent. of the domestic consumption of new copper that year.



DISTILLATION FURNACE HOUSES, CANEY ZINC WORKS



ZINC OXIDE WORKS, COFFEYVILLE, KAN.

crease in the total zinc content was in considerably greater ratio. The best ore produced in the Wisconsin field is now on even terms with the average ore of the Joplin district in respect to zinc content and freedom from objectionable impurities.

CONSUMPTION OF SPELTER

The stock of spelter in the hands of the smelters at the beginning of 1906 amounted to 4000 tons. The production of virgin spelter during the year was 225,494 tons. The imports amounted to 2203 tons. The total supply was consequently 231,697 tons. The exports of spelter during the year were 4670 tons. The stocks in the hands of smelters at the end of the year amounted to 4550 tons. The domestic consumption of virgin spelter was consequently 222,477 tons. The figures for 1906, in comparison with those of 1905, are given in the accompanying table.

In addition to the production of virgin spelter there is a considerable production of spelter from the resmelting of zinc dross obtained from galvanizing. This

considered as close approximations, footed up to a total of 208,479 tons. In the case of the galvanizing industry, wherein the consumers are chiefly large concerns, practically complete reports were received, which reduces the uncertainty in this investigation to the matter of the consumption of spelter for brass-making, sheet-zinc rolling and miscellaneous purposes. The consumption of spelter for the desilverization of lead is estimated on the basis of the desilverized lead produced, a consumption of 0.8 per cent. of spelter being reckoned. The statistics of consumption according to use are summarized in the accompanying table.

USES OF SPELTER IN THE UNITED STATES.

(In tons of 2000 lb.)

Purpose.	1905.	1906.
Galvanizing	100,000	124,000
Brass-making	52,000	57,000
Sheet zinc.....	34,000	36,000
Lead desilverization.....	2,400	2,500
Other purposes (a).....	10,854	6,000
Total	199,254	225,500

a. The apparent falling off in the consumption of zinc for "other purposes" in 1906 is explained by a more complete itemization of the consumption in 1906; in other words, there was probably more spelter used for brass-making in 1905 than the above table shows.

Assay of Barium Sulphide

According to L. Wessely (*Chem. Zeit.*, 1907, XXXI, 71-72), the sample is finely pounded, and 10 grains are very gradually introduced into 500-700 c.c. of boiling water, with continual shaking. Any lumps which form must be taken out and powdered again. When solution is complete, the whole is poured and rinsed into a liter flask, cooled, made up, and filtered. Of the filtrate, 25 c.c. are titrated with N/10 hydrochloric acid and methyl orange, then 300 c.c. of water, 2 c.c. of dilute hydrochloric acid, and a measured volume of N/10 iodine solution nearly equal to the volume of acid required in the first titration are placed in a roomy flask, and 25 c.c. of the barium sulphide solution allowed to flow in with shaking. The slight excess of barium sulphide is now titrated by iodine solution and starch. If more than a few tenths of a cubic centimeter are needed, the experiment should be repeated using a correspondingly greater amount of iodine solution in the first instance. One c.c. of N/10 iodine = 0.0084745 gram of barium sulphide.)

Tin Ore Dressing Plant, East Pool, Cornwall

Tin Oxide, Wolframite, Arsenical and Copper Pyrites are Separated by Stamps, Concentrating Tables, Calciners and Magnetic Separators

BY EDWARD WALKER

It is commonly supposed that modern ore-dressing methods have been introduced into Cornwall by outside engineers financed by outside capital. No doubt in some cases Cornish managers and directors have been impatient of outside advice as to improvements in methods of dressing, but to say that Cornishmen generally are not keenly alive to the necessity of drawing on the experience of the whole mining world for improvements in the method of dressing tin is very far from the truth. As an example of the remodeling of a plant and the adoption of every possible improvement, undertaken solely by Cornish men and with Cornish money, indeed out of the profits of the mine itself, I wish to draw attention to what has been done at East Pool.

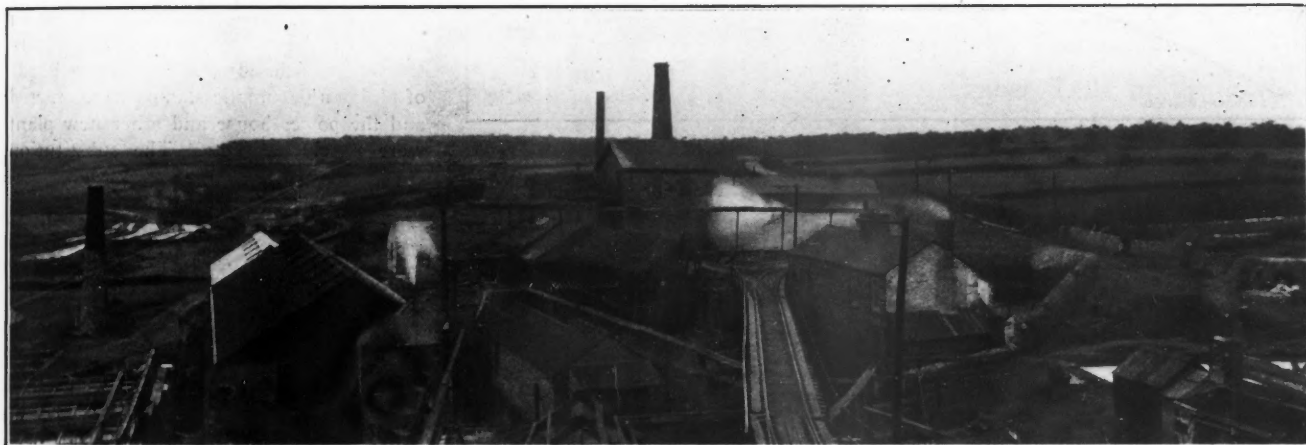
been done to show the course adopted. It will not be many months before the alterations and substitutions are complete. The money for the alterations has come entirely out of the mine, and was not provided by reconstruction and the subscription of new capital, so the substitution has been gradual instead of a clean sweep.

It would be invidious to give credit to any particular individual or individuals for this excellent work of reorganization, but J. M. Holman and J. H. Collins, directors, Joseph Tamblin, manager, and Amos Treloar, manager of the dressing works, deserve special mention.

In the accompanying illustrations are shown the location of the property, a general view of the dressing works, the Wil-

amounts recoverable and are not actual assays of the ore as it is mined. I suppose they represent about 70 per cent. of the contents of the ore, which is a very good result in tin dressing.

In the old days of buddles and rag frames, it was impossible to separate the tungsten and copper. The arsenic was collected when the first concentrates were calcined, and the copper was changed into oxide or sulphate by the same operation. The sulphate and some of the oxide was lost in subsequent dressing, and the remainder went into the tin concentrates and was not paid for by the smelters. The tungsten remained with the tin and caused the tin concentrates to fetch a correspondingly lower price when sold to the smelters.



TOLVADDEN ORE-DRESSING PLANT, EAST POOL, CORNWALL

The mine is situated about half way between Camborne and Redruth. It has been worked since 1834, and since 1896 it has been worked in conjunction with the adjoining Wheal Agar. The company operating the two is called the East Pool & Agar United Mines, and it is still a "cost book" company. There are 6400 shares on which £4 13s 3d. has been paid up, and the total profits since 1834 have amounted to £71 per share.

RECONSTRUCTION BY REPLACEMENT

Up to within four years ago the profits were divided up to the hilt, as was usual in Cornish mining, but in 1903 it was decided to make a radical change and to introduce all possible modern and improved methods. The profits were, therefore, allowed to accumulate, and one improvement after another has been gradually introduced, as funds allowed, without interrupting operations. The overhauling is not yet finished, but sufficient has already

fley tables and a Humbolt-Wetherill magnetic separator. The dressing works are located at some distance from the mine. The ore is broken in rock breakers at the shaft head and then trammed to the dressing works. There is no great amount of slope, if any, between the two, and the wagons are hauled by electric locomotives, the power being supplied by a company which operates the public car service between Camborne and Redruth.

CHARACTER OF THE ORE

The ore at East Pool contains tin oxide, wolframite, arsenical pyrites and copper pyrites. These are so evenly and finely distributed throughout the veins that the ore cannot be hand-picked or sorted into different grades. The ore will average about 22 lb. of tin oxide, a similar quantity of arsenic, 7 lb. of tungsten and one or two pounds of copper per long ton. These figures relate to the

NEW METHODS AND EQUIPMENT

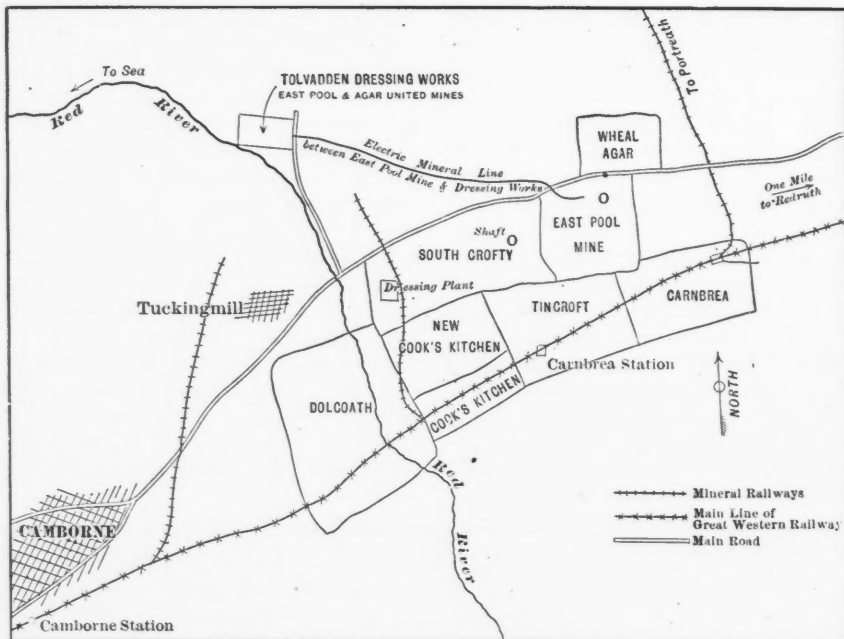
In the new dressing plant, all this has been altered. In the first place the pulp as it comes from the stamps is sized in classifiers into sands and slimes. The sands are treated on either Frue vanners or Wilfleys, both of which were bought at the time of reorganization for the purpose of experimenting. The percentages of recovery on these two tables are about the same, but as the Wilfley is far more rapid in action, the extensions of the installation have been entirely Wilfleys. The concentrates from the Wilfleys contain the tin oxide, tungsten and arsenical pyrites, and there is a middling product containing most of the copper pyrites, together with some tin oxide. This middling product is subsequently passed to Frue vanners, where the copper pyrites is quite separated from tin oxide.

The concentrates containing the tin oxide, tungsten and arsenical pyrites are sent to the burning house where the ar-

senic is removed and collected in flues. The residues from the calciner are classified and the sands passed over a second installation of Wilfleys. The concentrates from these are in very fair shape and comparatively free from gangue. They consist approximately of three parts of tin oxide to one of tungsten, together with

the tin oxide, tungsten, and iron oxide. The concentrator is of the type made by the Humboldt Company, of Cologne, and employs the Wetherill system. The material is fed from the hopper at the right upon a horizontal belt which passes round the two large drums at the ends of the machine and travels rapidly from right to

liver the iron oxide into bins. The material on the main belt then passes under a second and more powerful magnet, which removes the tungsten. This is dealt with similarly, and delivered by the second pair of chutes into another bin. The tin oxide and other non-magnetic material passes over the end of the main belt into another bin.



CAMBORNE, EAST POOL DISTRICT, CORNWALL

about 5 per cent. iron oxide. They are now ready for treatment on the magnetic separator.

TREATMENT OF SLIMES

The slimes, from the classifiers in front of the stamp battery, are treated on rag frames in the orthodox Cornish manner, and when they have been brought up to, say, 8 lb. of tin oxide per ton are passed over Acme tables. The concentrates from these tables are then sent to the burning house to remove the arsenic, and the calcined residues are again passed over Acme tables. The final concentrates are mixed with the concentrates from the sands and the other slimes, and the mixture treated by the magnetic separator.

This plant is a good example of the principle of classifying the stamp mill pulp. At Dolcoath, there is no preliminary classification, the whole of the pulp being passed over Frue vanners. Mr. Treloar, of East Pool, contends that as the Frue vanners have no effect on slimes, it is only overburdening them with work to send the slimes over them, and that it is harder to recover the tin oxide from the slimes when the latter are mixed with the tailings from the sands, than when a preliminary separation has taken place.

MAGNETIC SEPARATION

The mixture of final concentrates from the sands and slimes is treated by a magnetic concentrator for the separation of

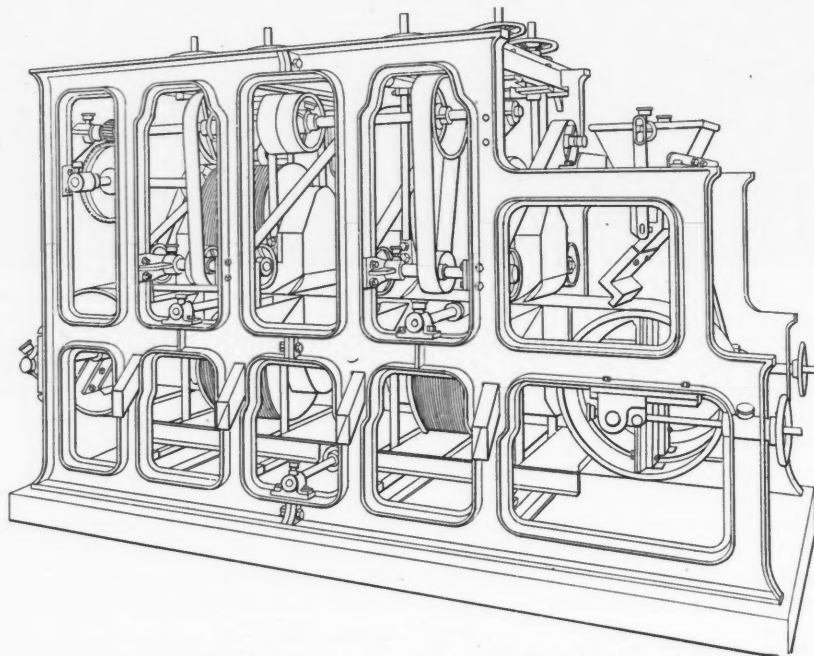
left. The material on the belt first passes under the poles of a feeble electro-magnet. The highly magnetic iron oxide is attracted up to the under surfaces of smaller belts which travel at right angles to the main belt. As these belts pass out of the magnetic field they deposit their iron oxide into chambers from which the side chutes, shown in the front of the illustration, de-

DIFFICULTIES OF THE PROCESS

During the two years that this magnetic concentrator has been at work, much careful study has been necessary in order to adjust details. The greatest difficulty of all was to prevent some of the tin oxide from going over with the tungsten. The tungsten concentrate contained as much as 25 per cent. of tin oxide. As the latter is non-magnetic this phenomenon was puzzling. Eventually it was surmised that particles of iron oxide adhered to the tin oxide, and so carried it over.

THE STAMP MILL

The crushing plant at East Pool is the part of the plant that has still to be reorganized. The old Cornish stamps continue in operation. There are altogether 156 of them, each capable of crushing 24 cwt. per 24 hours to a mesh of 25 holes to the linear inch. In February two heads of Holman pneumatic stamps were erected and the power house and other new plant were nearly complete. The substitution



HUMBOLDT-WETHERILL MAGNETIC SEPARATOR

of the present Cornish stamps by modern mills will depend to some extent on the results obtained by these pneumatic stamps. The objections to these stamps are that they require highly skilled superintendence; when they are hung up for repairs a much larger unit is out of work than is the case when a California stamp is hung up. It is claimed that the ad-

vantages obtained by the stamp more than counteract these two drawbacks.

Another improvement to be introduced in due course will be a treatment plant for the copper pyrites. At present this product is sold to the smelters. Probably a partial roast and lixiviation will be adopted.

The Diamond Drill as an Ore Finder

By JAMES HUMES*

There are diamond drills throughout this country, abandoned because ore was not struck in the first or second drilling and for no other reason. Objections to these drills for prospecting purposes are mostly due to ignorance. It is the mine

Smuggler, found bonanza ore with a diamond drill, so the manager of the Smuggler mine purchased a small drill of about 300-ft. capacity, and I was placed in charge.

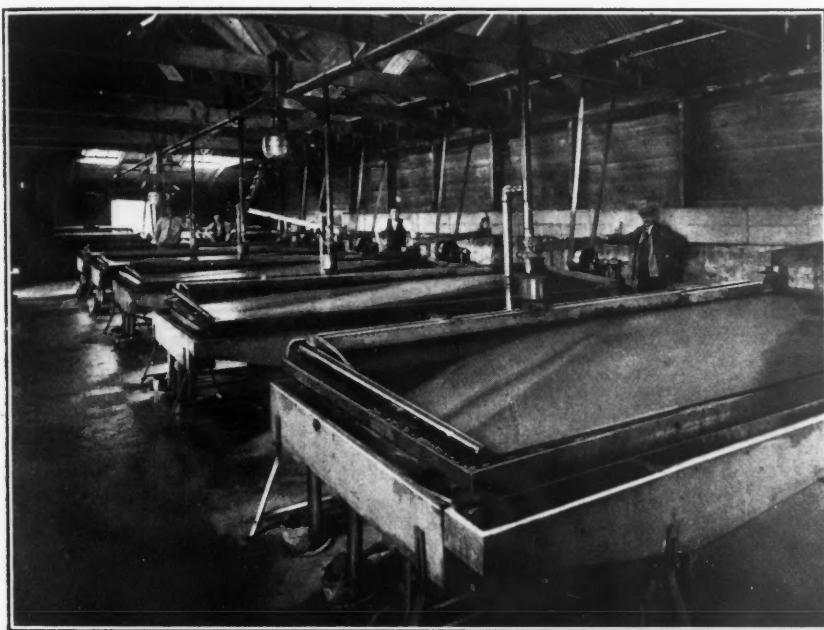
The machine was driven by an electric motor. I believe it was the second one operating with electric power, and it gave us considerable trouble before we got it running properly. It was comparatively expensive for the first two months, but when the drill worked satisfactorily we found it to be the best motive power for work of this kind. The operations consisted in drilling horizontal holes 90 deg. to the trend of the vein; the holes were short, for it was not expected to find ore outside of the contact line in which the drifts were run.

A number of holes were drilled without finding ore, and this, with the trouble we had had with the machine was discourag-

ing the lower levels of the mine which was opened up, as before, with a crosscut, run from the shaft, through the Carboniferous limestone, and into the gray shales, the drifts being started east and west from this crosscut in the limestone without having exposed ore. The drill was started at the Mollie Gibson line, and the holes were drilled north and south, 20 ft. apart.

Nothing was found until we reached a point 20 ft. from the crosscut. Here at 11 ft. ore was cut so rich in wire silver that it held the core together. We drilled 80 ft. up, then down from the same position. At 60 ft. in this hole we drilled into a band of pure silver, which was so tough that the cuttings gummed around the bit and we could not dislodge them. We afterward examined this band of pure silver when the miners had opened up the stope, and found that it was in about the center of the orebody and was surrounded by high-grade ore, averaging from 6 to 10 ft. in thickness.

One of the most useful applications of the diamond drill in mine work, is to determine geological conditions, more especially where there is considerable faulting.



WILFLEY TABLES, TOLVADDEN DRESSING WORKS

manager who deals in figures and is looking out for methods to facilitate his mine operations or reduce costs who looks with favor on this valuable tool. In many cases ore has been found in old workings by means of a drill after that part of the mine had been abandoned.

THE DIAMOND DRILL AT THE SMUGGLER MINE

The Smuggler mine at Aspen, Colo., is an example of the value of the diamond drill. In 1891 and 1892 this mine was not shipping any crude ore; all the ore mined went through the 100-ton concentrator and it was "nip and tuck" for the concentrator to pay mining and milling expenses. The property was in debt; there were 100,000 shares of stock outstanding at \$1050 per share.

The Mollie Gibson, which joined the

*Basin, Mont.

ing; the manager became irritable. He indicated a place to drill and we did as directed, boring through and beyond the mineralized zone without discovering any signs of ore. He was not satisfied, having no confidence in our operations, and ran a cross-cut in the same direction, keeping the drill hole in the center of the opening, with no better results.

DISCOVERY OF ORE

Our next field of operations was on the adit level of the same mine and about 500 ft. back from the face of the tunnel. We had drilled one hole and had started the second when, after drilling through exactly 10 in. of gangue, we bored into what proved to be 5 ft. of first-class ore. This shows how near a drift can be run to an ore shoot without exposing it. A diamond-drill hole may encounter the same luck.

We were then transferred to one of

Timber Tests by the Forest Service

Extensive tests to determine the strength of the commercial timbers of the United States are being made by the Forest Service. The tests are made on large beams. The material is generally tested while green, since timber is weakest in the green condition. The strength of a beam is indicated by the greatest fiber stress developed during the test. Technically speaking, this breaking strength is termed the modulus of rupture. In the table below the first column gives the green breaking strength of our principal commercial timbers. The second column gives the greatest load that a timber 5 in. wide and 12 in. high, with 15 ft. between the supports, would hold if the load were concentrated midway between the supports.

STRENGTH OF TIMBERS.

Species.	Bending.	Load Midway Between Supports, for a Beam 5 x 12 in. x 15 ft.	
		Lb. per Sq. In.	Lb.
Longleaf pine...	7,772		20,700
Douglas fir....	7,500		20,000
Western hemlock	5,783		15,400
Loblolly pine...	5,580		14,900
Tamarack	4,562		12,300
Norway pine...	3,975		10,600

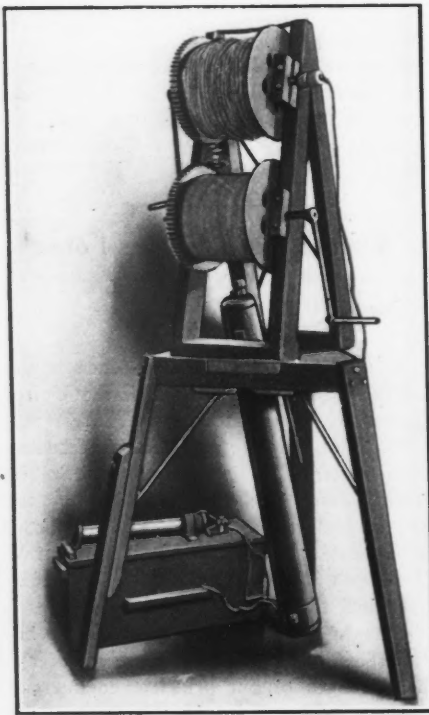
If, instead of being concentrated at one point, the load were uniformly distributed over the entire length of the beam, the beam would hold twice as much. In order to insure safety, in practice beams are seldom allowed to carry more than one-sixth of their breaking loads.

Camera for Photographing Walls of Bore-holes

Views of a Continuous Strip of the Formations Pierced by the Drill Show the Character and the Distribution of the Ore

B Y J . T . A T W O O D *

Before the apparatus here described was constructed an underground camera for photographing the sides of well holes had, so far as I know, never been made. However, it seems probable that such a camera has been used, because of the value of photographs of the earth's strata at levels reached only by drill holes. With the belief that such photographs would be of value in scientific research and in mining, the camera herein described was designed and built.



CAMERA WITH TRIPOD AND REELS FOR LOWERING

THE CAMERA

The camera is mounted in the lower end of a water-tight tube, 5 in. outside diam. and 43 in. long. Near the upper end of the tube is a plate-glass window with a mirror back of it, so mounted as to reflect the image of an object placed before the window, directly down the tube and into the camera. On each side of the mirror is mounted an electric lamp with a reflector, which sends the light through the window and also prevents any light from shining directly into the camera.

This iron tube, or camera tube, is lowered and raised in the well by a cable winding on the lower of two drums shown

*Instructor, University of Wisconsin, Madison, Wis.

in the illustration. The upper drum carries an electric cable to operate the lamps and to turn the camera film.

The cable is so fastened to the tube that the window will come close to the wall of the well, and, with the lights burning, the wall is brightly illuminated. In making an exposure with a No. 16 stop the lights are turned on for about 20 seconds. Before making a second exposure the camera tube is lowered or raised $4\frac{1}{2}$ in., the distance covered by one photograph, and a new part of the film is turned into place by making and breaking the circuit of an electro-magnet acting upon the roll of film. In this way a series of 50 or more photographs can be taken at the rate of one a minute, and they will show a continuous strip of the wall of the well for a distance of 20 ft. or more.

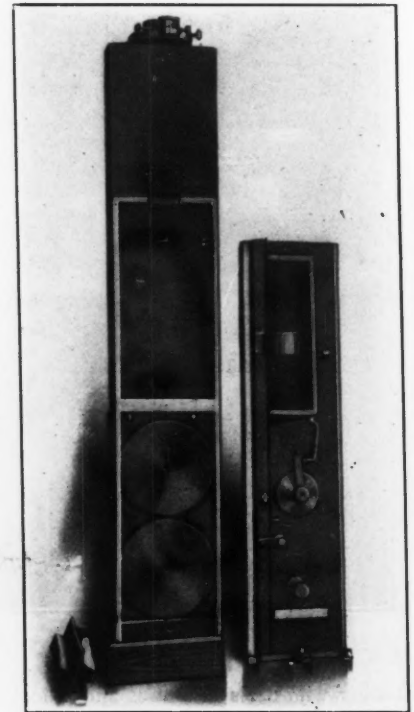
The window, which is $1\frac{1}{2}$ by $5\frac{1}{4}$ in., is set in litharge cement. A guard strip is riveted to the tube on each side of the window. The hoisting cable is attached to the hook 4 in. behind the window, so that in the ordinary 6-in. drill hole the window always hangs near the wall. The mirror, lamps and reflectors are mounted on an oak plate, which can be adjusted to bring the mirror in the right position behind the window. The two lamps are 10 volts and 5 c.-p. each. The camera is 32 in. long and $3\frac{3}{16} \times 1\frac{1}{8}$ in. in cross section. It is fitted with a 9-in. Bausch & Lomb rectilinear lens. The camera is so placed in the tube as to photograph the $4\frac{1}{2}$ in. of wall reflected in the mirror upon $3\frac{5}{8}$ in. of film, the maximum length obtainable with a width of film of $1\frac{1}{4}$ in. This reduction gives a photograph eight-tenths full size.

ADJUSTMENT

The camera is fastened in the tube by two thumb screws. One side of the camera is fitted in grooves and is easily removed for changing the film. The film winds from the end roll across the flat plate, where the exposure is made, and is wound upon the other roll by the operation of the electro-magnet acting through an arm and pawl upon a ratchet wheel. The wires for the coil have a plug connection at the bottom end of the camera. A three-conductor cable of No. 14 wire and 250 ft. long carries the current from four small double storage cells. A resistance coil is used to adjust the voltage for the lamps before lowering the camera tube. Connection from the cable to the battery and switches is made by a triple

plug in the end of the shaft of the winding drum.

The hoisting cable is a heavy clothes-line of small twisted wires, tested to over 500 lb. tension. The drum is wound with 300 ft. of this cable, and has length tags soldered to it at 5-ft. intervals. The ratchet on the drum has a double pawl permitting of $\frac{1}{4}$ -in. changes in the position of the camera tube. The hoisting frame is made in two parts, partly to facilitate handling, but primarily to permit



CAMERA WITH SIDE REMOVED

of an easy means of untwisting the two cables when raising the camera tube. A ring on the bottom of the upper part fits into a corresponding recess in the top of the adjustable tripod or stand. After the first untwisting of the cable there is little need for this turning device. No attempt has been made to record the direction in which the camera hangs. This could be done by using a light stiff rod carefully joined and allowed to stand without any weight or torsion upon it. Another way might be to use a brass camera tube, and to mount a magnetic needle to show in the photograph.

METHOD OF OPERATION

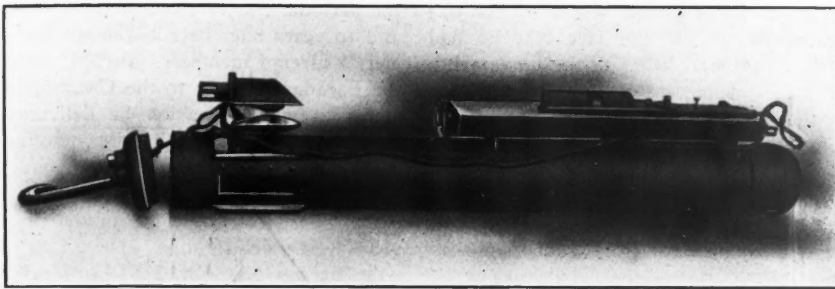
The field work done with the camera has been limited to a little over a week's

time. Because of unexpected difficulty in effectively drying the air in the tube, the results obtained are incomplete, but satisfactory in showing that good photographs can be taken in a well hole both above and below water. The camera was operated in a 200-ft. 6-in. prospect hole upon the Vinegar Hill Mining Company's property, about seven miles north of Galena, Ill. A very careful sludge record had been made of this hole, and zinc ore was shown in different amounts at several levels from a depth of 162 ft. to 200 ft. Water stood at about 85 ft. from the surface.

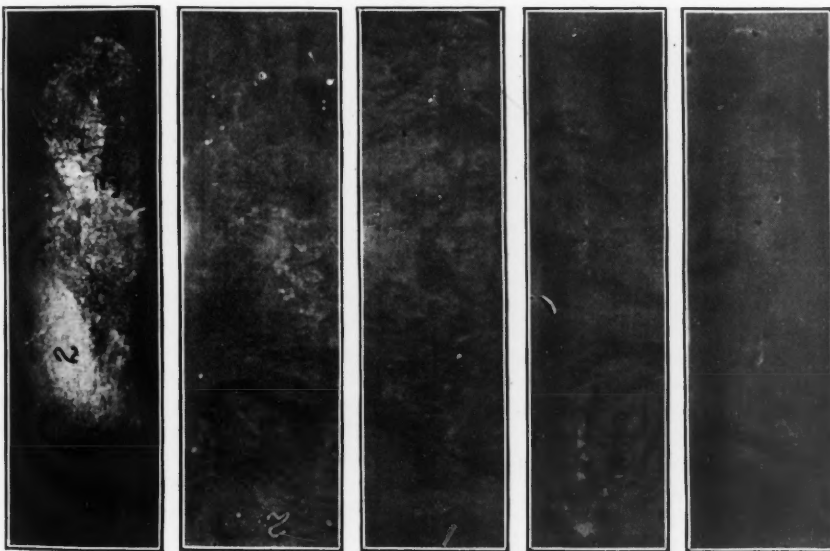
The first attempt in taking photographs under water was entirely successful. The camera was filled with air dried by forc-

which invariably disappeared before the camera came to the surface, and which did not appear upon the second lowering into the water, as was the case when the first photographs were taken. This fact was proved later in experimenting in water at the surface. That the unsuccessful results were not due to cloudy or muddy water was clearly shown by the clouded effect on the negative being a little uneven, and the same in exposures at different levels. Also a little opening in the precipitation on the window showed the wall of the well in one or two of the photographs.

ADVANTAGES OF BORE-HOLE PHOTOGRAPHY
Prospecting for copper, lead and zinc is



CAMERA TUBE WITH PARTS REMOVED AND PLACED IN THEIR RELATIVE POSITIONS OUTSIDE THE CASE



SPECIMEN BORE-HOLE PHOTOGRAPHS

The first shows limestone and jack. The second was taken 86 ft. under water.

ing through sulphuric acid. After lowering the camera tube into the water it was raised to the surface to see if in cooling any moisture had been precipitated on the inside of the window. The window was found dry and clear, and upon lowering the second time, the exposures were made without any regard to the location of ore-bodies.

Other attempts to take photographs under water were made at the first lowering of the camera, instead of at the second, and were unsuccessful because of a precipitation on the inside of the window

generally carried on by so-called churn drilling, or by diamond core drilling. The principal information given about the ore-bodies encountered is found in the material taken from the hole. In churn drilling this material is removed in the form of mud or sludge, and in diamond drilling in the form of a broken core.

When a piece of land is thought to be underlaid with lead or zinc ore it is common practice to drill a large number of test holes and by the information secured, determine the advisability of sinking a shaft. Much depends upon the informa-

tion given by the drill holes. The ore is generally found in horizontal and inclined deposits, called flats and pitches, or in small particles widely distributed throughout the limestone. The sheet formations are, as a rule, more extensive, and where a flat or pitch is cut in drilling it is more indicative of large orebodies than a strike of disseminated ore. If in drilling it were possible to recover all the material in the path of the drill, the sludge would give a good indication of the character and amount of ore passed through. However, the sludge often amounts to no more than 2 or 3 per cent. of the volume of the hole, because of crevices and pockets, and the consequent loss of sludge. The 2 or 3 per cent. of sludge may be largely mineral, but because of a lack of knowledge concerning the missing 97 or 98 per cent., uncertain and unsatisfactory information is obtained.

Again, in drilling through solid formations, when the sludge is brought up from one, two or three feet of drilling it may be that it shows a fair percentage of ore. The question naturally arises whether the deposit is disseminated or sheet ore. The question is not answered by further drilling because for a considerable distance after cutting a sheet, pieces of ore are knocked down by the drill and mixing with the sludge give the impression that the drill is passing through a body of disseminated ore. In a like manner, when the sludge shows that a sheet of two, four, six or more inches has been cut it is impossible to determine its real thickness, and the indication shows it thicker than in reality.

When a drill cuts or follows a pitch the indications as to the real amount of ore are magnified and unreliable, because of the slope, in addition to the other causes. In diamond drilling, the largest part of the core is often lost in passing through orebodies. The core, however, shows whether the deposit is sheet or disseminated ore, and in case of a sheet deposit the core shows its slope and some indication as to its thickness. Although the information is more satisfactory than with the churn drill, the cost is at least three times as great.

The photograph reveals information which can be obtained in no other way. It shows: the nature of the deposit, whether sheet or disseminated ore, and, in case of a sheet deposit the exact thickness and pitch. This information will be of the greatest value in connection with the sludge record, which combination lowers the cost of locating the ore, and what is of greater importance, gives the iron properties of the ore.

To an inexperienced person, a photograph of ore or orebodies shows little of the physical and mineral properties. Much of the information given by colors, or by differences in light and dark surfaces as seen in the ore by the eye is lost in the photograph. It is in the crystalline struc-

ture that the photograph is able to reveal the nature of the rock or ore and by study and experience, positive information can be obtained. The character of the surface of the wall of the well is favorable for photographic examination. The roughness is largely dependent upon the character of the material, and makes easier the detection of ore at the juncture with rock.

Dmitri Ivanovitch Mendeleeff *

Dmitri Ivanovitch Mendeleeff was born Feb. 7, 1834, at Tobolsk, in Siberia, the youngest child of a family of seventeen. He received his early education at the Tobolsk gymnasium, of which his father was director, and continued his studies at the University of St. Petersburg, where he obtained the M.A. degree, for which he prepared a dissertation on specific gravities and volumes, and problems involving these.

After teaching at Simferopol, in the Crimea, and at Odessa, he went in 1860 to Heidelberg, where he established a private laboratory. In 1861 he published investigations on the absolute boiling points of liquids. These fundamental experiments were afterward amplified, and further explained by Andrews, who termed the absolute boiling point, "the critical temperature."

In 1863 he returned to St. Petersburg as professor of chemistry at the Technological Institute, and three years later was appointed to the chemistry chair in the university. Soon after this appointment he began to write his "Principles of Chemistry," of which seven editions have appeared in Russian and three in English; the work was also translated into German. It was while engaged in writing the first edition of this work (1868-1870) that the Periodic Law occurred to him, and in March, 1869, he laid his ideas on the subject before the Russian Chemical Society. Arguing upon the basis that the two signs or manifestations of matter are (1) mass, and (2) individuality, and that both matter and the chemical elements are indestructible, his deduction was that there must be some bond of union between mass and the chemical elements, and hence also between the properties of an element and its atomic weight. This conception led him to compare the atomic weights and typical properties of the elements, and the result was a paper read before the Russian Chemical Society in March, 1869, "The Correlation of the Properties and Atomic Weights of the Elements." This paper included practically all the points of the Periodic Law as now generally accepted, and in subsequent articles only further applications of the same principles are to be found.

*From the *Journ. of the Society of Chemical Industry*, Feb. 28, 1907.

In his text-book, Mendeleeff stated that, although, when arranging the Periodic System, he made use of the previous researches of Dumas, Gladstone, and Pettenkofer on the atomic weights of allied elements, he was unacquainted with the work of De Chancourtois and of Newlands, the latter of whom, five years previously, had called attention to the periodicity of the properties of the elements ("Law of Octaves") when arranged in the order of their atomic weights, and had suggested that the unoccupied spaces in the table might be filled by elements then undiscovered, or by known elements the atomic weights of which had not been accurately determined (*Chem. News*, 1866, 113 and 130). It was, however, reserved for Mendeleeff to arouse the genuine interest of the scientific world. This was practically due to the fact that he had such a profound belief in the universality of the principle he had enunciated that he did not hesitate to prognosticate from it, and even to correct accepted atomic weights. He foretold not only the existence, but also the general properties, and chemical behavior of new and then undiscovered elements, to fill up blanks in the table he had constructed, and when gallium, scandium, and germanium were isolated, it was found that they fulfilled these predictions in a most striking manner. Moreover, the researches of Roscoe and Zimmermann have shown that he was correct in altering the atomic weight of uranium from 120 (which was generally accepted in 1869) to 240, and thus making it correspond with the Periodic System.

Mendeleeff was also fully alive to the importance of the application of chemistry to manufacturing industry, and his work on the "Principles of Chemistry" contains many details of industrial chemical processes, together with various suggestions for the practical utilization of minerals contained in Russian soil. He published a work on "Naphtha production in America and the Caucasus" (1877), for the purposes of which he visited Pennsylvania. He also made investigations of the nitro-compounds, with the view of providing a smokeless powder for the Russian Government.

An essay of singular originality and power was published by Mendeleeff in 1902, entitled, "An Attempt toward a Chemical Conception of the Ether." Starting with the assumption that the ether possesses both mass and materiality, and by extrapolation inserting a zero group in the Periodic System and a zero series of elements lighter than hydrogen, he deduced that in this series one element should have an atomic weight many times less than that of hydrogen, i.e., less than 10^{-6} if $H = 1$; it should have a monatomic molecule like argon and helium, and its exceedingly small density, or, in other words, the exceedingly rapid motion of its molecules, should enable it to permeate and penetrate all matter and space.

This gaseous element he believed to be the ether, and he was satisfied that the recently discovered physico-chemical phenomena connected with radio-activity could be satisfactorily explained by assuming the emission of a portion of this ether and the entrance of new ether into the sphere of attraction of particles of normal mean velocity, if it were supposed that uranium and thorium, having the highest atomic weights among the elements, would have in the highest degree that power of attraction which lies between gravity and chemical affinity, and which would cause the accumulation of ether atoms round their molecules.

In 1882 Mendeleeff, jointly with Lothar Meyer, was awarded the Davy medal of the Royal Society for his researches on the periodic classification of the elements, and 10 years later became one of that society's foreign members. In 1889 he was the Faraday lecturer to the Chemical Society, on which occasion he delivered a memorable discourse on his Periodic Law; and in 1905 he received in person the crowning honor at the disposal of the Royal Society, in the shape of the Copley medal. Mendeleeff died, Feb. 2, 1907, of inflammation of the lungs. The Tsar directed that the cost of the funeral should be defrayed by the State.

The Midnight Mine, Joplin, Mo.

BY EVANS W. BUSKETT*

The Midnight mine, located near Bellville, 6 miles west of Joplin, is one of the show places of the district. The mine is owned by Dr. G. E. Ladd, director of the Missouri School of Mines, at Rolla. The lease comprises 10 acres, which was formerly considered of no value, as it had been prospected extensively. Consequently Dr. Ladd secured a very favorable lease and started to prospect by drilling.

The ore was first struck at 65 ft. and continued to a depth of 110 ft. The drillings showed nearly one-half "jack." Several other holes were then drilled in the vicinity, all showing good ore.

A shaft was sunk and two drifts started and the erection of the mill begun. The mill is now in operation. In spite of numerous shut-downs always accompanying new mills, the first week's run was something more than 35 tons of 60 per cent. ore and about 5000 lb. of lead.

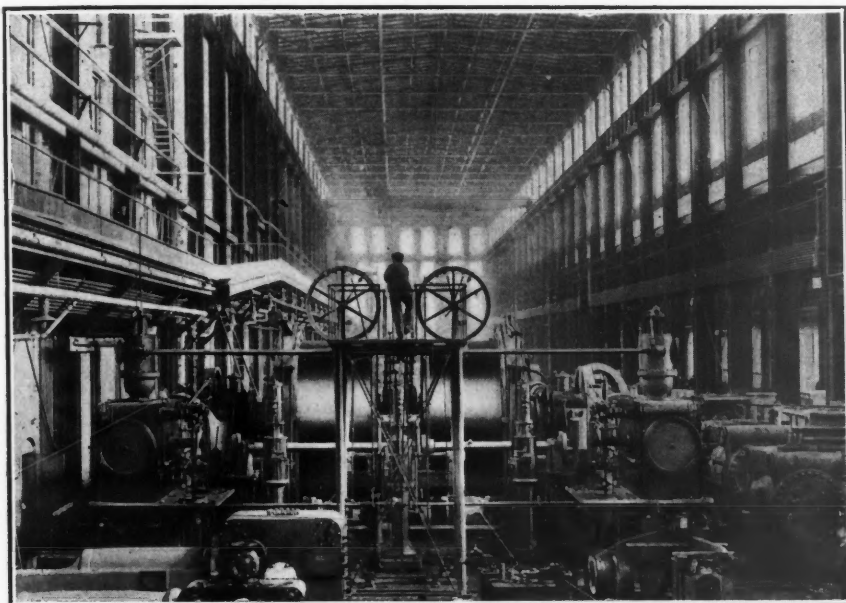
The shaft is 110 ft. deep and is dry, except for a little drip from the pond. The drifts are about 15 ft. wide and the same in height and are run in solid ore. The ground is loose, requiring much timbering, but very little drilling. The water for the mill is pumped from Turkey creek. Here a two-stage Harris centrifugal pump driven by a 25-h.p. Bessemer gas engine forces the water through a half mile of 5-in. pipe against a 120-ft. head.

*Metallurgical engineer, Joplin, Mo.

Duplex Corliss Hoisting Engine

The accompanying illustration shows one of the two new 32x72-in. duplex direct acting Corliss hoisting engines built by the Allis-Chalmers Company, Milwaukee, Wis., for the Boston & Montana Consolidated Copper and Silver Mining Company, Butte, Mont.

The two hoisting engines are duplicates and weigh approximately 250 tons each. They are of the first-motion type, fitted with automatic cut-off gear and governor, and also with complete steam reversing gear. Each crank shaft carries two steel hoisting drums, both provided with heavy friction clutches and powerful post brakes, all operated by individual steam cylinders and hydraulic oil controlling cylinders, so that either may be handled independently of the other, or both operated in balance, as desired.



DUPLEX CORLISS HOISTING ENGINE IN ERECTING SHOP

They will each have a lifting capacity of 34,000 lb., from a depth of 3500 ft., and will be operated at 140 lb. steam pressure. This load includes the weight of the rope, which is over six tons. When working regularly at full capacity the engines will develop approximately 2500 h.p., and will be required to make from six to seven trips per hour, night and day.

Consul Albert Halstead reports that the Birmingham corporation has awarded its contracts for gas fittings for the ensuing year. These contracts show an increase, due to the higher cost of materials, of from 3 per cent. on the lower grades of brass and copper fittings up to 25 per cent. on the highest grades, of about 0.75 per cent. on iron tubing, of 50 per cent. on jute, of 10 per cent. on the finer qualities of glass, while the lower qualities remain the same in price.

Mason & Barry, Ltd.

This British company owns and works a large deposit of copper-bearing pyrites in Portugal. Its report is for the year 1906.

The total quantity of ore broken and raised at the mine during the year was 218,217 tons, as against 176,843 tons in 1905, and the shipments during the same period, inclusive of ore from the cementation works, amounted to 353,273 tons, as against 351,094 tons in the previous year. The quantity of ore sold and invoiced for its sulphur value during 1906 amounted to 350,759 tons, as against 373,287 tons in 1905. After writing off in the mine books for depreciation of works, plant, etc., the sum of £9000, which is approximately the value of new works and plant added during the year, and allowing for the variation in the estimated value of the stocks

to be added the balance, £16,502, brought forward from 1905, making together the sum of £84,827; and the directors having written the sum of £1000 off La Sabina shares, there remains a balance for appropriation of £83,827. From this balance the directors recommend the payment of a dividend of 35 per cent. or 7s. per share, the appropriation of £1000 to the staff pension fund, and to carry forward the sum of £18,017 to the next account.

New York & Honduras Rosario Mining Company

The report of the New York & Honduras Rosario Mining Company of San Juancito, Honduras, C. A., covers mining operations for the year ending Sept. 30, and contains the financial statement for the year ending Nov. 30, 1906.

Development resulted in blocking out 10,170 tons of ore reserve having an estimated value of \$887,364. Mining operations were carried on along three veins, the old Rosario vein having been exhausted some years ago.

Many improvements were made including electric power plant, a large storage-battery, cyanide plant, pebble-tube slimer and a pipe line from the Rosario tunnel to the cyanide plant.

The total cost per ton of ore crushed was \$44.51 derived from the following data:

	TONS OF ORE CRUSHED, 31,451.	
	Total.	Cost Per Ton.
Milling, labor.....	\$97,833	\$3.11
Milling, supplies.....	246,453	7.83
Mining, labor.....	536,734	17.07
Mining, supplies.....	141,072	4.48
Tramming, labor.....	35,777	1.13
Tramming, supplies...	15,230	0.49
Surface plant, labor...	198,607	6.31
Surface plant, supplies	23,824	0.76
Freight charges.....	104,731	3.33
Total.....	\$1,400,261	\$44.51

The year's development was as follows: Drifts using timber, 5194 ft.; drifts un-timbered, 3025 ft.; raises and stope raises, 1926 ft.; crosscuts, 1038 ft.; prospect drifts, 374 ft.; total, 11,557 feet.

The cyanide plant proved successful but handled only one-half of the mill slimes.

The treatment of 30,944 tons of ore resulted in a production of 1,618,800 oz. silver and 3062 oz. gold valued at \$1,112,172. The net profit of \$427,192 was applied as follows: dividends, \$285,000; increase in equipment, etc., \$97,483; increase in cash assets, \$32,970; reduction of bills payable, \$11,739.

Though nearly all the metals have risen in price, mercury has fallen. This is due to the decline of the process of pan amalgamation for working silver ore. Gold mines utilize very small quantities of mercury. The two great consumers are China and Japan, where it is utilized for manufacture of vermilion and explosives of secret composition.

on hand in England, on the Continent, and in Portugal on Dec. 31, 1906, and after deducting management expenses, income tax and depreciation in value of investments, the net profits on working account have amounted to £56,497, to which has to be added £8148 received as dividend on La Sabina shares, and of £3680 from sundries, making together a total profit for the year of £68,325.

The stocks of ore and copper precipitate broken, raised, and on hand, Dec. 31, 1906, are valued at £55,057, against £67,680 Dec. 31, 1905. The mine assets in Portugal, after writing off for depreciation stood at Dec. 31, 1906, at £81,356. These assets embrace works, buildings, land, plant, railways, shipping piers, tug boats, mine stores and cash assets, stocks of ore and copper precipitate.

As shown by the profit and loss account, the profit realized on the year's working amounts to £68,325, to which has

Mineral Production of Eastern Australia

By F. S. MANCE*

The official returns for 1906 of the mineral production of the several eastern States of Australia, which are so far to hand, show that the results actually achieved are far in excess of expectations. The following are the figures: New South Wales, £8,169,624; Queensland, £4,198,647; Tasmania, £2,257,147; total, £14,625,418.

This is an increase of £2,084,846 on the returns for 1905, of which amount New South Wales is responsible for £1,083,731, Queensland £472,377 and Tasmania £528,738. The advance in the price of metals is almost wholly accountable for this result, although New South Wales has benefited to the extent of £333,766 by the increase in the output of coal.

COPPER

It is in connection with the production of copper that the most noteworthy results are recorded.

VALUE OF COPPER PRODUCTION FOR 1906, IN THREE STATES.

	Value	Increase
Tasmania	£934,924	£177,698
Queensland	916,546	412,999
New South Wales.....	789,527	262,124
Total	£2,640,997	£852,821

In Tasmania the production from the Mount Lyell mines has been most satisfactory, and the grade of the orebody opened up at the 850-ft. level in the North Lyell mine is of such a nature as to insure a continuance of profitable operations.

The feature of the year, however, is the progress the copper mining industry has made in the State of Queensland. This State bids fair to become the largest producer of copper in the commonwealth. The Mount Morgan Company is now engaged in the treatment of sulphide ores, and during the half-year ended November 30, produced 1923 tons of copper, in addition to 72,716 oz. of gold, as compared with 358 tons copper and 54,916 oz. gold for the previous year. It is stated that the quantity of auriferous copper ore so far smelted is 62,870 tons, and represents only 5.1 per cent. of the high-grade ore shown by the diamond drills to exist, and but 2.2 per cent. of the total quantity of both high and medium grade. The completion of the railway lines now in course of construction to the Hampden-Cloncurry and Etheridge fields will lead to the development of the numerous cupriferous lodes on an extensive scale.

In New South Wales, the value of the output for 1906 constituted a record. The reports from the established mines show that they have been placed in a position

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to contribute a greatly augmented output during the present year, while not only have many new deposits of promise been opened, but most of the mines which had suspended operations for years past have been re-opened and are yielding well.

A company with a capital of £150,000 has been formed with the object of refining blister copper electrolytically, and for the general purpose of smelting copper ores and mattes. It is intended to erect large metallurgical works in a central position. The controlling interests are represented by the Mount Morgan Company, and Aron Hirsch & Sohn. Captain G. A. Richards, the general manager of the Mount Morgan Company, will act as technical director to the new company.

TIN

The value of the output of tin by the three principal producing States during 1906 was as shown in the accompanying table:

	PRODUCTION OF TIN	
	Output 1906	Increase
Tasmania.....	£557,266	£194,596
Queensland	490,283	192,829
New South Wales.....	255,744	29,634
Total	£1,303,293	£417,059

It is doubtful if the yield from Tasmania will make such a satisfactory showing during the present year, as the output from the Mount Bischoff mine has fallen from 100 to 60 tons of tin concentrate per month. This is due to the sudden decrease in the value of the ore in three of the more important working places, and there is little prospect of any immediate improvement. In Queensland the yield from the mines on the Wales and Tinaroo field is being well maintained; another mine, the Dalziell, at Reid's creek, has been added to the list of producers, a good lode, said to average 8 per cent. tin, having been opened. In New South Wales the operations of the dredges continue to be attended with marked success, and the yield recorded for 1906 should, judging by present appearance, be well exceeded.

SILVER-LEAD

The chairman of the Broken Hill Proprietary Company, at the recent annual meeting of the company, estimated the production of the Broken Hill field to the end of 1906 as: Lead, 2,500,000 tons, and silver 250,000,000 oz., representing a total value of £60,000,000. The dividends are given as £13,750,000, of which the proprietary company alone has paid £9,152,000. The year 1906 has certainly proved a satisfactory one for the companies on this field despite the drawbacks occasioned by fires and creeps, as shown by the fact that the value of the output amounts to £3,539,596, out of which dividends totaling £868,327 were paid. Although the several companies are producing a large quantity of zinc concentrate, it is evident that the general results have not come up to ex-

pectations, and that much yet remains to be done before matters can be placed on a remunerative basis. It is understood that a highly satisfactory recovery of metals has been achieved, but that working costs and charges leave an insufficient margin of profit.

On the subject of the Potter process it may be mentioned that the action against the Broken Hill Proprietary Company, for infringement of patent by the use of the Delprat or salt cake process, has failed, but the matter has been taken on appeal to the High Court.

GOLD

The final returns show that the gold yield of Australasia for the year 1906 was 3,978,579 oz., fine, a decrease of 177,615 oz., fine, as compared with the production for 1905. At the present time the industry is in anything but a flourishing condition, and the yield for the States of Queensland, Victoria, and New South Wales for the first two months of this year amounted to only 199,915 oz., fine, which is less by 53,263 oz., fine, than the yield for the corresponding months of 1906. This, perhaps, is not to be wondered at when it is considered that the demand for competent miners at high wages in the other branches of the industry far exceeds the supply, and that interest is largely centered in the mining for copper, tin, lead, etc. A discovery reminiscent of the early history of gold mining was made near Tarnagulla, Victoria, toward the end of last year, and has been named the Poseidon Rush. The gold was found in shallow alluvium; the largest nugget weighed 960 oz., and realized £2879. Other nuggets weighing 675 oz., 502 oz., 387 oz., 373 oz., 253 oz., 206 oz., 156 oz., 120 oz., 105 oz. (three), 88 oz. (two), 87 oz., and numerous others ranging from 20 oz. to 30 oz. were unearthed.

Imports of Steel Ingots in 1906

The United States imported in 1906, 21,337 long tons of steel ingots, blooms, slabs, billets and bars of steel, having a value of \$3,010,589 or \$141.10 per ton. This compares with 14,641 tons (\$2,072,666) in 1905 and 10,807 tons (\$1,537,531) in 1904.

More than half of the imports of these materials in 1906 were entered at the port of New York and were mostly classified as special or high-grade steel having a value of 13@16c. or more per pound.

The Russian Gold and Platinum Congress, which recently adjourned, has asked that the gold-mining industry be freed from all taxation for 10 years, except a land tax which should be as low as possible. The taxes on the industry at present amount to \$1,250,000 per annum, which is a large percentage of the net profits from the operation of the mines.

Electrically Operated Copper Converter

At the plant being erected by the Orford Copper Company at Constable, N. J., the converter equipment consists of three electrically operated stands and nine shells 48 in. dia. x 126 in. long, built by the Allis-Chalmers Company, Milwaukee, Wis.

The shell has a peculiar shape. The bottom half is 84 in. dia., and from the center up to the joint both sides of the shell are formed in a tangent to a width at the top of about 6 ft. 8 in. This eliminates unnecessary curvature above the center line and permits of a more secure lining. The parting joint between the bottom and top halves is higher so as to avoid the extreme action of the molten

Another feature of the self-contained wind box is the absence of the long flange and cover usually used where the air valves of tuyeres are fitted on the inside of the wind box.

There are 14 Repath individual tuyeres and each tuyere is fitted with a Dyblie ball valve, and is secured to the wind box by swing bolts; and the discharge end, which is at right angles to the inlet, projects several inches inside the shell and through a cast-steel stuffing box, bored out to suit the projection on the tuyere and arranged for holding asbestos packing; the projection permits a lining of brick to be fitted securely around the end.

Each tuyere is arranged so that the ball valve and its seat are self contained and the valve can be taken out and replaced. The pipe distance-piece is also independent and accessible.

that the maximum speed of the shell is reduced to 1.5 r.p.m. If alternating current is available, induction motors are used to turn the converters.

The motor shaft is connected to the worm shaft by a coupling which also acts as a brake wheel for the solenoid brake, and on this extension is keyed a single-thread steel Hindley worm that runs in an oil bath and meshes with a solid worm wheel, thus making the first reduction. On the worm steel shaft is secured a cast-steel pinion, which in turn transmits its energy to a cast-steel gear, both having shrouded teeth. The gear is keyed to a hollow steel shaft which has fitted to the driving end a universal coupling, arranged so that the shells will lie true on the rollers and at the same time the drive will adjust itself to suit the alinement.

On the head of the shell is a groove, which matches a tongue on the universal drive. When placing the shell in position on the stand, the motor is turned around until the tongue is vertical; the shell is then placed, and there is clearance enough on each side of the tongue for keys, which are tapped into place by a light hammer.

The "A" frame for supporting the motor and carrying the gears consists of a massive box-frame casting with all bearings lined with babbit.

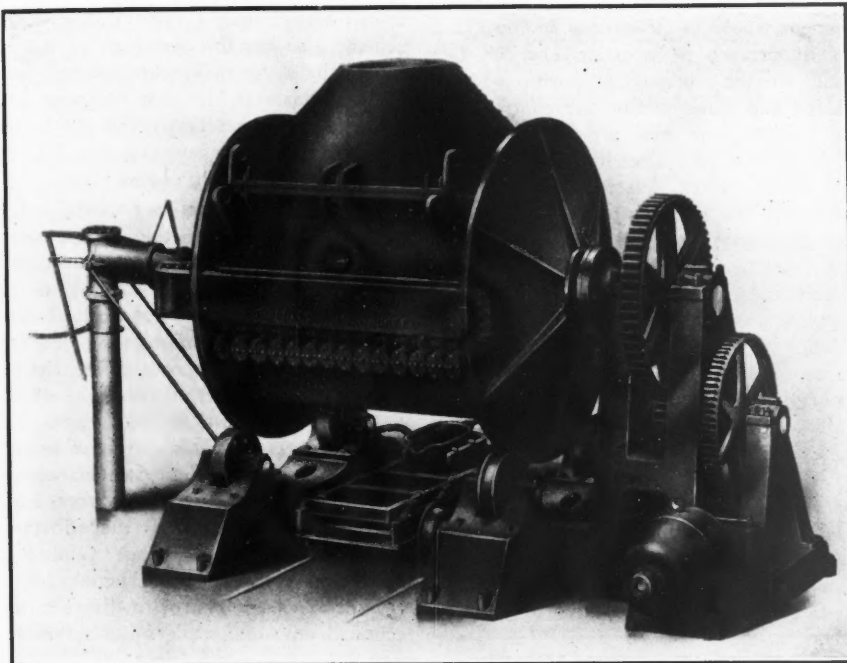
A Bennetts pouring spoon is hung on a steel arm on one side of the roller stand, with the arm so arranged that the spoon can be adjusted to suit the pour of copper from the shell and the position of the molds, which rest on the truck directly underneath.

The three stands are operated from a pulpit and may be manipulated by one operator.

The shell weighs 13 tons and the lining 28 tons. When newly lined the converter holds 5.25 tons of 40 per cent. matte and with a shallow lining the capacity is 9 to 10 tons. The average charge is 6.25 tons. The first slag is skimmed after 45 minutes' blowing, the second 60 later, and the total time from the start to pouring blister copper is 4 hours.

A pressure of 10 to 12 lb. is required. Under these conditions each 84x126-in. converter will produce about 780,000 lb. copper per month of 26 days.

Consul Albert Halstead, of Birmingham, reports that the wages of the coal miners of England and Wales are to be increased by 5 per cent. from the first "making-up day" in May. This applies to all underground labor and to the wages of surface labor engaged on the pit banks and screens in manipulating the coal. This will be the second advance of 5 per cent. this year, the previous one going into effect on the first "making-up day" in January. The two increases are said to add about 9c. per ton to the cost of mining the coal.



ELECTRICALLY OPERATED COPPER CONVERTER

copper. The bottom section of the shell is made of flange steel plate, and at both ends it is secured to a solid cast-steel head provided with a riding ring completely encircling the head.

Each head is spherical and reinforced with six ribs to reduce expansion and contraction, thus avoiding trouble and expense in fitting new shells into stands which had the air connections bolted to the heads.

The top half is slightly different from that shown in the illustration, the new converters being furnished with an independent removable pouring nose which is bolted to the cast-steel top, which permits of removal when corroded by molten metal.

The wind box is rectangular and consists of a plain casting which lies close to the shell and underneath the riding ring.

On the air end of each shell the cast-steel head is arranged to receive the end of the wind box, which is fitted with a ball-joint concave flange and receives the stationary air nipple of the patented blast connection. This joint is especially adapted to converters and air joints where it is not possible to bring flanges in line, due to the difference in centers of shells. This connection consists of a cast-iron tee, having the horizontal cylinder fitted with a ball joint and piston. When the shell is moved into position the lever is pushed forward, and this moves the nipple into the concave flange on the head. The air is then turned on and the pressure upon the piston holds the joint in place.

Each stand is provided with a 30-h.p. Allis-Chalmers direct-current, variable-speed, multi-polar, inclosed-type, series-wound motor for 110 volts and 600 r.p.m., which is geared to the main drive shaft so

Mines of the Utah Antimony Company

The deposits of antimony ore on Coyote creek, Utah, have been known for a long time, and were first described by Prof. W. P. Blake, in 1883. Attention has again been directed toward them by the present high price of the metal.

The mines are situated in Garfield county, on Coyote creek, which is a tributary of the Sevier river. The valley of the creek is about five miles long and leads into Grass Valley, at its southern end. From the east fork of the Sevier, where it cuts across the valley, good roads run to the junction of the south fork and turn north from that point to Marysville, a station on the Rio Grande Western Railroad.

CHARACTER OF THE FORMATIONS

The rocks of the district are soft, gray, granular sandstone underlain by a thin bed of limestone and conglomerate boulders. The beds are of Eocene age, and are almost horizontal, forming perpendicular cliffs on both sides of the narrow valley and its branches. The conglomerate is about 100 ft. thick. Above it, in the sandstone, which contains some gypsum, the antimony deposits are found. The ore is disseminated through a band about 5 ft. thick, and rests directly upon the conglomerate. The ore is found both in regular sheets, $\frac{1}{2}$ to 2 in. thick, and in lenticular masses approximately 2 ft. thick in the center and 20 ft. in diameter.

OPERATIONS

In recent years these properties have been worked intermittently by leasers who paid the owner a royalty of \$75 per ton of stibnite extracted. The stibnite shipped contained on an average 71 per cent. antimony, and during mining operations several thousand tons of 20 per cent. ore was thrown on the dumps.

In September, 1906, the Utah Antimony Company was incorporated by persons in Butte and Salt Lake City, for the purpose of working over the dumps. Twenty-three claims were acquired which virtually includes all the ground known to contain the antimony deposits. In addition the company owns about 6000 ft. of placer claims in the bottom of the cañon, and the water rights at the head and foot of the gorge from a creek that has a flow of approximately 2000 miners' inches of water.

It is the purpose of the company to work only the low-grade ore which is now lying on the dump. For this purpose bunk houses, offices and other buildings are being built, dams, a 2200-ft. ditch, and buildings for concentration and volatilization are under construction, and the necessary machinery is being bought.

The ore is unique in that it is absolutely

free from lead, differing in this respect from other antimony deposits in the United States, and making the concentration and smelting of the ore relatively inexpensive. It is proposed to use a method of volatilization, the details of which the company is not as yet ready to disclose, but the success of the process, it is stated, has been thoroughly proved by commercial tests.

The Centralization of Power Production on the Rand

BY EDWARD WALKER

After many years' debate and negotiation the scheme for supplying the gold mines of the Rand with power from huge central stations has taken definite shape with startling suddenness. Such a development would be of interest in itself, but its importance is intensified by the fact that all the various propositions have united and come within one control. At the present time there are two companies actually supplying electric power in bulk: the Rand Central Electric Works, controlled by the Siemens people and supplying about 4000 h.p.; and the General Electric Company, a branch of the Allgemeine Electricitäts Gesellschaft of Berlin, which supplies 5000 h.p.

The two great schemes which have been discussed as probabilities for the future are the utilization of the Victoria Falls on the Zambesi, 600 miles away, and the establishment of a steam power station at Vereeniging, on the Vaal river, in proximity to the coalfields, and 35 miles from the Rand. The former of these is in the hands of the British South Africa Company and the latter is a proposition made by the Lewis and Marks group.

VICTORIA FALLS POWER COMPANY

It is not necessary here to discuss the diplomacy required to bring all these four conflicting interests into line; I simply record the fact that a company has been formed by the British South Africa Company, called the Victoria Falls Power Company, which will absorb them all and in the near future control the whole of the power supply of the Rand. The name of the company brings into prominence one of the sources of supply, but from the force of circumstances several years must elapse before the company lives up to its name. The revenue for the first few years will come from the works of the Rand Central Electric and the General Electric Companies.

The program of the company provides for the immediate construction of a steam plant capable of producing 24,000 h.p. somewhere in the neighborhood of Johannesburg in addition to these two already in operation. It is not probable that the Vereeniging scheme will be proceeded

with at once, but the work in connection with the Victoria Falls will be put in hand immediately. At first, provision will be made for a plant generating 50,000 h.p.

It will be seen that the company takes up three separate systems of production and distribution. The steam stations at Johannesburg have the drawback of dear water and moderately dear coal; the proposed station at Vereeniging will have cheap water and cheap coal, but will have to transmit the electric power 35 miles; while the Victoria Falls scheme will obtain power from a water fall, but will be saddled with an immense outlay of capital spent on hydraulic works and transmission lines. Also it must be remembered that for a transmission of 600 miles, the generating plant will have to produce twice as much power as will be delivered at the Rand, and a large margin will also have to be provided for the consumption in the transformers. The Victoria Falls scheme also has the drawback of not obtaining its water power for nothing, for a million shares in the new company have to go to the representatives of the British South Africa Company to pay for the privilege of using the water.

Further information is required before justice can be done to the relative merits of the three different systems but I must confess that the relative economy of the Victoria Falls plant is not very obvious.

There can be no doubt that this new scheme will help to consolidate the interests and methods of working of the goldfields of the Rand. No general law can be laid down as to the relative benefits of individual efforts and combinations of financial and professional resources. Prospecting is done better by the efforts of needy individuals. A great number of mines and prospects yield better results without expensive boards of directors and technical advisers, while other mines are not poor men's propositions.

It has always seemed to me that the Rand deposits were the furthest removed from the poor man's propositions, and that they would be most profitably worked by adopting "trust" methods. In order to make the deposits, especially the unopened deep levels pay, it is necessary to cut down costs by reducing the charges for technical services, skilled and unskilled labor, and power. The problems to be worked out are almost the same at all the mines, so a central board of engineers and metallurgists would work more economically than a series of staffs for each mine or each group. "Trust" methods are often open to objection, but in this case the chief objection, the conspiracy to artificially raise the price of the article produced, would be absent.

It is probable that no actual amalgamation of the various groups and companies could ever be effected, but in the manner outlined their interests might be consolidated.

The Tungsten Deposits of Boulder County, Colo.

An Old Gold and Silver Camp, Which Now Produces More Than 80 Per Cent. of the Tungsten of the United States

BY WILLIAM E. GREENAWALT *

The tungsten deposits of Boulder county, Colo., which furnish more than 80 per cent. of the tungsten of the United States, were discovered more than 25 years ago, but at that time the discoverer, Samuel Conger, did not know what the heavy black mineral was. He was aware, however, that it did not carry gold or silver, for which he was then prospecting, and hence it had no value to him. About five years ago, after an absence from Colorado of 20 years, he learned what the mineral was, and that it had some value for the tungsten which it contained. On learning this he returned to the State and located the first tungsten claims in Boulder county.

From this beginning the present thriving tungsten industry has been developed. Its possibilities were slow in being recognized, and it was not until Morris J. Jones, of the Great Western Exploration Company, developed the first mine and built the first mill, that the industry was firmly established. The town of Nederland, the center of the district, and now a tungsten mining camp, was once the center of a gold and silver mining industry which had dwindled down to a defunct stamp mill, a dilapidated smelter, a town of empty houses, and one or two inhabitants.

LIMITS OF THE DISTRICT

The tungsten district of Boulder county is not large. Its present limits of profitable working are not more than eight miles long and three miles wide, although good prospects have been found outside of this limited area. There are good indications that the camp will ultimately extend further south into Gilpin county, but the large areas of patented agricultural land have discouraged prospecting in that direction. Good tungsten has been found as far south as Rollinsville, as far west as Eldora, as far east as Sugar Loaf and Magnolia, and as far north as Ward, where the tungsten occurs more in the nature of hubnerite.

All of the tungsten about Nederland, found in commercial quantities, occurs as Wolframite (Fe, Mn) WO₄, which contains, when pure, about 76.5 per cent. tungstic acid (WO₃) 9.5 per cent. ferrous-oxide, and 14 per cent. manganous oxide. The concentrate, as produced at the mills in Boulder county, will vary from 60 to 70 per cent. tungstic acid, which is made the basis of settlement in purchasing the ore.

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CHARACTERISTIC ANALYSES OF CONCENTRATES.

	Beaver Creek. Per Cent.	Nederland. Per Cent.	Gordon Gulch Per Cent.
WO ₃	66.41	63.20	60.84
FeO.....	24.31	20.36	18.36
MnO.....	3.25	1.10	4.73
Si.....	6.00	15.00	16.28
P.....	trace	trace	0.06
S.....	0.02	0.50	0.20
Au.....	trace	trace	trace
Ag.....	1.2 (oz.)	2.4 (oz.)	3.1 (oz.)

It will be seen from these analyses that the iron is high and the manganese low, as compared with the theoretical composition of wolframite.

GEOLOGICAL FORMATION

A peculiar characteristic of Boulder county wolframite is its brecciated appearance. There is no exception to this rule, but in some mines it is more pronounced than in others. The breccia consists of wolframite and feldspar; sometimes the



CHARACTERISTIC BRECCIA, BOULDER COUNTY WOLFRAMITE

feldspar is partially replaced by quartz. This peculiarity is shown in the illustration, which is of a characteristic specimen of the ore. The feldspar frequently has the appearance of being floated in the wolframite, and would suggest igneous conditions in the formation of the deposits. Frequently the mineral at the surface is beautifully crystallized, but the brecciated appearance is always in evidence. The crystals are usually grouped around the feldspar, and sometimes completely inclose it. Such ore gives a high-grade concentrate usually containing 70 per cent. tungstic acid. Some of the ore has the appearance, as if the breccia, of feldspar and wolframite, had been subjected to enormous heat, so as to partly fuse the ore and obliterate the sharp lines of demarkation between the constituent minerals; such ore gives a low-grade concentrate and high tailings.

The tungsten invariably occurs in connection with enormous andesite dikes which traverse the country in roughly parallel lines. No prospects of any consequence have been discovered in the intervening country between these dikes, and the working mines are all confined to their immediate vicinity. The prevailing country rock is schist and granite. The float from the outcrops is particularly rich, and much of the surface wash, adjoining some of the mines, has been shoveled over to recover the float. Many of the orebodies do not outcrop, but are found usually 10 to 60 ft. below the surface. Prospecting is made easy on account of the peculiar black tungsten stain which pervades the joints and cleavage planes of the mineral veins where tungsten occurs, and which is very pronounced. As the orebody is approached these stains take the form of stringers of wolframite in the dike rock, apparently without the accompanying vein matter.

It has been demonstrated beyond doubt that the orebodies are reasonably permanent. While the ore-shoots are not strictly continuous, no failure of the ore at depth has yet been recorded. The deepest shaft in the district is 400 ft. and several are almost 300 ft. In one of the mines the best ore was encountered at the lowest level, and in all the working mines the ore is practically as good at the bottom as it was nearer the surface.

CONCENTRATION

The treatment of the ore at the mines is not elaborate. It consists of simple concentration, as follows: (1) Crushing in rock breakers; (2) reducing in stamps or rolls to 10 or 20 mesh; (3) hydraulic classification; (4) concentrating on tables; (5) treatment on Frue vanners or slime tables.

In this way 70 to 80 per cent. of the mineral in the ore is saved as concentrate, containing 60 to 70 per cent. tungstic acid. Since wolframite is one of the heaviest known minerals, having a specific gravity of 7.5 as compared with 2.5 for the quartz matrix, it would be thought to make an ideal concentrating ore, and that a saving of 70 to 80 per cent. is quite low. The great difficulty in concentration lies in excessive sliming. As the concentration of the ore becomes better understood, the necessity of thorough classification before concentration becomes more and more evident. There is a field for a solvent process, if one could be found which is commercially applicable.

FORMER GOLD MILLS ARE USED

Most of the mills treating tungsten ore were originally built for the amalgamation and concentration of gold and silver ores. It took some experience and not a little experimenting to find out that the conditions that were ideal for one were fatal to the other. Most of these mills have been entirely remodeled, and it is probable that the average extraction will soon be increased to 80 or 85 per cent. The weight of the stamps in these mills varies from 750 to 850 lb. Careful experiments have been made with rolls to reduce sliming and to obtain a higher saving, but the results, while slightly improved, were not what was anticipated. The wolframite and matrix are frequently so intimately associated that a high recovery by mechanical concentration is practically impossible.

ORE PURCHASING

There are at present operating in the district one 20-stamp mill, three 10-stamp mills and several 5-stamp mills. All of these are operated in connection with the larger mines, but most of them also buy custom ore. At one of the mills a milling charge of \$4 per ton of ore is made, and the concentrates are purchased on the basis of \$9.50 per unit for concentrates containing 60 per cent. or more, and \$8.50 for concentrates containing between 50 and 60 per cent. tungstic acid. Concentrates containing 50, 60 and 70 per cent. tungstic acid are therefore worth \$425, \$570 and \$665 per ton, respectively.

At another mill the ore is bought outright on the following schedule of prices:

BASIS FOR PURCHASING TUNGSTEN ORE.

Percentage of WO ₃ .	Value Per Ton.	Percentage of WO ₃ .	Value Per Ton.
3	\$10	20	\$100
4	15	30	180
5	21	40	280
10	46	50	400
15	71	60	570

Ore containing less than 2 per cent. tungstic acid is profitably handled when the mine and mill are controlled by the same interests.

The total output of the district for 1905 was 721 tons of tungstic acid (WO₃) and in 1906 it was approximately 820 tons. The output for 1907 will probably reach 1200 tons. The largest producers are the Wolf-Tongue Mining Company, the Stein-Boericke Company, the Boulder County Mining Company and the Colorado Tungsten Company. These are energetically developing their various holdings, and at Beaver creek; at the Ebony mine, a tunnel is being driven to encounter the ore at a depth of 400 ft. Recently the "Rogers Patent," representing more than 2000 acres of tungsten mineral land, taken up under agricultural patents before the ad-

vent of tungsten mining, has been acquired by German interests and will be thoroughly exploited and developed.

The economic conditions of the Boulder county tungsten deposits are satisfactory. There is an abundance of water and wood, and two railroads pass through the district. They are the Colorado & Northwestern, a narrow-gage road passing over the northern extremity, and the Denver, Northwestern & Pacific Railroad in the southern extremity at Beaver creek. Nederland is 30 miles from Boulder and 60 miles from Denver via the Colorado & Southern Railroad, and 45 miles from Denver via the Denver, Northwestern & Pacific. Its altitude is 8000 feet.

The Purchase of Zinc Ore

The zinc smelters of Belgium, Holland, France and the west of Germany for the purchase of ore employ generally the formula $0.95 P \left(\frac{T-8}{100} \right) - R$, in which P is the price of spelter (good, ordinary brands) at London, T the units of zinc in the ore, and R the returning charge per ton of 1000 kg. This formula gives the value of the ore per ton of 1000 kg. The value is given in pounds sterling, marks, francs, or dollars according as P , the value of spelter at London, is reckoned in pounds sterling, marks, francs or dollars.

This formula is scientific and fair. The freights and cost of smelting per ton of ore are substantially the same irrespective of the grade of the ore (within certain limits). The returning charge R is therefore constant, as it should be. The percentage of metal extracted falls off as the grade of the ore falls off, because the losses in smelting are to a large extent constants, i.e., a ton of certain ore may contain 1000 lb. of zinc and a ton of another ore 800 lb. of zinc, but the loss of metal in smelting will be approximately 125 lb. in each case. The formula takes account of this by the uniform deduction of eight units from the zinc content of the ore as shown by assay. If the ore assay 60 units of zinc, the payment is for 52 units, or $86\frac{2}{3}$ per cent. of the zinc in the ore. An ore assaying 50 units, with eight units deduction, returns 84 per cent.; and an ore assaying 40 units, with eight units deduction, returns 80 per cent. These percentages are not very much below the actual metallurgical extractions. In being a little under the actual extraction it tends to increase slightly the smelter's margin as the value of spelter rises, as does also the discount of 5 per cent. from the London price, but this is equitable.

Sometimes, in the case of a desirable ore, the smelter will propose to buy the ore with a deduction of only seven units from the assay, instead of eight, as usual.

The percentage of zinc paid for, on different grades of ore, becomes then as follows:

60 units	:	88.33	per cent.
50 units	:	86.00	per cent.
40 units	:	82.00	per cent.

Sometimes, if it be anticipated that lower grades of ore than contemplated in the returning charge named in the contract will be offered, it is provided that the returning charge be increased with decrease in the grade of the ore. For example, it may be provided that for each unit of zinc below 50, the returning charge shall be raised 2.5 francs per 1000 kg. of ore, which is equivalent to 43.86c. per 2000 lb. If therefore the returning charge were named at \$11.50 per 2000 lb. for ore assaying 50 to 55 per cent. zinc, with increase of 43.86c. per unit below 50, the charge on ore assaying 48 per cent. zinc would be \$12.38 per 2000 lb.

Electrolytic and Lake Copper

The fact that certain mines in the region of the Great Lakes yield a mineral so free from objectionable impurities that a high-grade copper is obtainable directly by a simple furnace scorification, early gave Lake copper a premium in the market that electrolytic competition even yet has not entirely wiped out. For almost all purposes there should be no hesitation whatever today in specifying electrolytic copper. In conductivity it is superior to nearly all brands of Lake, and in mechanical properties it leaves little to be desired. There are a few classes of work in which the metal is subjected to very severe stress, such as in the making of cartridges, where Lake seems to stand up better than electrolytic, although even here it is a question how much to allow for the trade prejudices of the older generation of mill foremen.

Any advantage in Lake copper must be attributed to the fact that it is not so clean as electrolytic. A small quantity of arsenic, for example, while exceedingly detrimental to the conductivity, will appreciably improve the mechanical properties of copper; at one time, arsenic was considered necessary in English specifications for firebox copper. Each year a greater proportion of the world's output is electrolytically refined, and it seems probable that before long there will be but two grades of copper on the market—high-conductivity copper, which will include electrolytic and picked brands of Lake, and casting copper, covering all material which will not pass a conductivity requirement of 98 per cent. annealed.

According to *Min. Journ.*, March 30, 1907, the six leading companies exploiting manganese in Brazil exported 201,500 metric tons in 1906, officially valued at 6,716,660 francs.

Phosphate Rock in Utah, Idaho and Wyoming

The Utilization of the Deposits in These States Promises to Create a Market for Sulphuric Acid in the West

BY CHARLES COLCOCK JONES*

Investigations undertaken at first in the interests of the Mountain Copper Company, Ltd., and later continued on my own account have demonstrated the existence of a large phosphate field in the high intermountain country of north-eastern Utah, southeastern Idaho and western Wyoming. The occurrence appears as stratified deposits in the upper Carboniferous, lying above the Weber quartzite of the 40th Parallel Survey, or an analogous formation. The principal rich deposits so far as found seem to lie in that arm of the Carboniferous sea bounded on the north and east by the granite backbone of the Rocky mountains in Wyoming, with a few islands of the same granite lying to the west. It

Much of the country is at present commercially inaccessible.

The striking fact is that the Carboniferous is coal-bearing in the Appalachian, and phosphate-bearing in the Rocky mountains region. The one was probably a swamp accumulating vegetable material and the other a shallow sea receiving deposits by animal, vegetable and chemical means of phosphoric acid from the surrounding land areas.

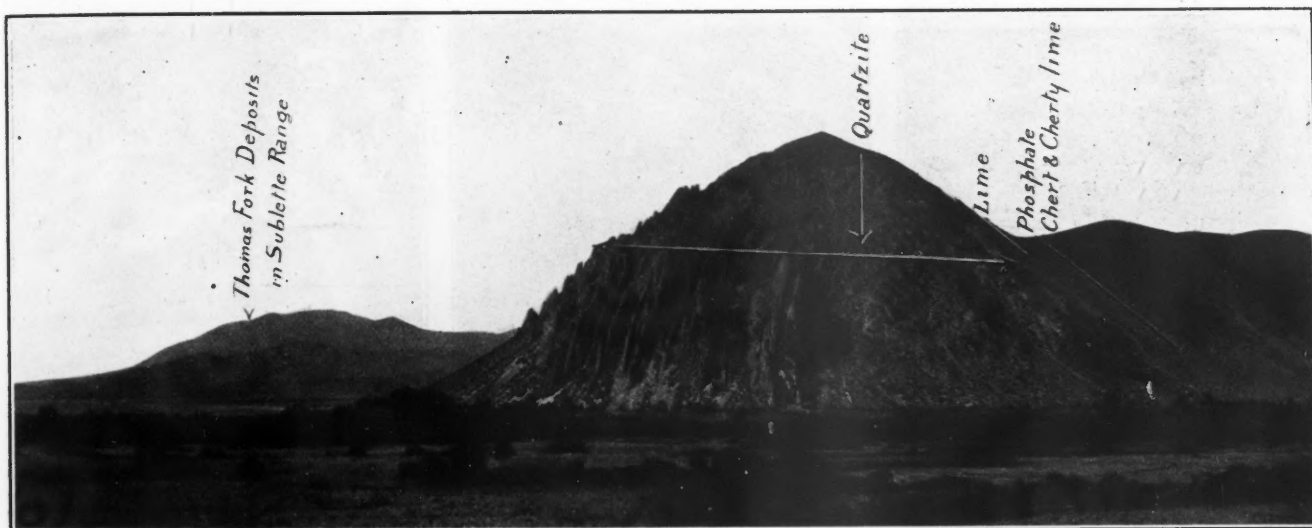
THE DEPOSITS IN RICH COUNTY, UTAH

In the summer of 1897 R. A. Pidcock while on a prospecting trip camped on "12 mile," a branch of Woodruff creek, Rich county, Utah. Finding some old workings in a soft black formation and

from the apparently underlying limestones, by Dr. G. H. Girty, of the U. S. Geological Survey, proved the formation to be upper Carboniferous.

The higher-grade phosphate occurs as brownish black oolitic stratified rock with a highly fetid odor, the oolitic structure being very regular with only a minimum amount of interstitial matter. The rock weathers readily to individual grains except a few layers of hard oolitic phosphate.

A study of Hayden's Report of 1871 and the text of the 40th Parallel Survey by Clarence King caused me to examine the Ogden and Echo Cañon regions. The remarkable Z contortion in the lower Carboniferous limestones spoken of by



ROCKY POINT, NEAR COKEVILLE, WYO. ARROW INDICATES STRIKE OF STRATA

must have been a shallow sea, devoid of currents, so far as we can judge from the bedding of the limestones, with the waters highly charged with phosphoric acid, which by animal, vegetable and chemical means was concentrated into beds of oolitic character.

The Carboniferous formation is exposed in the area under consideration in a series of north and south mountain ranges, as a result of faulting on a large scale, resulting in limited monoclines, anticlines, synclines and close folds.

In the phosphate formation we seem to have a gradually enriched series of beds from the bottom upward, the top bed being the most uniform and practically workable one. I feel convinced that future search will greatly enlarge the field.

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believing that he had a gold mine, he and others took up a number of claims. A sample was sent to San Francisco for analysis. The returns showed no gold or silver, but revealed the fact that the material was phosphate rock.

COMPOSITION OF RICH COUNTY ROCK	
Phosphoric Acid.....	32.44 per cent.
Iron and Alumina Oxides.....	1.52 "
Iron Sulphide.....	1.72 "
Calcium Oxide.....	43.02 "
Magnesium.....	.83 "
Carbon Dioxide.....	.85 "
Sulphur Trioxide.....	2.24 "
Flourine.....	1.36 "
Organic Matter.....	5.83 "

In May, 1903, I examined the deposits of phosphate rock on Woodruff creek, 11 miles west of the town of Woodruff in the Bear River valley. This phosphate formation extends for about 2½ miles, and dips from nearly vertical to 45 deg. to the west.

An examination of a series of fossils

these writers consists of a series of black limestones and shales 16 ft. or more in thickness bearing lime phosphate from 2 to 24 per cent., with a black oolitic band of one inch carrying 48 per cent. lime phosphate.

A like occurrence at this same horizon is also found in a cañon several miles south of Logan, Utah. There is nothing commercially valuable about it, but it has a great significance in being the earliest occurrence of oolitic bedded phosphate I have been able to find from the Cambrian to the Carboniferous.

DEPOSIT IN MONTPELIER CANON

In August, 1903, I learned of work being done near the town of Montpelier, Bear Lake county, Idaho, for coal, and upon visiting the locality I found that an incline shaft had been sunk 250 ft. deep in

the geologically lower black shaly limestone strata of the phosphate formation. The phosphate formation is exposed in Montpelier Canon 3 miles east of the town for a distance of one mile south and two miles north of Montpelier creek.

The strata composing the mountain just north and south of the cañon occupy an inverted position with the geologically upper rich bed of phosphate lying at the bottom, the mountain representing an immense reverse fold. The strata strike in a general north and south direction with a dip to the west of from 20 to 40 deg. Fossils submitted to the Geological Survey for identification showed that the horizon is without much doubt high in the Upper Carboniferous, probably not Permian, though not far below it.

At the bottom, geologically, it consists of a series of black phosphatic mud beds,

mud seam, similar to a slate parting in a coal bed, from the upper, harder, and more blocky phosphate of an average thickness of 3 ft. The whole bed can be classed generally as a black oolitic phosphate in appearance like the black phosphate of Tennessee and averages 70 per cent. bone phosphate.

BEDS AT RICH HOT SPRINGS

From developments at the Hot Springs on Bear Lake 15 miles south, and Thomas Fork, 15 miles east, and at Cokeville, 20 miles southeast of the Montpelier deposit, the workable bed described above has held its character and relative position with a definiteness similar to a coal bed over such an area, especially as regards the parting.

The next determination of the bed was made near Rich's Hot Springs. The

Woodruff Creek and Montpelier deposits. The openings showed a considerable width of material running from 20 to 50 per cent. bone phosphate, with intercalated lime ledges. In the spring of 1904 I discovered the south extension of the formation 1 mile south of the Union Pacific Railway, and followed it between the two points at the Weber river and on Dry creek.

The phosphate formation to the south of this is covered by the later formation unconformably, and its next appearance is just east of Salt Lake City, north of Fort Douglas. It shows about 100 ft. of phosphatic limes, and cherty beds, with a few thin oolitic bands, but apparently no workable bed of commercial value. It is probable that other areas in the Wasatch mountains will contain phosphate in commercial quantities.



OUTCROP VIEW SOUTH OF MONTEPELIER CREEK



PHOSPHATE WORKINGS NEAR COKEVILLE



FACE OF TUNNEL, SOUTH OF MONTEPELIER CREEK

black or brown phosphatic shaly limes, lime concretions and more or less pure beds of limestones, about 60 ft. thick containing from 10 to 53 per cent. bone phosphate, the amount of phosphoric acid in any one bed being seemingly subject to rapid changes in a short distance. A large part of this measure will undoubtedly be found capable of concentration when needed.

Sharply divided from this lower member by a band of hard black limestone 20 in. thick, at places very full of omphalotrochus shell casts and other fossils, comes the top and commercially workable layer of phosphate rock 5½ to 6 ft. thick. This bed is made up of two members, a lower (geologically) slaty member, averaging 2 ft. thick, separated by a thin shaly

workable bed is slightly different from that at Montpelier, and the richest bed yet found in the field occurs as a separate one of 18 to 22 in. in width, composed of hard black oolitic phosphate with a layer of curious saucer or disk-shaped concretions, from ⅛ to ¾ inches in diameter.

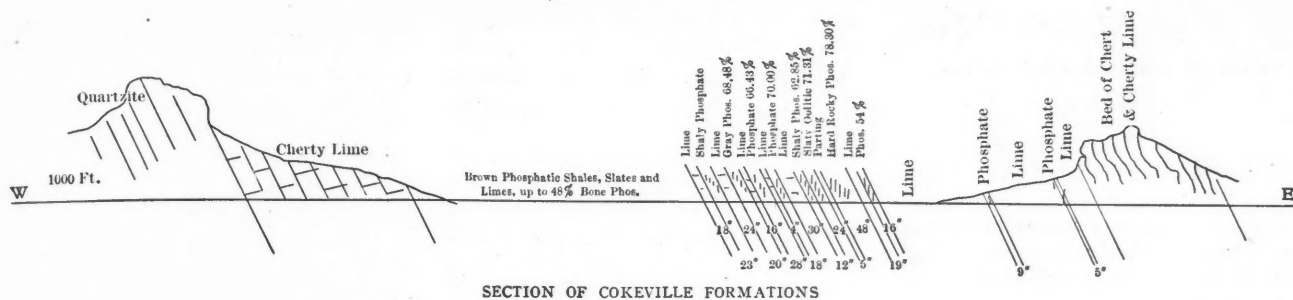
The formation has been traced for several miles outcropping nearly north and south with a dip to the west of 45 to 70 deg. A black chert bed, overlying the phosphate formation forms a prominent feature, standing up like a volcanic dike for 3 miles, and throughout the field a chert bed is characteristic of the top of the upper Carboniferous.

Upon examination of the phosphate formation north of Croyden Station I found that it corresponds in position with the

WESTERN WYOMING AND EASTERN UTAH

In the summer of 1904 I was directed to some workings that had been prospected for coal in the Sublette range of mountains of Wyoming, just east of the Idaho line, on Thomas fork of Bear river. From this I determined the phosphate formation for three miles running nearly north and south dipping from vertical to 65 deg. to the east. The east bed is the commercially workable one, and the similarity to the Montpelier deposits is marked, even to the shale or mud partings separating the two members of the bed.

Finding the Carboniferous to outcrop in two sharp peaks, one mile east of Cokeville, Wyoming, I entered negotiations to examine the lands. The result of the ex-



SECTION OF COKEVILLE FORMATIONS

amination showed the quartzite about 1000 ft. thick to form the ridge in the form of a close fold. The phosphate formation follows to the east and dips under the valley of Smith's fork of Bear river, in a broad syncline showing exposures of the rocks from the Carboniferous to the Cretaceous with the phosphate formation again exposed, eight miles east of Cokeville, in Sublette cañon, dipping to the west.

Later investigations showed the continuation of the latter exposure to the south on Rock creek, but so far without commercial beds being opened.

In July, 1905, I discovered a small exposure of the Carboniferous in the low hills 1½ miles east of Sage Station, Wyoming. The occurrence here is on the west side of a gentle anticline, the west side of which has been abruptly faulted in the making of the Bear River valley. Compared with other exposures the phosphate formation is thin. So far as developed there seems to be a workable bed from 7 to 10 ft. thick showing a top member of 4 ft. hard, jaspery red and green oily looking rock averaging 74 per cent. bone phosphate separated by a 5-in. shaly parting from 6 ft. of soft gray oolitic rock running as high as 80 per cent. phosphate. The continuation of this formation was located in the River Hills, east of Bear river, in Utah, 6 miles further south of Sage Station.

At Bennington, Idaho, 3 miles north of Montpelier, a disconnected and faulted

portion of the phosphate formation is shown. The material runs from 25 to 50 per cent. bone phosphate, and further work will be necessary to determine its position and relation to the other deposits.

Two miles west of the town of Bloomington, Idaho, a phosphate formation about 75 ft. thick, has been opened by a tunnel prospecting for coal. It consists of beds of brownish porous material devoid of oolitic structure or casts. In value it runs from 12 to 45 per cent. bone phosphate with only a few feet of the latter.

North of Montpelier I have found the phosphate formation in a cañon east of Soda Springs, Idaho, and at a number of points between the two places locations have since been made. From a great number of analysis, the following are the general characteristics of the rock: moisture rarely exceeds 1 per cent., the rock disintegrates readily by weathering without absorbing moisture to any appreciable extent; insoluble runs from 5 to 7 per cent.; and iron and alumina below 3 per cent.

Regular shipments can be made of material from 65 to 73 per cent. lime phosphate, and higher by separating special beds up to several feet thick. The specific gravity is from 2.85 to 2.98. There is considerable organic matter which will be a slight detriment in making superphosphate.

At present there are three concerns active in developing and shipping: The San

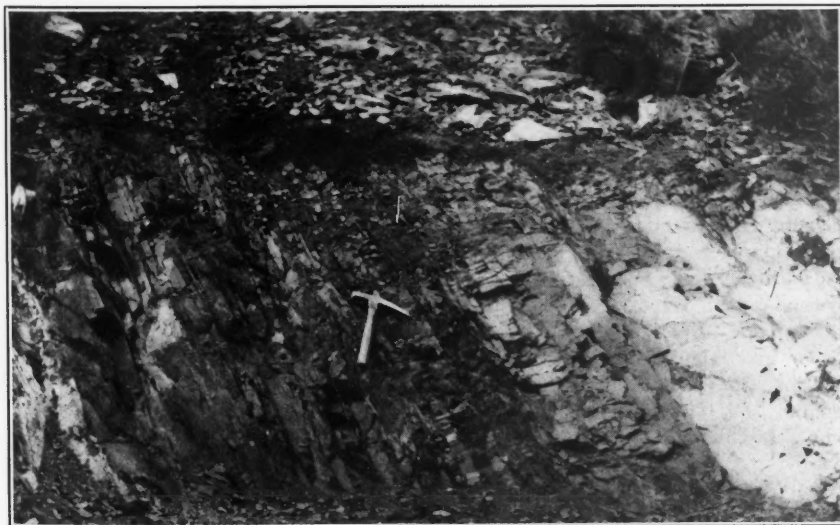
Francisco Chemical Company, operating department for the Mountain Copper Company, Ltd., which latter is an English concern, shipping to the coast from Montpelier, Idaho; the Union Phosphate Company, of San Francisco, shipping from Cokeville, Wyoming, to the coast; and the Bradley interests, shipping at Sage Station, Wyoming, from Utah deposits.

The exposures in highly tilted beds render mining above water level a simple matter for a long time to come.

Conductivity of Electrolytes

The conductivity of an electrolyte depends upon the number of ions present, the speed of migration and the charge of electricity each carries. The charge carried is a constant for the various compositions, as the valency does not change. In copper refining, the ions concerned are copper, hydrogen and sulphion. Hydrogen is much the swiftest; hence, the effect of the free acid present in lowering the resistance. The number of ions present depends upon the concentration and the degree of dissociation. In electrolytic copper refining we have a mixture of two electrolytes with a common anion, SO₄, and the proportion of one present controls the degree of dissociation of the other. Starting with a fixed percentage of free acid present, additions of copper sulphate at first increase the conductivity due to the increased number of ions present. After a certain quantity of copper is reached, however, further additions have the reverse effect. This is due to the driving back of the dissociation of the acid by the increased proportion of the SO₄ ions claiming a copper mate in accordance with the laws of equilibrium. It will be seen from these data that the copper should not exceed 3 per cent. at the most, or 12 per cent. if figured as sulphate. The acid may advantageously be run up to about 13 per cent. If carried higher, polarization troubles are likely to offset the gain in conductivity. These figures are for pure electrolytes. In practice, impurities cause the resistance to be 10 to 15 per cent. higher.

Extensive deposits of anthracite are said to have been discovered about 30 to 40 versts from Kharbin in Eastern Siberia.



OUTCROP PIT AT COKEVILLE, WORKABLE BED

Note on the Adiabatic Volume-change on Mixing Two Gases

BY ALFRED J. LOTKA*

In regard to certain chemical processes it is of interest to know what is the change in the total volume of two quantities of gases which are originally at different temperatures, and which are then mixed, without chemical action, so as to acquire one common temperature. It is of course a simple matter to work out the result as the need arises in each particular case, but a general investigation presents some points of interest.

Consider two gases, both at the same pressure, P mm. of mercury; let v_1 be the volume of the first; t_1 deg. C. its absolute temperature; and s_1 its specific heat at constant pressure and at the temperature t_1 deg. Also, let its density at 0 deg. C. and 760 mm. be d_1 , so that its actual density at t_1 deg. and P mm. will be:

$$\frac{P}{760} \cdot \frac{273 d_1}{t_1}$$

Similarly let v_2 be the volume of the second gas; t_2 its absolute temperature; s_2 its specific heat at constant pressure and at the temperature t_2 deg.; d_2 its density at 0 deg. C. and 760 mm.; hence its actual density at t_2 deg. and P mm. will be:

$$\frac{P}{760} \cdot \frac{273 d_2}{t_2}$$

Then, if the two gases are mixed in such manner that no heat either enters or leaves the system, and if T is the final temperature reached, we have for this adiabatic process the condition:

$$v_1 \frac{P}{760} \cdot \frac{273 d_1}{t_1} \cdot s_1 (T - t_1) + v_2 \frac{P}{760} \cdot \frac{273 d_2}{t_2} \cdot s_2 (T - t_2) = 0,$$

or:

$$d_1 s_1 \cdot v_1 \frac{T - t_1}{t_1} + d_2 s_2 \cdot v_2 \frac{T - t_2}{t_2} = 0 \tag{1}$$

THE VOLUME CHANGE

Let us now consider the volume change. This will evidently be the same as if each gas had been separately brought to T deg. at constant pressure, and the two had then been mixed; for in that case no further change in total volume would take place on mixing.

Now, if Δv_1 represents the change in volume v_1 corresponding to the change in temperature from t_1 to T , we have:

$$\Delta v_1 = v_1 \frac{T - t_1}{t_1} \tag{2}$$

Similarly, the change in v_2 is given by:

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$$\Delta v_2 = v_2 \frac{T - t_2}{t_2} \tag{3}$$

If Δv is positive this means increase in v or expansion; a negative Δv means contraction.

The change in the total volume ($v_1 + v_2$), of the gases is given by:

$$\Delta(v_1 + v_2) = \Delta v_1 + \Delta v_2 = v_1 \frac{T - t_1}{t_1} + v_2 \frac{T - t_2}{t_2} \tag{4}$$

From (1) we have:

$$v_2 \frac{T - t_2}{t_2} = - \frac{d_1 s_1}{d_2 s_2} \cdot v_1 \frac{T - t_1}{t_1} \tag{5}$$

Substituting this in (4):

$$\Delta(v_1 + v_2) = v_1 \frac{T - t_1}{t_1} \left(1 - \frac{d_1 s_1}{d_2 s_2} \right) \tag{6}$$

We may solve (1) for T :

$$T = \frac{t_1 t_2 (d_1 s_1 v_1 + d_2 s_2 v_2)}{t_2 d_1 s_1 v_1 + t_1 d_2 s_2 v_2} \tag{7}$$

and substitute this in (6):

$$\Delta(v_1 + v_2) = v_1 v_2 \frac{(t_1 - t_2) (d_1 s_1 - d_2 s_2)}{t_2 d_1 s_1 v_1 + t_1 d_2 s_2 v_2} \tag{8}^*$$

It is evident from (6), or more readily from (8), that if $t_1 > t_2$, i.e., if v_1 is the hotter gas, $\Delta(v_1 + v_2)$ will be positive, zero, or negative, according as:

$$d_1 s_1 > d_2 s_2; \text{ or, } d_1 s_1 = d_2 s_2; \text{ or, } d_1 s_1 < d_2 s_2.$$

In other words, there will on the whole be expansion, no change, or contraction, according as the product ds for the hotter gas is greater than, equal to, or less than that for the colder gas. The same conclusion is, of course, reached on the supposition that $t_2 > t_1$.

A table, given herewith, shows in round numbers the value of the product ds for some of the principal gaseous elements and compounds:

THE VALUE OF ds FOR SOME OF THE PRINCIPAL GASEOUS ELEMENTS AND COMPOUNDS

Substance	ds
Mercury, Hg (monatomic).....	2.4
Argon, A (monatomic).....	2.4
Helium, He (monatomic).....	2.5
Hydrogen, H ₂ (diatomic).....	3.4
Nitrogen, N ₂ (diatomic).....	3.4
Oxygen, O ₂ (diatomic).....	3.5
Hydrochloric acid, HCl.....	3.4
Hydrobromic acid, HBr.....	3.3
Hydriodic acid, HI.....	3.5
Nitric oxide, NO.....	3.5
Carbon monoxide, CO.....	3.4
Chlorine, Cl ₂ (diatomic).....	4.4
Bromine, Br ₂ (diatomic).....	4.4
Iodine, I ₂ (diatomic).....	4.2

*This result holds strictly only for gases which obey the laws of Boyle and Charles, and for which s is constant. It is independent of the units employed, so long as the temperatures are measured from absolute zero.

Iodine monochloride, ICl.....	4.1
Water vapor, H ₂ O.....	4.3
(s at 130-250°C.)	
Hydrogen sulphide, H ₂ S.....	4.1
Nitrous oxide, N ₂ O.....	4.9
Carbon dioxide, CO ₂	4.3
(s at 0°C.)	
Carbon dioxide, CO ₂	4.7
(s at 100°C.)	
Sulphur dioxide, SO ₂	4.9
Ammonia, NH ₃	4.3
Marsh gas, CH ₄	4.7
(Density of Hydrogen = 1.)	

It will be seen from the table, that the product ds , is approximately the same for a number of gases whose molecules are similarly constituted (Neumann's law); and that, as a rule, the gases with more complex molecules have also a greater value for ds , though this is not by any means invariably so. It must be borne in mind that the specific heat s , is in general a function of the temperature, its variation with the latter becoming marked when the gas is approaching liquefaction, or is undergoing dissociation or association.

The case where $d_1 s_1 = d_2 s_2$ (e.g. hydrogen and nitrogen), and where therefore (practically) no change in volume takes place on mixture, deserves brief consideration.

In this case, since the heat lost by the hot gas is equal to that gained by the cold gas, while at the same time the volume-pressure energy lost by the first is equal to that gained by the second, it follows that the fraction of the total heat-change which appears or disappears in the form of volume-pressure energy, is the same for each of the two gases. Or, in the language of the kinetic theory of gases, the ratio,

$$\frac{\text{change in translational energy}}{\text{change in total energy}}$$

is the same for the molecules of either gas. This is in accordance with the fact that for a gas which obeys the laws of Boyle and Charles (as was assumed for the gas under consideration), the value of the produce ds fixes that of the ratio between the two specific heats. For such a gas the ratio of the two specific heats is given by

$$\frac{s_p}{s_v} = \frac{2 ds}{2 ds - 1.98}$$

A report from Vice-Consul Rea Hanna, of Amoy, gives an American mining engineer's account of some mineral deposits in Fukien province, China. It is stated that a mountain of magnetite exists near Amoy, and zinc blende is also reported in the same neighborhood, while the natives bring in samples of rich antimony ore and graphite.

At Monkwearmouth colliery, Durham, England, a 6-ft. seam of coal at a depth of 1800 ft. is being successfully worked by the longwall system.

Mescal Canyon Coalfield, New Mexico

By CHARLES R. KEYES*

Mescal cañon extends along the eastern foothills of the Sierra de los Caballos, in Sierra county, New Mexico, and opens out into the Rio Grande valley at the northern end of the range. The recent discovery of important coal deposits in this locality is of special interest for the reason that it is the most southerly known fuel deposit occurring in the Southwest. The discovery also has an economic bearing which is of great value in that the deposit is 100 miles nearer the markets of Arizona and Mexico than any other known.

EXTENT AND QUALITY

The coal-bearing section is now known to be at least several hundred feet in

valuable data. The field is easily accessible to the railroad, being only 10 miles distant, and no heavy grading will be necessary.

At the present time the exact extent of the coalfield cannot be told. The geologic structure indicates that it is one of considerable area. It is not probable that it is a continuation of the Carthage field, nearly 100 miles to the north, although probably at nearly the same geological horizon. The present developments are on the west margin, where the strata are rather steeply upturned on account of proximity to a profound fault line. Eastward the rock layers rapidly assume a horizontal position. This opens up many square miles of promising ground for diamond-drill prospecting.

GEOLOGY OF THE BEDS

The exact geologic age of the coal-bearing section is believed to be the Laramie division of the late Cretaceous. Fos-

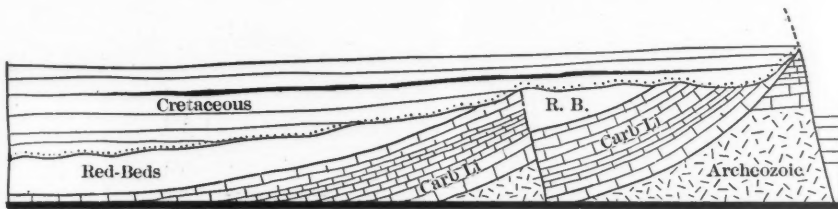


FIG. 1. GEOLOGICAL SECTION, MESCAL CANYON COALFIELD

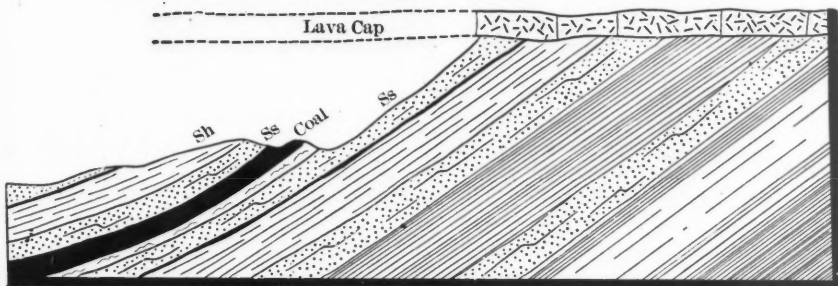


FIG. 2. MESCAL CANYON COAL SEAM

thickness, one dark shale bed alone being nearly 400 ft. thick. This section is composed of dark colored clay shales and shaly sandstones, and contains more than a dozen important coal horizons. Only one seam has as yet been opened up to a sufficient depth to determine its commercial value. At the point referred to a thickness of over 4 ft. of good coal is exposed. The coal at this mine is being used for a large power plant, from which electric wires are stretched several miles to supply the lead mines and concentrating mills lying to the southwest.

The quality of the coal is good. It is rather hard, clean and easily handled. The coal of this seam appears to have good coking qualities. Other seams are a foot or more in thickness on the outcrop. With development some of these may prove to be of workable thickness. Diamond-drill prospecting has produced

sil plants found in the beds associated with the coal seams fully indicate this conclusion.

On the other hand, extensive oyster and inoceramus beds occurring both above and below the horizon of the principal coal seam would suggest the Montana series. It may be, however, that the records of the terrestrial plants and marine animals are quite discordant, as it has recently been proved to be in other parts of New Mexico and as is rather to be expected.

The geological history and geologic structure of the immediate vicinity is rather complicated and puzzling. The Cretaceous beds are laid down over an old land surface, the substructure of which had been already profoundly faulted. These conditions have caused to be preserved a considerable thickness of Carboniferous red beds in close relationship to the Cretaceous.

There are everywhere in New Mexico extensive beds of Cretaceous and even Tertiary ages, showing marked red coloration, but these are readily distinguishable from the true red beds, which are of Permian or Triassic ages. Eliminating the effects of the most recent erosion, the stratigraphic relationships of the various geological formations as clearly displayed a short distance south of the coal outcrops, are represented in Fig. 1. The structural details of the coal seam are shown in Fig. 2.

The Lovejoy Culm Briquet

A new fuel, composed of a mixture of culm and tar, and compressed into blocks about the size of an egg, is being manufactured at the Lovejoy coal briquet plant, in Scranton, and is so successful that the Lackawanna Railroad Company has made a contract with the manufacturers to take the entire production. The process is a secret which is closely guarded, and the company will be unable to manufacture sufficient of the fuel to meet the demand of the Lackawanna railroad alone. It is understood that it is cheaper for the latter corporation to use this fuel than to burn its own culm, when it is taken into consideration that the Lovejoy company will pay royalties on the culm taken for the manufacture of the briquets.

The Reading Company's New Development Work

The Philadelphia & Reading Coal and Iron Company is about to begin work on what promises to become one of the largest coal operations in the world. The mine is to be located in the Reevesdale basin, about 5 miles east of Tamaqua. This region is known to contain some of the richest anthracite coal seams in Pennsylvania, which fact has been thoroughly proved by recent bore holes that have been put down. It is stated that the prospect work here carried on has cost upward of \$75,000. The breaker that will be erected will be the largest and most modern that is operated by the Reading Company. Plans are being made to construct several mining towns in this region in order to care for the miners and laborers who will be employed.

Streams for operating hydraulic mines are ordinarily used under a head varying from 150 to 300 ft. (Los Angeles Mining Review, March 30, 1907.) A much heavier pressure is extremely dangerous. Under all high pressures the nozzle or giant, as it is called, is securely anchored. A stream under 300 ft. head would instantly kill a man should he be so unfortunate as to be struck by the solid portion of it. Nozzles for hydraulicking vary in diameter from 2 to 10 in.—6 or 7 in. being the most common.

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Conveyer-system for Loading at the Coal-face

Certain Thin and Dirty Seams Can Be Worked Profitably by This Method When Other Systems Would Result in Loss

BY FLOYD W. PARSONS

Recent developments in the coal-mining industry are forcing operators to recognize the fact that former extravagant methods of development can no longer be practiced with success. This condition is brought about by the decrease in the available area of clean, thick coal seams. Especially is this true in the older districts where the operators are now compelled to work thin seams containing a large percentage of bone and slate.

The introduction of mining machines has come as a direct result of these new conditions, and such progress has been

made. Third, thin and dirty seams can be worked with machines when no other system would result in any profit. Fourth, holing is less frequently done in the coal, and as a consequence there is not so much slack produced. Fifth, there is a larger percentage of lump coal obtained.

The disadvantages of machines may be stated as follows: First, machines are not advisable where the coal is very soft or where there is danger of falls of roof. Second, they are not adapted where there are numerous faults or dikes. Third, they cannot be used to advantage when

that the conveyer is kept close up to the working face.

Especially is this conveyer system adapted to a coal seam where the vein is so low that cars can only be gotten to the face by the expensive method of taking down roof. It is also most essential that some system similar to the longwall method be adopted in working the seams. The conveyers can be driven either by electricity or air, and it is proved by experience that in many cases the loss of efficiency in the use of air is largely compensated by the greater simplicity of the

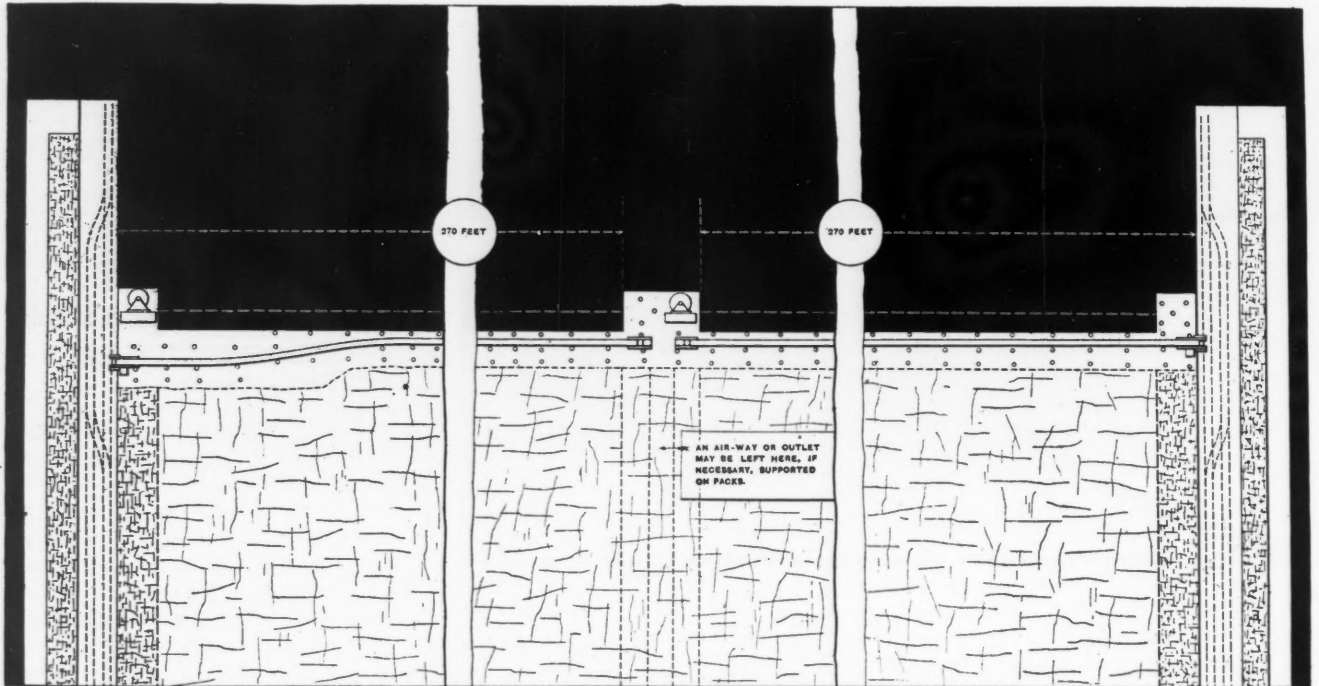


FIG. 1. PLAN OF ALTERNATIVE METHODS OF WORKING LONGWALL ON THE CONVEYER SYSTEM

made that nearly three-fourths of the entire coal output of some States is machine mined.

ADVANTAGES OF MINING MACHINES

The chief advantages of coal-mining machines are first, a more regular line of face is obtained, which facilitates ventilation and leads to more systematic timbering; this also causes the waste to be more uniform and permits the roof to be more easily supported. Second, greater rapidity of working is obtained which tends to keep down costs, causes the surface to subside more evenly and prevents the coal from deteriorating excessively from ex-

posure. Fourth, mining machines often mix considerable of the bottom rock into the coal that is loaded at the face.

WHERE UNDERGROUND CONVEYERS ARE SUITABLE

In working these thinner seams, it has been found that the costs of production are so high that the ordinary methods of mining cannot be profitably used. This has resulted in several companies both in this country and on the continent, providing underground conveyers for carrying coal from the coal face to the cars in the nearest haulway. These conveyers are so constructed that they can be moved with little expense and great rapidity, so

air-engine, especially in the hands of more or less untrained men.

THE VINTONDALE INSTALLATION

The principal example of this underground conveyer system in America is probably that installed at the Vintondale colliery in Pennsylvania. At this mine, the system has been in use for several years, and has resulted in greatly reducing the cost of production, and providing a profitable system where ordinary methods would certainly fail.

At this operation, the coal averages about 3 ft. 6 in. in thickness, is free from slate partings, and is soft and friable. The coal is bound tightly to both roof and floor, which makes it necessary to use a considerable amount of powder in blast-

Note—Abstract of paper read before the Institute of Mining Engineers of Great Britain by W. C. Blackett and R. G. Ware.

ing the coal. The roof of the seam is a blue slate, about 12 ft. thick, overlain by a layer of shale sand-rock. There are marked slips or crevices in the slate, making an angle of about 22 deg. with the line of the main heading. It is therefore necessary, that the line of the longwall faces be relatively perpendicular to the slips of the roof-rock; in this way the roof is more easily controlled.

The system of development is a modification of the longwall method, and is partly advancing, and partly retreating. Instead of pack walls being used, it is found cheaper and better to use timber cribs to support the haulage road. The coal territory in the mine is divided by a main heading and an air-course running practically with the pitch of the coal seam; this pitch is variable, the average being about 8 per cent. Coal pillars 80 ft. thick are left on each side of the main heading.

When the work of extracting the coal is started, timber props are used to support the space made vacant, and a considerable distance in the advancing direction is cleared before the roof becomes heavy enough to fall. This varies from 70 to 120 ft. When it is found that the roof is weighting heavily on the props, they are

adjacent to the outcrop, the face is advanced up the hill, and the roadway for the cars is protected by timber cribs until the block has been worked out to about 18 ft. from the upper heading. Then the adjacent block of coal near the main heading is attacked, and so on until the entire coal between the upper and lower heading has been exhausted.

When the work of the conveyer has been completed in any section, the heading rib, and the 18-foot pillar, left to protect the roadway, are drawn back by hand to the main heading.

METHOD OF OPERATION

The conveyer here used is of the pan type, 12 in. wide at the bottom, 18 in. at the top and 6 in. high. In the pan is run a malleable drag chain. This chain passes over a sprocket wheel at the head end, which does the driving, and returns over another sprocket at the rear end. Both front and rear ends are inclined; at the front to obtain height enough to allow the mine cars to pass under, and at the rear end to compensate for the necessary size of the sprocket wheel.

The conveyers are driven by a small double-cylinder air engine. The engine

is finished, and it occupies only about 20 min., some of the men are set to putting up a new break-row of props, adjacent to the lower side of the conveyer. At the head end the conveyer runner fills the timber crib in the heading and assists with the timber when he has finished this.

RESULTS OF THE SYSTEM

By the use of this conveyer the overhanging ledge has been materially reduced, inasmuch as the conveyer occupies less space than the track rails previously used, and thus the weight of the gob-timber is reduced. The height of the conveyer is small, and the work of shoveling into the same is easily accomplished. It is also possible, with this system, to have the conveyers distribute timber along the face. One further advantage in this method is that the mine cars used for the work can be of large capacity, as they travel in relatively high headings.

The work of the men where such a method is employed is concentrated and the maximum returns can be obtained from each laborer. It has also been noted that the percentage of large coal is materially increased, and that the men working at this kind of work make higher

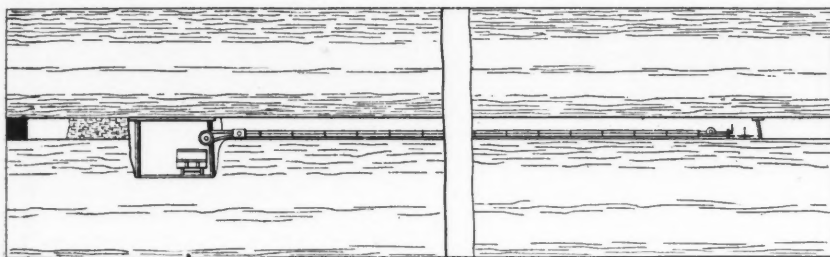


FIG. 2. LONGITUDINAL SECTION OF CONVEYER FACE

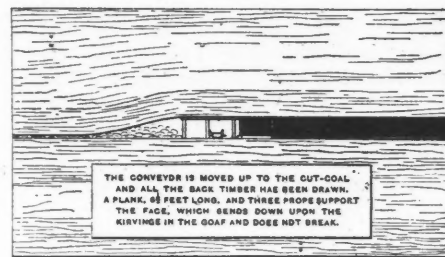


FIG. 3. CROSS SECTION OF CONVEYER FACE

removed, and good solid break-rows are set along the lower side of the conveyer; the roof is then allowed to fall in sections until the slate cover above the coal is all down. From this time until the heavier rocks above the slate begin to settle, great care has to be exercised and good break-rows maintained. It usually takes from one to two weeks for the heavier rocks to settle.

PLAN OF DEVELOPMENT

In preparing the mine for longwall faces, pairs of cross headings are turned off from the main heading at intervals of 500 ft., and these headings are driven to the outcrop. A barrier pillar 80 ft. thick, is left to protect the main heading, and at intervals of 270 ft. block headings are driven at right angles to the cross headings. It is important that these headings be driven on an absolutely straight line, for if they are driven crooked, considerable trouble is entailed in having to shift the conveyer forward or backward.

When the blocks of coal for the longwall development have been formed, the conveyer is installed, first in the block ad-

and gearing are mounted on a frame, separate from the conveyer proper, and power is transmitted by means of a steel roller chain to a sprocket wheel on the drive shaft of the conveyer. The power for operating the conveyer and the longwall machines is brought through a compressed-air pipe, 2 in. in diameter, from the heading above. Connection to the pipe is made by means of a 10-ft. length of a 2½-in. wire-wound hose from the pipe running down the heading to a second pipe, which runs the entire length of the face, and is attached to the conveyer. This conveyer pipe has outlets with 2-in. stop cocks at intervals of 48 ft. The hose of the compressed-air longwall machine is arranged so that it can be attached to these cocks.

After a specified length of coal face has been cut and loaded, and it is then desired to move the conveyer laterally to its new position on the face against the new line row of posts, which have been set by the machine men by the time that the loading is finished, the plan is to use any suitable kind of pulling-jack, of which several types are in use. As soon as the moving

wages per month than the men working by contract.

As to the pecuniary advantages of this system over any other method of working thin seams, it may be said in conclusion that the record at one mine, for the past three years of the cost of coal loaded into mine cars in comparison with the previous price for pick work, showed a saving of 48 per cent. over the latter method. Figs. 1, 2 and 3 show a plan and section of the general system. Several modifications which have recently been added to this general system have resulted in greatly increasing the efficiency of operations.

Open Lights Prohibited

In the Allegheny county, Penn., courts recently, Judge Young sustained the decision of the State mine inspectors that open lights and electric haulage could not be used in the Harwick mine of the Allegheny Coal Company, where 185 lives were lost by an explosion in 1904.

The Wolf Safety Lamp*

By L. H. HODGSON

In the Wolf safety lamp the many advantages of which have won for it a wide use, the oil vessel is made of one piece of steel pressed cold, and when finished it is doubly tinned, previous to which the top cover containing the wick, igniter and filling apparatus is fixed, and the vessel filled with specially prepared cotton-wool ($\frac{2}{3}$ ounce, which has a maximum absorption of 30 drams). The wick is brought to the bottom of the vessel, and is so regulated by the wick adjuster that it is impossible to obtain a smoky flame. It is necessary, before this can be attained, to burn a lamp, when first it is used, for a few minutes, and then the lamp attendant will determine how much wick should be left above the wick tube, so as to afford the maximum of light without smoking.

The friction igniter consists of a metal box fitted with a scratcher and a hinged door, to the outside of which is attached a thumb spring for fixing it into position. The pull bar, to which a scraper is connected, is placed (after the igniting strip is fitted into position) so that the scratcher and scraper come together, causing an ignition of the cap on the strip, and thus the wick is lighted.

OIL SUPPLY

To fill the oil vessel, so that only sufficient benzine is absorbed by the cotton-wool and that no liquid be left unabsorbed in the vessel, an automatic filling apparatus has been introduced; it is fitted with one or more taps, as may be found necessary. A glass reservoir is placed above the tap, with a capacity of 2 oz. (slightly more than the maximum absorption of the cotton-wool), and at the top a brass tube is inserted, extending on the outside to near the top of the tank; it is then bent and brought downward to the mouth of the tap. As soon as the cotton-wool has absorbed sufficient benzine, air rushes up the tube and prevents any further flow; and, consequently, should an oil vessel, containing, say, 9 drams, be put under the tap, only 21 drams more will be added before charging is automatically stopped. The top of the tank is provided with a safety-valve and inner cylinder, covered with wire-gauze (784 meshes per sq.in.) which allows any excess of air and vapor to escape. The larger apparatus, fitted with two or more taps, is placed on a cast-iron stand, and is additionally provided with a glass gage, a wing-pump, and circular stands, carrying the oil vessels, and these are, by a lever and counterbalance weight, brought up to

the required height for filling. The wing pump is attached by a pipe $\frac{1}{2}$ in. in diameter to the storage vessel placed adjacent to the lamp room, so that the attendant never needs to handle the liquid. The capacity of the tanks varies from 9 to 19 gallons.

To insure the safe locking of the lamp the oil vessel is provided with two threads, with a maximum thickness of $\frac{1}{8}$ in., in which three apertures are cut; into these the anchor head of the magnetic lock successively falls, when the parts of the

are used for all joints, and they have been found to be more durable than asbestos.

Inside the top ring supporting the bonnet a series of strong steel springs is fixed; they hold the glass firmly in position and are of such a tension that they take up the little expansion of the glass that takes place while the lamp is in use. The bonnet is made of seamless steel, pressed cold, and is treated in a similar manner to the oil vessel. Both the inner and outer gauzes are fitted with fixed copper rings, which insure that their normal shape will be maintained while being cleaned. The inner gauze is 4 in. high, $1\frac{3}{4}$ in. in diameter at the base, and $1\frac{3}{8}$ in. in diameter at the top. The outer gauze is $4\frac{1}{4}$ in. high, $2\frac{1}{4}$ in. in diameter at the base, and $1\frac{1}{2}$ in. in diameter at the top. It will thus be seen that there is a space of $\frac{1}{4}$ in. between the tops of the inner and outer gauzes and ample clearance at the sides; and, as the five standards or poles are only brought up to and fastened to the bonnet ring, an air space is thus provided, keeping the lamp cool.

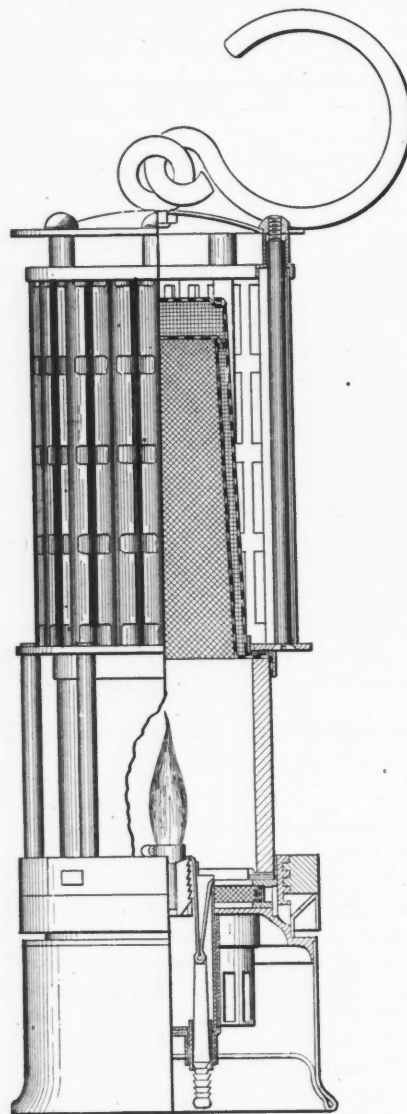
EFFICIENCY

It is essential that a safety lamp possess the attribute of safety under the known conditions met with in mines. The Wolf lamp will withstand a velocity of 47 ft. per sec. in an explosive current; the usual velocity in a main intake is, say, 12 to 15 ft. per sec., and round the face, say, 5 to 8 ft. per sec. Of course one may get a velocity of 90 ft. per sec., when cages are running in an upcast shaft; but no safety lamp yet manufactured can withstand such a velocity, excepting an electric lamp.

The Wolf safety lamp is capable of detecting as low as $\frac{3}{4}$ per cent. of fire-damp. It is fitted with a flat wick $\frac{5}{8}$ in. wide and gives a light equal to 1.43 c.-p., and, fitted with a round wick, it produces a light of 1.02 c.-p. The time of burning of this lamp is 16 hours when fitted with a flat wick and 20 hours when fitted with a round one.

Remembering that a lamp fitted with a flat wick $\frac{5}{8}$ in. wide, when fully charged with 30 drams, burns 16 hours, therefore, while burning 9 hours it will consume 16.88 drams during five days; and, at 14c. per gallon, the cost will be 92c. per lamp for a week of five shifts. With a round wick this cost is reduced to 74c. per lamp for five shifts. The oil vessel will only require to be loaded with the maximum charge 2.81 times during the five shifts for a wick $\frac{5}{8}$ in. wide and 2.25 times for a round wick. The life of the cotton-wool is considerable, it having been known to last 14 years.

The Courrières disaster on March 10, 1906, would not have been so appalling if those who survived the explosion had been able to relight their lamps. The colliery is now equipped with 4000 Wolf safety lamps.



WOLF SAFETY LAMP

lamp are fitted together, three distinct clicks being heard.

METHOD OF ASSEMBLING

The standard brass ring contains the magnetic lock, which is dust-proof. The air-inlet ring is fitted with double wire gauze, and for fixing the same firmly against the glass cylinder it is provided with two small projections, which are forced by a circular key through small slots in the standard ring, upon which they ride and are turned back to the check placed upon this ring. Perpetual washers

*From a report of the select committee on accidents in Scottish mines, in the *Transactions of the Mining Institute of Scotland*, Vol. XXIX, Part 2.

The Problem of Educating Employees

By W. E. Joyce*

After twenty years of existence the Jeddo Literary Club has disbanded and the library collected during that time, its furnishings, bric-a-brac, and club-house equipment are now being offered for sale.

For mining men everywhere there is much of interest in this announcement. The Jeddo literary organization was originally promoted by John Markle, managing partner of G. B. Markle & Co., the Jeddo coal operators, and now the largest individual shippers in the anthracite region. The passing of the literary club marks the decay of an ideal, and it is quite safe to predict that the effort will not be repeated by others in the coalfield when it comes to exercising philanthropy.

John Markle had fixed ideas about trained and educated workmen. He conceived the idea many years ago that if the mine owner could surround himself with men fairly well equipped mentally, or educated men, he must necessarily succeed in his mining by reason of better workmanship, better results in general, while the class of citizens would supply a standard for mining communities that would make of the coalfield a very desirable place in which to live. This theory is still held by some mining men who take another means for promoting.

THE LESSON OF EXPERIENCE

John Markle has found in practice and by direct contact with mine employees, that the idea of holding an educated laborer in your employ is impossible. He has found more than this; he is convinced that interference by the mine owner with the plans of employees, such as assisting in their entertainment and culture will never be accepted in the spirit in which it is given. During the past week an order was therefore issued by the Markle company withdrawing the privilege granted twenty years ago to the Jeddo Literary Club, the use of a building with conveniences. This is the first step in severing social relations, which, it was fondly hoped, would make the Markle mining corporation an Arcadia in the industrial field, beyond the reach of the labor agitator, and which would insure tranquility and mutual happiness during the life of the mining community.

The first jolt sustained by Mr. Markle which materially shook his faith in such a scheme came in 1900, when a general strike was ordered by the United Mine Workers in the anthracite coalfield. On the date named by the union for suspension, there was an almost unanimous withdrawal of workers from the mines of

the three anthracite districts. Here and there a mine continued to defy the order and efforts of the labor leaders. The one conspicuous exception to the general suspension was found at Jeddo, where the Markle mines continued at work almost to their full capacity. President Mitchell saw at once that there was trouble ahead for his scheme of winning the strike if such an important shipper continued to market coal while his army in the Wyoming and Schuylkill fields was faithful to the command. He did not then understand why there was hesitancy shown at Jeddo, and to overcome the difficulty he personally went into the Jeddo district. Then it was learned that years before the workers and the operators of the Jeddo mines had entered into a mutual agreement which bound the men to remain at work until efforts at arbitration had failed.

President Mitchell and Manager Markle debated the issues from the same platform, and for the first time the labor leader learned that he would be compelled to do some elastic stunts in reasoning because arbitration then was the great issue for the union, as it bore upon the other operators. By the force of his appeals Mr. Mitchell did justify a repudiation of his own argument, at least, to the satisfaction of his followers, and the Markle mines were forced to suspend as a result.

ABANDONED THEORIES

Up to that time Manager Markle had implicit confidence in his scheme to surround himself with educated workmen, and in their loyalty when it came to an issue between the labor agitator and his company. He had not only been active in providing club houses for the workmen, but had gone into the public schools. The best teachers available were secured for the Jeddo schools. He was a director of the borough board, and saw to it that the teachers received every needed encouragement.

After his failure to hold his men by the exercise of a supreme effort he concluded that he had been theorizing wrongly. He was ready to recede from his position. The strike cost the Jeddo company a large sum in dollars and cents, but it is doubtful if the monetary loss proved so keenly disappointing as did the realization of failure of his scheme to cement bonds of loyalty between mine owner and men that would resist the blandishments of the demagogue or appeals of the warmest organization champion.

The conclusions adduced found no fault with the men but with the idea he had himself evolved. He was convinced that the laboring man had his own ideas about liberty, and such ideas could not be changed by the employer. A strictly business relation alone should exist, and this system henceforth will be followed at Jeddo. The years of labor, however, have not been spent in vain as far as effects

upon the property are concerned, and as compared with other mines. The Jeddo operations are admittedly the best equipped and best manned of any in the anthracite region. It needs only a glance at the output and report of the State inspector to show that production to the percentage of employees places Jeddo in the front rank, while the system obtaining there, and the discipline among the men come as near the stage of perfection as it is possible to find in the mining district.

Work Mining and Milling Company

In the report of the Work Mining and Milling Company for the year ended March 31, 1906, the statement is made that important discoveries were made, by lessees in the Little Clara claim, of an orebody from which 12,884 tons of ore were shipped yielding \$842,748 gross and \$137,864 net after deducting freight and smelter charges and royalty.

Of this amount \$75,000 was paid in dividends, leaving a balance of \$73,724 in the treasury.

It was decided by the board of directors to grant a new lease for 2½ years on the expiration of the present lease of the Little Clara claim. The successful bidder was A. E. Humphreys. The financial statement follows:

Receipts from ore.....	\$856,063
Balance, April 1, 1906.....	14,735
Interest, etc.....	838
Total receipts.....	\$871,636
Sampling and treatment.....	\$140,378
Freight and haulage.....	18,711
Payment to lessees.....	557,071
Management at mine.....	1,410
Salaries and office expenses.....	2,684
Miscellaneous.....	567
Total expenses.....	\$720,821
Dividends paid.....	75,000
Total disbursements.....	\$795,821
Balance, April 1, 1907.....	\$75,815

Development is being done by six sets of lessees operating on other blocks of territory, but no important discoveries have so far been made.

In French patent 368,755, Aug. 9, 1906, N. Lecesne describes the industrial manufacture of zinc soaps. A suitable quantity (from 0.25 per cent.) of oleic acid or other fatty acids is mixed and thoroughly incorporated with zinc oxide and a little water, the fatty acids being used either pure or diluted with boiled oil. The resulting zinc soap can be mixed into an emulsion with raw or boiled oil, and the emulsified oil will then form a thick paste with zinc oxide or other pigment, and the constituents will not separate even on prolonging standing. It is claimed that in this way the covering power and qualities of resistance looked for in lead pigments are imparted to zinc oxide.

*Freeland, Penn.

Colliery Notes, Observations and Comments

Practical Hints Gathered from Experience and from the Study of Problems Peculiar to Bituminous and Anthracite Coal Mining

DEVELOPMENT AND MANAGEMENT

The diffusion of fire damp in a mine is much more rapid than that of the carbon dioxide or after damp.

Wash-houses are required by law in Nova Scotia at every mine employing more than 12 men underground. The best practice seems to be to have concrete floors and to utilize exhaust steam to heat the wash-house.

Most of the coal mines of northern Cape Breton are submarine workings extending in some cases a mile from shore. In order to make the workings as safe as possible, the law requires that no seam shall be worked under less cover than 180 ft. of solid measures.

It has been found that the average ton of coal burned for steam-making purposes equals two tons of dry peat; $2\frac{3}{8}$ tons of average dry wood; $2\frac{3}{4}$ tons of dry tan bark; $2\frac{7}{8}$ tons of cotton stalks; $3\frac{1}{2}$ tons of barley and wheat straw; 7 tons of wet tan bark; 0.44 ton of natural gas, or about 30,000 cu.ft., and 0.55 ton of petroleum.

In working a seam of coal by the pillar-and-stall system, the proper size of the pillars depends to a great extent, on the depth of the seam from the surface and the strength of the roof and floor. For a seam 200 ft. deep with fairly good floor and slate roof, 26-ft. pillars and 24-ft. chambers is the practice in the anthracite field.

A 15,000-lb. electric locomotive, with the current commonly employed, will run at a speed of from 6 to 10 miles per hour, and exert a draw-bar pull at full running load of 2100 lb. when the haulway is level; on a 1 per cent. grade, the draw-bar pull is 1950 lb.; on a 3 per cent. grade, 1650 lb.; on a 5 per cent. grade, the draw-bar pull is approximately 1350 lb.

The advantages which result from using a jet condenser are the low first cost, the fact that it occupies less space, and its high efficiency. The heat lost by radiation is small, but the water used must be pure so as to be available for feed-water purposes; while the water used for the surface condenser need not be so pure, as it does not go into the feed water.

A recent investigation instituted to compare a disk machine and a chain-breast mining machine showed that the latter requires about 30 per cent. less power, made only half the noise, and would not climb up or down in the coal. On the other hand, such a machine requires about 12 ft. of space between the face and the

timbering, and this cannot be provided in many coal mines at present.

The Colorado Fuel and Iron Company maintains a sociological department for the purpose of bettering the social conditions of its employees. Among the betterments it has introduced are public schools, good teachers, free text-books, model dwelling houses, reading rooms, club houses, wash-houses and the excellent central hospital at Pueblo.

The Luzerne county commissioners have fixed the valuation of coal in that Pennsylvania region at \$67 per ft. acre, after considering the question for a number of weeks. The city assessors for the city of Wilkes-Barre fixed the value this year at \$100 per foot acre. This action is the most important of the moves incident to the readjustment decided upon. The companies have appealed on the ground that the rate is too high.

The Dominion Coal Company in Canada maintains a series of fire brigades at each of its collieries. A number of the best men are chosen for membership, and they are given comfortable quarters in one of the colliery buildings, where they may smoke and spend their evenings. Interest is further aroused by frequent contests between the different brigades in relay racing, hose reeling and coupling contests for a prize offered by the coal company.

In stripping an anthracite-coal seam, cableways are sometimes used in removing the wash and loose rock deposits over the coal. The cost of transporting the overburden varies with local conditions and also depends upon the distance to which the waste is carried before dumping. This cableway can also be used when mining coal. In practice the maximum length of a single span is 1200 ft.; loads 6 tons, traveling speed 750 to 1000 ft. per min.; speed of hoist, 200 to 300 ft. per minute.

One statistician estimates that the total coal area in the United States is approximately 400,000 square miles with an average thickness of $6\frac{1}{2}$ ft. The total amount of coal under the above conditions would be 1,500,000,000,000 tons. In 1905 we used nearly 393,000,000 tons, and in 1906 about 410,000,000 tons. In all we have used, in round figures 6,000,000,000 tons, so that the total area worked out is a little less than 1,000,000 acres up to the beginning of 1907. At the rate of production during the past few years, the supply of coal in the United States would last about 4500 years, according to this estimate.

Experience has shown that the angles at which props should be set depends on the inclination of the seam. The higher the pitch of the seam the greater the angles of props. The following are the results of careful observations:

Pitch of Seam	Under set of Props
5 deg.	0.5 deg.
10 "	1.0 "
15 "	1.5 "
20 "	2.0 "
25 "	2.5 "
30 "	3.0 "
35 "	3.5 "
40 "	4.0 "
45 "	5.0 "
50 "	6.0 "
55 "	7.0 "
60 " and over	8.0 "

A practical mine track-layer imparts the following advice: In laying mine rails the ties should be carefully spaced, about 2 ft. center to center. The rails should be well spiked to the ties with 4 spikes per tie. The joint of two rails should be midway between the two joints on the opposite rail. In locating spikes care should be taken so that they are not all in the center of the ties, otherwise, it will cause a tendency to split the ties. The dimensions of ties should be 5 in. face, 4 in. deep and 5 ft. 6 in. long for narrow gage, rails should be 16 to 20 lb. per yard. For gangways and mechanical haulage roads, ties should have a 6 in. face and be 5 in. deep, while the rails should be 35 to 40 lb.

The first consideration in constructing siphons is that the pipes and joints should be made in such a way as to prevent inward leakage of the air, otherwise the apparatus is useless. They should be laid as regularly as practicable, either vertically or horizontally, because if not regular, the air which cannot be prevented entering along with the water will accumulate at the highest points and thus destroy the action. Provisions should be made for charging the siphon at the beginning, and sometimes, when so much air has entered as to injure the work. To do this a tap is placed at the discharging end so that it may be closed and opened by hand and a light clack is placed in the pipe at the feed end. The clack will open and keep it open when the siphon is at work and close when the top is shut at the discharging end, so as to keep the siphon charged when not working. The maximum height the water will rise in a siphon is 27 feet, but in practice this seldom exceeds 21 feet.

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The Average Price of Copper in 1906

All of the Lake companies, which publish detailed reports of their operations, now having made their statements to their stockholders covering the year 1906, in accordance with our usual custom we make comparison of the prices actually received for their output of copper during the year with the average for the year as shown by the market reports of the JOURNAL. Omitting the few companies which did not begin to produce until the latter part of the year, or greatly increased their output during the latter part of the year, when the price rose so largely; and omitting the Atlantic, which produced only a portion of the year, the following table shows the figures given by the Lake companies, which have published their reports:

RECEIPTS OF LAKE COPPER COMPANIES, 1906.

	Pounds.	Value.	Per Lb.
Adventure	1,552,628	\$292,823	18.860c.
Allouez	3,486,900	667,567	19.145
Baltic	14,397,557	2,742,403	19.05
Centennial	2,253,015	439,516	19.51
Champion	16,954,986	3,231,329	19.06
Isle Royale	2,937,098	552,468	18.81
Mass	2,106,739	411,235	19.52
Michigan	2,875,341	568,399	19.77
Mohawk	12,723,515	2,493,809	19.60
Osceola	18,588,451	3,511,358	18.89
Quincy	16,194,838	3,157,993	19.50
Tamarack	9,832,644	1,853,453	18.85
Trimountain	9,507,933	1,791,715	18.85
Total	113,411,645	\$21,714,068	19.146

The average price for Lake copper in 1906, as reported by the JOURNAL, was 19.616c. per lb. The average actually received by 13 companies, producing 113,411,645 lb., or a little more than one-half of the total production of the Lake Superior region, was 19.146c. per lb. The highest price received was 19.77c., which was realized by the Michigan on a small output. The Mohawk received 19.60c. for a comparatively large output, while the Mass, Centennial, and Quincy, each received about 19.50c.

The great variation among the prices received by the several companies, and also between their own averages and ours, is extraordinary. There is always a variation among the averages of the companies, because all of the copper is not of the same grade; it is not all sold with the same skill, and mistakes are often made in forecasting the market. In 1906 some of these factors were exaggerated, and some were conflicting. In the early part of the year, when there was a decline in the market, some companies continued to sell copper, while others withdrew from the market, and did not sell any at all. In the latter portion of the year, when the

market was rising, nearly all of the companies sold ahead, though for different periods. These factors are natural ones which always exist, but a comparison extending over a whole year, for a number of companies, and a reduction to a general average tend to equalize the variations. In this respect, however, 1906 was an exception, owing chiefly to the intensification of some of the conditions mentioned above.

Another Smelter-smoke Decision

Another decision bearing upon the troublesome smelter-smoke problem has been rendered, the Supreme Court of the United States having held, May 13, that the State of Georgia has the right to protect its forests, and that the Tennessee Copper Company and the Ducktown Sulphur, Copper and Iron Company can be enjoined from operating their smelting works in such a way as to cause damage to property in the State of Georgia. The works of the Tennessee Copper Company are about one-fourth of a mile distant from the State line; those of the Ducktown company are a little farther away. The text of the decision is not yet available, wherefore it is premature to discuss what effect it may have upon similar litigation elsewhere. The companies fought the case on constitutional grounds, arguing that the State of Georgia had no right to bring suit where individual citizens alone were concerned. Apparently, the Supreme Court did not take that view, holding rather that a State has the right to protect its citizens when their property is subject to damage by operations conducted in another State. Inasmuch as the decision involved such broad constitutional grounds as the relationship between sovereign States, it is likely that the decision in this case, or, at least, portions of it, will have no bearing upon similar litigation in the West. So far as we are aware, the only other smelting works in the United States which are operated under precisely parallel conditions is that of the Orford Copper Company, at Constable Hook, N. J., the smoke from which frequently blows across the Kill van Kull into the State of New York; however, in this case there is no litigation, although there is considerable complaint against the nuisance.

We understand that neither of the smelting companies in Tennessee will be immediately affected by the decision, it

being the intention both of the Supreme Court and of the State of Georgia to allow them time to inaugurate new plans. As a matter of fact, the Tennessee Copper Company has been for a long while engaged upon the construction of a sulphuric acid plant, which will take care of a large portion of the sulphurous gas which heretofore it has been discharging into the atmosphere. It is hoped that this plant will be ready to go into operation during the coming summer, after which the gas discharged will be so much reduced in volume that the atmospheric dilution will prevent it from being any longer a nuisance. So far as we are aware, the Ducktown company has not yet made any plans as to this matter. Both these companies are singularly fortunate, as compared with those at Salt Lake City and elsewhere, in that they are situated in a portion of the country where there is a large market for sulphuric acid. Thus, the Tennessee Copper Company, under the able technical direction of J. Parke Channing, its president, has already entered upon this efficient means of disposing of sulphurous gas upon its own initiative, as a strictly commercial step. However, this has required careful study, and a good deal of time for the development of the plans, inasmuch as the company is boldly entering upon a new departure in the manufacture of sulphuric acid, namely, the utilization of the gas discharged by pyritic-smelting blast furnaces. The scheme is undoubtedly feasible, as the management of the company is distinctly convinced; but, nevertheless, its boldness in trying it for the first time in the world deserves proper recognition.

Paternalism in Engineering

In discussing the question of the utilization of black sand, which we raised in our issue of April 13, a correspondent, whose communication was published recently, and another whose letter is printed in this week's issue, inquire why the work inaugurated by the Geological Survey and carried to a certain point should not be further extended by the Survey, exception being taken to our remark that such extension would be outside of the province of the Survey. The reason is simply that the American people are not yet prepared to go so far in Government paternalism in engineering.

The prime function of a government is to govern. The civilized world in general has departed more or less from that fundamental idea, but it is still conceived to be a wise policy that a government should not undertake work that the people can and ought to do for themselves. Confining our remarks to the U. S. Geological Survey, it is well recognized that it has far exceeded its natural purpose of conducting a topographic survey of the interior of the United States and making such studies in geological science as are required to determine the value of the public lands. No one will criticize the immense value of the services that the Survey has rendered, or will desire to limit its scientific investigations to narrow lines, although it may be pointed out that it has in some instances improperly and unwisely encroached upon the field of the geological surveys of the several States; but the Survey has been severely criticized in the past for its ventures into the general field of engineering, and for many years has not overstepped the line. The coal investigation and black-sand investigation were made by the direct order of Congress, as special investigations, and of course Congress, as the representative of the people, has the right to do whatever it pleases within the limits of the Constitution. If Congress should order the Geological Survey to go further in the black-sand matter, it would do so, but otherwise it will not and cannot because the engineering part of the problem is outside of its province.

It is unnecessary to discuss at any length the objections to paternalism in industries. There is no more reason why the Government should undertake to show the people of this country how best to mine black sand than there is why it should attempt to show them the best way to manufacture shoes, weave cloth, design automobiles, or do other useful things. We have a great and growing engineering profession, whose business it is to promote industrial development. The history of the United States, as well as of the rest of the civilized world, shows that this body has been efficient. There is no reason why the Government should encroach on the field of private effort. It would be wrong to do so. Some governments have gone further than others in this sort of paternalism. Some of the immediate results are demands for bounties on production and miscellaneous scandals. The

recent experience wherein statements of the U. S. Geological Survey in connection with its black-sand investigation were circularized by an impudent private company as an indorsement for the sale of stock is an example of what would happen; and is quite sufficient to keep the Geological Survey out of further contact with commercialism, at least in that particular line.

Charles Haynes^o Haswell

Charles Haynes Haswell, who died on Monday of this week in his ninety-eighth year, although never personally active in mining, was a friend in need to many a mining engineer. His "Mechanics' and Engineers' Pocket-book" has been the companion and guide of thousands engaged in mining operations. That pioneer of those collections of concentrated facts, which have since become indispensable in the various specialized branches of engineering, passed through 75 editions in the original language and has been translated into 69 foreign tongues.

Mr. Haswell's life bears testimony to the healthfulness of engineering pursuits. During his long and active life he saw the remarkable engineering development of the past 80 years, the most active industrial period in the world's history. He began the construction of steam engines in 1827 and joined the United States Navy as chief engineer in 1836. Although his more important labors were connected with marine engineering, his activities extended to other fields. He built many public works about the harbor of New York, and the development of the steam engine owes much to his efforts. He designed the machinery for 10 United States war vessels and in 1847-48 he drew up the plans for the entire boiler and engine equipment of the steam frigate "Powhatan," personally designing every detail and making all the working drawings with his own hands.

He wrote many treatises on engineering subjects and was the author of a number of papers of a more popular character, among others of "Reminiscences of an Octogenarian of New York, 1816 to 1860." He was in active service as a consulting engineer until his death, tall and erect, a commanding figure, and was always proud of the title "engineer."

Metallics

Saws to be used in mines need a wide set.

The miner who continually complains of the other shift frequently, and almost always, requires investigation himself.

A miner caught hiding tools should be dismissed. He not only keeps others from using the tools that he has hidden, but when he leaves, the tools are almost sure to be lost.

A stope where all the miners are friendly will accomplish more than one divided into factions, unless one can induce a healthy rivalry in regard to the amount of work done.

The shift boss should be a good enough miner himself to be able to make a pretty good guess at what is a day's work at each place. The ground broken by the miner, the rock put in the box by the mucker, shows whether a shift's work has been done or not.

The Joplin district is now supplied with natural gas, piped from Southern Kansas. For burning under boilers, the gas is supplied at 10c. per 1000 cu.ft.; for use in gas engines, the price is 25c. per 1000 cu.ft. In either way, great economy is realized as compared with coal in the old practice.

The dynamo made electrolytic copper both possible and necessary. The consumption of copper required in the generation and transmission of electric power has many times exceeded the output obtainable from the few sources of the native metal which yield a product of satisfactory conductivity without electrolytic treatment.

In reply to an inquiry: In the purchase of ore the "unit" is 1 per cent.; consequently, in the case of the ton of 2000 lb. it corresponds to 20 lb., and in the case of 2240 lb. to 22.4 lb. A lead ore containing 30 per cent. lead, to be paid for at the rate of 40c. per unit, would be worth \$12. A pyrites containing 40 per cent. sulphur, to be paid for at the rate of 11c. per unit, would be worth \$4.40.

The temperature coefficient of electrolytes is large and varies with the temperature. The practical effect of the change in temperature upon the resistance is rather complex. The transfer resistance exhibits a very large temperature coefficient, while the contacts and metallic conductors are not appreciably affected. The resultant coefficient figured from the switchboard is approximately 0.5 per cent. per degree Fahrenheit.

Contact resistances in electrolytic copper refining are met with at the joints in the main bars and at the connections between bars and electrodes. The joints in the main bars should be equal in conductivity to the bar itself. This standard can easily be attained if the bars are properly faced. Three or four hundred amperes

per square inch of bearing area will give no trouble. The contacts between the electrodes and the main bars are variable. A single contact will run from 0.000005 to 0.0005 ohm, according to the cleanness of the engaging surfaces and the pressure.

In small, irregular veins the leaser can invariably do better than the company. He has a keener scent for ore than the average foreman; he is free from administrative expenses; he takes risks that the company can not; and when the mine is in *borrasca* he will work for less than the regular wage in the hope of recouping himself when the mine comes again in *bonanza*. There is many a mine in the United States which has been unprofitable under company management and has become profitable when turned over to leasers.

European smelters, in buying zinc ore, take as the basis the price for spelter (average for good ordinary brands) at London, as reported by the *Public Ledger*, during the month of the arrival of the shipment. In the case of contracts covering the output of a year or more, it is sometimes provided that the settlement basis shall be the average price of spelter for the year. Provisional settlements are made on the monthly averages, but at the end of the year a final computation is made and the difference between it and the sum of the monthly settlements is debited or credited as required.

Most accidents from drilling into missed holes occur in development work and very seldom in stopes. From the nature of overhead stoping it is generally easy to judge where to look for a missed hole; generally the fuse, still in the hole, renders it impossible not to notice it. A rough diagram of the cross section of the winze, shaft, raise or drift can be drawn by any miner. By means of a small circle and an arrow, whose direction indicates that of the hole and whose length the relative length of the hole, the position of the holes can be easily and clearly indicated. Such a card enables any miner to see quickly whether all the holes have been fired or not.

Transfer resistance is the name which has been given to a liquid resistance, the nature of which is not fully understood. If we make a series of measurements of the voltage drop between a pair of electrodes at varying current densities, Ohm's law requires that a current-voltage plot should be a straight line. Where this line cuts the ordinate of zero current is a measure of the counter electromotive force present. If we analyze the results, however, we shall find that the indicated specific resistance of the electrolyte is higher than it should be, and that the discrepancy is greater the nearer were the electrodes spaced during the measurements. The most probable explanation seems to be that there are minute bubbles of gas in the neighborhood of the electrodes, due

to slight generation of hydrogen and oxygen. The transfer resistance is greatest in the high-acid electrolytes and at low temperatures. Its practical effect is to reduce the gain to be expected by spacing electrodes close together and from increasing the acidity of the electrolyte, and to increase the gain to be expected from heating the electrolyte.

In the purchase of zinc ore, the terms offered by European smelters include various provisions, which must be given consideration. The basis of settlement is always c.i.f. at some specified port, usually Antwerp. A percentage of the value of the consignment, say 75 per cent. or 80 per cent., may be drawn upon remittance of the bill of lading; the remainder upon arrival of the consignment, and determination of its assay value. In connection with the latter, the zinc must be determined by the Schaffner method (sodium sulphide titration). Differences of one unit or less between the assays of the buyer and seller are split. Differences in excess of one unit are umpired. The umpire must be an European chemist (specified in the contract). His result is accepted as final if it fall between those of the buyer and seller. If it fall outside, the original assay which is nearest to the umpire's is taken. The party whose assay is furthest from the umpire's pays the expense of the latter. These conditions as to umpire-assays are the same as obtain in the settlement for ores in the United States.

When the pay streak is narrower than the minimum width of efficient stoping, say 3 ft. 6 in., the cost of production per ton of ore increases directly as the width of the pay streak decreases. If for example we should have a pay streak of solid blende 12 in. wide and 30 in. of quartz beside it, all of which would have to be removed in stoping, a square foot of vein would yield (assuming clean separation of the minerals to be possible, which, however, would never be entirely practicable) 1 cu.ft. of blende weighing about 250 lb., and 21½ cu.ft. of quartz weighing about 412.5 lb., wherefore out of every ton of material broken there would be obtained three-eighths of a ton of blende, and if the cost of mining per ton of material were \$3, the cost per ton of blende would be \$8. If the blende assayed 60 per cent. zinc, the mining of a 12-in. streak would be equivalent to the mining of a 3½-ft. streak assaying 22.5 per cent. zinc, but the solid streak would have the advantage of avoiding the milling expense. The ultimate comparison, however, would depend greatly upon the cleanness with which the ore could be broken down and handled. In the case of ore which must be milled, the cost of production per ton of concentrate is obviously dependent chiefly upon the yield per ton of crude ore and the cost of mining the latter.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information

CORRESPONDENCE AND DISCUSSION

Utilization of Black Sand

I have read with interest the articles on black sand that have appeared from time to time in the JOURNAL. Your editorial in the issue of April 13 especially appealed to me, for I believe you have sounded the keynote of the problem, upon the solving of which alone depends the success of the now failure-ridden black sand operations.

It has been my privilege to give this subject much study and investigation during the past two years, and I have as yet failed to find a single operation that met with any degree of success, or, with the possible exception of a stock company or two using doubtful methods, that even claimed any degree of success.

That it is a topic of vital interest to the mining public I am prepared to say, for I have personally interviewed hundreds of mining men and miners on the subject, and received hundreds of letters from like sources. They all say and write practically the same thing. The placer miner: "How can we economically save the black sands that we know are carrying away a large, or the larger, proportion of our values?" The prospective beach and placer miner: "How can we economically obtain a first low-grade concentrate suitable for further treatment by known successful methods that will make our now worthless properties pay?"

COLLECTING THE SANDS

That there are millions of dollars in gold and platinum metals distributed along the beaches and rivers of the Pacific slope is a well known fact to all who have given the subject the least attention. The problem of saving these values, however, has not been solved, and your statement that it is a problem of obtaining a rough black sand concentrate at low cost is, in my opinion, the whole problem.

The United States Geological Survey, in the black sand investigation conducted in Portland, has proved beyond a doubt that the ordinary concentrating table, aided by magnetic separation, could produce a very rich and marketable product from the heavy sluice and riffle sands and cocoa matting material, but it has not entered into the greater problem of obtaining these sands commercially.

You have solicited ideas and information from your readers as to what they consider the best means of approaching the problem. Personally it has not been my privilege to experiment along these

lines at all, nor can I say I have consistently followed the experiments of others; hence I would refrain from speaking of the various methods that have come within my observation, many of which I know are and have been of great value and aid in regular placer and dredge operations as a small side issue.

What I would say is this: Is it not a matter of enough vital importance, not only to the placer miner, but to all users of the metals produced, that this problem be given consistent experimentation? The United States uses more platinum than all nations combined, yet this country is looking to the foreign countries for its supply when it has tons within its own borders.

A PROBLEM FOR THE U. S. SURVEY

Again, is it not a matter of enough importance for us to insist that it is the duty of the mining department of the U. S. Geological Survey to enter upon such consistent experimentation? The survey has brought these demands upon its own head; it has shown to the miner, and to the world the wonderful values scattered along the western beaches and rivers. This knowledge has created the desire to be shown how these values can be obtained. Such experimentation is of too general benefit, and has a scope too large for even the richer mining operators to undertake. A mining concern would have the benefit of the advice of an engineer or two, while the Survey has access to the combined skill and advice of the best engineers and mechanics throughout the country.

I believe the JOURNAL could do nothing of more general benefit to the mining and metal-using public than take the lead in these demands upon the Survey, and in so doing would add another laurel to the many it now holds. FRED H. HAZARD.

Portland, Ore., April 22, 1907.

Concentration of Manganese Ores

I read with considerable interest E. K. Judd's article in the JOURNAL of March 9 on the "Crimora Manganese Mine." It appears that the jig concentrates are obtained in four sizes, of which the largest is not greater than $\frac{3}{8}$ in. It would be interesting to know the composition of these concentrates and the way in which they are used. In India all ore of such small size is at present thrown away, no doubt owing to the ease with

which large quantities of lump ore can be quarried. But if the miners knew that there was a market for smalls they might endeavor to save them.

Mr. Judd also mentions the quartzite conglomerate, of which the cementing material is manganese oxide, as being stored for a possible future market. Details as to how material containing such a small percentage of manganese and such a large percentage of silica could be profitably made use of, together with the points I have raised in connection with the jig concentrates would form the subject of an article that would probably interest a large number of your readers.

L. L. FERMOR.

Geological Survey of India Calcutta, India, April 18, 1907.

Mining Reference System

Is there any practical, topical classification for mining and mining engineering references, to be used in the form of a card index? If there is, we should be glad to know of it. N. E. B.

May 8, 1907, Binghamton, N. Y.

We do not know of any such classification that has been published, but the following might be used.

- I. Boring.
 - a Churn drills. b Rotary drills.
 1. Diamond drills. 2. Calyx drill.
- II. Breaking Ground.
 - a Hand tools. b Machine drills.
 1. Standard air drills. 2. Air-hammer drills. 3. Electric drills. c Air compressors and air transmission. d Channelling machines. e Coal cutters.
- III. Explosives.
- IV. Support of Excavations.
 - a Timber. b Metallic. c Masonry.
- V. Methods of Mining.
 - a Overhand stoping. b Underhand stoping. c Mill-hole. d Caving. e Room and pillar. f Long-wall.
- VI. Surveying.
 - a Surface. b Underground.
- VII. Haulage.
 - a Tramways-Underground.
 1. Hand. 2. Horse and mule. 3. Electric. 4. Compressed air. 5. Rack-rail. 6. Mono-rail. 7. Shaking chutes, etc. b Tramways.
 1. Surface. 2. Aerial.

- VIII. Hoisting.
- IX. Pumps.
- X. Ventilation.
- XI. Lightening.
- XII. Placer Mining.
 - a Ordinary.
 - b Hydraulic.
 - c Dredging.

Treatment of Tonopah Ores

My attention has been called to an error in an article entitled "Treatment of Tonopah Ore," in the JOURNAL of April 27 1907. The experimental work which led to the adoption of the process for the treatment of the Montana Tonopah ore was performed by me as the company's metallurgist. The general outline of the milling scheme was drawn up by me and not by Mr. Bosqui as stated and I think Mr. Bosqui will make no claim to the credit. By agreement the Montana Tonopah company pays me a bonus for the process which has been adopted.

F. M. FIELD.

Rhyolite, Nev., May 7, 1907.

Assay of Copper Ores for Precious Metals

The method given by A. R. Crook on page 853 of the JOURNAL has one objection, namely, the addition of salt solution to the nitric-acid solution which also may contain free sulphuric acid.

I note that Mr. Crook takes care to have his solutions very dilute, but even in the cold and in dilute solutions, nitric acid will act on salt, forming hydrochloric acid, and this with the excess of nitric will form aqua regia in sufficient quantity to attack some of the finely divided gold which occurs in copper ores.

I prefer to filter off the gold residue and to precipitate the silver from the filtrate, then add it when filtered to the gold residue and fuse the two together in the same manner as Mr. Crook describes, in a crucible.

HENRY WATSON.

Chicago, May 7 1907.

Legal System of Mine Bell Signals in California

The California State Mining Bureau furnishes copies of the act establishing a uniform system of mine bell signals in that State. The law makes the use of the following signals compulsory in all mining operations:

- 1 bell, to hoist (See Rule 2.)
- 1 bell, to stop if in motion.
- 2 bells, to lower. (See Rule 2.)
- 3 bells, man to be hoisted; run slow. (See Rule 2.)
- 4 bells, start pump if not running, or stop pump if running.

- 1—3 bells, start or stop air compressor.
- 5 bells, send down tools. (See Rule 4.)
- 6 bells, send down timbers. (See Rule 4.)
- 7 bells, accident; move bucket or cage by verbal orders only.

- 1—4 bells, foreman wanted.
- 2—1—1 bells, done hoisting until called.
- 2—1—2 bells, done hoisting for the day.
- 2—2—2 bells, change buckets from ore to water or *vice versa*.
- 3—2—1 bells, ready to shoot in the shaft. (See Rule 3.)

Engineer's signal, that he is ready to hoist, is to raise the bucket or cage two feet and lower it again. (See Rule 3.)

SEC. 2. For the purpose of enforcing and properly understanding the above code of signals, the following rules are hereby established:

Rule 1. In giving signals, make strokes on bell at regular intervals. The bar (—) must take the same time as for one stroke of the bell, and no more. If timber, tools, the foreman, bucket or cage are wanted to stop at any level in the mine, signal by number of strokes on the bell, number of the level first before giving the signal for timber, tools, etc. Time between signals to be double bars (— —). Examples:

6—5 would mean stop at sixth level with tools.

4—1—1—1—1—1, would mean stop at fourth level, man on, hoist.

2—1—4 would mean stop at second level with foreman.

Rule 2. No person must get off or on the bucket or cage while the same is in motion. When men are to be hoisted, give the signal for men. Men *must* then get on bucket or cage, *then* give the signal to hoist. Bell cord must be in reach of man on the bucket or cage at stations.

Rule 3. After the signal "Ready to shoot in shaft," engineer must give his signal when he is ready to hoist. Miners must then give the signal of "Men to be hoisted," then "spit fuse," get into the bucket, and give the signal to hoist.

Rule 4. All timbers, tools, etc., "longer than the depth of the bucket," to be hoisted or lowered, must be securely lashed at the upper end to the cable. Miners must know they will ride up or down the shaft without catching on rocks or timbers and be thrown out.

Rule 5. The foreman will see that one printed sheet of these signals and rules for each level and one for the engine room are attached to a board not less than 12 in. wide by 36 in. long, and securely fasten the board up where signals can be easily read at the places above stated.

Rule 6. The above signals and rules must be obeyed. Any violation will be sufficient grounds for discharging the party or parties so doing. No person, company, corporation, or individuals operating any mine within the State of California shall be responsible for accidents that may happen to men disobeying the

above rules and signals. Said notice and rules shall be signed by the person or superintendent having charge of the mine, who shall designate the name of the corporation or the owner of the mine.

SEC. 3. Any person or company failing to carry out any of the provisions of this act shall be responsible for all damages arising to or incurred by any person working in said mine during the time of such failure.

Mica Deposits of North Carolina

The mica deposits of western North Carolina have been examined by several investigators. A brief paper on the subject, prepared by Douglas B. Sterrett, appears in Bulletin No. 315 of the United States Geological Survey, "Contributions to Economic Geology, 1906."

Active mica mining has been carried on in North Carolina for the last 38 years, though with varying degrees of energy and success; and the remains of ancient workings, with crude stone tools, around some of the better deposits, suggest early mining by the aborigines or prehistoric people. It is claimed that the earliest mica mining in the State was done in Jackson county in 1867, by a Mr. Person, of Philadelphia. After a number of years depression, due to low market values at a time when India mica was imported into the country in large quantities, the production is again increasing. Mr. Sterrett's paper discusses briefly the occurrence, distribution, and origin of the mica-bearing rocks and the minerals associated with the micas, and describes the principal mining properties.

The Pierce Phosphate Plant

The plant of the Pierce Phosphate Company of Polk county, Fla., will have a capacity, when completed, of 250,000 tons of phosphate rock per year, and will be the largest individual plant in the State.

The equipment of the property is being installed by the Allis-Chalmers Company, Milwaukee, Wis., and consists of one 70-ton steam shovel; one 12-in. Frayer dredge; four 6x60-ft. Allis-Chalmers driers, equipped with 18x24-in. Gates patent feeders; electric generators furnishing power for 18 motors, which drive conveyers and handling apparatus, and the usual installation of conveyer belts, screens, loaders, etc. The plant is expected to be in operation before June 1, 1907.

The production of copper by the three smelteries in the Urals, Russia, in 1906, was 258,793 poods, against 223,883 poods in 1905.

New Publications

MODERN AMERICAN MACHINE TOOLS. By C. H. Benjamin. Pp. 320; illustrated. $5\frac{1}{2} \times 8\frac{1}{2}$ in.; cloth, \$5. New York, 1907: E. P. Dutton & Co.

STREIFZUEGE DURCH DIE BLEI- UND SILBERHÜETTEN DES OBERHARZES. By Karl Waldeck. Pp. 68; illustrated. $6\frac{1}{2} \times 9\frac{1}{2}$ in.; paper, 3 marks, 40 pf. Halle a. S., 1907: Wilhelm Knapp.

DEUTSCHES PATENTRECHT FUER CHEMIKER. By Julius Ephraim. Monographien über angewandte Elektrochemie, XXV Band. Pp. 608. $6\frac{1}{2} \times 9\frac{1}{2}$ in.; paper, 18 marks. Halle a. S., 1907: Wilhelm Knapp.

LOCOMOTIVES: SIMPLE, COMPOUND AND ELECTRIC. By H. C. Reagan. Fifth edition, revised and enlarged. Pp. 932; illustrated. $5\frac{1}{2} \times 8$ in.; cloth, \$3.50. New York, 1907: John Wiley & Sons.

ELEKTROMETALLURGIE DES EISENS. By Bernhard Neumann. Monographien über angewandte Elektrochemie, XXVI Band. Pp. 176; illustrated. $6\frac{1}{2} \times 9\frac{1}{2}$ in.; paper, 7 marks. Halle a. S., 1907: Wilhelm Knapp.

ECONOMIC GEOLOGY OF THE AMITY QUADRANGLE, EASTERN WASHINGTON COUNTY, PENNSYLVANIA. By Frederick G. Clapp. P. 144; illustrated. 6×9 in.; paper. Washington, 1907: Government Printing Office.

ZINC AND LEAD DEPOSITS OF THE UPPER MISSISSIPPI VALLEY. By H. Foster Bain. U. S. Geological Survey, Bulletin No. 294. Pp. 155; illustrated. 6×9 in.; paper. Washington, 1906: Government Printing Office.

ECONOMIC GEOLOGY OF THE KITTANNING AND RURAL VALLEY QUADRANGLES, PENNSYLVANIA. By Charles Butts. U. S. Geological Survey Bulletin No. 279. Pp. 198; illustrated. 6×9 in.; paper. Washington, 1906: Government Printing Office.

SELF-PROPELLED VEHICLES. A PRACTICAL TREATISE ON THE THEORY, CONSTRUCTION, OPERATION, CARE AND MANAGEMENT OF ALL FORMS OF AUTOMOBILES. By James E. Homans. Fifth edition, revised and enlarged. Pp. 598; illustrated. $5\frac{1}{2} \times 8\frac{1}{2}$ in.; cloth, \$2. New York, 1907: Theo. Audel & Co.

GEOLOGY OF THE MARYSVILLE MINING DISTRICT, MONTANA. A STUDY OF IGNEOUS INTRUSION AND CONTACT METAMORPHISM. By Joseph Barrell. U. S. Geological Survey, Professional Paper No. 57. Pp. 178; illustrated. 9×12 in.; paper. Washington, D. C., 1907: Government Printing Office.

MANUAL OF EXAMINATIONS FOR ENGINEERING POSITIONS IN THE SERVICE OF THE CITY OF NEW YORK. By Myron H. Lewis and Milton Kempner. In three volumes and eight parts. Vol. I, Axman, Chainman and Rodman, Lev-

eler, Transitman and Computer. Vol. II, Assistant Engineer. Vol. III, Draftsman and Inspector. Illustrated. $5\frac{1}{2} \times 8\frac{1}{2}$ in.; cloth, \$5. New York, 1907: Engineering News Publishing Company.

WEST AUSTRALIAN METALLURGICAL PRACTICE. Pp. 186; illustrated. 8×10 in.; cloth, 21s., postage 2s. Kalgoorlie, W. A., 1906: Chamber of Mines of Western Australia.

A description of the ore treatment, mills and processes of 12 of the principal gold mines of Western Australia, with illustrations, tables and charts, written especially for the Chamber of Mines of Western Australia, together with introductory notes and addenda.

THE MECHANICS OF HOISTING MACHINERY, INCLUDING ACCUMULATORS, EXCAVATORS AND PILE DRIVERS. By Julius Weisbach and Gustav Herrmann. Authorized translation from the second German edition by Karl P. Dahlstrom. Pp. 332; illustrated. $5\frac{1}{2} \times 8\frac{1}{2}$ in.; cloth, \$3. New York, 1907: Macmillan Company.

Contents: Introduction. Levers and jacks. Tackle and differential blocks. Windlasses, winches and lifts. Hydraulic hoists, accumulators and pneumatic hoists. Hoisting machinery for mines. Cranes and sheers. Excavators and dredges. Pile-drivers.

MINE TIMBERING. By Wilbur E. Sanders, Bernard MacDonald, Norman W. Parlee and others. Pp. 179; illustrated. 6×9 in.; cloth, \$2. New York, 1907: Hill Publishing Company.

Contents: Preface. Mine timbering, by Wilbur E. Sanders. Mine timbering by the square-set system at Rossland, B. C., by Bernard MacDonald. Methods of mining and timbering in large orebodies in British Columbia and Michigan, by Norman W. Parlee. Mine timbering in Section 16 of the Lake Superior Mining Company, Michigan, by C. St. G. Campbell. The framing of rectangular shaft timbers, by Wilbur E. Sanders. Square-set timbering at Bingham, Utah, by Claude T. Rice. Square-set practice at Bingham, Utah, by Louis S. Cates. Mine timbering at Lake Superior, by W. R. Crane. Timber and timbering in the Cœur d'Alene, by J. H. Batcheller. Timbering at the Chillagoe mines, Queensland, by T. J. Greenway. Timbering in Tasmania, by Mark Ireland.

This book, following the style of "Sampling and Estimation of Ore in a Mine," "Pyrite Smelting," "Notes on Metallurgical Mill Construction," and "Lead Smelting and Refining," which have met with so favorable a reception, is a collection of articles that have previously been printed in the ENGINEERING AND MINING JOURNAL, together with a few papers from the transactions of various societies, which have been added to round out the subject. The leading article of the book is the

noteworthy paper of Wilbur E. Sanders, which was published originally in the *Mineral Industry*, Vol. VIII, where it attracted wide attention, being recognized as one of the most valuable contributions to this important subject. In its original publication, the illustrations accompanying this paper were unfortunately so greatly reduced that the numerals showing dimensions, explanatory legends, etc., were in many cases illegible. For the republication of the paper in the present work, all of the illustrations have been redrawn, and having been engraved with great care, the practical value of the paper has been immensely enhanced.

No less noteworthy are the papers on "Mine Timbering by the Square Set System, at Rossland, B. C.," by Bernard MacDonald; and "Methods of Mining and Timbering in Large Ore Bodies in British Columbia and Michigan," by Norman W. Parlee. Both of these papers are excellent examples of what a technical paper ought to be, presenting as they do the full practical details of their subject, together with figures of costs, etc., and illuminating the whole by intelligent and discriminating discussion.

The concluding part of the book is made up chiefly of articles that have appeared in ENGINEERING AND MINING JOURNAL during the last two or three years, and satisfactorily amplify the subject of the book. The book is presented by the editor with the same limitations that have been acknowledged with respect to the previous works of the same character. It is not offered as a complete treatise on the subject, but simply as a collection of valuable papers bearing upon it, in the selection and preparation of which much care has been exercised. The excellent character of the engravings, with which the book is profusely illustrated, deserves especial approbation. In the absence of any treatise on this important subject, which in the hand-books and textbooks on mining is dealt with only in a superficial way, it has appeared worth while to make such a collection. Undoubtedly a thorough and systematic treatise on the subject of mine timbering will some day be written.

One of the most painful accidents known in Rand mining occurred recently at the Driefontein Consolidated mine, when by the burning and explosion of two cases of dynamite, 63 lives were lost, of whom nine were white men. It is not yet known exactly how the accident happened, but it appears that through the gross carelessness of someone the gelatin was set ablaze near a level in the mine, where over 60 men were waiting to come to the surface. Most of the victims were fortunately killed outright, but others were rescued, and died in the hospital later on in great agony, either from burns or from nitrous oxide poisoning.

Personal

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

H. W. Hardinge, of New York, visited Cobalt, Ont., recently.

Dr. Franz Beyschlag has been appointed director of the Geological Survey of Prussia.

W. Bornhardt has been appointed director of the Bergakademie at Berlin, Germany.

Courtenay De Kalb, mining engineer, of Los Angeles, Cal., has been examining mines in Maine.

S. F. Fowler, general manager of the Canadian Metal Company, Nelson, B. C., is visiting New York.

Frank J. Hagenbarth has returned to Salt Lake City, Utah, after having made an inspection of Mexican mining interests.

Prof. Henry Louis, of Newcastle-upon-Tyne, England, has just returned from Spain where he has been examining mines.

J. B. Tyrrell has completed the examination of the Right-of-Way mines at Cobalt, and has returned to Toronto, Ontario.

J. Parke Channing, who has been making an extended tour in the West on professional business, returned to New York last week.

R. W. Hutchinson, of Chihuahua, Mex., who represents the interests of Charles M. Schwab, in Mexico, is visiting Butte, Mont., on business.

H. H. Taft, representing Boston men who are backing the Butte & Summit Valley Company, has gone from Butte, Mont., to Denver on a visit.

Joseph C. Houston, formerly with the O'Brien company, has been engaged as superintendent of the Right-of-Way mines at Cobalt, Ontario.

O. Q. Beckworth, operating in the northern part of Gilpin county, Colo., districts has gone to St. Joseph, Mo., to look after mining interests.

F. W. Denton, general manager of the Copper Range Consolidated Company's mines in Michigan, has returned to the mines from a visit to Boston.

W. J. MacDonald, of Duluth, secretary of the Ida-Montana Copper Company, spent several days at the company's mines in Butte, Mont., recently.

Joseph L. Walters, superintendent of the Evergreen Gold and Copper Mines Company at Apex, Colo., has left for a trip to California and Nevada camps.

Paul R. Forbes, mining engineer, of New York, returned recently from Mexico, and expects shortly to go to Europe, where he will spend the summer.

John A. Church, mining engineer, of New York, who has been engaged upon

mine examinations in Mexico, is expected to return to New York next week.

John C. Adams, superintendent of all mines of the Boston & Montana Company, has returned to Butte, Mont., from a business trip to Bisbee and Cananea.

J. P. Hutchins, mining engineer, of New York, has just returned from Dutch Guiana, where he has been engaged on professional work for the last six months.

Percy Rider, formerly of Ouray, Colo., but now of Arizona, has been making an examination of mining property in Clear Creek county, Colo., in the interests of Eastern investors.

Dr. Ira Remsen, president of Johns Hopkins University, Baltimore, made the class-day address to the students of the Michigan College of Mines on May 3, at Houghton, Mich.

Victor Nordberg, of the Nordberg Machinery Company, of Milwaukee, who makes Butte, Mont., his headquarters, has gone to the Cœur d'Alene mining district of Idaho on business.

Walter Harvey Weed, mining geologist, of New York, who has been absent in the West for nearly two months, on professional business, is expected to return about the end of this week.

W. A. Farish, of New York, and J. K. Turner, consulting engineer for the A. D. Myers interests, recently examined the Wonder Stray-Horse mines at Wonder, Nevada, owned by A. D. Myers.

F. F. Sharpless, mining engineer, of New York, has returned from Mexico, where he has been engaged on professional business. He expects to go to Colorado about the end of this month.

Geo. Crerar has resigned as metallurgist in charge of the San Fernando del Cobre Smelter, Mexico, to accept the management of the Takilma Smelting Company in Josephine county, Oregon.

T. R. Drummond, general manager of the Dominion Copper Company's properties in the Boundary district of British Columbia, has gone to Cobalt, Ont., as general manager of the Nipissing mines.

William P. Jahn, manager of the property of the Pilot-Butte Copper Company, in Butte, has gone to Milwaukee, Wis., to confer with members of the company on matters pertaining to the plan of development.

W. M. Laird, of Pittsburg, Penn., president of the Pittsburg Consolidated Mining and Tunnel Company, operating at Idaho Springs, Colo., has been out looking after interests and attending a stockholders' meeting.

Benjamin Magnus has left New York for Australia, to assume the management of the Electrolytic Refining and Smelting Company of Australia, Ltd. His Australian address will be 118 Pitt street, Sydney, New South Wales.

A. W. Park has joined the staff of the John A. Traylor Machinery Company, of

Denver, Colo. He was formerly with the Mine and Smelter Supply Company and recently with the Joshua Hendy Iron Works, of San Francisco.

Leo Goldsmith recently returned to New York from Virginia, where he had been examining some manganese properties, and has gone to Canada to develop a molybdenite deposit. His address for some time will be St. Patrick, Renfrew county, Ontario.

Henry Harris, who recently resigned as superintendent of the Hall Mining and Smelting Company's smelter at Nelson, B. C., has gone to Hadley, Prince of Wales Island, Alaska, where he will be superintendent of the smelting works of the Alaska Smelting and Refining Company.

Paul Johnson, who lately resigned the management of the Alaska Smelting and Refining Company's works at Hadley, southeast Alaska, left Seattle on April 30 by steamer for San Francisco, on his way to Nevada. He will be in New York about the middle of June, sailing thence for Europe.

Bruce R. Warden, one of the Canadian Pacific Railway Company's mining engineers, for some time past engaged at that company's colliery at Bankhead, Alberta, has been retained by the Nicola Coal and Coke Company to superintend the installation of machinery and plant at its Middlesboro' colliery, Coulee, Nicola district, British Columbia.

M. E. MacDonald has resigned the position of general manager of the Guanajuato Consolidated Mining and Milling Company's properties at Guanajuato, Mexico, and taken the position of consulting engineer for the company, making his headquarters for the company's business at its New York office, Mills building, No. 35 Wall street, with office for his private business at No. 40 Wall street.

The number of claims awaiting inspection is so great that the Ontario Government has been obliged to increase the staff of inspectors. In addition to A. H. A. Robinson, who officiated last year, the following have been appointed inspectors of mining claims: A. G. Burrows, late provincial assayer, C. W. Murray, G. C. Mackenzie, G. R. McLaren, R. T. Irwin, E. Wade of the School of Practical Science, Toronto, and D. W. Houston. They will enter upon their duties at once.

Obituary

George E. Davis, founder and for 20 years editor of the *Chemical Trade Journal*, died in London, England, April 20, aged 56 years. Mr. Davis was formerly one of the inspectors under the alkali works regulation acts; he was one of the original fellows of the Institute of Chemistry; a fellow of the Chemical Society;

and he took a prominent part in the inauguration of the Society of Chemical Industry, filling several offices. He contributed largely to chemical, technological, and microscopical literature.

John M. Bell, an old-time Montana mining engineer, died in Chalchihuites, Zacatecas, Mexico, April 23. He was connected with the mining department of the Chalchihuites Mining and Smelting Company, and while visiting some properties his horse fell with him cutting his knee; blood poison set in causing death after seven weeks' illness. Mr. Bell was born in Teesdale, England, coming to the United States when a child. He served in the Civil War, and went to Montana soon after 1864 to conduct placer mining. He was a member of the Montana House of Representatives from Deer Lodge county for two years.

Societies and Technical Schools

National Association of Manufacturers—The annual convention will be held in New York, May 20-22. Headquarters will be at the Waldorf-Astoria Hotel. Reports on a number of subjects, especially interesting to manufacturers at this time, will be made by the committees which have them in charge for the association, and an open discussion of the subjects will probably follow each report.

McGill University—Twenty students of the mining department of McGill University, Montreal, have gone to spend the summer studying practical mining in British Columbia. The trip is under the supervision of Dr. J. B. Porter, professor of mining, and J. W. Bell, assistant professor. They will be joined in British Columbia by Dr. Stansfield, professor of metallurgy, and J. A. Bancroft, assistant professor of geology, the latter having charge of the geological work to be undertaken by the students.

Case School of Applied Science—The mining department of this school, at Cleveland, Ohio, has been conducting an extensive series of experiments upon the concentration of the wall-rock of the Cobalt mines. About 20 tons of rock from the Buffalo mine were shipped to the school last fall. After a series of laboratory experiments were completed three-mill runs were made in the presence of representatives from the mines.

The results of these experiments, which included almost every known method of silver extraction, will shortly be published.

Industrial

The New York office of the Standard Railway Equipment Company, of St. Louis, has been removed to No. 90 West street.

The Broderick & Bascom Rope Company, of St. Louis, owing to the increased demands of business, has moved its New

York office from No. 19 Murray street to larger quarters at No. 76 Warren street.

The Range Power Company, Chisholm, Minn., has placed an order with the Weber Gas Engine Company, at Kansas City, Mo., for one 350-h.p. triple-cylinder, vertical producer-gas engine, with twin suction gas producers. An electric light plant on the Mesabi range will be operated continuously by this engine.

The Southwestern Bridge Company, Joplin, Mo., has received a contract for nine steel mill buildings and two steel tanks and towers for the Kaw Gas Company, at Independence, Kan. The company has also received a contract from the Texas Company for the steel of three pump houses, two boiler houses and one warehouse at Dallas, Texas.

Max F. Abbé, inventor of the Abbé tube-mill, sailed from New York April 30, for a trip abroad. He will spend from five to six months in England, and on the Continent. Arrangements have been made with Sutcliffe, Speakman & Co., Ltd., of Leigh, Lancashire, England, to manufacture the various types of the Abbé mill, including the patented spiral feed and discharge, for use in European countries.

As the outcome of experiments carried on extensively for some time by William Bruce, of Winnipeg, Manitoba, to test the value for ornamental work of the clay found near Winnipeg, a company has been formed to carry on the manufacture of architectural terra cotta, faience decorations and ornamental tile work, the raw material being found in a clay deposit six miles from Winnipeg. The company will import skilled workmen with experience in the manufacture of high-class clay products.

Morse Bros. Machinery and Supply Company, Denver, Colo., reports the following recent sales: 100-ton concentrating plant for the Jessie Mines Company, Chaparral, Arizona, in which will be installed three No. 3 Wild mills; F. W. Hearne & Co., Central City, Colo., one No. 3 Wild mill; La Belle Gold Mining Company, Alma, Colo., 10-stamp mill with power; Balkan Mining Company, Rockford, S. D., five-stamp mill with power and tables; and Bear Top Mining Company, Murray, Idaho, one Franklin compound steam, two-stage air compressor, 690 cu.ft. capacity.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

W. G. Wilkins Company, Pittsburg, Penn. Views of Bituminous Collieries and Coke Plants. Pp. 88, all illustrations, 6x9 in., 1907.

Trill Indicator Company, Corry, Penn. The Triumph Steam Engine Indicators and Appliances. Pp. 31, illustrated, paper, 6x9 in. 1907.

American Locomotive Company, New York City. Pamphlet No. 10,015. Rotary Snow Plow. Pp. 28, illustrated, paper, 6x9 inches.

Colorado Iron Works Company, Denver, Colo. Catalog No. 7-E. Concentration Mills and Machinery. Pp. 92, indexed, illustrated, paper, 6x9 in. 1907.

Link-Belt Company, Philadelphia, Penn. Price Lists of Sprocket and Traction Wheels, substitute pages of catalog No. 37. Pp. 22, illustrated, paper, 6x9 in.; April 1907.

Keuffel & Esser Company, 127 Fulton street, New York. Folding Rules, Automatic Print Hanger and Sperry's Pocket Calculator. Folder, illustrated, paper, 5½x9 in.; 1907.

Allis-Chalmers Company, Milwaukee, Wis. Bulletin No. 1057. Allis-Chalmers Direct Current Motors and Generators Type "K." Pp. 16, illustrated; paper 8x10½ in.; January, 1907. Bulletin No. 1423. Gates Breakers with Short Head and Concaves for Fine Crushing. Pp. 4, illustrated; paper, 8x10½ in.; February, 1907. Bulletin 1056. Induction Motors. Pp. 4, illustrated; paper, 8x10½ in.; January, 1907.

Construction News

Cornucopia, Oregon—There is talk of building a smelter at the Indiana mine. Mr. Mesner, Baker City, Oregon, is manager.

Red Cloud District, California—Cyanide plants are to be put in at Bull Creek and Red Cloud. A. J. Wagoner, Stockton, Cal., is president.

Oroville, Washington—It is proposed to build a smelter to work ore from neighboring mines. A. M. Wehe, Oroville, Okanogan county, Wash., is managing the project.

Georgetown, Colorado—Chicago capitalists are interested in the Astor group and contemplate the erection of a milling plant. E. J. Butts, Georgetown, Colo., is manager.

Weatherby, Oregon—The Butler-Platt-Thompson Mines Company is developing a group of mines and will reed hoisting and other machinery. Butler & Platt, Baker City, Oregon, are managers.

Dumont, Colorado—The First Republican Mining Company has become interested in a group of claims, and the company intends to erect a mill to treat its own product. Ira La Munyon, Dumont, Colo., is manager.

Pactolus, Colorado—The Perigo & Six Day Mining, Milling and Power Company, in which Denver and Boston people are interested, proposes to erect a large electric power plant at Pactolus, to furnish power and lighting for its own and neighboring mines. J. K. Richardson, Rollinsville, Colo., is manager.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives
at Denver, Salt Lake City, San Francisco and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

May 8—The farmers of Yuba and Sutter counties who are about to bring an injunction suit to determine the legal status of dredge mining in the Feather and Yuba rivers seem to have been able to obtain whatever financial assistance they need, and it is expected they will shortly begin their crusade. The dredge-owners are prepared for any contest, but have little or nothing to say in the public press.

The Porter Bar Dredging Company, which has been working near Callahan, Siskiyou county, is rebuilding its dredge, and has under consideration the construction of another machine. A Marysville company has been boring prospect holes at Indian Creek and Oro Fino in the same county, where the gravel is quite deep. Machines to dredge to 100 ft. depth will be required to reach bedrock. The placer mines in Mill Gulch, Osceola, Nevada, are to be dredged by the Nevada Gold Placer Mining Company, a Colorado organization.

The Dutch Mining and Milling Company of Tuolumne county has been forced into bankruptcy on the petition of creditors, who asked Judge De Haven to declare that corporation a bankrupt and stop further proceedings by the court of Tuolumne county under a judgment obtained by S. C. Bright. The property of the company was to have been sold by the Sheriff to satisfy a judgment for \$16,114 obtained by Bright on March 12. An order was issued restraining the sheriff.

The litigation over the Slap Jack mine, Groveland, Siskiyou county, which has kept that fine property idle for fully eight years has been settled amicably, and the property will be operated by the Yosemite Gold Mining Company, as was the case before the shut-down. The case was fought in all the courts, the last decision being from the United States Supreme Court; and this decision settled nothing, but left the litigants in a position to keep up the battle. But here wiser counsel prevailed and the matter was settled. The mine is well equipped with machinery, consisting of a hoist, compressor, pumps, etc., and a mill was to have been brought from a mine in Mariposa, when required.

The gravel channel of the Lucky Dog mine at Alleghany, Sierra county, was lost years ago, but has just now been again located, and is under bond to H. L. Johnson, owner of the Tightner mine. The channel was discovered many years ago by gulch miners, and was worked from several tunnels, yielding many thousands

of dollars. The last leasers mined about \$10,000 from a pot hole, or low pit, in the bed of the channel, and when they drove ahead found that the channel apparently ended dead against a wall of rock. Nothing was done with the mine for several years, when H. L. Johnson took hold of it. He believed that the pot hole was caused by the water of the ancient river pouring over falls, and that the high rock which cut off the channel was the rock which caused the falls. He had driven an incline tunnel through this rock and tapped the channel above the falls.

The Nevada County Mine-owner's Association has voluntarily reduced the hours of work of surface men to eight hours. Better wages elsewhere were attracting the men away, especially to the camps in the State of Nevada. Some of these camps, however, are becoming overcrowded and it is expected that men will begin to return to California before long.

Wages of men at the Keswick smelter of the Mountain Copper Company are to be increased. The company has 800 men on the roll, but needs more about the furnaces. The men working at present are satisfied with the wages and hours.

The electrical plant of the Great Western Power Company in Butte county will have a capacity of 100,000 h.p. when completed. In addition to using the power for mines it will be utilized to electrify the Western Pacific Railway across the Sierras. At Big Bend, upon the North Fork of the torrential Feather river, along which the Western Pacific runs, the river makes a great bend in a horseshoe shape and the proposition is simply to divert the river through a tunnel across this narrow neck. About $2\frac{1}{4}$ miles of this tunnel is now constructed, leaving one mile yet to be finished. They will thus obtain a fall to run their electrical machinery. The old tunnel of the Big Bend Mining Company is being utilized. This was a river-bed mining scheme on a large scale, designed to lay bare a dozen or so miles of the North Fork of the Feather. On completion of the long tunnel, when work on the bed of the river was commenced, it was found to be unprofitable. The tunnel carried all the water of the river through the hills, leaving the Big Bend around the point dry for mining. The enterprise was a failure as a mining venture, but the tunnel, dug at great expense, is now to be utilized for another purpose.

The California Metal Trades Association has failed to come to an agreement with the Iron Trades Council, represent-

ing the allied 18 iron trades, the differences not having yet been adjusted. The offer of the Metal Trades Association to submit the questions in dispute to a board of arbitration for settlement has been declined by the Iron Trades Council. As a result some 9000 iron-workers are still idle in this city. It is well known that wages in this city are very much higher than obtained in any other manufacturing center; and, consequently, the production of fabricated articles costs more. Already the effect of this is felt by manufacturers here, who are brought into hopeless competition with manufacturers operating under more reasonable conditions elsewhere. Further concessions to the workmen undoubtedly will result in the almost complete destruction of manufacturing operations here.

Salt Lake City

May 10—Construction work at the new Garfield mill of the Boston Consolidated Mining Company has received a setback on account of a strike of carpenters, who have made demands for higher wages which have been refused. This will probably delay the starting of the plant, which was scheduled to take place in July next. In the meantime the Rio Grande Western Railroad is building its tracks up to the ore-bins which were completed several weeks ago.

The operators of the Alta mining district are jubilant over the announcement that the reconstructed aerial tramway owned by the Unity Mines Company, will be ready for operation within two weeks. The line was greatly damaged by snow-slides during last winter. The present management of the Unity Company has contracted to move the output of the principal mines of the Alta district to the lower terminal, a distance of about seven miles. Heretofore these companies have had to depend on teamsters to move their ore. The Rio Grande Western will rebuild its Alta branch during the present year, the end of the line to be at the lower terminal of the aerial tramway, which will be established at Wasatch, near the mouth of Little Cottonwood cañon.

Four steam shovels are employed in the moving of overburden from the low-grade ore deposits of the Boston Consolidated Mining Company's property in Bingham. High-grade ore shipments are being made at the rate of ten carloads per day.

Tracklayers in the employ of the Western Pacific Railroad have crossed the

Utah-Nevada State line. So with the exception of the ballasting, the road is completed as far as Utah is concerned. In Nevada, the grading and laying of track is being pushed forward as rapidly as possible. It is expected that the first branch line to be built off from the Western Pacific will be started in June. It is to be built to the Gold Hill mine of the Western Utah Copper Company, in the western part of Tooele county, and will be about 30 miles in length.

Scranton

May 14—General Manager W. J. Richards, of the Philadelphia & Reading Coal Company, had a heart-to-heart talk with the officials of the coal department, to the number of more than 100 in the company's office in Pottsville, a few days ago. Owing to its being Ascension Day the mines were shut down and Mr. Richards took advantage of the idle day to marshal the officials, including division superintendents, district superintendents, outside foremen, chute-bosses and others in authority. Two sessions, morning and evening, were held, and opportunity was given every man present to speak out upon any subject pertinent to the gathering. Quite a number responded, making suggestions for the improvement of the operations of the company.

Forty-one mules were suffocated by a fire in the stable of the Woodward colliery, of the Delaware, Lackawanna & Western, last week. The company's loss aggregated \$10,000. About 300 employees are thrown out of work for some time.

The first tournament of the First Aid Society at the Clear Spring colliery, West Pittston, was held last week, when some excellent work was done. The team captained by Sergeant Patrick Gibbons, carried off the honors with a percentage of 80.08. The leader was presented with a handsome Red Cross badge.

All the coal companies in Luzerne county have appealed against the new assessment of the coal lands. They claim that, as the result of an investigation, it has been found that property other than coal is assessed at about 50 per cent. of its actual value and that there can be no proper equalization when coal is assessed at a much higher figure.

The Philadelphia & Reading Coal and Iron Company is planning elaborate improvements at the Brookside Colliery, near Pottsville. Work on a new shaft was commenced in 1902, and it is now to be hastened so that the coal will be reached earlier than was originally planned. Work was commenced last week upon a new slope to connect with the basin slope, and this will take the place of the two inside slopes. The hoisting engine for this slope will be placed on the surface; bore-holes will be drilled from the surface, and the hoisting ropes passed through. Both breakers are to be

remodeled and an expensive tunnel is to be built between Rausch Gap and Brookside. There are reports that the steam pumps inside the mines are to be replaced by electric pumps.

Toronto, Ont.

May 11—Larder lake is attracting an increasing amount of attention and the number of claims taken up is about 4000. The fact that none of these have as yet passed inspection or been subjected to the amount of development necessary to secure a title has not prevented many of them from changing hands at high figures. At present there are so many on the market that they are being bought up extensively at a low rate, some offering for as low as \$40. John L. Church, of New York, is inspecting a number of claims at Larder lake, on which extensive development work is contemplated.

W. F. Brunne, of Haileybury, who with his brothers holds 14 claims some 3 miles northwest of Larder lake, states that the cyanide process will have to be adopted instead of milling for the extraction of the gold. On his properties is a dike of porphyry, 400 ft. wide in some places, a strip of which has been tested, giving assays in gold. No free gold was visible. Dr. von Hagen has bought a group of 12 claims two miles northwest of Larder lake and organized the Little Larder Lake Mining Company. J. Gordon Magee, consulting engineer of the Blue Bell syndicate, possessing extensive properties in Larder lake, has brought out samples showing free gold. He will purchase a complete camp outfit to prepare for the installation of stamp mills.

Active explorations and development are taking place in the district about Sturgeon Falls, Ont. A large reef of bluish quartz has been found a few miles west of the town some 30 ft. in width. A shaft is being put down and samples showing free gold have been taken out. Pockets of copper pyrites have also been encountered. Further west a find of copper ore has been made. A shaft has been sunk 20 ft. on a vein carrying bornite, which has been found to be 4 ft. wide at that depth. Prospectors working about 25 miles north of Sturgeon Falls report several discoveries of gold.

The provincial government of Ontario has appointed Prof. G. R. Mickle, of the Toronto School of Practical Science, mining assessor under the new mining act. He has wide powers in connection with the tax imposed on the annual profits of mines in excess of \$10,000, having authority to enter any mine and examine all books and accounts. An appeal lies from his decision to the bureau of mines, and when the amount involved exceeds \$1000 the case may be carried to the appeal court.

Hon. Wm. Templeman, Dominion minister of mines, has appointed Erik Nys-

trom, an engineer on the staff of the mines branch, to investigate the peat industry of Europe. He is instructed to proceed to Holland, Norway, Sweden, Denmark, Finland and Germany; to study the peat plants in operation and collect information in regard to machinery used, methods of working peat bogs, cost of production and manufacture of peat into briquets or other forms of fuel.

The Ontario government has set apart a portion of the Temagami forest reserve under the name of the Montreal Reserve mining division. This includes the Lady Evelyn lake area and other sections on the Montreal river. The recorder's office for the division is located at Latchford.

London

May 4—At this time of year we usually receive the reports of the various West Australian mines. The yearly reports for 1906 of the Ivanhoe, Horseshoe, Fingall, and Perseverance have been issued this week. The Ivanhoe has made sufficient profits to distribute £240,000 as dividend for the year. The ore treated was 208,304 tons and the extraction valued at £518,918. Twenty-five per cent. of the contents of the ore is extracted in the mill, 39 per cent. out of sands and slimes, and 22 out of concentrates, the total extraction being 86 per cent. The ore reserves amount to as much as 12 years' production and average \$13 to \$14 per ton. The Golden Horseshoe has paid exactly the same dividend as Ivanhoe; the ore treated amounted to 237,294 long tons and the total extraction by the mill, cyanide, smelting, etc., was £607,383. The ore reserves are estimated at about four years, valued at \$15 per ton. The Great Fingall has paid £225,000 in dividends; treated 249,646 short tons, producing £518,657. The mine has reserves to last about 2½ years; but as mentioned by me a few months ago, the developments of new ore are far from encouraging, the average contents of all new discoveries not being more than \$6 per ton. The most interesting point in the report is the confession by the managers, Bewick, Moring & Co., that they cannot give a dependable estimate of the contents of the ore reserves, owing to the irregularity of the deposit and its contents. The Great Boulder Perseverance is in somewhat of the same position as the Fingall, having reserves for two years averaging \$8 to \$9, and large bodies also of \$6 ore. For 1906, 169,194 short tons gave £343,605, and the dividend distributed was £69,973. It will be remembered that this company nearly came to grief two years ago through the carelessness, or worse, of the old controllers. The way the mine has been rehabilitated and the costs cut down reflects great credit on the new directors and engineers.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

General Mining News

Sault Ste. Marie Canal—Although lake navigation was not fairly opened until last week, owing to various obstructions, the Canadian canal at the Sault was opened April 22, and United States canal April 23. Vessel passages up to May 1 were 424; freight carried was 330,690 tons eastbound, and 747,923 westbound, a total of 1,078,613 net tons, or 1,434,654 tons less than in April, 1906. Mineral freight reported was 150,881 tons anthracite and 552,437 tons bituminous, a total of 703,318 tons coal; 204,660 tons iron ore; 34,092 tons pig and manufactured iron; 585 tons copper; 33,780 bbl. salt.

Alaska

KETCHIKAN DISTRICT

Alaska Industrial Company—This company recently made a shipment of 1575 tons of high-grade ore from Ketchikan to Ladysmith, B. C., where it will be treated in the Tyee smelter.

Hadley Consolidated—This company is now shipping ore from its Stevenstown mine to the Hadley smelter. A surface tramway has been built to the Mamie mine, where ore is transferred to the aerial tramway to the shipping point.

Uncle Sam—At this mine, formerly the White Eagle, a good body of ore has been opened, from which regular shipments are being made to the Hadley smelter.

United Metals Company—At this company's mine, formerly the Corbin, near Coppermount, a crosscut is being run on the 100-ft. level, in the hope of striking the main orebody.

Valparaiso—The surface tram is finished to the lake, a distance of 1½ miles from salt water. To the mine, from the end of this tram, the distance is about the same across the lake, over which the ore will be conveyed in scows to the upper end of the tram and thence by car to the beach at Dolomi. It is the intention to ship only the richer ore to the smelter, reserving the lower grade to be reduced by the stamp mill, the erection of which the management has in contemplation.

Arizona

GRAHAM COUNTY

Arizona Copper Company, Ltd.—This company reports the production of its

mines at Clifton in April at 1316 short tons of copper.

YAVAPAI COUNTY

Golden Idol—This company has had its mill in operation only a short time, but results have been satisfactory. The mines are in the Cherry Creek district, 30 miles east of Prescott, the nearest railway station being Dewey, on the Prescott & Eastern Railway, 15 miles from the mines.

Leland—This company has commenced grading preparatory to the erection of a new mill; the machinery has been ordered.

Square Deal—This company has declared its first dividend from a month's run of the mill. Its mines are in the Cherry Creek district, 30 miles east of Prescott. The mill is only an eight-ton mill, but will be increased to 25-ton capacity. The ore is a honeycomb quartz and the values are chiefly gold, most of which is caught by amalgamation.

Arizona Smelting Company—This company at Humboldt, produced for the month of April nearly 1,000,000 lb. of copper, and had it not been delayed on account of an accident to one of the furnaces this would have been passed. The supply of ore delivered to the smelter still exceeds the capacity of the plant.

Marschall Group—This group of claims, situated on the Santa Maria river, 15 miles west of Hillside, has passed from the original owner, Wm. Marschall, to J. K. Miller. He has a company to take over the claims and development work will be prosecuted. The ledges are not large though the values run up well; the ore is free milling.

McKinley—This company is the owner of the Peacock group, situated in the Copper Basin district, about two miles south of Iron Springs. The property has been developed to a depth of 100 ft.; the vein on the surface is of 40 ft. in width and on the 60-ft. level it is known to be of the same width, the walls not having been reached. The values are gold and copper. There is an abundance of timber on the ground for all immediate purposes. The stockholders are mostly local people.

Mother Lode Copper Company—This company has been organized by local people to take over a group of claims in the Copper Basin district. The group consists of seven full claims and at present there is considerable ore exposed although the workings are not deep. The ledge is in a lime and porphyry contact, porphyry forming the hanging wall.

California

AMADOR COUNTY

Bunker Hill Mining Company—This company, at Amador City, is arranging to install a hoist suitable for a shaft 4000 ft. deep.

BUTTE COUNTY

Matheson—The Gold Dike Company has taken over this mine on Butte creek, 20 miles from Chico. The company plans to invest about \$50,000 in equipment. The executive officers of the company are: W. M. Moran, president; Dan A. Matheson, treasurer; A. C. Musselman, secretary. Other directors are George K. Lane and G. M. Sparks.

CALAVERAS COUNTY

Benson—This company will begin sinking the shaft shortly, and continue it to a depth of 1000 ft. The newly-elected officers are: W. B. Robertson, of Scranton, Penn., president; Dr. Frank Burton, of Stockton, vice-president; Alfred Harvey, of Los Angeles, treasurer; Charles Sollars, of Lodi, secretary.

EL DORADO COUNTY

Crane's Gulch—At this mine, Georgetown, work has been resumed at the point where the slide covered the machinery.

Alpine—This mine is being unwatered and will be examined by the expert for George Wingfield, of Nevada.

INYO COUNTY

Bishop Creek Gold Mines Company—The road has been broken through to these mines and machinery and supplies can now be brought in from Laws.

Darwin—Mines near this place, long idle, are being reopened, Nevada mining men having made large investments there. Systematic prospecting is being done in the vicinity.

LOS ANGELES COUNTY

Ocean Beach Sands—F. E. Clark, of Salt Lake, Utah, has set at work two of his gold-saving machines on the ocean beach at Shakespeare, where they are handling black sands.

MARIPOSA COUNTY

Red Cloud and Marble Springs—These mines in Bull Creek and Red Cloud districts, are being reopened after long idleness, and are being equipped with machinery. Cyanide plants are to be put in. A. J. Wagoner, of Stockton, Cal., is presi-

dent, and Ray Knight, of San Francisco, is secretary of the company.

MONO COUNTY

Liberty-Pittsburg—A 6-ft. ledge of high-grade ore has been cut in this property at Masonic in a crosscut from the shaft being sunk.

True Friend—Men have commenced on a contract to sink the shaft on this mine at Masonic 200 ft. A hoist has been purchased.

Pauline—On this mine, at Masonic, work has been commenced under superintendence of John Phillips acting for the Colorado company which has bonded the claim.

NEVADA COUNTY

Ethel—Work has been resumed on this property, which has been idle all winter for lack of fuel.

Central Consolidated—After several months' idleness the 20-stamp mill at this mine has been started up on good milling ore.

Cold Spring—The new 10-stamp mill of this drift mine, near Nevada City, has been completed by Superintendent H. B. Gray.

ORANGE COUNTY

Western Zinc Company—This company, at Silverado Cañon, near Santa Ana, has commenced a new tunnel 200 ft. lower than the old one. The company owns 27 adjacent claims.

Iron Mine—L. C. Trent has a number of men at work in this old mine, which is being pumped out preparatory to extensive development.

Gold Run Gravels—An electric plant will be put in this mine this summer, and 30 stamps added to the mill. A few compressor has been installed.

Three Star—The shaft on this mine has reached the 1200 level and the ore is of satisfactory value.

SAN BERNARDINO COUNTY

Alvord—In this old mine, 23 miles northeast of Daggett, a strike of good ore has been made in the lower level.

Milford—This mine, near Ivanpah, a producer of silver lead ore, is superintended by C. Clare, who is installing a gasoline hoist.

SHASTA COUNTY

Golinsky Group—This group of 10 copper mines, near Kennett, is under bond to the Guggenheims, who have had 25 miners at work opening up the property. Work has temporarily stopped owing to some questions relating to future rights of way.

Milkmaid—This mine, with the adjoining Franklin and Wheeler claims, is under bond to the Western Exploration Company, of Goldfield, Nev., with Ed-

ward Lewis as superintendent. The mine is now being reopened. It was at one time a good producer.

SIERRA COUNTY

Mabel Mertz—With the establishment of the exact location of the Emigrant Channel in American Hill, made recently by this company, its location and elevation on the property of the Buckeye Gold and Gravel Mining Company, which adjoins the former on the south, is made easy of discovery: It is stated that, as soon as surveys can be made, a tunnel will be driven by that company.

Croesus Mining Company—At the Plumbago mine of this company, at Alleghany, Mason W. Mather, superintendent, another rich shoot of ore has been cut.

Quartz—George McCullough and associates have found a very extensive quartz ledge on Chipps ridge, and are now developing it.

Discovery—What is considered to be an extension of the Tightner and Rainbow ledge has been made in the South Fork mine, at Forest. The quartz was found in a tunnel being driven for a gravel channel.

SISKIYOU COUNTY

Towne Mining Company—This company, which has a bond on the Blue Ledge copper mine, near Hutton, is working 180 men, paying \$3.50 per day to miners and \$3 to surface men. They have expended large sums in development work. F. W. Carnahan is superintendent.

Badger Gold-Copper Company—This company has been formed at Medford, Oregon, to work a group of mines in Elliott district, and has let a contract for development work.

TUOLUMNE COUNTY

Ellen Winton—A five-stamp mill has been bought, and will be set up at once.

YUBA COUNTY

Mount Hope—New York men have obtained control of this mine, in New York township on the Forbestown road, and will develop it under superintendency of Paris Beau.

Colorado

CLEAR CREEK COUNTY

Dunkirk—It is reported that there is a deal on for the sale of this property at Georgetown, reported price being \$100,000; Eastern people are interested.

Pay Rock—H. H. Sturm, of Denver, representing Eastern people, is examining this property at Georgetown, and there is some indication of an early sale.

Russell Page Mining and Tunnel Company—A contract has been let for the installation of an 80-h.p. boiler and three-drill air compressor for this property on

Cascade creek by A. H. Page, Idaho Springs, Colo., as manager.

LAKE COUNTY—LEADVILLE

Big English Gulch—Considerable attention is being paid to this section at present and more work will be down in that neighborhood this year than ever before. The strike made in the Eagle group during the winter has been the means of causing a revival of mining in the district. It is more than probable that the owners of Bug Gold will erect a mill this summer to treat the immense body of low-grade gold ore that is in the mine. During the winter several carloads of ore were sent to Denver to ascertain the value of the crude ore and also to determine the character of mill to be installed; the results were so satisfactory that the company has decided to erect a mill. On the Rough and Ready group a tunnel has been driven several hundred feet by Lee Norris and several veins have been cut that assay fairly well. A tunnel is being driven by J. Frank on the Kankakee group and the outlook is very promising.

Crescentia—This property, Rock hill, is shipping a good grade of oxidized lead ore amounting to 30 tons daily, and also carrying on development work in the lower levels. A. F. Wuensch, the manager, has met with such success in the Crescentia, that he has decided to lease the Delaware, about 1000 ft. to the southeast of the Crescentia. Machinery has been ordered and a new shaft will be sunk. The first lift will be 550 ft., where it is expected the first ore-horizon will be encountered; the shaft will then be sent down another 200 ft. to the lime.

Dinero Tunnel—Good headway is being made on the great bore, Sugar Loaf district and it is now in a little over 350 ft. In about two weeks the Bartlett vein should be caught at a depth of about 400 feet from the surface. The Bartlett at present is shipping high-grade ore from its own tunnel level, and when the vein is cut by the Dinero tunnel it will give the owners an opportunity to double the output. R. Pitcher Woodward, financial manager and director of the Dinero Company, has been on the ground for the past few days.

Placer Mining—Work for the season has been started on all of the principal placers in the county. The tract of ground extending from the old Union smelter, California gulch, to Hayden's on the Arkansas river, a distance of eight miles, is under consideration by experienced placer miners for a dredge proposition. The ground has been repeatedly prospected and the average yield is 25c. per cu.yd.; the only successful way to work it is by dredge, and that is what the parties who are looking the ground over decide to do, if the deal is made. It is believed that lower California gulch is rich in fine gold, washed down from the work done by the pioneer miners in 1860.

Indiana**SULLIVAN COUNTY**

Linton Bituminous Coal Company—This company has been declared insolvent and placed in the hands of a receiver. The failure is attributed to poor management, unfavorable locality of the mine and the general depression of the coal trade. The mine, which is located three miles west of Jasonville, has a 6-ft. vein of coal of excellent quality. The company owns, all told, over 700 acres of excellent coal land. It was organized with a paid-up capital of \$90,000. The plan is to organize a new company to take over the property.

Traction Coal Company—This company, of Indianapolis, recently incorporated with a capital of \$100,000, has purchased the Sullivan County Coal Company's mines, near Dugger, and will operate the mines to their fullest capacity, shipping the product to Indianapolis over the Southern Indiana road at a rate of 50c. a ton. The new company is formed by the merging of a number of retail coal dealers or firms, with C. D. Trobridge as president. Coal men say the new merger company is to be an important factor in giving Southern Indiana mines a better outlet and will afford Indianapolis a more regular supply. This company will also be in a position to reduce the retail price of coal to the local trade, it is claimed.

Indian Territory**CHEROKEE NATION**

Lanyon Starr Smelting Company—This company, at Bartlesville, has placed an order for a steel tank and tower with the Southwestern Bridge Company, of Joplin, Missouri.

Michigan**KEWEENAW COUNTY—COPPER**

Keweenaw Copper Company—This company has ordered a new hoist for its Empire property.

Ojibway—Thomas Hoatson, managing director of the Keweenaw Copper Company, is to have charge of the explorations on the property of the Ojibway. Considerable drilling was done on this property last fall under the supervision of L. L. Hubbard and some very fine cores were taken out.

ONTONAGON COUNTY—COPPER

Adventure—This company produced in April 91½ tons mineral, which was the largest month for the year. All work at the property is being centered in opening No. 3 shaft, which is showing better than has been experienced in some time.

Mass—Production in April was 172 tons mineral.

Michigan—The April output of this mine was 150 tons mineral.

Missouri**ZINC-LEAD DISTRICT**

A. M. Wagner, until recently the manager of the Winslow properties at Webb City, is devoting time to the preparation of a map 6x8 ft. in dimensions, of the blanket vein operations, north of Webb City.

Mercantile Metal Milling Company—This company has placed the contract for a new 250-ton mill at Webb City, including steel tank and tower, with the Southwestern Bridge Company, of Joplin, Missouri. This will be the first mill constructed entirely of steel in the zinc-lead district of Missouri.

Elliott & Zimmerman Land—W. S. Bartlett, of Joplin, formerly of Boston, owns a lease of 40 acres of this land, which joins the old Sucker Flat mines, in the south edge of Webb City, and which is also being opened up again. Mr. Bartlett is now drilling his lease, and has found the blanket vein in two different holes, the first of which showed 18 ft. of ore on the 224-ft. level, and the second found 17 ft. of ore on the 219-ft. level. Drilling is being done on the northwest 10 acres.

Ideal Mining Company—Since the purchase of the 240-acre tract of land south of Blendville, in the southwest edge of Joplin, the company has been active in having the property developed. The initial sale of ore from this tract was made last week by F. N. Vaughn & Co., who sold 8500 lb. silicate. At numerous times in the history of the Joplin mines this land has been gouged over for shallow ore deposits, but owing to the land being always in a legal tangle, mines would no sooner be opened than operations would be stopped. About a year ago the title was straightened out and the property sold to the Ideal company last fall. There are now six shafts going down by as many different lessees.

Rice Farm—The Onwata Mining Company, composed of Arkansas men, has a lease on the Rice farm southwest of the town of Jasper, in the north part of Jasper county, five miles north of any present mining operations. The land was prospected several years ago by drill and shaft, and, it is said, developed a good face of ore. Being so far from other mining operations drainage was a heavy item of expense. The present company has capital to exploit the property, and will build a large mill.

Trinity Zinc, Lead and Smelting Company—The framework for the 500-ton mill of the Deacon mine, in Richland valley, Duenweg district, is up and the work of completion is rapidly being pushed. It is to be equipped with modern machinery. This mill is being built on the south end of the 120-acre lease. J. P. Newell is the general manager. Just south of the Trinity lease, the Jasper County Royalty Com-

pany has a lease on which Mattes Bros., of Joplin, have just completed the 500-ton San Gabriel mill. Both of these companies have developed a rich body of the blanket vein ore.

Montana**BUTTE DISTRICT**

Anaconda—Mining was suspended in the Anaconda mine, May 1, to permit of repairs to the hoisting engine, but has been resumed. The company is stoping on the 2200 of the main vein of the mine in Neversweat territory and is also driving west on the same level. It is crosscutting south on the 2400-ft. level of the Neversweat, but has not yet encountered ore in that direction. It is also preparing to re-timber the shaft of the Belmont from top to bottom and enlarge the opening by one compartment, making it three.

Boston & Montana—This company is sinking the shaft of the Mountain View from the 1800 to the 2200 and will connect the bottom with the 2200 of the High Ore. This mine is one of the great producers of the company, its daily output averaging 1200 tons of ore. Sinking is also in progress at the West Colusa, Badger State and Greenleaf. Seven of the new boilers at the New Leonard shaft, which have a capacity of 250 h.p. each, are in commission and the remaining one will be ready about May 12. Two large compressors are going into place at this mine.

Coalition—The shaft on the Minnie Healey will be finished to the 1400-ft. mark soon. Development is progressing on the 1300 and orebodies are blocked out in all directions from the shaft. Almost the entire claim is ore at this level and the greater part of the ore is copper glance. The lower workings are now well ventilated, as the result of connections with the openings of the Leonard. The shaft on the Rarus is still sinking and development is going ahead in intermediate levels. The mine is yielding between 500 and 600 tons of ore a day. The Corra is giving up some ore, but its grade is not up to that of the other developed mines of the company.

Alliance—This is one of the new companies that has struck commercial copper ore. On May 5 it cut the vein 35 ft. south of the 300-ft. station and has crosscut it 10 ft. without striking the hanging wall. This vein is from 20 to 25 ft. wide at the 200 and is full of high-grade ore. Drifting has been carried on east and west of the shaft at the 200, with the result that there is more than 1000 tons of ore in sight on this level. The bins are overflowing and shipments will have to be made to make room for the output.

Colusa-Leonard Extension—The company has struck a third vein of ore in a crosscut south of the 600-ft. station. Its

character differs from that of the other two veins. It is lead and copper. The vein is 4 ft. wide and its strike is north-east and southwest, while that of the others is east and west.

North Butte—The company is hoisting all the ore it can and is letting other work wait. Crosscutting to the north from the 1600 of the Jessie continues, but progress is slow on account of the distance the waste must be hauled to the shaft, and the work which the engine must do in raising ore and lowering timbers. The output of the veins remains about the same as usual, between 1100 and 1250 tons a day, much of which is second-class ore.

Reins Copper—This company has increased its power plant and is shipping copper ore at intervals. The ore is coming from the 800 and 900-ft. levels. Drifting east on the north vein at the 1200 is progressing.

Nevada

ESMERALDA COUNTY—GOLDFIELD

The Miners' Strike—The struggle between the Mine Owners and Business Men's Association, and the Industrial Workers of the World, which resulted in the closing down of the majority of the mines on this field for over 40 days, has been settled by the mine owners making terms with the Western Federation of Miners, Union No. 220. The basis of the agreement is a series of resolutions passed at a recent meeting of the union, which are substantially as follows:

"In order to establish a definite understanding between the Western Federation of Miners Local No. 220 and the mine owners and operators of the Goldfield mining district, it is agreed that mining and milling operations will be resumed under the following terms:

"First. The wage scale in effect in the district March 1, 1907, shall remain in force, and eight hours shall constitute a day's work for all men under the jurisdiction of the miners' union.

"Second. The miners' union shall have jurisdiction over all men regularly employed in and around the mines, mills and smelters, including timbermen, timber framers, engineers, blacksmiths and machinists and excepting superintendents and managers.

"Three. No strike nor boycott shall be officially declared by the miners' union unless by a two-thirds vote of the organization in favor thereof, and no lockout shall be enforced by the mine owners and operators unless by a like vote.

"Four. No town labor controversy shall interfere with the operations of the mines or the employment of miners.

"Five. These terms shall remain in force for a period of two years from date."

The opposing union which caused all the trouble, has become thoroughly disor-

ganized and has abandoned the district, which will hereafter be controlled by the Western Federation of Miners.

NYE COUNTY—TONOPAH

Mispah Extension—Operations have been resumed on this property, which consists of a group of twelve claims adjoining the Belmont on the northeast. A 75-h.p. electric hoist has been purchased by the company, which will be erected without delay. When mining was suspended three years ago the main shaft had reached a depth of 800 ft., and the level at that depth was run on a ledge 25 ft. in width, carrying low-grade ore. Recent discoveries in the adjoining mines have shown that it is necessary to sink deeper to get rich ore, and the company decided to resume mining and continue the shaft to a greater depth. The ledge should carry ore of shipping grade before the 1500-ft. level is reached.

German-American—The north crosscut on the 500-ft. level is out about 190 ft., and the south cross cut has been run a total distance of 155 ft. from the shaft, no improvement being noticeable in the country rock, the management has decided to resume sinking to the 300-ft. level.

Boston-Tonopah—The crosscut from the 500-ft. level has been run out a distance of 350 ft. The formation is very hard, and progress is slow. Several quartz stringers have been met with, but the general impression is that the shaft must be sunk to a much greater depth before substantial returns are obtained.

Molly Group—This property, consisting of 13 claims lying east of the Jim Butler mine, has been purchased by the Western Exploration Consolidated Company, of Philadelphia. The shaft, which has reached a depth of 500 ft., will be sent down a further distance of 1000 ft. Mining will be resumed as soon as a new plant is obtainable.

Ore Shipments—The ore shipped over the Tonopah Railroad for the week ended May 2 was: Tonopah Company, 1040 tons; Belmont, 370; Montana-Tonopah, 138; Tonopah Extension, 335; total, 1883 tons. In addition the Tonopah Company shipped 2500 tons to its mill, making a total of 4383 tons reported for the week.

Pennsylvania

ANTHRACITE COAL

Delaware, Lackawanna & Western—This company will spend about \$1,000,000 in improvements upon its breakers and equipment in the coal department during the present year, the statement being made after an inspection trip by Vice-president Loomis last week. Some of the breakers are old and have passed their best days, while there is a considerable quantity of coal to be mined. The company is also making large use of electrical equipment in place of steam machinery

and mules. Detailed plans have not been made of the improvements.

Lehigh Coal & Navigation—This company will convert the new No. 14 breaker at Greenwood into a washery and wash the large culm banks there, which are the richest in that part of the anthracite region. After the culm banks are worked over, the breaker will be used to treat the coal mined from the new slope now being sunk.

COKE

Connellsville Central Coke Company—This company, the output of which is controlled by J. H. Hillman & Son, of Pittsburg, has announced its plans to erect 200 of the modified Belgian type coke ovens at the Herbert works, New Salem, Penn., and the work is now under way. Contract for the brick has been closed with the Harbison-Walker Refractories Company, of Pittsburg. These new ovens will be 35 ft. long and 5 ft. wide and, although larger, are of the same general plan as the experimental ovens erected last fall at the Mt. Braddock plant of the Rainey Coal and Coke Company.

South Dakota

LAWRENCE COUNTY

Homestake—A circular to stockholders, signed by J. B. Haggin, president, and Fred. Clark, secretary, has been issued. It says in part: "The management regrets to announce that for the first time in over 28 years it is deemed advisable to discontinue temporarily the payment of the monthly dividend. The advisability of this action becomes apparent when it is known that there is a fire in the mine which prevents operations underground on account of the gases, and that the mills are hung up in order to allow the water ordinarily used in them to go into the mine to extinguish the fire, all other known methods of subduing it having failed, notwithstanding the heroic efforts, long continued, of all the employees on the ground. It is expected that the fire will be submerged on or about the first of June, when the water now going into the mine will be available for milling purposes again, and as many stamps (probably 500 to 600) will be started as can be furnished with ore from the surface openings. Nothing serious occurring to prevent, the mine will be unwatered to the 500 level about the middle of July, when underground operations to that depth will be resumed, and the remainder of the 1000 stamps started. Operations below the 500 will follow as each level is relieved of its water contents. When the fire was discovered the mine was in excellent physical condition. No material impairment of that condition is looked for from water contact. The unwatering will not be expensive. The treasury will take care of that. We have 20 years' ore in

sight and owe nothing. Our slime plant is practically finished, and the property generally in good order and condition."

Utah

JUAB COUNTY

Tintic Ore Shipments—Last week the mines of the Tintic district were represented in the Salt Lake market by 178 carloads, the contributing mines and respective amounts being: Ajax, 6; Beck Tunnel, 12; Bullock, 2; Bullion Beck, 12; Black Jack, 1; Centennial Eureka, 56; Colorado, 9; Carisa, 4; Eureka Hill, 12; Eagle & Blue Bell, 8; Gemini, 5; Lower Mammoth, 9; La Clede, 2; Scranton, 6; Dragon Iron, 9; Uncle Sam Consolidated, 3; Victoria, 2; Yankee Consolidated, 6 cars.

Eureka Railway—The grading of the roadbed for this railway, which will connect the new Tintic smelter with the principal mines of the Tintic mining district, has begun. The company will operate between 10 and 15 miles of track.

Scranton—A strike of considerable significance was made last week in this Tintic property, it having demonstrated the continuity of the Scranton orebody for a distance of fully 2000 ft. The mine is a regular shipper of lead and zinc ore.

Utah Mine—Regular shipments of ore are being made from this property. A car of ore sold last week gave returns of 49 per cent. lead and 108 oz. silver per ton.

IRON COUNTY

Reuben—This company is getting ready to begin a campaign of development on its property at Stateline. At the bottom of a 50-ft. shaft a body of ore is exposed which averages about \$15 in gold and silver to the ton. W. J. Dooley, of Salt Lake, is president of the company.

Jennie Gold—The mill operated by this company at Gold Springs is treating successfully about 40 tons of ore per day. Charles A. Short, of Gold Springs, Utah, is manager.

Desert Wonder—This property, located near Modena, is opening up encouragingly. In the shaft considerable lead silver ore has been found. W. F. Bramel, of Salt Lake, is manager.

Washington

OKANOGAN COUNTY

Nespelem—In this camp, in the southeastern part of this county, there are about 130 claims under development and some of them produce very rich ore.

Palmer Mountain—The Kimberley Development Company will install next month a hoisting engine, boiler, compressor, drills, pumps, track and cars. A shaft has been sunk 100 ft. and drifts are being driven on a vein of 7 to 10 ft. in width. The ore assays in gold, silver, lead and copper.

Plant & Callahan—This company was recently organized to take over the Anaconda group of four claims for \$40,000. It is capitalized at \$1,250,000. The directors are James T. Plant, C. E. Williams, Henry Rines and G. W. Newbert, of Mora, Minn.; G. P. Ward, of Alexander, Minn.; S. Callahan, of Spokane, and P. Connelly, of Somas, Wash. J. T. Plant is president; C. E. Williams, vice-president; H. Rines, secretary and treasurer. There are two veins on the group, which will be cut by a tunnel already started, one at 400 ft. in from the portal and the other at about 600 ft.

Ruby—At this mine, on Mount Chopaca, two new levels have been opened on ore. Connections have been made between all of the levels and the mine is in fair shape to ship right along, after the railway reaches it.

Salmon River—This company owns a large group of claims 3 miles south of Conconnulli, on Peacock mountain, upon which several bodies of copper ore have been developed near the surface. The company is about to start a tunnel and drive it through 3000 ft. The tunnel work will be under the direction of William McDaniel.

Trinity—A large interest in the company was recently purchased by C. Johns, of Chicago. Arrangements will be made with the Similkameen Falls Power Company to transmit power to the mine. A wagon road, 1¼ miles, will be constructed from the mine. The company's main office is at Spokane, Wash. Edward Davis is the president.

Canada

ALBERTA

During the present year up to March 4, coal lands aggregating nearly 100,000 acres, chiefly in the province of Alberta, have been disposed of by the Canadian Government. The price received was \$7 per acre, the land being disposed of in lots of the usual size of 320 acres, though some were of smaller dimensions.

BRITISH COLUMBIA

Eva Gold Mines, Ltd.—A Canadian Rand compound duplex Corliss-valve 15-drill air compressor has been installed at the mill at Camborne, northern Lardeau district. This engine is direct connected to a Pelton water-wheel 13 ft. 2 in. diameter. The compressed air for operating machine drills is conveyed up the mountain about 4500 ft. to the Eva mine.

Snowshoe Mine—A Jeffrey electric locomotive has been ordered by the Consolidated Mining and Smelting Company, of Canada, for hauling purposes on the main tunnel level of its Snowshoe mine at Phoenix in the Boundary district.

West Kootenay Power and Light Company—This company, with head office at Roseland, is now using its new hydro-

electric generating station at upper Bonnington falls, Kootenay river, near Nelson, where it has one 8000-h.p. unit in operation and another available whenever additional power shall be required. The voltage of the current transmitted to the Boundary district since starting the new plant has been up to 40,000 volts. The two 78-mile circuits connecting the generating station with the main sub-station at Greenwood have been constructed and equipped for 60,000 volts. These high-tension lines are carried on wooden poles, varying in height from 35 to 80 ft. and placed on an average 150 ft. apart. The conductors used are hard-drawn copper cable. Wires are strung in a rectangle with each wire distant 6 ft. from the others. The line is transposed at every mile. Cross-arms are of wood, 5x6 in., and insulators are 60,000-volt porcelain, made by the Locke Insulator Company, of New York. There are also two 20,000-volt circuits running out of the generating station transformer house. All three Boundary copper smelters and six or more district mines are now using electricity as motive power.

NOVA SCOTIA

Dominion Coal Company—The output for April was 316,114 tons coal, against 296,417 tons for April, 1906. The product for the first four months of the year was 1,063,548 tons in 1906 and 997,595 tons in 1907, a decrease of 65,953 tons.

Nova Scotia Steel and Coal Company—This company has made arrangements to purchase a large deposit of iron ore in Brazil. Negotiations have been carried on for some time, and last year an expert was commissioned to make an examination of the property. His report was favorable and the purchase was decided upon. Harvey Graham, one of the directors, and J. L. Jennison, of New Glasgow, solicitor for the company, left for Brazil recently to close the transaction.

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of ore from Cobalt over the Timiskaming & Northern Ontario road for the week ending May 4 were: Cobalt Townsite, 40,070 lb.; Coniagas, 62,000; O'Brien, 130,390; Silver Queen, 44,000; total 276,470 pounds.

Buffalo—In this mine, Cobalt, another important find was made May 2. In trenching, a rich vein about 5 in. wide was exposed, which has been stripped for 50 ft. It branches out at one place into a network of small veins. A shaft will be sunk upon it.

Cleveland-Cobalt—The gas-producer plant from Philadelphia, ordered some time since, is being installed to furnish power for the mine at Cobalt and a pipe is being laid to carry air from the plant, which is three-quarters of a mile distant from the mine, across the Silver Queen and Timiskaming & Hudson Bay proper-

ties, which intervene. Work on one shaft is being continued by hand, operations on the other four being suspended until the producer plant is in working order.

Florence—This company, which has an action pending against the Cobalt Lake Mining Company, claiming a prior right to the bed of Cobalt lake on the ground of previous discovery, has petitioned the Dominion government to disallow the act passed at the last session of the Ontario legislature validating the title of the Cobalt Lake Company. It is urged that the act is *ultra vires*, as it is confiscation of the rights of the Florence Mining Company. The case before the court has been postponed to await the result of the petition.

Kerr Lake Crown Reserve—It has been decided to lower the lake level 8 ft. by drainage, which will leave a considerable area of the property uncovered. A find of native silver has been made 16 ft. below the surface of the water.

Lumsden—This company has a force of 94 men at work on the Brady claim, Cobalt, adjoining the Beaver and Timiskaming mines, where 20 ft. of stripping has been done, resulting in the discovery of 14 veins, some of which have native silver contents in addition to cobalt, smaltite and nickel. Machinery has been installed on the Geeling claim, Bucke township, where 14 men are at work.

ONTARIO—MANITOU LAKE

Laurentian Gold Mine—The working force has been largely increased and the rate of pay raised 25c. a day all round. Chauncey Whetmore, late of Sonora, Mexico, is in charge of the stamp mill, operating 20 stamps. The pump and boilers installed at Crystal lake are pumping 500 gallons of water per minute to the mine.

Paymaster Gold Mine—Drifting operations commenced at the 100-ft. level have disclosed a good vein, the quartz showing visible gold. A good find of similar character has also been made at the 200-ft. level.

ONTARIO—STURGEON LAKE

St. Anthony's Reef—At this gold mine, Sturgeon lake, the management has decided to suspend development work until proper transportation facilities are available. The mine will be re-opened on an extensive scale as soon as the Lake Superior branch of the Grand Trunk Pacific, now under construction, is open for traffic. Meanwhile the exploration of the vein will be undertaken.

Mexico

JALISCO

Copper Range—This company has ordered a 50-ton smelting plant for its properties near Autlan, in the southern part of the State of Jalisco.

GUANAJUATO

The many improvements and extensive development work continue unabated in the camp of Guanajuato. The 100-ton mill of the Guanajuato Amalgamated Gold Mines is running full, and from 20 to 25 tons of concentrates are shipped weekly to the smelters. The Los Angeles & Guanajuato Development Company is preparing to start operations in La Luz district. Examinations have been made of the group known as La Luz to determine upon the size and details of a mill for the treatment of the old fillings and the ore blocked out. The old San Cayetano property, consisting of 750 acres and held since 1814 by the United Mexican Mines Association, Ltd., of London, which is now winding up its affairs, seems to have been at last placed by W. Murdock Wiley, who for some time has held an option on the property, and who has had it about placed several times. The San Cayetano Tunnel Mines Company, as the new company will probably be named, will be closely allied to the Mineral Development Company, of 99 John street, New York, with Mr. Wiley as temporary president. It is understood that the transfer was made for \$135,000 gold. The Peregrina Company has completed its new 120-stamp and cyanide mill, which is a model of its kind. It consists of Gates crushers, with belt conveyers to the stamp bins; stamps of 1000 lb. each in batteries of five, dropping 6 to 8 in. and about 90 times a minute. The material passes through a 30-mesh sieve over plates to cone classifiers and Wilfleys, the oversize going to tube mills. The sands are drained before leaching and then handled wholly by the Blaisdell automatic system.

For the San Matias, of the Guanajuato Transportation and Milling Company, a Butters slime plant is being installed at a cost of \$10,000 gold. Work has started on the construction of the initial 20 stamps of the 80 for the Republic Mining Company for treating the ores from its Union, Cordobanes and other properties. The Guanajuato Reduction and Mines Company is completing its second 80-stamp unit and preparing for the installation of a third 80, making a total of 240 stamps, capable of treating about 750 tons under one roof. Even at this rate it is estimated that it will take close to 10 years to work over the company's old dumps.

The old Cinco Señores, of San Luis de la Paz, Guanajuato, which 10 or 12 years ago was in bonanza and whose shares were selling for \$3000 and over, but which in the last few years has fallen greatly in production, partly because it did not keep up with development work, has been re-organized with \$300,000 Mexican capital, divided into 6000 shares, of which 1729 will be free and the remaining 4271 assessable. The shares are to be sold at \$5 cash and 90 per cent. in nine assessments as called, the proceeds to be used

in working the lower levels, which are now largely under water. Manuel Aramburu, of 18 Cadena street, Mexico City, is the president of the new organization.

Australia

NEW SOUTH WALES

The gold yield in March was 36,973 oz. fine. For the three months ended March 31, it was 95,493 oz. fine in 1906, and 87,024 oz. in 1907; a decrease of 8469 oz. this year.

WESTERN AUSTRALIA

The output of gold in March is reported at 129,725 oz. fine, being 14,467 oz. less than in February. For the three months ended March 31 the production was 442,364 oz. in 1906, and 426,156 oz. in 1907; a decrease of 16,208 oz. this year.

The January gold yield, 162,238 oz. fine, was a great improvement on previous few months' yield and shows an increase of 7873 oz. over that of January last year. The many new fields which are opening up well will, it is hoped, more than make up for a falling off in the Great Fingall mine, and the general lowering of the grade of ore now treated at Kalgoorlie.

Dividends paid by the various West Australian companies during 1906 totaled £1,992,062.

The old Southern Cross fields are in great favor and gold mining is looking very promising. The Marvel Loch mine has been floated into a strong company in Melbourne. A large capital is provided for and active development work is in progress. A great deal of prospecting is going on for miles around.

On the northern fields Black Range continues to do well. The last fortnightly return by the Black Range Company's mine was 567 oz. from 385 tons treated by battery and 331 oz. from 467 tons of tailings cyanided. The 200-ft. level is opening up well. The Kohimoor lease, which was also secured by the Black Range Company, has since the purchase yielded 909 oz. gold from 115 tons treated; the sands will bring up the average value to over 10 oz. per ton.

The Pilbarra fields are quiet, owing to delay in starting the proposed railway. A promising silver-lead mine is being worked near Roebourne and the tinfields of Wodgina are steadily increasing their output.

New Zealand

Exports of gold and silver in January are reported by the Mines Department as follows, in ounces:

	1906.	1907.	Changes.
Gold.....	61,704	27,510	D. 34,194
Silver.....	85,552	189,552	I. 104,000

The gold bullion reported this year was equal to 25,221 oz. fine gold, or \$521,303 in value.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, May 15—The coal trade in the West presents no new features. The cold weather seems to have come to an end at last, so that the abnormal late demand for domestic coal has probably come to an end. The market for steam coal continues active, factories being generally well occupied. Apparently, also, there is a disposition to put in stocks, so as to avoid a repetition of the troubles of last winter. The Lake trade is in full swing, and vessels are getting away from Lake Erie ports as fast as possible. The railroad service, for the time being, is good, and few complaints are heard.

In the East the trade is moving along steadily. Steam-coal requirements are large and are taking most of the available coal, both anthracite and bituminous. The coastwise trade is hanging back a little, on account of scarcity of vessels at the shipping ports.

Railroad service is generally good; but there is much complaint about long and vexatious delays in unloading coal cargoes at New England ports.

There are rumors that the control of the New York, Ontario & Western, and its anthracite properties, now held by the New York, New Haven & Hartford Company, is to be passed over to the New York Central. Possibly there is some foundation for these, but nothing definite can be said as yet.

COAL-TRAFFIC NOTES

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to May 4 were as follows, in short tons:

	1906.	1907.	Changes.
Anthracite.....	1,402,770	1,862,324	I. 459,554
Bituminous.....	11,835,574	12,737,790	I. 1,402,216
Coke.....	4,380,705	4,797,723	I. 417,018
Total.....	17,119,049	19,397,837	I. 2,278,788

The total increase this year was 13.3 per cent.

Shipments of Broad Top coal over the Huntingdon & Broad Top Railroad for the year to May 11 were 378,028 tons.

Coal tonnage originating on the lines of the Southern Railway for the two months ended Feb. 28 was: Tennessee district, 245,777; Alabama district, 398,223; total, 644,000 short tons.

Shipments of anthracite coal in April were 5,916,583 long tons, a high figure for that month. This compares with 488,203 tons in April, 1906, when most of the mines were shut down pending a set-

tlement with the miners. For the four months ended April 30 the shipments, by companies, were, in long tons:

	1906.		1907.	
	Tons.	Per Ct.	Tons.	Per Ct.
Reading.....	3,355,430	20.4	4,201,935	20.0
Lehigh Valley....	2,799,560	17.1	3,597,766	17.2
N. J. Central.....	2,064,234	12.6	2,685,379	12.8
Lackawanna.....	2,758,386	16.8	3,378,544	16.1
Del. & Hudson..	1,671,880	10.2	2,071,803	9.9
Pennsylvania....	1,439,497	8.8	1,932,548	9.2
Erie.....	1,610,264	9.8	2,214,838	10.6
N. Y., Ont. & W....	705,003	4.3	893,244	4.2
Total.....	16,404,254	100.0	20,976,057	100.0

The total increase this year was 4,571,803 tons, or 27.9 per cent. Shipments by months this year have been: January, 5,249,946; February, 4,563,720; March, 5,245,808; April, 5,916,583 tons.

Receipts of coal at Boston for the four months ending April 30 are reported by the Chamber of Commerce as follows:

	1906.	1907.	Changes.
Anthracite.....	475,406	662,197	I. 186,791
Bituminous.....	1,025,329	913,119	D. 112,210
Total domestic....	1,500,735	1,575,316	I. 74,581
Foreign coal.....	283,237	186,065	D. 96,182
Total.....	1,783,972	1,760,371	D. 23,601

The foreign coal is chiefly from Nova Scotia, with a small quantity from Great Britain.

ANTHRACITE SIZES

A statement compiled by W. W. Rulley, of Philadelphia, gives the sizes of anthracite shipped to market in 1906 as follows:

	Tons.	Per Ct.
Lump.....	1,420,311	2.55
Broken.....	3,723,515	6.68
Egg.....	6,988,770	12.55
Stove.....	10,061,784	18.06
Chestnut.....	10,699,744	19.21
Total large.....	32,894,124	59.05
Pea.....	7,400,203	13.29
Buckwheat.....	8,320,522	14.94
Rice and barley.....	7,083,746	12.72
Total small.....	22,804,471	40.95
Total.....	55,698,595	100.00

The proportion of small sizes was highest in the Schuylkill district, where it was 44.78 per cent. The Lehigh region reports 43.29 cent., while the Wyoming region shipped 38.6 per cent. of small sizes.

New York

ANTHRACITE

May 15—The warm spring weather which has set in at last—unexpectedly, as it generally does—rather emphasizes the dullness in the anthracite trade, so far as larger sizes go. The small steam sizes are still in strong demand, but supply is a little better. Coastwise trade has been restricted by scarcity of vessels. Car sup-

ply is good, and there is little trouble about transportation.

Prices are unchanged, as follows: Broken, \$4.35; egg, stove and chestnut, \$4.60. Small sizes are quoted nominally: Pea, \$3; buckwheat, \$2.50; rice, \$1.85; barley, \$1.50. All f.o.b. New York harbor.

BITUMINOUS

The Atlantic seaboard soft-coal trade is quiet at this time, although lack of vessels is having some effect, shippers being unable to move orders in hand; in the meantime other orders are accumulating. Many coasting vessels are taking outside freights, for which rates are very high and attractive. The general market for soft coal is slightly improved outside of this situation, in that accumulations of coal at tidewater ports are being materially reduced. There is, however, no change in prices, quotations being \$2.30@2.35 f.o.b. New York harbor shipping ports. Good steam coal can still be purchased from \$2.60@2.70, same delivery.

Trade in the far East is calling for fair shipments upon the season contracts in hand, which will permit a prompt moving of the coal when available vessels arrive at shipping ports. Discharging at the unloading ports is slightly better than it was, and most vessels are being finished without much demurrage.

Trade along the Sound is showing an inclination to take a little more coal than it did and the worst effects of the lower prices of anthracite which began April 1 are about over.

Trade in New York harbor is quiet, but the situation is clearer on account of the absorption of the stocks of coal which were at tidewater. Contractors are taking their usual amount for this period of the season and things are apparently shaping themselves to move more regularly.

All-rail trade is quiet on new business and contractors are pretty well filled up as coal is being delivered to them and accumulations are piled up at tide. Good coals can be bought around \$1, f.o.b. mines. Car supply is up to all demands and transportation from mines to tide is very nearly up the schedule.

Coastwise vessels are very scarce and in great demand. We quote rates from Philadelphia to Boston, Salem and Portland \$1@1.05; to Providence, New Bedford and the Sound, 90c.; to Lynn and Bangor, \$1.25; to Portsmouth, Gardiner and Saco, \$1.15; to Bath, \$1.10, with towages where usual.

Birmingham

May 13—Alabama coal producers report no change in conditions and the production, demand and future prospects are as active and bright as they could be. Good prices obtain for coal. The railroads are giving a better service and the operators are complaining but little in this regard. The real warm weather has not yet been felt in this section of the country, and the slack conditions usually observed when warm weather does come on are delayed. The Jenifer Iron Company is opening a new slope in the vicinity of Connellsville, in Tuscaloosa county. Several coal companies were organized during the past three weeks and new openings are going to be made by all. Activity in the iron market will hold up the coal market.

Coke is not so strong in demand and quotations are not as firm as they have been. The production is none too large, however, and the producers look for a recovery in the near future.

Chicago

May 13—Sales of all grades of domestic coals have been good in the last week. The cold weather has been chiefly responsible for this. Eastern and western coals alike have profited.

Sales of steam coals have been good and contracts are increasing in number and quantity of coal. There is still a tendency on the part of users of large amounts to hold off, in the belief that the open market will be more favorable to their interests.

Western bituminous sells for \$1.70@2.50 for run-of-mine; \$1.90@2.65 for lump and egg, and \$1@1.75 for screenings.

Eastern bituminous is firm. Smokeless is held at \$3.35 for run-of-mine and \$3.65 for egg and lump. Pittsburg No. 8 is held at about \$2.90, and receipts are not yet adequate. Youghiogheny is scant at \$3.20 for 3/4-in. Hocking is firm at \$3.15 for lump.

Cleveland

May 14—Local buyers are bidding for grain tonnage up the lakes, but there is little activity in iron-ore shipments. The tonnage moved to Cleveland during the month of April showed a big falling off, but receipts during the week picked up considerably. The Chamber of Commerce today completed its table of coal receipts and shipments, by rail and lake. The receipts of anthracite were 22,541 tons, all by rail; bituminous, 456,420 tons, all by rail. Bituminous forwarded by lake, 282,974 tons.

Coal dealers report a firmer market on the opening of navigation. Supplies on hand have been materially lessened, but prices continue about the same.

Pittsburg

May 14—There is a good supply of railroad cars this week and the mines are

practically in full operation. The demand is fair, but prices are somewhat easier, quotations being on the basis of \$1.20 for mine-run coal at mine. The rivers are still navigable and several tows of coal boats and barges were sent to lower ports during the past few days, the total tonnage sent out being in the neighborhood of 1,000,000 bu. There is plenty of empty craft in the pools and harbors and the mines will be kept running steadily for some time, and a large tonnage likely will be accumulated for the June rise.

Connellsville Coke—Coke prices continue low, sales having been made at \$2.25 for furnace coke for prompt shipment. Higher prices, however, are expected to prevail before the end of the week. For last-half delivery \$2.65@2.75 is quoted. Foundry coke for spot shipment is down to \$3 per ton, the lowest rate reached for a long time. For second half, sales of foundry coke are being made at \$3.50@3.75. The *Courier*, in its summary for the week, gives the production in both regions at 415,482 tons. The shipments aggregated 15,115 cars, distributed as follows: To Pittsburg, 5067 cars; to points west of Connellsville, 9126 cars; to points east of Connellsville, 922 cars.

Foreign Coal Trade

May 15—Imports of coal into Germany for the three months ending March 31 were, in metric tons:

	1906.	1907.	Changes.
Coal.....	1,824,026	2,375,856	I. 551,830
Brown coal.....	1,960,500	2,013,953	I. 53,453
Total.....	3,784,526	4,389,809	I. 605,283

Imports of coke in 1907 were 105,258 tons; of briquets, 40,382 tons.

Exports of coal from Germany for the three months ending March 31 were, in metric tons:

	1906.	1907.	Changes.
Coal.....	5,215,596	4,724,804	D. 490,792
Brown coal.....	5,057	3,982	D. 1,075
Total.....	5,220,653	4,728,786	D. 491,867

Exports of coke in 1907 were 865,966 tons; of briquets, 289,267 tons. Included in the coke exports were 1033 tons to the United States.

Coal production in Germany for the three months ended March 31 was, in metric tons:

	1906.	1907.	Changes.
Coal.....	35,240,546	35,410,498	I. 169,952
Brown coal.....	14,542,212	14,904,190	I. 361,978
Total mined..	49,782,758	50,314,688	I. 531,930
Coke made.....	4,818,132	5,237,732	I. 419,600
Briquets made,	3,705,463	3,777,140	I. 71,677

A large part of the briquets is made from brown coal, or lignite.

Iron Trade Review

New York, May 15—The work has shown increasing activity in the iron trade, and active buying in various lines is reported. Although there is still some un-

certainly about the crop outcome, the foundries seem to have dropped all uncertainty and are contracting freely for third and fourth quarter delivery; while there have been sales running into the first quarter of 1908. Basic pig is in demand, as well as foundry.

In finished material there has been more inquiry for structural steel. Bridge and building projects still seem to be coming forward. The rail capacity for 1907 is pretty well taken up, and a considerable tonnage is already on the books for 1908 delivery.

The first shipments of Lake iron ore have arrived at Lake Erie ports, and the receipts there will be large and continuous from now on.

There has been a good deal of talk in the press about accidents due to breakage of rails; and charges have been freely made that a good many rails of recent make are not up to the proper standard. Some careful investigation will be needed to determine whether this is the case or not. This talk has started also some discussion as to the superiority of open-hearth steel rails over those of bessemer steel. On this point some things have been said which show little knowledge of the subject.

Pig-iron Production—The statement of the furnaces in blast on May 1 shows coke and anthracite furnaces active, with a total weekly capacity of 523,900 tons, or 26,400 tons more than on April 1. The estimate of the *Iron Age* for coke and anthracite production, with an allowance for the charcoal furnaces, gives a total production for April of 2,251,500 tons of pig iron, and for the four months ended April 30 of 8,830,600 tons.

Lake Iron-ore Rates — The *Cleveland Marine Review* has compiled the average rate at which all ore, both wild and contract, was moved from the head of the lakes to the lower lakes during the season of 1906. The rate is an absolute one, as the figures are obtained directly from the shippers. The average rates for 10 years have been, in cents per ton:

1897	63.800	1902	77.490
1898	59.000	1903	84.010
1899	79.400	1904	72.540
1900	120.700	1905	75.060
1901	79.990	1906	75.079

In 1906 the great bulk of ore was moved at the flat rate of 75c., but certain shippers have continuing contracts somewhat lower than this figure, and a small amount was moved at a rate considerably higher than 75c. The average rate works out as given in the table.

Baltimore

May 14—Imports of steel-making alloys for the week were: Spiegeleisen, 1225 tons; ferromanganese, 2800 tons; ferro-silicon, 318 tons; silicon-spiegel, 300 tons. Receipts of manganese ore were 443 tons. Arrivals of iron ore were 6050 tons from Nicolaieff, Russia; 4300 tons from Spain; 11,175 tons from Cuba; 21,525 tons in all.

Birmingham

May 13—Alabama pig iron appears to have taken a strong position. No. 2 foundry, for delivery during the last quarter of the year, commands \$20@21 per ton and is selling right along. In fact, there is talk of some of the manufacturers in this section withdrawing from the market altogether. Third-quarter iron is hard to get and is being sold almost as spot iron. Some spot iron has been selling lately, one brokerage firm announcing during the past week that orders to the amount of 1600 tons had been accepted; more than \$23.50 per ton, No. 2 foundry, has been received. Some of the larger companies in this district have been in the spot market also. Several sales of iron for delivery during the first quarter of 1908 have been made and the statement is given out that the quotation for that product is but a little under \$19 per ton. The first sales of 1908 iron, according to good information, were made on a basis of \$18 and less per ton.

Foundries and machine shops are doing well. There is no hesitation in the demand for cast-iron pipe. Soil-pipe makers report much activity, though they are feeling the labor troubles in San Francisco and other western places. Alabama manufacturers have sold no less than 15,000 tons of soil-pipe to San Francisco, Los Angeles and Seattle this year. The freight rate on pipe from this district to San Francisco is \$13 per ton.

Chicago

May 13—The last week has held the iron market firmly in line with previous weeks, and has seen a turning to foreign irons as a means of relief from the present scarcity of small supplies. The demand for iron generally has been strong, but the shortage in supplies has kept actual sales small in tonnage, though many in number.

No. 2 Northern for quick delivery brings \$27 and No. 2 Southern, \$26@27. For second-half delivery No. 2 Northern is quoted at \$24.50@25, and No. 2 Southern at \$20@20.50, Birmingham, or \$24.35@24.85 Chicago.

The demand for finished material continues. Coke is steady, with Connellsville foundry at \$6 and Southern coke 25 to 50c. lower.

Cleveland

Sales of pig iron continue strong on the advance to these quotations for last-half delivery; Bessemer, \$23.90; No. 1 foundry, \$24; No. 2, \$23.50; No. 3, \$23; No. 2 Southern, \$23.85; gray forge, \$22.50.

Spot furnace coke is quoted at \$2.50 and foundry at \$3.30@3.35, while foundry for future delivery is selling at \$3.25. The market reports a fair demand, but prices appear to have reached the top for the time being.

Philadelphia

May 14—This territory is more disturbed by what is transpiring outside of its limits than within. The most interest felt is among a very few who handle basic pig. The large transactions which took place recently have been followed up by smaller sales which go to show that all the basic pig which can be had can find ready market. The heavy under-current has advanced prices nominally all around, but the volume of business definitely closed within six days does not size up much. Brokers speak of possibilities of business on a large scale, especially in pipe iron, No. 2 foundry and basic. Conditions are more or less unsettled, and there are rumors of business of large proportions, but careful inquiry reveals a moderate volume only. Quotations are nominally higher than a week ago, but sales have been made at about last week's level.

Steel Billets—Deliveries are now being hurried along on orders placed some time ago, but new orders for the week have been light.

Pittsburg

May 14—Indisputable evidence of the remarkable strength of the iron and steel markets was shown in the bi-monthly examination of sales of bar iron, tin-plate and sheets under the wage scale of the Amalgamated Association of Iron, Steel and Tin Workers. The adjustment clearly shows that all sales made in March and April were at the established prices and that but few low-price contracts remain unfilled. Compared with the previous examination held early in March there was an advance in all branches. In sheets the advance was the first to be recorded under the sliding scale. The base is 2.30c., being the average of Nos. 26, 27 and 28 gages. The established price for No. 26 is 2.45c., for No. 27, 2.50c. and for No. 28, 2.60c. The average of all sales shows a price of 2.46c., which was a surprise when it is known that large sales were made of No. 26 gage and that on all large orders a concession of 0.05c. was allowed. As a result the wages of the sheet workers were advanced 2.6 per cent., this being the increase for every 0.10c. above the base.

Tin-plate took another jump and the average for the past two months was \$3.72 a box. The base of the tin-plate scale is \$3.40 a box and the wages are advanced 2 per cent. with every increase of 10c. a box above the base. The January settlement showed \$3.50, the March settlement \$3.60 and the present settlement \$3.70, making the advance in tin-plate workers' wages this year 6 per cent. The American Sheet and Tin Plate Company voluntarily concedes this advance to the men employed in its non-union mills.

Late this afternoon the National Tube Company issued its new price list. This

company withdrew quotations on March 8, and the new list provides for an advance over the old list of two points, or \$4 a ton, except for 7- to 12-in. pipe, which remains the same at 70 per cent. for black and 55 per cent. for galvanized. The extreme discount to jobbers in carload lots is 74 and 5 per cent. off the list, and to consumers one point less discount. All pipe mills are crowded with orders and cannot promise deliveries inside of from four to six months.

Pig Iron—Second-half pig iron sold above the \$23 rate during the week, when contracts were closed for 7500 tons of basic and 600 tons bessemer for fourth-quarter delivery at about \$24, Pittsburg, or 15c. above the highest previous sale. Two lots of basic iron sold later in the week at \$22.25, Valley furnaces, for delivery in the last quarter. Furnaces are evidently discouraging sales at fancy prices that are calculated to disturb the market, and endeavoring to keep prompt and future prices down. One significant transaction was the sale of 3750 tons of malleable bessemer iron for equal deliveries over the first quarter of 1908 at \$22, Valley furnaces. During the past 10 days there have been a number of important inquiries from steel interests for pig iron for second half. One large producer rejected inquiries aggregating over 40,000 tons. It is announced that there is no bessemer or basic iron and but little foundry and forge iron for delivery this year. It is believed, however, that some producers are reserving some which will be sold later on. Some small lots of bessemer and No. 2 foundry sold this week at \$25 and higher for prompt shipment. A sale of 5000 tons of gray forge for second-half delivery at \$22.85, Pittsburg, is reported. For third-quarter delivery bessemer, basic, malleable bessemer and No. 2 foundry are quoted at the uniform price of \$23, Valley furnaces.

Steel—There is scarcely any tonnage in billets or sheet-bars available and prices are nominal, \$31.50 being named for bessemer and \$33 for open-hearth billets. Sheet-bars for prompt shipment readily command \$31. Merchant-steel bars are firm at 1.60c. and plates at 1.70c.

Sheets—Mills are still several months behind in deliveries and new business is being booked almost daily, but no date for shipment is promised. Black sheets remain at 2.60c. and galvanized at 3.75c. for No. 28 gage.

Ferro-Manganese—Another drop in ferro for prompt shipment occurred this week when a sale was made at \$69 a ton. The tonnage was small and it is believed this price can be shaded.

Dusseldorf, Germany

May 1—The German Iron and Steel Union reports the output of the German blast furnaces in March at 1,099,257 tons of pig iron, which was 40,730 tons more

than in March, 1906. For the three months ended March 31 the total make of pig iron was, in metric tons:

	1906.		1907.	
	Tons.	Per Ct.	Tons.	Per Ct.
Foundry iron....	522,328	17.3	544,663	17.3
Forge iron.....	210,101	7.0	201,787	6.4
Steel pig.....	225,706	7.5	256,116	8.2
Bessemer pig....	112,000	3.7	121,132	3.9
Thomas pig.....	1,945,287	64.5	2,015,902	64.2
Total.....	3,015,422	100.0	3,139,600	100.0

There were this year increases of 22,335 tons in foundry iron; 30,410 in steel pig, which includes spiegeleisen, ferromanganese and all similar alloys; 9132 in bessemer; 70,615 in Thomas, or basic pig. There was a decrease of 8314 tons in forge, making the total gain 124,178 tons, or 4.1 per cent.

Metal Market

NEW YORK, May 15.

Gold and Silver Exports and Imports At all United States Ports in March and year

Metal.	Exports.	Imports.	Excess.
Gold:			
Mar. 1907..	\$2,126,173	\$ 5,007,319	Imp. \$2,881,146
" 1906..	5,918,627	5,630,695	Exp. 287,932
Year 1907..	5,703,304	11,607,691	Imp. 5,904,387
" 1906..	20,146,622	10,316,087	Exp. 9,830,535
Silver:			
Mar. 1907..	5,058,461	3,936,139	Exp. 1,122,322
" 1906..	5,213,811	3,509,838	" 1,703,973
Year 1907..	14,669,396	11,315,168	" 3,354,228
" 1906..	19,165,608	12,676,998	" 6,488,610

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York

For week ending May 11 and years from Jan. 1

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.....	\$84,910	\$ 44,947	\$ 491,930	\$ 34,669
1907.....	1,877,446	5,397,379	13,707,558	703,143
1906.....	4,310,036	26,184,896	24,175,124	746,364
1905.....	32,903,625	4,979,478	11,502,218	1,225,625

Exports of gold for the week were to the West Indies; of silver to London and Paris. Imports for the week, both gold and silver, were from the West Indies and Mexico.

Shipments of silver from London to the East are reported by Messrs. Pixley & Abell as follows, for the year to May 2:

	1906.	1907.	Changes.
India.....	£ 6,394,103	£4,465,334	D. £ 1,928,769
China.....	.....	.....	.....
Straits.....	1,750	321,500	I. 319,750
Total.....	£ 6,395,853	£4,786,834	D. £ 1,609,019

Imports for the week were £10,000 from the West Indies; £277,000 in bars and £104,000 in Mexican dollars from New York; £156,000 in bars and £58,000 in Mexican dollars from China; a total of £605,000. Exports were £56,000 in coin to the Straits and £55,550 to India; £111,550 in all.

Indian exchange has been easier, the Council bills offered in London having been taken at an average of 16.06d. per rupee. There has been rather more active buying of silver in London on Indian account.

The joint statement of all the banks in the New York Clearing House for the week ending May 11 shows loans \$1,126,223,600, a decrease of \$14,096,700; deposits, \$1,104,419,100, a decrease of \$16,183,800, as compared with the previous week. Reserve accounts show:

	1906.	1907.
Specie.....	\$186,443,400	\$212,484,800
Legal tenders.	80,090,300	72,106,200
Total cash.....	\$266,533,700	\$284,591,000
Surplus.....	\$12,894,600	\$ 8,486,225

The surplus over legal requirements shows an increase of \$1,661,600, as compared with the previous week this year.

Specie holdings of the leading banks of the world, May 11, are reported as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York.....	.....	.....	\$212,484,800
England.....	\$177,925,460	.....	177,925,460
France.....	520,860,285	\$195,702,455	716,562,740
Germany.....	167,925,000	55,975,000	223,900,000
Spain.....	77,400,000	126,305,000	203,705,000
Netherlands.....	26,087,000	27,700,000	53,787,000
Belgium.....	16,473,335	8,236,665	24,710,000
Italy.....	162,015,000	24,962,000	186,977,000
Russia.....	586,955,000	30,625,000	617,580,000
Aust.-Hungary.....	226,985,000	63,365,000	290,350,000
Sweden.....	20,800,000	.....	20,800,000

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports. The European statements are from the cables to the *Commercial and Financial Chronicle* of New York.

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars.....	\$0.50½	\$0.52½
Peruvian soles and Chilean.....	0.45½	0.48½
Victoria sovereigns.....	4.85	4.87
Twenty francs.....	3.85	3.89
Spanish 25 pesetas.....	4.78½	4.80

SILVER AND STERLING EXCHANGE.

May.	Sterling Exchange.	Silver.		May.	Sterling Exchange.	Silver.	
		New York, Cents.	London, Pence.			New York, Cents.	London, Pence.
9	4.8600	64½	30	13	4.8620	65½	30½
10	4.8615	64½	30	14	4.8620	65½	30½
11	4.8620	65½	30½	15	4.8625	65½	30½

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals

May.	Copper.			Tin.	Lead.	Spelter.	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.			New York, Cts. per lb.	St. Louis, Cts. per lb.
9	25 @25½	24½ @24½	101½	43	6.00	6.40 @6.50	6.25 @6.35
10	25 @25½	24½ @24½	101½	44	6.00	6.40 @6.45	6.25 @6.30
11	25 @25½	24½ @24½	.....	44	6.00	6.35 @6.45	6.20 @6.30
13	25 @25½	24 @24½	102	44	6.00	6.35 @6.45	6.20 @6.30
14	25 @25½	24 @24½	102½	44	6.00	6.35 @6.45	6.20 @6.30
15	25 @25½	24 @24½	102½	44	6.00	6.35 @6.45	6.20 @6.30

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions as made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting and Refining Company for near-by shipments of desilverized lead in 50-ton lots, or larger. The quotations on spelter are for ordinary western brands; special brands command a premium.

The silver market has advanced this week on improved demand from India. In London it closes firm, with 30 5/16d. bid.

Copper—The market seems to be drifting back into the same condition which existed a few weeks ago, as a result of the disparity between the prices of furnace material as offered in Europe and the prices for electrolytic in this market. The stimulating influence of a brisk European business has disappeared and quotations for all grades have receded gradually. Business in the domestic market is at a standstill, and the close is nominal at 25@25½ for Lake copper; 24@24¼ for electrolytic in ingots, cakes and wirebars; 22½@22¾ for casting copper.

The standard market in London has been fluctuating within narrow limits, business being of rather reduced proportions. The close is easy at £102 2s. 6d. for spot, £101 5s. for three months'.

Refined and manufactured sorts we quote: English tough, £108@109; best selected, £112@113; strong sheets, £120@121.

Exports of copper from New York for the week were 230 long tons. Our special correspondent reports exports for the week from Baltimore at 1244 long tons copper.

Copper Sheets—The base price of copper sheets is 32c. per pound.

Copper Wire—The base price of copper wire, No. 0000 to No. 8, is 27¼@27½c. per pound.

Tin—The visible supply in this market is very small. Spot deliveries are hard to obtain, and are ruling at a premium. Futures are entirely neglected. We quote the market 44@45c.

The foreign market, after being well sustained in the early part of the week, has broken quite sharply on liberal sales for both accounts, and closes unsettled at £189 for spot, £185 for three months.

Exports of tin from the Straits, as reported by cable for April, were 4893 long tons in 1906 and 3729 in 1907; a decrease of 1164 tons. For the four months ended April 30 the total was 19,150 tons in 1906, and 17,298 tons in 1907; a decrease of 1852 tons, or 9.7 per cent.

Lead—The market remains unchanged at 6c. New York.

The market in Europe has been without any special features throughout the week,

and closes at £19 15s. for Spanish lead, £19 17s. 6d. for English.

Spelter—A fair business is doing from day to day at declining prices. Sellers are particularly anxious to place future deliveries, for which there is no ready market. The close is easy at 6.35@6.45 New York, 6.20@6.30c. St. Louis.

The market in London is unchanged at £25 17s. 6d. for good ordinaries, £26 2s. 6d. for specials.

Zinc Sheets—The base price is now \$8.60 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 600-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 pounds.

Antimony—On free offerings of metal, with a demand that is only fair, the market has declined. At the close, quotations are 22½@23c. for Cookson's, 19c. for Hallitt's, and 16½@17½c. for ordinaries.

Nickel—For large lots, New York or other parallel delivery, the chief producer quotes 45@50c. per lb., according to size and terms of order. For small quantities prices are 50@65c., same delivery.

Platinum—The market has fluctuated rather sharply and prices are a little uncertain. The latest quotation is \$31 per ounce for ordinary metal and \$33.50 for hard. Scrap is quoted at \$20@22 per ounce.

Quicksilver—Current prices in New York are \$41 per flask of 75 lb. for large quantities and \$42 for smaller orders. San Francisco orders are \$38@39 per flask, according to quantities, for domestic orders, and \$37@37.50 for export. The London price is £7 per flask, but £6.16s. 3d. is quoted by jobbers.

Missouri Ore Market

Joplin, Mo., May 11—A number of producers have undertaken to head off the tendency among miners to ask for higher wages by laying off the night shifts. This move works three ways. It stops the cry of a shortage of miners, stops the possibility of demands from labor and aids in restricting the output at a time when it exceeds the demands. It is estimated that the output has been reduced 300 tons per month by this move, although only a few mill-owners have adopted it. An effort is being made to have the movement spread as far as possible.

The highest price paid for zinc was \$50 per ton, on a basis of \$45@47 per ton of 60 per cent. zinc; average price, \$45.86. The highest price for lead was \$82 per ton, with medium grades selling at \$77 to \$80; the average price is \$78.68.

Following are the shipments of zinc and lead from the various camps of the district for the week ending May 11:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville.	3,173,200	904,690	\$116,204
Joplin.....	2,291,280	287,520	58,097
Galena-Emplie	1,526,010	132,400	40,328
Alba-Neck City.....	1,590,970	.....	39,978
Duenweg.....	597,490	179,480	21,131
Spurgeon.....	450,670	174,270	16,262
Prosperity.....	450,970	135,800	15,959
Oronogo.....	611,930	2,580	13,689
Badger.....	370,220	.....	11,402
Granby.....	470,000	40,000	9,600
Aurora.....	427,900	13,490	7,882
Baxter Springs.....	65,190	82,840	4,729
Stott City.....	183,620	.....	4,223
Sarcozie.....	112,350	.....	2,584
Sherwood.....	74,130	1,280	1,792
Cave Springs.....	66,210	.....	1,496
Zincite.....	61,520	.....	1,476
Carthage.....	41,050	.....	1,005
Peoria.....	64,790	8,990	998
Carl Junction.....	26,980	7,100	910
Totals.....	12,656,480	1,970,440	\$367,839

19 weeks.....229,417,950 36,077,470 \$6,901,674
 Zinc value, the week, \$290,308; 19 weeks, \$5,419,346
 Lead value, the week, 77,531; 19 weeks, 1,482,328

Average prices for ore in the district, by months, are shown in the following table:

ZINC ORE AT JOPLIN			LEAD ORE AT JOPLIN.		
Month.	1906.	1907.	Month.	1906.	1907.
January ...	47.38	45.84	January ...	75.20	83.53
February ..	47.37	47.11	February ..	72.83	84.58
March	42.68	48.66	March	73.73	82.75
April	44.63	48.24	April	75.13	79.76
May	40.51	.....	May	78.40	.....
June	43.83	.....	June	80.96	.....
July	43.25	.....	July	74.31	.....
August	43.56	.....	August	75.36	.....
September ..	42.58	.....	September ..	79.64	.....
October	41.55	.....	October	79.84	.....
November ..	44.13	.....	November ..	81.96	.....
December ..	43.68	.....	December ..	81.89	.....
Year.....	43.24	.....	Year	77.40	.....

Wisconsin Ore Market

Platteville, Wis., May 11—The record of the past week has been above the average as far as production is concerned. Two strikes in different parts of the district have given promise of an increased production as soon as machinery can be placed on the ground. Weather conditions had somewhat to do with the loading, as did the continued scarcity of cars. The price of 60 per cent. ore was off from last week, ranging from \$47 to \$48. Two separate lots are reported as having been sold at \$50. Lead sold strong at unchanged prices.

The shipment for the district, by camps, for the week ending May 11 is as follows:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	409,800	33,650	.....
Buncombe-Hazel Green..	618,300	.....	.....
Benton.....	378,020	.....	.....
Cuba City.....	308,410	.....	.....
Galena.....	283,200	.....	.....
Linden.....	214,760	.....	.....
Livingston.....	138,000	.....	.....
Mineral Point.....	112,290	.....	46,000
Highland.....	70,000	.....	.....
Rewey.....	62,000	.....	.....
Total for week.....	2,594,780	33,650	46,000
Year to May 11.....	33,622,879	1,451,320	189,160

Producers are not working their mines to the limit, as had been supposed; most of them are running at about their normal capacity.

Chemicals

New York, May 15—The chemical market generally continues active, and in good

condition. There is, however, little that is specially new to report.

Copper Sulphate—The market continues strong and steady, with no material change. Sellers continue to quote \$7.50 per 100 lb. for carload and larger lots; \$7.75 per 100 lb. for smaller parcels.

Nitrate of Soda—There is no change in the market. The demand continues good and prices remain the same. We continue to quote for spot \$2.70 per 100 lb. with 96 per cent. for all positions of 1907 at \$2.50. The price for 95 per cent. is \$2.45 for both 1907 and 1908. Stocks are reported extremely low, and spot nitrate is hard to get.

Mining Stocks

New York, May 15—The general stock markets have been irregular, moving up and down from day to day with no definite tendency apparent. Money has been a little harder; and another cause affecting the markets is found in reports current of damage to crops from late cold weather. Strong speculation in grain has taken something away from stocks. Some large issues of new securities have not been well received by the public, and trading has been largely professional, as for some weeks past.

On the curb market in New York trading in mining stocks has not been active. The market was dull through the week, with buying orders scarce and a downward tendency in prices. Greene-Cananea was among the more active stocks, closing at \$15.50, while Butte Coalition was steady around \$8. Foster Cobalt closed at \$1.25, while Nipissing sold from \$13 down to \$12.25, recovering a fraction.

Boston

May 14—Trading in the mining-share market is at a low ebb and fluctuations have been unimportant the past week. For a spell they drifted downward, but have recovered and closing prices tonight are at, or near, the prices of a week ago.

Amalgamated Copper ran off \$1.62½ to \$93, since touching \$95. Copper Range fell \$2 to \$80.75, recovering to \$83. North Butte fell a little more than this, touching \$89.50, with subsequent recovery to \$92.75. Old Dominion settled \$1 to \$54.25, and rights for the new stock have been quoted from 15 to 12c. Quincy went off \$2.25 to \$130, touching \$132 today. The stock of this company is more widely scattered than ever, there being over 1700 stockholders now.

Calumet & Hecla is up \$10 to \$875. It is now said that there is no possibility of a compromise between Calumet and the Osceola interests and the former will press the matter to a final conclusion. Mohawk slid back \$3 to \$85 on a narrow market. Osceola is off \$3 to \$141, while Tamarack is up \$5 to \$125 on light trad-